REQUEST FOR ADDITIONAL INFORMATION
FAX TOLL FREE 800-837-6805

1. I need additional information:
   - ❑ Please send a 'Temperature Sensor Products' catalog.
   - ❑ Please send a 'Temperature Sensor Products' CD
   - ❑ Please send information on products checked below.
   - ❑ Please have a factory sales engineer contact me.
   - ❑ Please have a field sales engineer contact me.

THERMOCOUPLES
- ❑ Industrial Assemblies, Elements, Protection Tubes
- ❑ MgO Insulated Thermocouples
- ❑ Plastics, Rubber, and Packaging Thermocouples

RTDs
- ❑ General Purpose Assemblies
- ❑ CIP Sanitary Connected RTDs
- ❑ RTD Thermowell Assemblies

ACCESSORIES
- ❑ Connecting Heads
- ❑ Thermocouple Wire and Cable
- ❑ Thermowells

INSTRUMENTS
- ❑ RTD Transmitters
- ❑ Digital Panel Meters
- ❑ Hand Held Pyrometers

2. Please send quotation on the items listed below. *(Provide Pyromation part number, other manufacturers name and part number, a complete description of desired sensor and its operating parameters, or send drawing and complete specifications.)*

QUANTITY **DESCRIPTION or PART NUMBER**

_____ _____

_____ _____

(Please use reverse side, if needed, for additional quotation items or comments.)

3. Our interest in temperature sensors is for:
   - ❑ In-House Use ❑ OEM Applications ❑ Resale or Distribution

Products manufactured, sold, or distributed _____

4. Please complete the following:

_____ _____
Company Name Your Name

_____ _____
Street Address Position

_____ _____
Phone

_____ _____
City State Zip Fax

Pyromation, Inc.

Fax Request Form (side 2)

TOLL FREE FAX (800) 837-6805

QUANTITY **DESCRIPTION or PART NUMBER**

_____ _____

_____

_____ _____

_____

SENSOR SKETCH

_____ Company Name	_____ Your Name
_____ Street Address	_____ Position
_____	_____ Phone
_____ City State Zip	_____ Fax

Comments:_____

_____

_____

1. ***INSIDE SALES CONTACTS for ORDER ENTRY, QUOTATIONS, and PRODUCT INFORMATION***

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9. ***GENERAL ADMINISTRATIVE INFORMATION*** . . . . . ***Pete Wilson***
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10. ***CATALOG and LITERATURE REQUESTS*** . . . . . ***Michelle Honeycutt***
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13. ***BILLING, CREDIT INFORMATION, and ACCOUNTS RECEIVABLE*** . . . . . ***Beth Terry***
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Calibration Ordering Information

Our NVLAP Accredited Metrology Laboratory provides comparison temperature calibrations from (-196 to 1450) °C [-321 to 2642] °F on the International Temperature Scale of 1990 (ITS-90) for temperature sensors and instruments. We conform to the requirements of AMS 2750, ASTM E220, ISO 17025 and ANSI/NCSL Z540-1-1994.

Pyromation' Laboratory managerial staff and technical personnel have documented education, training, technical knowledge and experience for their assigned functions. The environment in which these functions are performed is constantly monitored and controlled with regard to all appropriate conditions and access is strictly defined and controlled.

Our Laboratory equipment includes fluidized baths and tube furnaces, standard platinum resistance thermometers, and types "B" and "S" thermocouples. All standards and calibrations are traceable to the National Institute of Standards and Technology (NIST) or have been derived from accepted values of natural physical constants, or by the ratio of self calibration. Our reports are complete and include as found and as left data when appropriate. All personnel work within a quality management system, described in our Quality Manual PM-525-01.

ORDER CODES

Example Order Numbers:

1	2	3		4		5
CAL	5520	F	-	TD	-	TBL (100)

1	2	3		4
CAL	(32 212 300)	F	-	TD

1 Calibration Code

CODE	DESCRIPTION
CAL	Sensor Calibration - All sensors of that item number will be tested at the specified temperature(s).
LOT	Lot Calibration (BE) - One sample from the beginning and the end of the lot will be tested at the specified temperature(s).
BME	Lot Calibration (BME) - One sample from the beginning, middle, and end of the lot will be tested at the specified temperature(s).
RND(X)	Sample Calibration - Specified number of random sample(s) from the lot will be tested at the specified temperature(s).
LOP	Loop Calibration - One instrument and one sensor will be tested together at the specified temperature(s).

X = Specify number of sensors

2 Common Test Points

CODE	DESCRIPTION								
	°C				°F				Application
5010	-196	0	30		-321	32	86		ITS 4
5020	-40	0	30		-40	32	86		ITS 5
5040		0	30			32	86		ITS 11
5060		0	30	156		32	86	313	ITS 10
5080		0	30	232		32	86	450	ITS 9
5100		0	30	420		32	86	788	ITS 8
5120	-196	0	30	156	-321	32	86	313	ITS 4, 10
5140	-196	0	30	232	-321	32	86	450	ITS 4, 9
5160	-196	0	30	420	-321	32	86	788	ITS 4, 8
5180	-40	0	30	156	-40	32	86	313	ITS 5, 10
5200	-40	0	30	232	-40	32	86	450	ITS 5, 9
5220	-40	0	30	420	-40	32	86	788	ITS 5, 8
5240		0	100	420		32	212	788	CVD
5260	-196	0	100	420	-321	32	212	788	CVD
5280	-40	0	100	420	-40	32	212	788	CVD
5300	-75	0	100	420	-103	32	212	788	CVD
5320		0	100	300		32	212	572	CVD
5340		0	100	200		32	212	392	CVD
5360		0	100	150		32	212	302	CVD
5380		0	50	100		32	122	212	CVD
5520	-196	-40	-5		-321	-40	23		T
5540	-75	-40	-5		-103	-40	23		T
5560	-75	-40	-5		-103	-40	23		T
5580		-40	-5			-40	23		T
5600		25	100			77	212		T
5620		25	100	200		77	212	392	T
5640		25	100	300		77	212	572	T
5660		100	200	200		212	392	572	K, J
5680		100	300	500		212	572	932	J
5700		300	500	700		572	932	1292	K, J
5720	300	500	700	1050	572	932	1292	1922	K
5740		500	700	1050		932	1292	1922	K

3 Temperature Scale

CODE	DESCRIPTION
C	Degrees Celsius
F	Degrees Fahrenheit

4 Tagging Options

Standard tags include report number and date	
CODE	**DESCRIPTION**
TD(X)	Calibration Detail
TI(X)	Stainless Steel Tag
TA(X)	Tag ALL with Beg and End
TG(X)	Tag ALL with Average
TV(X)	Tag ALL with Beg, End, and Average
X=Additional Tag Quantities	

5 Custom Table Options

CODE	DESCRIPTION
TBL	Table in 1 degree increments
TBL(0.1)	Table in 0.1 degree increments
TBL(10)	Table in 10 degree increments
TBL(100)	Table in 100 degree increments
TBL(CVD)	Callendar Van Dusen Coefficients

PAYMENT TERMS: *Net 30 days*

MINIMUM BILLING CHARGE: *$25.00 Net Per Order*

PRICES: *Prices are subject to change without notice. Customer order acknowledgements will reflect current prices.*

SHIPPING CHARGES: *Shipped F.O.B. sellers plant. UPS shipments are prepay and add, as are air shipments unless otherwise requested. Truck shipments are freight collect. Packing and insurance charges are included in the shipping charge.*

PARTIAL SHIPMENTS: *Partial shipments will normally only be made at the customers request, or when unreasonable delay for an entire order would occur due to holding items for complete order shipment. Requests for '***partial shipments***', or requests for '***shipments in full only***', must be clearly marked or stated at the time of order entry.*

DROP SHIPMENTS: *Drop shipments will be made at a customer's request provided that a separate purchase order is issued for each drop shipment, and that the invoice is to be issued to the '***ordering customer***' and not to the '***drop shipment customer***'. Drop shipment orders cannot be combined with other order quantity discounts.*

SHIPMENT DAMAGES: *Damage to shipments beyond the F.O.B. point is the responsibility of the carrier. Shipments should be opened promptly upon receipt and any claim for damage is to be initiated by the purchaser with the carrier. Replacement shipments will be made on a chargeable basis.*

SHIPMENT SHORTAGES: *Each shipment should be examined promptly by the purchaser upon receipt. All claims for loss or shortages must be made to Pyromation within 7 (seven) days of receipt of shipment.*

SHIPPING LENGTHS: *The maximum uncoiled straight length shipment of Pyromation temperature sensors is 264 cm [104 in], if shipped via UPS. Straight lengths over 264 cm [104 in] must be shipped by truck.*

MATERIAL SUBSTITUTION: *Pyromation reserves the right to substitute superior materials of construction without notification. These include, but are not limited to, superior metals and special limits of error thermocouple wire.*

MATERIAL RETURNS: *No returns for credit, warranty repairs, or evaluation will be allowed without prior factory authorization. Contact the factory for a 'Return Authorization' (RA) number, and clearly state what the item is and the reason the return is desired. Provide the factory with the original purchase order number, date ordered, and the invoice number for the item being returned.*

RESTOCKING CHARGES: *Unused and in like-new condition materials returned to Pyromation for credit will be subject to a minimum 20% restocking charge. The actual restocking charge will be determined by the type of material, its resale value, and finally upon our receipt, inspection and evaluation of the material in question.*

BLANKET ORDERS: *Blanket orders will be accepted for a defined quantity of products with scheduled releases for a time period not exceeding one year. Blanket orders will be afforded price protection for 60 days after customer notification of a price change.*

EXPRESS ORDERS: Orders for manufactured products that require delivery earlier than normal delivery schedules provide, can be placed as an express order with either a same day, 24 hour or 72 hour shipping guarantee. Our acceptance of any express order will be dependent upon material availability, the manufacturing complexity of the product, and on the quantity ordered. Actual acceptance of any express order will be determined at the time of order entry, and acceptance will be at the sole discretion of Pyromation, Inc.

1. Express orders may be placed with our Sales Department anytime during normal office hours and can be placed for any reasonable quantity of temperature sensors, or other related products, on either a same day, 24, or a 72 hour customer selected shipping schedule.

2. **Same day express orders** will normally be **shipped** the **same workday** the order is placed.

3. **24 hour express orders** will normally be **shipped** the **next workday** following the date of order entry.

4. **72 hour express orders** will normally be **shipped** on the **third workday** following the date of order entry.

5. Express orders may also be placed for expedited delivery on manufactured products that require Pyromation to order non-stock materials from our vendors. The 24 or 72 hour express order period will begin on the day of our receipt of the ordered materials.

6. Express orders cannot be guaranteed nor deliveries confirmed unless the order is placed via telephone.

7. Express orders that miss scheduled delivery dates will forfeit all customer express charges.

8. Not all cataloged items are available on an express service basis. Consult factory for availability when in doubt.

LIMITED DISCOUNTS: Limited discounts may apply for some sensor assemblies. See individual price pages for discount information.

CALIBRATION: NIST traceable calibration is available for new unused temperature sensor assemblies and for thermocouple wire. Calibrations are limited to temperatures of -196 °C [-321 °F], -75 °C [-103 °F], and between (-40 to 1450) °C [-40 to 2642] °F, and are subject to calibration limitations of element materials and sheaths where applicable. The minimum sensor assembly lengths for calibration is 18" of element or sheath length, and 72" of insulated thermocouple wire. Thermocouple wire is calibrated by making 72" thermocouples from each end of the wire spool and calibrating at the specified temperatures. NIST traceable Report of Calibration results are provided for each calibration order. (Consult factory for calibration of sensors and wire of less than the minimum specified lengths)

WARRANTY: **Thermocouples, assemblies, wire, and related parts are sold by Pyromation, Inc. under the following warranties which extend only to the first buyer of said products as new merchandise directly from Pyromation or from an authorized Pyromation distributor, representative, or reseller.**

These products are warranted to be free from functional defects in materials and workmanship at the time of manufacture and to conform to specifications set forth in relevant Pyromation catalog pages for such products.

Pyromation's sole and exclusive obligation and buyer's sole and exclusive remedy under the above warranty is limited to repair or replacement, at Pyromation's option, free of charge, the products which are reported in writing to Pyromation at its main office - Pyromation, Inc., 5211 Industrial Road, Fort Wayne, IN 46825 - and which, if so advised by Pyromation, are returned to the designated facility during normal business hours, transportation prepaid, and which upon examination by Pyromation are found not to comply with the above warranty.

Pyromation shall not be liable for any expressed or implied warranties beyond the above warranty, nor for any incidental, consequential, special or other damaged, costs or expenses, excepting only the repair or replacement described above. Pyromation makes no warranty of merchantability or fitness for a particular purpose with respect to these products.

THERMOCOUPLES - Thermocouples are the most common, convenient, and versatile devices used to measure temperature. They convert units of heat into useable engineering units that serve as input signals for process controllers and recorders.

A thermocouple consists of a welded 'hot' junction between two dissimilar metals - usually wires - and a reference junction at the opposite ends of the parent materials. Heating the 'hot' junction in the working environment produces a temperature gradient which generates an Electromotive Force (EMF). The EMF appears across the free ends of the thermocouple wires where it is measured and converted into units of heat calibration. Through selection of appropriate thermocouple wires and sheath components, thermocouples are suitable to be used in temperature ranges from (-200 to 2316) °C [-328 to 4200] °F.

RESISTANCE TEMPERATURE DETECTORS - Resistance temperature detectors (RTD) accurately sense temperature with an excellent degree of repeatability and interchangeability of elements. The RTD is composed of certain metallic elements whose change in resistance is a function of temperature. In operation, a small excitation current is passed across the element, and the voltage, which is proportional to resistance, is then measured and converted to units of temperature calibration. The RTD element is manufactured by winding a wire (wire wound elements) or plating a film (thin film elements) on a ceramic or glass core and sealing the element within a ceramic or glass capsule.

Since most RTDs have a low initial resistance, often 100 ohms, and have a small change in resistance per unit of temperature range, the resistance of the lead wire is often compensated for with a three or four wire bridge configuration built into the measuring devices. By selecting the proper elements and protective sheathing, RTDs can operate in a temperature range of (-200 to 650) °C [-328 to 1202] °F.

THERMISTORS - A thermistor is an economical means of precisely sensing heat over a limited range of temperatures. A thermistor is a metal oxide whose change in resistance is typically an inverse function of the change in temperature. An excitation current is passed across the sensor and the voltage, which is proportional to the resistance, is measured and converted to units of heat calibration. Since thermistors usually have a large base resistance and a large change in resistance per unit of temperature change, lead wire length does not generally need to be compensated for. Thermistors can operate across a temperature range of (-40 to 149) °C [-40 to 300] °F by selecting the proper sensor and protective materials.

ADDITIONAL REQUIREMENTS - Other components usually essential in integrating the principles of thermocouple, RTD, and thermistor sensors into a functioning system may include: (1) a protection tube or sheath of a material suitable to protect the sensing element from the environment surrounding the point of measurement, (2) a connecting head and terminal block, or possibly a temperature transmitter, (3) leadwire of the correct material and insulation to connect the temperature sensor and the process instrumentation, and (4) recording or controlling instrumentation and control devices to provide a continuous temperature history of the system and to provide constant or programmed temperature regulation.

Thermocouple Material Specifications

The thermocouple element materials listed below are those most commonly found in process applications. Selection of the proper thermocouple type for a particular application is determined by temperature expectations and by the environment in which the sensor will be placed. The following temperature and application tables are intended to aid in this selection. The thermocouples are listed by ASTM letter designations by thermocouple type.

Letter Designated Thermocouples

TYPE		TEMPERATURE RANGE	APPLICATION INFORMATION
J E230	Iron (+) Copper - 45% Nickel (Constantan) (-)	(0 to 760) °C [32 to 1400] °F	Suitable for vacuum, reducing, or inert atmospheres, oxidizing atmosphere with reduced life. Iron oxidizes rapidly above 538 °C [1000 °F] so only heavy gauge wire is recommended for high temperature. Bare elements should not be exposed to sulphurous atmospheres above 538 °C [1000 °F].
K E230	Nickel - 10% Chromium (+) Nickel - 2% Aluminum, 2% Manganese, 1% Silicon (-)	(0 to 1260) °C [32 to 2300] °F	Recommended for continuous oxidizing or neutral atmospheres. Mostly used above 538 °C [1000 °F]. Subject to failure if exposed to sulphur. Preferential oxidation of chromium in positive leg at certain low oxygen concentrations causes 'green rot' and large negative calibration drifts most serious in the (816 to 1038) °C [1500 to 1900] °F range. Ventilation or inert-sealing of the protection tube can prevent this.
N E230	Nickel - 14% Chromium, 1 1/2% Silicon (+) Nickel - 4 1/2% Silicon - 1/10% Magnesium (-)	(0 to 1260) °C [32 to 2300] °F	Can be used in applications where Type K elements have shorter life and stability problems due to oxidation and the development of 'green rot'.
T E230	Copper (+) Copper - 45% Nickel (Constantan) (-)	(-200 to 370) °C [-328 to 700] °F	Useable in oxidizing, reducing, or inert atmospheres as well as vacuum. Not subject to corrosion in moist atmospheres. Limits of error published for sub-zero temperature ranges.
E E230	Nickel - 10% Chromium (+) Copper - 45% Nickel (Constantan) (-)	(0 to 870) °C [32 to 1600] °F	Recommended for continuously oxidizing or inert atmospheres. Sub-zero limits of error not established. Highest thermoelectric output of common calibrations.
R E230	Platinum - 13% Rhodium (+) Platinum (-)	(538 to 1482) °C [1000 to 2700] °F	Recommended for high temperature. Must be protected with non-metallic protection tube and ceramic insulators. Continued high temperature usages 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 R is used in industry; Type S in the laboratory.
S E230	Platinum - 10% Rhodium (+) Platinum (-)		
B E230	Platinum - 30% Rhodium (+) Platinum - 6% Rhodium (-)	(871 to 1704) °C [1600 to 3100] °F	Same as R & S but output is lower. Also less susceptible to grain growth and drift.
C E230	95% Tungsten - 5% Rhenium (+) 74% Tungsten - 26% Rhenium (-)	(0 to 2315) °C [32 to 4200] °F	Very high temperature applications in inert or vacuum. Preferred over Tungsten/Tungsten-26% Rhenium because it is less brittle at low temperatures.

Non-Letter Designated Thermocouples

TYPE		TEMPERATURE RANGE	APPLICATION INFORMATION
M E1751	Nickel - 18% Molybdenum (+) Nickel - 0.8% Cobalt (-)	(-50 to 1410) °C [-58 to 2570] °F	High temperature applications in inert or vacuum atmosphere. Useful in many hydrogen applications. Continuous cycling causes excessive grain growth
P E1751	Platinel II[1] Platinel 5355 (+) Platinel 7674 (-)	(0 to 1395) °C [32 to 2543] °F	Noble metal combination which approximates Type K curve but has much improved oxidation resistance. Should be treated as any noble metal calibration.

[1] Trademark of Engelhard Corp., Specialty Metals Division

The following tables list the ASTM stated INITIAL thermocouple material tolerances and the INITIAL thermocouple tolerances. The accuracies stated are only for new, cleaned, fully annealed thermocouples prior to their being exposed to elevated temperatures and to detrimental environments. The stated limits of error may not indicate the accuracies of thermocouples in actual service.

Tolerances on Initial Values of EMF vs Temperature for Thermocouples

Reference Junction 0 °C [32 °F]. Published in ASTM E230

TYPE	TEMPERATURE RANGE for STANDARD TOLERANCES	STANDARD TOLERANCES	TEMPERATURE RANGE for SPECIAL TOLERANCES	SPECIAL TOLERANCES
J	(0 to 293) °C [32 to 559] °F (293 to 760) °C [559 to 1400] °F	± 2.2 °C [± 4 °F] ± 0.75%	(0 to 275) °C [32 to 527] °F (275 to 760) °C [527 to 1400] °F	± 1.1 °C [± 2 °F] ± 0.4%
K	(-200 to -110) °C [-328 to -166] °F (-110 to 0) °C [-166 to 32] °F (0 to 293) °C [32 to 559] °F (293 to 1260) °C [559 to 2300] °F	± 2% [1] ± 2.2 °C [± 4 °F][1] ± 2.2 °C [± 4 °F] ± 0.75%	 (0 to 275) °C [32 to 527] °F (275 to 1260) °C [527 to 2300] °F	[2] [2] ± 1.1 °C [± 2 °F] ± 0.4%
N	(0 to 293) °C [32 to 559] °F (293 to 1260) °C [559 to 2300] °F	± 2.2 °C [± 4 °F][1] ± 0.75%	(0 to 275) °C [32 to 527] °F (275 to 1260) °C [527 to 2300] °F	± 1.1 °C [± 2 °F] ± 0.4%
T	(-200 to -67 °C [-328 to -89] °F (-67 to 0) °C [-89 to 32] °F (0 to 133) °C [32 to 271] °F (133 to 370) °C [271 to 700] °F	± 1.5%[1] ± 1 °C [± 1.8 °F][1] ± 1 °C [± 1.8 °F] ± 0.75%	 (0 to 125) °C [32 to 257] °F (125 to 370) °C [257 to 700] °F	[2] [2] ± 0.5 °C [± 0.9 °F] ± 0.4%
E	(-200 to -170) °C [-328 to -274] °F (-170 to 0) °C [-274 to 32] °F (0 to 340) °C [32 to 644] °F (340 to 870) °C [644 to 1600] °F	± 1% [1] ± 1.7 °C [± 3.1 °F][1] ± 1.7 °C [± 3.1 °F] ± 0.5%	 (0 to 250) °C [32 to 482] °F (250 to 870) °C [482 to 1600] °F	[2] [2] ± 1 °C [± 1.8 °F] ± 0.4%
R	(0 to 600) °C [32 to 1112] °F (600 to 1480) °C [1112 to 2642] °F	± 1.5 °C [± 2.7 °F] ± 0.25%	(0 to 600) °C [32 to 1112] °F (600 to 1480) °C [1112 to 2700] °F	± 0.6 °C [± 1.1 °F] ± 0.1%
S	(0 to 600) °C [32 to 1112] °F (600 to 1480) °C [1112 to 2700] °F	± 1.5 °C [± 2.7 °F] ± 0.25%	(0 to 600) °C [32 to 1112] °F (600 to 1450) °C [1112 to 2642] °F	± 0.6 °C [± 1.1 °F] ± 0.1%
B	(870 to 1700) °C [1600 to 3100] °F	± 0.5%	(870 to 1700) °C [1600 to 3100] °F	± 0.25%
C	(0 to 400) °C [32 to 752] °F (400 to 2315) °C [752 to 4200] °F	± 4.4 °C [± 8 °F] ± 1.0%	Not Available	

[1] Thermocouples and thermocouple materials are supplied to meet the limits of error specified for temperatures above 0 °C. A thermocouple material may not conform to the published sub-zero limits of error for that material when purchased, unless conformance is agreed upon by customer and Pyromation when ordering.

[2] Special limits of error for sub-zero temperatures have not yet been established. The following limits for calibrations E and T are useful to start discussion between customer and Pyromation.

(-200 to 0) °C Type E ± 1 °C or ± 0.5%, whichever is greater
Type T ± 0.5 °C or ± 0.8%, whichever is greater

Initial values of tolerance for Type J and Type K thermocouples below 0 °C are not given due to the characteristics of the materials.

Tolerances on Initial Values of EMF vs Temperature for Thermocouples

CODE	MATERIAL	TEMPERATURE RANGE	LIMITS OF ERROR
M	Ni18Mo/Ni	(-50 to 1410) °C [-58 to 2570] °F	± 0.75%
P	Platinel II	(0 to 1395) °C [32 to 4200] °F	± 0.10 mV

Recommended Temperature Limits and Color Codes

Thermocouples must be selected to meet application conditions and only general recommendations of size and type can be given. Selection considerations involve useful length of service life, temperature, atmosphere, and response time. Smaller gauges provide faster response times and less service life. Larger gauges provide longer service life and reduced response times. The recommended temperature limits below are to be used as a guideline in the selection process, and the table is only for thermocouples protected by a suitable protecting tube, sheath, or well. The color coding chart below provides ANSI/ASTM standard color codes found on thermocouple wire, extension wire, and plug and jack connectors.

Suggested Upper Temperature Limits For Protected Industrial Thermocouples

TYPE	MAXIMUM TEMPERATURE						
	8 GAGE	11 GAGE	14 GAGE	20 GAGE	24 GAGE	28 GAGE	30 GAGE
	°C [°F]	°C [°F]	°C [°F]	°C [°F]	°C [°F]	°C [°F]	°C [°F]
T			370 [700]	260 [500]	200 [400]	200 [400]	150 [300]
J	760 [1400]		590 [1100]	480 [900]	370 [700]	370 [700]	320 [600]
E	870 [1600]		650 [1200]	540 [1000]	430 [800]	430 [800]	370 [700]
K, N	1260 [2300]		1090 [2000]	980 [1800]	870 [1600]	870 [1600]	760 [1400]
M		1287 [2250]	1287 [2250]				
R, S					1480 [2700]		
B					1700 [3100]		
C					2330 [4200]		

Thermocouples in conventional closed-end protecting tubes. These limits do not apply to sheathed thermocouples having compacted mineral oxide insulation.

Upper Temperature Limit For Various MgO Insulated Sheath Diameters

SHEATH DIAMETER IN. [mm]	TYPE T	TYPE J	TYPE E	TYPE K, N
	°C [°F]	°C [°F]	°C [°F]	°C [°F]
0.020 [0.5]	260 [500]	260 [500]	300 [570]	700 [1290]
0.032 [0.8]	260 [500]	260 [500]	300 [570]	700 [1290]
0.040 [1.0]	260 [500]	260 [500]	300 [570]	700 [1290]
0.062 [1.6]	260 [500]	440 [825]	510 [950]	920 [1690]
0.093 [2.4]	260 [500]	480 [900]	580 [1075]	1000 [1830]
0.125 [3.2]	315 [600]	520 [970]	650 [1200]	1070 [1960]
0.188 [4.8]	370 [700]	620 [1150]	730 [1350]	1150 [2100]
0.250 [6.3]	370 [700]	720 [1330]	820 [1510]	1150 [2100]
0.375 [9.5]	370 [700]	720 [1330]	820 [1510]	1150 [2100]

This table gives the suggested upper temperature limits for the various thermocouples in several common sheath sizes. It does not take into account environmental temperature limitations of the sheath material itself, nor does it address compatibility considerations between the thermoelement materials and the sheath containing them. Note 2 - The temperature limits given here are intended only as a guide to the user and should not be taken as absolute values nor as guarantees of satisfactory life or performance. These types and sizes are sometimes used at temperatures above the given limits, but usually at the expense of stability, life or both. In other instances, it may be necessary to reduce the given limits in order to achieve adequate service.

Thermocouples Type Color Codes

TYPE	THERMOELEMENT DESIGNATION	MAGNETIC YES	MAGNETIC NO	COLOR CODING			
				SINGLE CONDUCTOR	OVERALL T/C WIRE	OVERALL EXTENSION GRADE WIRE	PLUG & JACK
T	TP (+) TN (-)		X X	Blue Red	Brown	Blue	Blue
J	JP (+) JN (-)	X	 X	White Red	Brown	Black	Black
E	EP (+) EN (-)		X X	Purple Red	Brown	Purple	Purple
K	KP (+) KN (-)	 X	X 	Yellow Red	Brown	Yellow	Yellow
N	NP (+) NN (-)		X X	Orange Red	Brown	Orange	Orange
S	SP (+) SN (-)		X X	Black Red		Green	Green
R	RP (+) RN (-)		X X	Black Red		Green	Green
B	BP (+) BN (-)		X X	Gray Red		Gray	White (Uncompensated)
C	CP (+) CN (-)		X X	Green Red		Red	Red

STANDARD PLATINUM RTD ASSEMBLIES - Pyromation standard RTD assemblies are constructed using either wire wound platinum elements or thin film elements with a reference resistance of 100 ohms at 0 °C, a temperature coefficient 0.003 85 $°C^{-1}$ and are in accordance with the following standards:

1. International Standard, IEC 60751 2. American Standard, ASTM E1137

Other platinum elements and elements of other materials, resistances, and temperature coefficients are available as standard order items. See the 'Standard RTD Material Specification' chart located in this catalog section. Non-listed special sensor elements are also available by consulting with the factory.

RTD ELEMENT TERMINOLOGY

Temperature Coefficient of Resistance: The fractional change in element resistance per change of 1 °C, expressed as Ω/Ω/°C or $\Omega \bullet \Omega^{-1} \bullet °C^{-1}$ or $°C^{-1}$.

Accuracy: A statement of the initial element accuracy as measured at one point only, usually 0 °C [32 °F].

Interchangeability: An expression of the element material tolerance at various temperatures over the sensor range.

Typical 100 OHM Platinum Element Tolerances

TEMPERATURE		CLASS B (0.12%) [1] TOLERANCE ±[0.30 + 0.0050 |t|] °C		BAND 1 (0.1%) [1] TOLERANCE ±[0.26 + 0.0042 |t|] °C		CLASS A (0.06%) [1] TOLERANCE ±[0.15 + 0.0020 |t|] °C		BAND 3 (0.03%) [1] TOLERANCE ±[0.08 + 0.0017 |t|] °C		BAND 5 (0.01%) [2] TOLERANCE ±[0.03 + 0.0017 |t|] °C	
°C	[°F]	°C	[°F]	°C	[°F]	°C	[°F]	°C	[°F]	°C	[°F]
-200	[-328]	1.30	[2.34]	1.10	[1.98]	0.55	[0.99]	0.42	[0.76]	0.37	[0.67]
-100	[-148]	0.80	[1.44]	0.68	[1.22]	0.35	[0.63]	0.25	[0.45]	0.20	[0.36]
0	[32]	0.30	[0.54]	0.26	[0.47]	0.15	[0.27]	0.08	[0.14]	0.03	[0.05]
100	[212]	0.80	[1.44]	0.68	[1.22]	0.35	[0.63]	0.25	[0.45]	0.20	[0.36]
200	[392]	1.30	[2.34]	1.10	[1.98]	0.55	[0.99]	0.42	[0.76]	0.37	[0.67]
300	[572]	1.80	[3.24]	1.52	[2.74]	0.75	[1.35]	0.59	[1.06]	0.54	[0.97]
400	[752]	2.30	[4.14]	1.94	[3.49]	0.95	[1.71]	0.76	[1.37]	0.71	[1.28]
500	[932]	2.80	[5.04]	2.36	[4.25]	1.15	[2.07]	0.93	[1.67]	0.88	[1.58]
600	[1112]	3.30	[5.94]	2.78	[5.00]	1.35	[2.43]	1.10	[1.98]	1.05	[1.89]

where: |t| = value of temperature without regard to sign, °C

[1] The equations represent values for 3 and 4-wire PRTs. Caution must be exercised with 2-wire PRTs due to lead resistance.

[2] This tolerance can only be met with a 4-wire PRT.

Element Types: Single platinum elements of 100 ohms at 0 °C and duplex platinum elements of two 100 ohm sensors inside the same sheath are both available as standard. Consult factory for other duplex style of elements.

Sensor Leadwire: All standard RTD sensor leadwire is stranded, silver or nickel-plated copper with Teflon® or fiberglass insulation. Teflon® insulated leads are rated at 204 °C [400 °F] maximum and fiberglass insulated leads are rated at 482 °C [900 °F] maximum.

Element Connections: RTD sensor assemblies are available with 2, 3, and 4 wire leads. Two wire connected elements do not provide lead resistance compensation for the measuring device. Three and four wire connected elements provide a means for compensating for lead resistance between the sensor and the measuring device.

Temperature Limits:

Low range (L) RTD assemblies are constructed using Teflon® materials and low temperature epoxies to make them resistant to moisture penetration. These units are rated at 204 °C [400 °F] maximum.

High range (H) RTD assemblies are constructed using nickel element leads, MgO insulation, and other materials suitable for maximum temperatures of up to 600 °C [1112 °F].

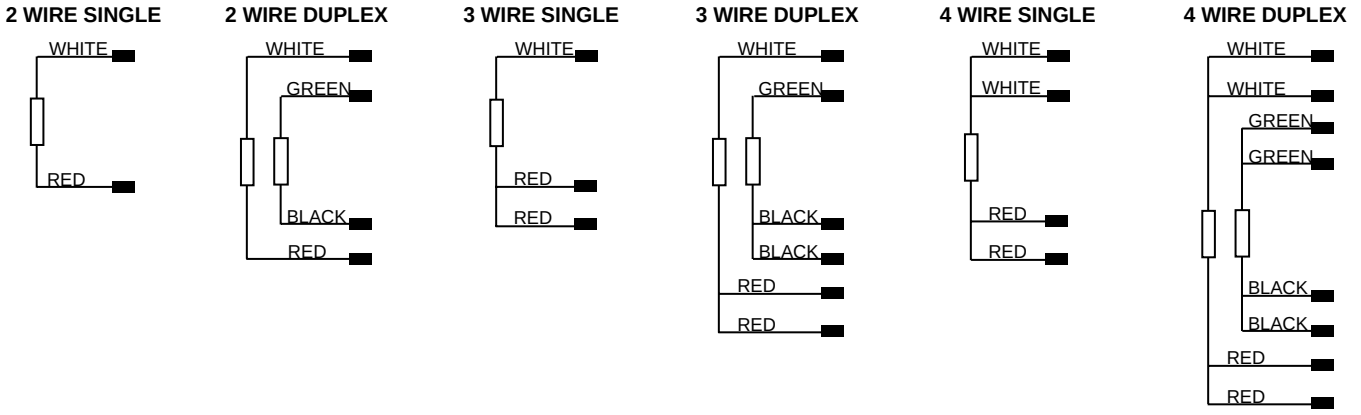
Self-Heating: Self-heating is the rise in the measured temperature caused by the power dissipated in the element. Self-heating error is affected by the thermal conductivity and velocity of the process being measured and is negligible for most applications. The self-heating effect at 25 °C [77 °F] in water flowing at 1 m/s [3 ft/s] on a 3/16" OD stainless steel sheath diameter RTD is 50 mW/ °C typical.

Thermal Response: The time required to sense 63.2% of a step temperature change from (20 to 77) °C [68 to 171] °F in water flowing at 1 m/s [3 ft/s].

Two-Wire: Provides one connection to each end of the element. This construction is suitable where the resistance of the lead wire may be considered as an additive constant in the circuit, and particularly where the changes in lead resistance due to ambient temperature changes may be ignored.

Three-Wire: Provides one connection to one end of the element and two to the other end of the element. Connected to an instrument designed to accept three wire input, sufficient compensation is usually achieved for leadwire resistance and temperature change in leadwire resistance. This is the most commonly used configuration.

Four-Wire: Provides two connections to each end of the element to completely compensate for leadwire resistance and temperature change in leadwire. This configuration is used where highly accurate temperature measurement is vital.



Pyromation Standard RTD Element Specifications

ELEMENT MATERIAL[1]	ELEMENT TYPE	RESISTANCE @ 0 °C	TEMPERATURE COEFFICIENT	OPERATING RANGE[2]	AVAILABLE TOLERANCES @ 0 °C						
					±0.5%	±0.2%	±0.12%	±0.1%	±0.6%	±0.03%	±0.05%
Platinum	Thin Film	100 Ohm	α=0.003 85 $^oC^{-1}$	(-70 to 550) °C [-94 to 1022] °F			X		X		
Platinum	Wire Wound	100 Ohm	α=0.003 85 $^oC^{-1}$	(-200 to 600) °C [-328 to 1112] °F				X		X	X
Platinum	Wire Wound	100 Ohm	α=0.003 92 $^oC^{-1}$	(-200 to 600) °C [-328 to 1112] °F				X		X	
Platinum	Wire Wound	200 Ohm	α=0.003 85 $^oC^{-1}$	(-200 to 600) °C [-328 to 1112] °F				X		X	X
Platinum	Wire Wound	200 Ohm	α=0.003 92 $^oC^{-1}$	(-200 to 600) °C [-328 to 1112] °F				X		X	
Platinum	Thin Film	500 Ohm	α=0.003 85 $^oC^{-1}$	(-70 to 550) °C [-94 to 1022] °F			X				
Platinum	Thin Film	1000 Ohm	α=0.003 85 $^oC^{-1}$	(-70 to 550) °C [-94 to 1022] °F			X				
Copper[3]	Wire Wound	10 Ohm	α=0.004 27 $^oC^{-1}$	(-101 to 204) °C [-150 to 400] °F		X					
Nickel	Wire Wound	120 Ohm	α=0.006 72 $^oC^{-1}$	(-101 to 204) °C [-150 to 400] °F	X						
Nickel-Iron	Wire Wound	604 Ohm	α=0.005 18 $^oC^{-1}$	(-101 to 204) °C [-150 to 400] °F	X						

[1]: Sensing elements of other materials, base values, and temperature coefficients are available upon request.

[2]: Stated operating ranges are typical values and are dependant upon the sensing element, element substrate, and the construction style of the total sensor assembly. Sensor assemblies to exceed the stated limits may be available upon request.

[3]: Base resistance of 10 Ohm Copper RTD is measured at 25 ºC.

Pyromation provides a variety of common tubing, MgO sheath, protection tube, and drilled well materials to protect temperature sensing elements from the environmental conditions typically found in industrial process applications. The following tables are intended as guidelines to aid in the selection of the proper materials for sensors used in different environments. Consult the factory for the availability of other protective materials for specialty applications. NOTE: All chemical compositions and temperature ratings are nominal and are stated as received from suppliers.

MATERIAL CODE INDEX							
METALS						CERAMICS and COMPOSITE MATERIALS	
CODE	MATERIAL	CODE	MATERIAL	CODE	MATERIAL	CODE	MATERIAL
2	Molybdenum	25	Tantalum	37	Alloy 800	12	Metal Ceramic LT-1
3	Alloy 600	26	Titanium	38	Alloy 20	13	Vesuvius
4	310 S.S.	27	Alloy 400	41	HR - 160®	14	Cerite® - II
5	446 S.S.	28	Alloy B	50	Zirconium	15	Cerite® - III
6	Carbon Steel	29	Alloy C -276	59	F22-1	16	Mullite
7	Alloy 601	31	Nickel 200	60	F11-2	17	Alumina®
8	316 S.S.	32	304 LC S.S.	61	A105	18	Silicon Carbide
9[2]	304 S.S.	33	316 LC S.S.	91	F91	19	Hexoloy® SA
11	Cast Iron	35	321 S.S.			71	Recrystallized Silicon Carbide
22	Brass	36	347 S.S.				
23	Copper						
24	Platinum						

Metals

CATALOG MATERIAL CODE	MATERIAL/COMPOSITION	TYPICAL AREAS OF USE				APPLICATION GUIDELINE INFORMATION
		TUBING	MGO SHEATHS	PROT. TUBES	DRILLED WELLS	
2	**MOLYBDENUM** 99.9% min. Molybdenum, 0.03% Tungsten	X	X			Up to 1926 °C [3500 °F] in inert atmospheres, to 1871 °C [3400 °F] in vacuum at 10-4 torr. Has poor mechanical shock resistance after heated to 1038 °C [1900 °F]. Oxidizes in air above 427 °C [800 °F].
3	**ALLOY 600 (UNS N06600)** 72% Nickel, 15% Chromium, 8% Iron	X	X	X	X	Up to 1149 °C [2100 °F] under oxidizing conditions. Reducing conditions reduce maximum temperature to 1038 °C [1900 °F]. Must not be placed in sulfurous atmospheres above 538 °C [1000 °F]. Main areas of application for thermocouple protection are carburizing, annealing and hardening furnaces, Cyanide saltbaths, blast furnace downcomers, open hearth flue stacks, steel soaking pits, waste heat boilers, ore roasters, cement exit flues, incinerators, and glass tank flues. (INCONEL® 600)
4	**310 STAINLESS STEEL (UNS S31000)** 25% Chromium, 20% Nickel	X	X	X	X	Up to 1038 °C [1900 °F] continuous, 1149 °C [2100 °F] intermittent. Mechanical and corrosion resistance similar to and better than 304 stainless steel.
5	**446 STAINLESS STEEL (UNS S44600)** 27% Chromium		X	X	X	Up to 1093 °C [2000 °F] under oxidizing conditions. Excellent high temperature corrosion and oxidizing resistance. Main areas of application are hardening, nitriding, and annealing furnaces, salt baths, molten lead, tin and babbit metal, sulfurous atmospheres. Not for carburizing atmospheres. Other areas are steel soaking pits, tinning pots, waste heat boilers, ore roasters, cement exit flues, boiler tubes to 982 °C [1800 °F], incinerators to 1093 °C [2000 °F], glass flue tanks.
6	**CARBON STEEL**[1]	X		X	X	Up to 538 °C [1000 °F] in non-oxidizing environments. Main areas of usage are galvanizing pots, tinning pots, molten babbit metal, molten mangesium, molten zinc, Petroleum refinery applications such as dewaxing and thermal cracking.
7	**ALLOY 601 (UNS N06601)** 61% Nickel, 23% Chromium, 14% Iron, 1.35% Aluminum		X	X	X	Similar applications to Inconel® 600 but with superior resistance to sulfur, high temperature oxidation resistance to 1260 °C [2300 °F]. (INCONEL® 601)
8	**316 STAINLESS STEEL (UNS S31600)** 16% Chromium, 12% Nickel 2% Molybdenum	X	X	X	X	Up to 927 °C [1700 °F] under oxidizing conditions. Same areas of applications as 304 stainless steel. Has improved resistance to mild acid and pitting corrosion.
9[2]	**304 STAINLESS STEEL (UNS S30400)** 18% Chromium, 8% Nickel	X	X	X	X	Up to 899 °C [1650 °F] under oxidizing conditions. Has general good oxidation and corrosion resistance in a wide range of industrial environments. Subject to carbide precipitation, which can reduce corrosion resistance in the (427 to 538) °C [800 to 1000] °F range. Good mechanical properties from (-184 to 788) °C [-300 to 1450] °F. Main areas of usage for thermocouple protection is in chemicals, foods, plastics and petroleum. Generally regarded as standard protection tube material.

[1] Materials available in various alloys - consult factory
[2] Machined fittings may be supplied as 303 Series stainless steel

Metals

CATALOG MATERIAL CODE	MATERIAL/ COMPOSITION	TYPICAL AREAS OF USE				APPLICATION GUIDELINE INFORMATION
		TUBING	MGO SHEATHS	PROT. TUBES	DRILLED WELLS	
11	**CAST IRON**			X		Up to 704 °C [1300 °F] in oxidizing conditions. Main area of usage is in molten non-ferrous metals, daily whiting is recommended. Can be used to 871 °C [1600 °F] under reducing conditions.
22	**BRASS**[1]	X			X	Up to 538 °C [1000 °F] continuous. Good thermal conductivity and mechanical strength.
23	**COPPER**	X	X Limited Avail.			Up to 260 °C [500 °F] continuous. Excellent thermal conductivity. Poor mechanical strength.
24	**PLATINUM**[1]	X	X			Up to 1374 °C [2500 °F] continuous oxidizing atmospheres. Good thermal conductivity. Used in applications where high temperature but no vacuum or inert atmosphere is available.
25	**TANTALUM**[2]	X	X		X[2]	Up to 2349 °C [4350 °F]. Good resistance to corrosion and quick heat conductivity. Good mechanical strength. Used in chemical processes and high temperatures in vacuum or inert atmosphere.
26	**TITANIUM**	X	X		X	Up to 1260 °C [2300 °F] in inert or vacuum atmosphere. Acid and chemical resistant. Oxidation resistance to 538 °C [1000 °F].
27	**ALLOY 400 (UNS N04400)** 67% Nickel 30% Copper	X	X	X	X	Up to 538 °C [1000 °F] in sulfur-free atmosphere. Excellent resistance to corrosion. Used in chemical processing and food processing equipment. MONEL® 400
28	**ALLOY B (UNS N10001)** 62% Nickel 28% Molybdenum, 5% Iron	X	X Limited Avail.	X	X	Up to 815 °C [1500 °F] in inert or vacuum atmospheres. 538 °C [1000 °F] in air. Has excellent resistance to pitting, to stress-corrosion cracking. Suitable for most chemical processes. Application excellent in hydrochloric acid. (HASTELLOY® B)
29	**ALLOY C-276 (UNS N10276)** 54% Nickel 16% Molybdenum, 15% Chromium	X	X Limited Avail.	X	X	Up to 1038 °C [1900 °F] in oxidizing atmospheres. Exceptional resistance to a wide variety of chemical environments. Withstands wet chlorine gas, hypochlorite and chlorine dioxide. (HASTELLOY® C 276)
31	**NICKEL 200 (UNS N02200)** 99% Nickel		X Limited Avail.		X	Up to 899 °C [1650 °F] in sulfur-free atmospheres. Good corrosion resistance. Used in contact with reducing acids, foods, chemicals caustics, rayon, and plastics.
32	**304 STAINLESS STEEL LOW CARBON (UNS S30403)** 18% Chromium, 8% Nickel	X	X	X	X	Same characteristics as 304 except the low carbon allows corrosion resistant weld areas. Not recommended to be used above 427 °C [800 °F]. (0.03% max. carbon)
33	**316 STAINLESS STEEL LOW CARBON (UNS S31603)** 16% Chromium 12% Nickel 2% Molybdenum	X	X	X	X	Same characteristics as 316 except the low carbon allows corrosion resistant weld areas. Not recommended to be used above 427 °C [800 °F]. (0.03% max. carbon)
35	**321 STAINLESS STEEL (UNS S32100)** 18% Chromium 10% Nickel, Titanium	X	X	X	X	Good corrosion resistance between (482 to 871) °C [900 to 1600] °F. Used where conditions are too severe for low carbon stainless steels.
36	**347 STAINLESS STEEL (UNS S34700)** 18% Chromium, 10% Nickel, Columbium	X	X Limited Avail.		X	Good corrosion resistance between (482 to 871) °C [900 to 1600] °F. Used where conditions are too severe for low carbon stainless steels.
37	**ALLOY 800 (UNS N08800)** 33% Nickel 42% Iron 21% Chromium	X	X Limited Avail.	X	X	Strong resistance to oxidation and carburization at high temperatures. Resists sulfur attack, internal oxidation, and scaling in a wide variety of atmospheres. (INCOLOY® 800)
38	**ALLOY 20 (UNS N08020)** 35% Nickel 35% Iron 20% Chromium Columbium		X Limited Avail.	X	X	Superior resistance to stress-corrosion cracking in boiling 20-40% sulfuric acid. Also used in high octane gas, solvents, explosives, heavy chemicals and agri-chemicals. (CARPENTER® 20Cb-3)
41	**HR - 160® (UNS N12160)** 37% Nickel 30% Cobalt 28% Chromium		X	X		A premier alloy that provides excellent resistance to sulphur, vanadium, chlorines, chlorides, and other salt deposits up to 1204 °C [2200 °F]. A superior material for use in aggressive waste incineration processes.

[1] Materials available in various alloys - consult factory
[2] Generally applied as a well jacket.

Metals

CATALOG MATERIAL CODE	MATERIAL/COMPOSITION	TYPICAL AREAS OF USE				APPLICATION GUIDELINE INFORMATION
		TUBING	MGO SHEATHS	PROT. TUBES	DRILLED WELLS	
50	**ZIRCONIUM (UNS R60702)** 99.2% Zr	X		X	X	Up to 400 °C [752 °F]. Zirconium has a high affinity to oxygen that results in the formation of regenerative protective oxide layer in most media. This oxide layer gives the material chemical resistance and erosive resistance in high velocity applications. Zirconium is resistant to corrosion from most organic and inorganic acids, salts and it is totally resistant to alkalis.
59	**F22 (UNS K21590)** Cr 2.25%, Mo 1%			X	X	Carbon steel alloy typically used in power plant, boiler and turbine applications.
60	**F11 (UNS K11572)** Cr 1.25%, Mo .5%, Si			X	X	Carbon steel alloy typically used in power plant, boiler and turbine applications.
61	**A105** C, Si				X	Carbon steel alloy typically used in power plant, boiler and turbine applications.
91	**F91 (UNS K91560)** Cr 9%, Mo 1%, V			X	X	Chrome Moly alloy typically used in power plant, boiler and turbine applications.

Ceramics and Composite Materials

CATALOG MATERIAL CODE	MATERIAL/ COMPOSITION	TYPICAL AREAS OF USE				APPLICATION GUIDELINE INFORMATION
		TUBING	MGO SHEATHS	PROT. TUBES	DRILLED WELLS	
12	**METAL CERAMIC LT-1** (slip cast composite of chromium and aluminum oxide,) 77% chromium, 23% aluminum oxide			X		Up to 1374 °C [2500 °F] in oxidizing conditions. Main areas of usage are molten copper base alloys to 1149 °C [2100 °F], blast furnace and stack gases to 1316 °C [2400 °F], Sulfur burners to 1093 °C [2000 °F], cement kilns to 1204 °C [2200 °F], chemical process reactors to 1371 °C [2500 °F]. A ceramic primary tube is required when a noble metal thermocouple is used.
13	**VESUVIUS**			X		Up to 927 °C [1700 °F]. For use in aluminum and other non-ferrous metals. Not wetted by molten aluminum and other non-ferrous metals. No contamination. Resists thermal and mechanical shock. Brittle after heating. Handle carefully.
14	**CERITE®-II** (Cast oxide composites)			X		Up to 1093 °C [2000 °F]. For submerged use in aluminum and other non-ferrous metals. Not wetted by molten aluminum and other non-ferrous metals. No contamination. Good thermal and mechanical shock resistance.
15	**CERITE®-III** (Cast oxide composites)			X		Up to 1093 °C [2000 °F]. For submerged use in aluminum and other non-ferrous metals. Not wetted by molten aluminum and other non-ferrous metals. No contamination. Good thermal and mechanical shock resistance.
16	**MULLITE** 63% alumina			X		Up to 1510 °C [2750 °F] when supported. Has poor mechanical shock resistance, good thermal shock resistance. For barium chloride salt baths to 1288 °C [2350 °F]. Should be vertical mounted or supported if horizontal. For high temperature applications of ceramic industry, heat treating, glass manufacture. Impervious to gases at high temperature.
17	**ALUMINA®** (Recrystallized 99.7% AL_2O_3)			X		Up to 1889 °C [3400 °F] when supported. Has only fair resistance to thermal and mechanical shock. Essentially same areas as Mullite including induction melting, vacuum furnaces. Impervious to gases at high temperatures.
18	**SILICON CARBIDE** 90% silicon carbide, 9% silicon dioxide, balance aluminum oxide			X		Up to 1650 °C [3000 °F]. For an outer protection tube with Alumina® or mullite primary tube. For brick and ceramic kilns, steel soaking pits, molten non-ferrous metals. Can withstand direct flame impingement. Fair thermal shock resistance. Approximately 14% porosity.
19	**HEXOLOY® SA** sintered alpha, silicon carbide			X		Up to 1650 °C [3000 °F] in air. High thermal conductivity, excellent wear and abrasion resistance, high thermal shock resistance, and good mechanical strength. Superior chemical resistance in both reducing and oxidizing environments. Attacked by Halides, fused caustics, and ferrous metals.
71	**RECRYSTALLIZED SILICON CARBIDE** (Halsic R) 99% silicon			X		Up to 1600 °C [2912 °F] in oxidizing atmosphere, and 2000 °C [3632 °F] in a vacuum atmosphere. Used as a outer protection tube in hot stack emissions, combustion chambers, chemical reactors, and incineration of medical, municipal, and industrial waste. Can withstand direct flame impingement, has excellent thermal shock characteristics, and excellent corrosion resistance. A ceramic inner tube is required when used with noble metal thermocouples.

CORROSIVE SERVICE GUIDE TO MATERIALS FOR SHEATHS and THERMOWELLS

Refer to A.S.M.E. Boiler Code, Section VIII for allowable stress levels

(Teflon® coated thermowells and/or Teflon® sheaths may be substituted for all corrosive agents listed)

CORROSIVE AGENT	TEMP °C	TEMP °F	CONC %	RECOM. MATERIAL	CORROSIVE AGENT	TEMP °C	TEMP °F	CONC %	RECOM. MATERIAL
Acetic Acid (Glacial)	199	[390]	ALL	316 SS	Chlorine (Gas)	93	[200]	ALL	Monel
Acetic Acid	143	[290]	80%	Hast. C		199	[390]	ALL	316 SS[1]
	199	[390]	50%	316 SS	Chlorine (Gas - Moist)	66	[150]	ALL	Hast C
	143	[290]	80%	Carp. 20[1]	Chloroacetic Acid	182	[360]	ALL	Hast. B
Acetic Anhydride	132	[270]	ALL	Hast. C	Chloroform	93	[200]	ALL	Nickel
	199	[390]	ALL	316 SS[1]		93	[200]	ALL	Carp. 20[1]
Acetone	199	[390]	ALL	316 SS	Chromic Acid	93	[200]	50%	Titanium
Acetylene	199	[390]	ALL	304 SS		93	[200]	50%	Hast. C[1]
Alcohol, Ethyl	93	[200]	ALL	Hast. C	Citric Acid	127	[260]	ALL	Hast. C
	199	[390]	ALL	316 SS[1]		93	[200]	ALL	Carp. 20[1]
Aluminum Chloride (Aqueous)	143	[290]	ALL	Hast. B	Copper Chloride	88	[190]	ALL	Titanium
	143	[290]	ALL	Nickel[1]		88	[190]	ALL	Hast. C[1]
Aluminum Nitrate (Saturated)	93	[200]	ALL	446 SS	Copper Nitrate	149	[300]	ALL	304 SS
	88	[190]	ALL	316 SS[1]	Copper Sulfate	93	[200]	ALL	Hast. C
Aluminum Sulfate (Saturated)	93	[200]	ALL	Titanium		199	[390]	ALL	316 SS[1]
	93	[200]	ALL	316 SS[1]	Corn Oil	238	[460]	ALL	TFE
Ammonia (Anhydrous)	293	[560]	ALL	316 SS		193	[380]	ALL	FEP
Ammonia (Gas)	93	[200]	ALL	304 SS		171	[340]	ALL	316 SS[1]
Ammonium Chloride	88	[190]	ALL	Titanium	Crude Oil	93	[200]	ALL	304 SS
	293	[560]	ALL	Nickel[1]	Cyanogen Gas	238	[460]	ALL	TFE
	71	[160]	50%	Nickel		193	[380]	ALL	FEP
Ammonium Hydroxide	27	[80]	ALL	Steel		171	[340]	ALL	316 SS[1]
	82	[180]	ALL	Steel[1]	Ether	88	[190]	ALL	304 SS
Ammonium Nitrate	93	[200]	ALL	Carp. 20	Ethyl Acetate	93	[200]	ALL	Titanium
Ammonium Sulfate	93	[200]	SAT.	Hast. B		199	[390]	ALL	316 SS[1]
	143	[290]	SAT.	304 SS[1]	Ethyl Chloride (Dry)	293	[560]	ALL	316 SS
	93	[200]	10 - 40%	Titanium	Ethylene Glycol	93	[200]	ALL	Carp. 20
	199	[390]	10 - 40%	316 SS[1]		93	[200]	ALL	304 SS[1]
Amyl Acetate	143	[290]	ALL	304 SS	Ethylene Oxide	21	[70]	ALL	Hast. C
Aniline	254	[490]	ALL	304 SS		199	[390]	ALL	316 SS[1]
Barium Chloride (Saturated)	93	[200]	ALL	Hast. C	Fatty Acids	199	[390]	ALL	316 SS
	293	[560]	ALL	Inconel[1]	Ferric Chloride	143	[290]	ALL	Titanium
Barium Hydroxide (Saturated)	104	[220]	50%	Carp. 20		27	[80]	ALL	Hast. C[1]
	199	[390]	ALL	316 SS[1]	Ferric Sulfate	49	[120]	ALL	Carp. 20
Beer	88	[190]		304 SS		88	[190]	10%	316 SS
Benzene (Benzol)	104	[220]	ALL	Carp. 20	Ferrous Sulfate	27	[80]		Titanium
	104	[220]	ALL	304 SS[1]		93	[200]	ALL	304 SS[1]
Benzoic Acid	199	[390]	ALL	Titanium	Formaldehyde	49	[120]	ALL	304 SS
	199	[390]	ALL	304 SS[1]		49-293	[120-560]	50%	304 SS[1]
Black Liquor	238	[460]	ALL	TFE	Formic Acid (Anhydrous)	93	[200]	50%	Carp. 20
	193	[380]	ALL	FEP	Freon (F-11)	204	[400]	ALL	Monel
	93	[200]	ALL	Carp. 20[1]		204	[400]	ALL	316 SS[1]
Bleach (Active Chlorine)	60	[140]	12.5%	Hast. C	Furfural	199	[390]	ALL	Nickel
Borax	199	[390]	ALL	316 SS		199	[390]	ALL	304 SS[1]
Boric Acid	293	[560]	ALL	Hast. C	Gallic Acid	238	[460]	ALL	TFE
	93	[200]	ALL	Nickel[1]		193	[380]	ALL	FEP
Brine Acid	60	[140]	ALL	Hast. C		199	[390]	ALL	316 SS[1]
	27	[80]	ALL	Brass[1]	Gasoline (Unleaded)	154	[310]	ALL	Hast. C
Bromine (Liquid)	293	[560]	ALL	Tantalum		16	[60]		446 SS
	93	[200]	ALL	Aluminum[1]		171	[340]		Steel[1]
Butane	171	[340]	ALL	Steel		238	[460]		TFE
Butyl Acetate	93	[200]	ALL	Titanium	Gasoline (Refined)	193	[380]		FEP
	188	[370]	ALL	316 SS[1]		88	[190]		Steel[1]
Butyl Alcohol	199	[390]	ALL	316 SS		27	[80]	ALL	Nickel
Butyric Acid	143	[290]	ALL	Carp. 20	Glucose	193	[380]	ALL	316 SS[1]
	199	[390]	ALL	316 SS[1]		27	[80]	ALL	Hast. B
Calcium Bisulfite	93	[200]	ALL	TFE	Glue	60	[140]	ALL	Steel[1]
	193	[380]	ALL	FEP		127	[260]	ALL	304 SS
	171	[340]	ALL	316 SS[1]	Glycerine	88	[190]	50%	Titanium
Calcium Chlorate	238	[460]	ALL	TFE	Hydrobromic Acid	121	[250]	50%	Hast. B[1]
	193	[380]	ALL	FEP		60	[140]	38%	Hast. B
	93	[200]	ALL	316 SS[1]	Hydrochloric Acid	238	[460]	ALL	TFE
Calcium Chloride (Saturated)	171	[340]	ALL	Hast. C	Hydrocyanic Acid	193	[380]	ALL	FEP
	93	[200]	ALL	Carp. 20[1]		171	[340]	ALL	316 SS[1]
Calcium Hydroxide	93	[200]	50%	Hast. C		238	[460]	ALL	TFE
	88	[190]	SAT.	304 SS[1]	Hydroflouric Acid	193	[380]	ALL	FEP
Carbonic Acid	293	[560]	ALL	Carp. 20		93	[200]	ALL	Hast. C[1]
	171	[340]	ALL	316 SS[1]		293	[560]	ALL	Carp. 20
Carbon Dioxide (Dry)	427	[800]	ALL	Brass	Hydrogen Chloride (Gas, Dry)	38	[100]	ALL	304 SS
Carbonated Beverages	100	[212]	ALL	304 SS	Hydrogen Flouride (Dry)	199	[390]	ALL	304 SS[1]
Carbon Disulfide	93	[200]	ALL	Titanium		88	[190]	90%	Hast. C
	199	[390]	ALL	316 SS[1]	Hydrogen Peroxide	71	[160]	ALL	316 SS
Carbon Tetrachloride	93	[200]	ALL	304 SS	Hydrogen Sulfide (Dry)	293	[560]	ALL	316 SS

All materials listed are rated < 2 Mils penetration/Year except as noted: [1] = < 20 Mils penetration/Year

CORROSIVE SERVICE GUIDE TO MATERIALS FOR SHEATHS and THERMOWELLS

Refer to A.S.M.E. Boiler Code, Section VIII for allowable stress levels

(Teflon coated thermowells and/or Teflon sheaths may be substituted for all corrosive agents listed)

CORROSIVE AGENT	TEMP °C	TEMP °F	CONC %	RECOM. MATERIAL	CORROSIVE AGENT	TEMP °C	TEMP °F	CONC %	RECOM. MATERIAL
Iodine	83	[190]	ALL	Hast. C	Sea Water (Cavitation)				316 SS
	21	[70]	ALL	Nickel	Soap Solutions	16	[60]	ALL	446 SS
Kerosene	238	[460]	ALL	TFE		54	[130]	ALL	Nickel[1]
	193	[380]	ALL	FEP	Sodium Bicarbonate	171	[340]	20%	316 SS
	171	[340]		Steel[1]	Sodium Bisulfite	71	[160]	10%	316 SS
Ketones	32	[90]	ALL	Hast. C		93	[200]	10 - 40%	Carp. 20
	127	[260]	ALL	316 SS[1]	Sodium Carbonate	93	[200]	30%	Carp. 20
Lactic Acid	154	[310]	ALL	Titanium		293	[560]	10-100%	Hast. B[1]
	116	[240]	ALL	Hast. B[1]	Sodium Chloride	27	[80]	30%	Nickel
Lime (Sulfur)	238	[460]	ALL	TFE	Sodium Flouride	71	[160]	ALL	Monel
	193	[380]	ALL	FEP		77	[170]	ALL	Carp. 20[1]
	154	[310]	ALL	316 SS[1]	Sodium Hydroxide	104	[220]	ALL	Monel
Linseed Oil	60	[140]	ALL	Carp. 20		71	[160]	ALL	316 SS[1]
	27	[80]	ALL	Steel[1]	Sodium Nitrate	171	[340]	60%	316 SS
Magnesium Chloride	143	[290]	ALL	Nickel	Sodium Nitrite	93	[200]	Saturated	Titanium
	88	[190]	50%	Carp. 20[1]		93	[200]	40%	304 SS[1]
Magnesium Hydroxide	93	[200]	ALL	304 SS	Sodium Peroxide	16	[60]	10%	446 SS
Magnesium Sulfate	93	[200]	60%	Nickel		171	[340]	10%	316 SS[1]
	171	[340]	ALL	316 SS[1]	Sodium Phosphate Acid	93	[200]	ALL	Titanium
Mercuric Chloride	143	[290]	ALL	Tantalum		93	[200]	ALL	304 SS[1]
	77	[170]	10%	Hast. C[1]	Sodium Silicate	27	[80]	ALL	446 SS[1]
Mercury	293	[560]	ALL	304 SS		166	[330]	ALL	316 SS[1]
Methyl Chloride (Dry)	171	[340]	ALL	316 SS	Sodium Sulfate	199	[390]	ALL	316 SS
Methylene Chloride	93	[200]	ALL	Carp. 20	Sodium Sulfide	238	[460]	50%	TFE
Milk	93	[200]		304 SS		193	[380]	50%	FEP
Naphtha	16	[60]	ALL	446 SS		93	[200]	50%	316 SS[1]
	116	[240]	ALL	304 SS[1]	Sodium Sulfite	93	[200]	10%	304 SS
Natural Gas	238	[460]		TFE	Sodium Thiosulfate	16	[60]	25%	446 SS
	193	[380]		FEP		116	[240]	ALL	316 SS[1]
	43	[110]		Steel[1]	Steam (Low Pressure)				Inconel
Nickel Chloride	93	[200]	80%	Hast. C					304 SS[1]
Nickel Sulfate	82	[180]	10%	Tantalum	(Medium Pressure)				Nickel
	93	[200]	ALL	304 SS[1]					304 SS[1]
Nitric Acid	21	[70]	ALL	304 SS	(High Pressure)				316 SS[1]
	93	[200]	40%	304 SS	Sulfur	293	[560]	ALL	304 SS
Nitrobenzene	143	[290]	ALL	Carp. 20		871	[1600]	ALL	Alloy 556
	171	[340]	ALL	316 SS[1]	Sulfur Chloride (Dry)	32	[90]	ALL	Tantalum
Oleic Acid	138	[280]	ALL	316 SS		293	[560]	ALL	Nickel[1]
Oleum	49	[120]	40%	Hast. C	Sulfur Dioxide (Dry)	49	[120]	ALL	Steel
	116	[240]	ALL	316 SS[1]		293	[560]	ALL	316 SS[1]
Oxalic Acid	93	[200]	ALL	Tantalum	Sulfur Trioxide (Dry)	238	[460]	ALL	TFE
	93	[200]	ALL	Carp. 20[1]		193	[380]	ALL	FEP
Oxygen	271	[520]	ALL	Tantalum		293	[560]	ALL	304 SS[1]
	16	[60]	ALL	446 SS	Sulfuric Acid	38	[100]	100%	Carp. 20
	171	[340]	ALL	316 SS[1]		121	[250]	60%	Hast. B
Palmitic Acid	238	[460]	ALL	TFE	Sulfurous Acid	71	[160]	ALL	Titanium
	193	[380]	ALL	FEP		177	[350]	ALL	Carp. 20[1]
	199	[390]	ALL	304 SS[1]	Tannic Acid	93	[200]	10 - 20%	Titanium
Phenol (Carbolic Acid)	293	[560]	ALL	316 SS		93	[200]	ALL	304 SS[1]
Phosphoric Acid	93	[200]	50-85%	Hast. C	Tartaric Acid	199	[390]	ALL	304 SS
Phosphoric	43	[110]	50-85%	Carp. 20	Titanium Tetrachloride	27	[80]	ALL	Carp. 20
	171	[340]	ALL	316 SS		138	[280]	ALL	Titanium
Phosphoric Solutions	27	[80]	ALL	Titanium	Toluene (Toluol)	171	[340]	ALL	Steel
Picric Acid	21	[70]	ALL	Aluminum		93	[200]	ALL	304 SS
	199	[390]	ALL	316 SS[1]	Trichloroacetic Acid	238	[460]	ALL	TFE
Potassium Bromide	93	[200]	30%	Titanium		193	[380]	ALL	FEP
	93	[200]	30%	446 SS		93	[200]	ALL	Hast. C[1]
Potassium Carbonate	93	[200]	50%	304 SS	Trichloroethylene	71	[160]	ALL	Inconel
Potassium Chlorate	171	[340]	30%	316 SS	Turpentine	88	[190]	ALL	304 SS
Potassium Hydroxide	93	[200]	50%	Nickel	Whiskey and Wine			ALL	304 SS
Potassium Nitrate	171	[340]	80%	Aluminum	Xylene (Xylol)	88	[190]	ALL	446 SS
	277	[530]	80%	446 SS[1]	Zinc Chloride	82	[180]	to 70%	Titanium
Potassium Permanganate	21	[70]	20%	Hast C.		293	[560]	ALL	Hast. B[1]
	171	[340]	20%	316 SS[1]	Zinc Sulfate	93	[200]	SAT.	316 SS
Potassium Sulfate	171	[340]	10%	316 SS					
Propane	60	[140]	ALL	446 SS					
	27	[80]	ALL	Brass					
Pyrogallic Acid	27	[80]	ALL	Copper					
	171	[340]	ALL	316 SS[1]					
Salicylic Acid	116	[240]	ALL	Hast. C					
	171	[340]	ALL	316 SS[1]					
Sea Water (Stagnant)				Monel					

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All materials listed are rated < 2 Mils penetration/Year except as noted: [1] = < 20 Mils penetration/Year

Fahrenheit and Celsius Conversion Chart

Read known temperature in bold face type. Corresponding temperature in degree Fahrenheit will be found in column to the right. Corresponding temperature in degree Celsius will be found in column to the left.

INTERPOLATION FACTORS

°C		°F	°C		°F
0.56	1	1.8	3.33	6	10.8
1.11	2	3.6	3.89	7	12.6
1.67	3	5.4	4.44	8	14.4
2.22	4	7.2	5.00	9	16.2
2.78	5	9.0	5.56	10	18.0

TEMPERATURE CONVERSION FORMULA

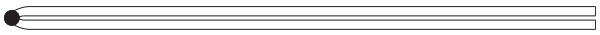
°C = (°F - 32) ÷ 1.8

°F = (°C x 1.8) + 32

0 to 100						100 to 1000						1000 to 2000						2000 to 3000					
°C		°F	°C		°F	°C		°F	°C		°F	°C		°F	°C		°F	°C		°F	°C		°F
-17.8	0	32.	10.0	50	122.0	38	100	212	260	500	932	538	1000	1832	816	1500	2732	1093	2000	3632	1371	2500	4532
-17.8	1	33.8	10.6	51	123.8	43	110	230	266	510	950	543	1010	1850	821	1510	2750	1099	2010	3650	1377	2510	4550
-16.7	2	35.6	11.1	52	125.6	49	120	248	271	520	968	549	1020	1868	827	1520	2768	1104	2020	3668	1382	2520	4568
-16.1	3	37.4	11.7	53	127.4	54	130	266	277	530	986	554	1030	1886	832	1530	2786	1110	2030	3686	1388	2530	4586
-15.6	4	39.2	12.2	54	129.2	60	140	284	282	540	1004	560	1040	1904	838	1540	2804	1116	2040	3704	1393	2540	4604
-15.0	5	41.0	12.8	55	131.0	66	150	302	288	550	1022	566	1050	1922	843	1550	2822	1121	2050	3722	1399	2550	4622
-14.4	6	42.8	13.3	56	132.8	71	160	320	293	560	1040	571	1060	1940	849	1560	2840	1127	2060	3740	1404	2560	4640
-13.9	7	44.6	13.9	57	134.6	77	170	338	299	570	1058	577	1070	1958	854	1570	2858	1132	2070	3758	1410	2570	4658
-13.3	8	46.4	14.4	58	136.4	82	180	356	304	580	1076	582	1080	1976	860	1580	2876	1138	2080	3776	1416	2580	4676
-12.8	9	48.2	15.0	59	138.2	88	190	374	310	590	1094	588	1090	1994	866	1590	2894	1143	2090	3794	1421	2590	4694
-12.2	10	50.0	15.6	60	140.0	93	200	392	316	600	1112	593	1100	2012	871	1600	2912	1149	2100	3812	1427	2600	4712
-11.7	11	51.8	16.1	61	141.8	99	210	410	321	610	1130	599	1110	2030	877	1610	2930	1154	2110	3830	1432	2610	4730
-11.1	12	53.6	16.7	62	143.6	100	212	413	327	620	1148	604	1120	2048	882	1620	2948	1160	2120	3848	1438	2620	4748
-10.6	13	55.4	17.2	63	145.4	104	220	428	332	630	1166	610	1130	2066	888	1630	2966	1166	2130	3866	1443	2630	4766
-10.0	14	57.2	17.8	64	147.2	110	230	446	338	640	1184	616	1140	2084	893	1640	2984	1171	2140	3884	1449	2640	4784
-9.44	15	59.0	18.3	65	149.0	116	240	464	343	650	1202	621	1150	2102	899	1650	3002	1177	2150	3902	1454	2650	4802
-8.89	16	60.8	18.9	66	150.8	121	250	482	349	660	1220	627	1160	2120	904	1660	3020	1182	2160	3920	1460	2660	4820
-8.33	17	62.6	19.4	67	152.6	127	260	500	354	670	1238	632	1170	2138	910	1670	3038	1188	2170	3938	1466	2670	4838
-7.78	18	64.4	20.0	68	154.4	132	270	518	360	680	1256	638	1180	2156	916	1680	3056	1193	2180	3956	1471	2680	4856
-7.22	19	66.2	20.6	69	156.2	138	280	536	366	690	1274	643	1190	2174	921	1690	3074	1199	2190	3974	1477	2690	4874
-6.67	20	68.0	21.1	70	158.0	143	290	554	371	700	1292	649	1200	2192	927	1700	3092	1204	2200	3992	1482	2700	4892
-6.11	21	69.8	21.7	71	159.8	149	300	572	377	710	1310	654	1210	2210	932	1710	3110	1210	2210	4010	1488	2710	4910
-5.56	22	71.6	22.2	72	161.6	154	310	590	382	720	1328	660	1220	2228	938	1720	3128	1216	2220	4028	1493	2720	4928
-5.00	23	73.4	22.8	73	163.4	160	320	608	388	730	1346	666	1230	2246	943	1730	3146	1221	2230	4046	1499	2730	4946
-4.44	24	75.2	23.3	74	165.2	166	330	626	393	740	1364	671	1240	2264	949	1740	3164	1227	2240	4064	1504	2740	4964
-3.89	25	77.0	23.9	75	167.0	171	340	644	399	750	1382	677	1250	2282	954	1750	3182	1232	2250	4082	1510	2750	4982
-3.33	26	78.8	24.4	76	168.8	177	350	662	404	760	1400	682	1260	2300	960	1760	3200	1238	2260	4100	1516	2760	5000
-2.78	27	80.6	25.0	77	170.6	182	360	680	410	770	1418	688	1270	2318	966	1770	3218	1243	2270	4118	1521	2770	5018
-2.22	28	82.4	25.6	78	172.4	188	370	698	416	780	1436	693	1280	2336	971	1780	3236	1249	2280	4136	1527	2780	5036
-1.67	29	84.2	26.1	79	174.2	193	380	716	421	790	1454	699	1290	2354	977	1790	3254	1254	2290	4154	1532	2790	5054
-1.11	30	86.0	26.7	80	176.0	199	390	734	427	800	1472	704	1300	2372	982	1800	3272	1260	2300	4172	1538	2800	5072
-0.56	31	87.8	27.2	81	177.8	204	400	752	432	810	1490	710	1310	2390	988	1810	3290	1266	2310	4190	1543	2810	5090
0	32	89.6	27.8	82	179.6	210	410	770	438	820	1508	716	1320	2408	993	1820	3308	1271	2320	4208	1549	2820	5108
0.56	33	91.4	28.3	83	181.4	216	420	788	443	830	1526	721	1330	2426	999	1830	3326	1277	2330	4226	1554	2830	5126
1.11	34	93.2	28.9	84	183.2	221	430	806	449	840	1544	727	1340	2444	1004	1840	3344	1282	2340	4244	1560	2840	5144
1.67	35	95.0	29.4	85	185.0	227	440	824	454	850	1562	732	1350	2462	1010	1850	3362	1288	2350	4262	1566	2850	5162
2.22	36	96.8	30.0	86	186.8	232	450	842	460	860	1580	738	1360	2480	1016	1860	3380	1293	2360	4280	1571	2860	5180
2.78	37	98.6	30.6	87	188.6	238	460	860	466	870	1598	743	1370	2498	1021	1870	3398	1299	2370	4298	1577	2870	5198
3.33	38	100.4	31.1	88	190.4	243	470	878	471	880	1616	749	1380	2516	1027	1880	3416	1304	2380	4316	1582	2880	5216
3.89	39	102.2	31.7	89	192.2	249	480	896	477	890	1634	754	1390	2534	1032	1890	3434	1310	2390	4334	1588	2890	5234
4.44	40	104.0	32.2	90	194.0	254	490	914	482	900	1652	760	1400	2552	1038	1900	3452	1316	2400	4352	1593	2900	5252
5.00	41	105.8	32.8	91	195.8				488	910	1670	766	1410	2570	1043	1910	3470	1321	2410	4370	1599	2910	5270
5.56	42	107.6	33.3	92	197.6				493	920	1688	771	1420	2588	1049	1920	3488	1327	2420	4388	1604	2920	5288
6.11	43	109.4	33.9	93	199.4				499	930	1706	777	1430	2606	1054	1930	3506	1332	2430	4406	1610	2930	5306
6.67	44	111.2	34.4	94	201.2				504	940	1724	782	1440	2624	1060	1940	3524	1338	2440	4424	1616	2940	5324
7.22	45	113.0	35.0	95	203.0				510	950	1742	788	1450	2642	1066	1950	3542	1343	2450	4442	1621	2950	5342
7.78	46	114.8	35.6	96	204.8				516	960	1760	793	1460	2660	1071	1960	3560	1349	2460	4460	1627	2960	5360
8.33	47	116.6	36.1	97	206.6				521	970	1778	799	1470	2678	1077	1970	3578	1354	2470	4478	1632	2970	5378
8.89	48	118.4	36.7	98	208.4				527	980	1796	804	1480	2696	1082	1980	3596	1360	2480	4496	1638	2980	5396
9.44	49	120.2	37.2	99	210.2				532	990	1814	810	1490	2714	1088	1990	3614	1366	2490	4514	1643	2990	5414
			37.8	100	212.0				538	1000	1832				1093	2000	3632				1649	3000	5432

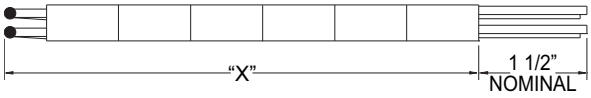
The straight base metal thermocouple elements illustrated on this catalog page are replacement elements for use in Pyromation's complete industrial thermocouple assemblies as found elsewhere in this catalog section. These replacement elements are also compatible for use in other manufacturers' thermocouple assemblies. These thermocouples are available as bare wire or ceramic insulated elements, with options as listed below, and with special construction designs.

BARE ELEMENT

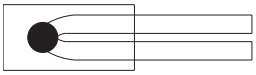


INSULATED ELEMENT

DUPLEX INSULATED

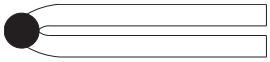


INSULATED JUNCTION



TWIST WELD

TIG WELD



ORDER CODES

Example Order Number:

1	2		3		4
K8	C	M	- 24	-	1,341

1 Single Straight Element Type

CODE (Type + Wire Gauge)				DESCRIPTION
J8	J11	J14	J20	Iron - Constantan
K8	K11	K14	K20	Chromel - Alumel
N8		N14		Nicrosil - Nisil
DUPLEX STRAIGHT ELEMENTS				
Use thermocouple type code letter twice. Example: JJ14 or KK11. Dual elements with ceramic insulators are supplied as two single elements.				

2 Element Insulation

CODE	DESCRIPTION	WIRE GAUGE	INSULATOR DIMENSIONS (inches)	
			SINGLE	***DUPLEX***
O	Bare Element		None Used	
C	Oval Ceramic	8 Ga.	0.500 x 0.281	
		11 Ga.	0.375 x 0.218	
		14 Ga.	0.313 x 0.188	
R	Round Ceramic	8 Ga.	0.465 OD	0.500 OD
		11 Ga.	0.465 OD	0.500 OD
		14 Ga.	0.250 OD	0.320 OD
		20 Ga.	0.150 OD	0.188 OD
The above insulated elements are supplied with refractory insulators: 1277 °C [2330 °F] maximum temperature.				
Element Options				
CODE	**DESCRIPTION**			
M	Special limits wire - types J and K (consult factory for other types)			

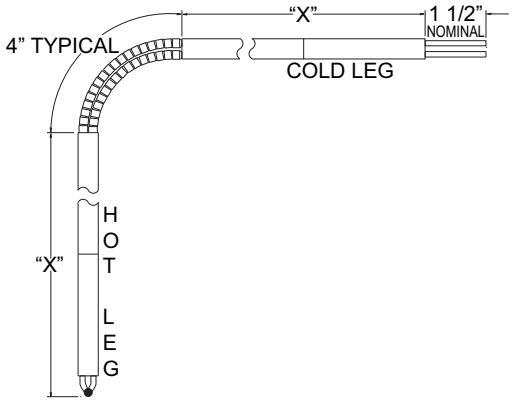
4 Element Options

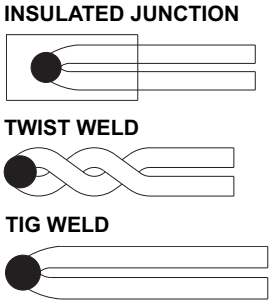
CODE	DESCRIPTION
0	Standard weld as noted below
1	Twist and tig weld (not available with 8 gauge duplex)
2	Tig weld without twist
L	Insulated hot junction
341	Single terminal block on element
342	Duplex terminal block on element
Unless specified by option numbers above, all 8, 11, and 14 gauge elements will be provided with Opt. 2 (tig weld without twist). 20 gauge elements will be provided with Opt. 1 (twist and tig weld). All elements, regardless of gauge, over 96" will be supplied with Option 1 (twist and tig weld).	

3 Element "X" Length

LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	
Specify other lengths in 1 inch increments.	
Actual cut length will be 1(1/2)" longer than specified length to allow for terminal connections.	

The angle base metal thermocouple elements illustrated on this catalog page are replacement elements for use in Pyromation's complete angle thermocouple assemblies as found elsewhere in this catalog section. These replacement elements are also compatible for use in other manufacturers' angle thermocouple assemblies. These thermocouples are available with the options listed below and with special construction designs. These replacement elements are shipped in a straight configuration and are to be bent at the time of installation.





ORDER CODES

Example Order Number: **K8 | A - 12 - 18 - 1, L, 341**

(1) (2) (3) (4) (5)

1 Single Angle Element Type

CODE (Type + Wire Gauge)			DESCRIPTION
J8	J11	J14	Iron - Constantan
K8	K11	K14	Chromel - Alumel
N8		N14	Nicrosil - Nisil
DUPLEX ANGLE ELEMENTS			
Requires the use of 2 single elements.			

2 Element Insulation

CODE	INSULATOR DESCRIPTION	WIRE GAUGE	INSULATOR DIMENSIONS (inches)
			SINGLE
A	Two hole oval ceramic insulators on hot and cold legs. Ball and socket insulators at bend	8 Ga.	0.500 x 0.281
		11 Ga.	0.500 x 0.286
		14 Ga.	0.375 x 0.218
The above insulated elements are supplied with refractory insulators: 1277 ºC [2330 ºF] maximum temperature.			

Element Options

CODE	DESCRIPTION
M	Special limits wire - types J and K (consult factory for other types)

3 Hot Leg "X" Length

LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	Specify Other Lengths

4 Cold Leg "X" Length

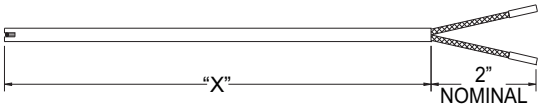
LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	
Specify other lengths in 1 inch increments.	
Actual cut length will be 1(1/2)" longer than specified length to allow for terminal connections.	

5 Element Options

CODE	DESCRIPTION
0	Standard weld as noted below
1	Twist and tig weld
2	Tig weld without twist
L	Insulated hot junction
341	Single terminal block on element
342	Duplex terminal block on element
Unless specified by option numbers above, all 8, 11, and 14 gauge elements will be provided with Opt. 2 (tig weld without twist).	
All elements, regardless of gauge, over 96" will be supplied with Option 1 (twist and tig weld).	

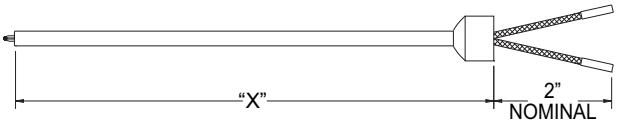
The noble metal platinum thermocouple elements illustrated on this catalog page are replacement elements for use in Pyromation's complete high temperature industrial thermocouple assemblies as found elsewhere in this catalog section. These replacement elements are also compatible for use in other manufacturers' high temperature thermocouple assemblies. All insulated elements are supplied with high temperature alumina insulators and are available with the options as listed below. Element types R, S, and B are supplied with a fusion weld. Custom designed constructions are available.

INSULATED ELEMENT without COLLAR
(supplied with recessed junction as standard)



Note: Elements supplied without collars are intended to be used with ceramic tubes that are not supplied with hex fittings.

INSULATED ELEMENT with COLLAR



Note: Elements supplied with collars are intended to be used with ceramic tubes with hex fittings.

ORDER CODES

Example Order Number:

1	2		3		4
R24	R	-	18	-	3

1 Single Straight Element Type

CODE (Type + Wire Gauge)		DESCRIPTION
R24	R26	Platinum - Platinum 13% Rhodium
S24	S26	Platinum - Platinum 10% Rhodium
B24		Platinum - 30% Rhodium - Platinum 6% Rhodium
DUPLEX STRAIGHT ELEMENTS		
Use thermocouple type code letter twice. EXAMPLES: RR24 or SS26		

2 Element Insulation

CODE	INSULATOR DESCRIPTION	WIRE GAUGE	INSULATOR DIMENSIONS (inches)
			SINGLE and DUPLEX
O	Uninsulated Bare Element		None
R	Round, 99.7% Alumina Insulator (4-hole, single and duplex) 1871 ˚C [3400 ˚F] maximum temp.	24	0.188 OD w 0.535 OD Collar
		26	0.188 OD w 0.535 OD Collar
Element Options			
CODE	**DESCRIPTION**		
M	Reference grade (consult factory for other types)		

3 Element "X" Length

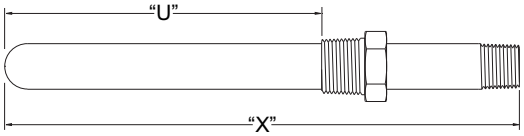
LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	
Specify other lengths in 1 inch increments.	

4 Element Options

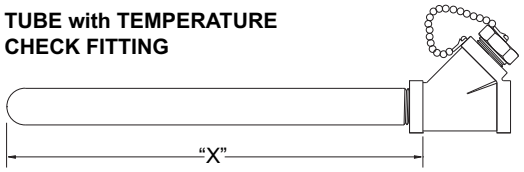
CODE	DESCRIPTION
3	Supplied without ceramic collar
L	Recessed insulated hot junction

The thermocouple protection tubes illustrated on this catalog page are replacement tubes for Pyromation's complete thermocouple assemblies as found elsewhere in this catalog section. They are compatible replacements for other manufacturers' protection tubes. The materials of construction are those most commonly used in general purpose industrial process heating applications. These protection tubes are available with the options as listed below, with other pipe schedule sizes, and they can be supplied with custom designed constructions. **Note: Welded bushings will be welded at maximum length possible when X and U dimensions are specified as the same length. Actual U dimension will be 1 to 2 inches shorter than specified depending on bushing size.**

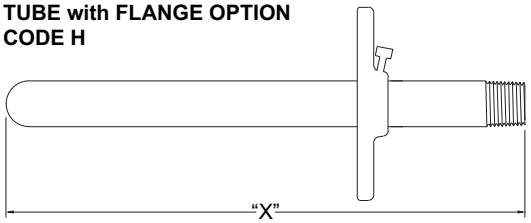
TUBE with OPTIONAL WELDED BUSHING



TUBE with TEMPERATURE CHECK FITTING



TUBE with FLANGE OPTION CODE H



ORDER CODES

Example Order Number: 1: **8-50** - 2: **18** - 3: **8D16**

1 Protection Tube NPT Connections

CODE	NPT SIZE (inches)	PIPE SCHED.[1]
CARBON STEEL 538 ºC [1000 ˚F] Max.		
6 - 25	1/4	40
6 - 50	1/2	40
6 - 75	3/4	40
6 - 100	1	40
316 SS 927 ºC [1700 ˚F] Max.		
8 - 25	1/4	40
8 - 50	1/2	40
8 - 75	3/4	40
8 - 100	1	40
446 SS 1093 ºC [2000 ˚F] Max.		
5 - 50	1/2	40
5 - 75	3/4	40
INCONEL 600 1149 ºC [2100 ˚F] Max.		
3 - 50	1/2	40
3 - 75	3/4	40
INCONEL 601 1260 ºC [2300 ˚F] Max.		
7 - 50	1/2	40
7 - 75	3/4	40
7 - 100	1	40

[1] Schedule 80 and 160 are available in some alloys as special order items.
Consult factory for price and delivery.

2 Tube "X" Length

LENGTH (inches)
12
18
24
30
36
Specify other lengths in 1 inch increments.

3 Protection Tube Options

CODE	DESCRIPTION
A	Open end tube (closed end standard)
H	Adjustable steel mounting flange
NT	Supplied without threads
6Y	Steel temperature check fitting

Optional Welded Bushings

CODE		DESCRIPTION
STEEL	*316 SS*	BUSHING SIZE (inches)
6C(U)	8C(U)	1/2 NPT Bushing (25 tubes only)
6D(U)	8D(U)	3/4 NPT Bushing (25 and 50 tubes only)
6E(U)	8E(U)	1 NPT Bushing (25, 50, and 75 tubes only)
6F(U)	8F(U)	1(1/4) NPT Bushing
6G(U)	8G(U)	1(1/2) NPT Bushing

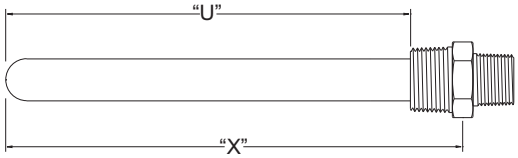
Substitute insertion length, in inches, measured from hot tip to bottom of bushing for (U) above. Insert NW in place of insertion length (U) for bushing supplied loose on tube.

Metal Alloy Tube Dimensions

PIPE SIZE (inches)	OD (inches)	SCH. 40 ID (inches)	SCH. 80 ID (inches)	SCH. 160 ID (inches)
1/4	0.540	0.364	0.302	
1/2	0.840	0.622	0.546	0.466
3/4	1.050	0.824	0.742	0.612
1	1.315	1.049	0.957	0.815

The protection tubes listed below are designed for use in high temperature corrosive service applications. The Series 41 protection tubes are used in waste incineration, cement and lime kilns, utility and recovery boilers, fluidized bed combustion systems, and other harsh process environments when high levels of sulphur, chlorides, ash, and salt deposits are commonly found. The Series 12 protection tubes are also excellent choices for use in waste incineration, immersion into molten copper, brass, basic steels and slag, and for use in open hearth furnaces, soaking pits, and blast furnace applications. **Note: Welded bushings will be welded at maximum length possible when X and U dimensions are specified as the same length. Actual U dimension will be 1 to 2 inches shorter than specified depending on bushing size.**

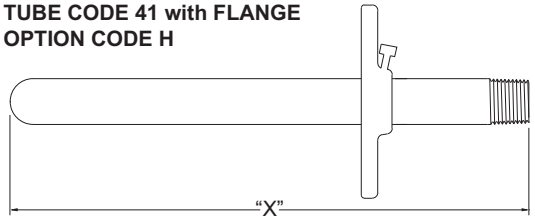
TUBECODE 12 (see note below)



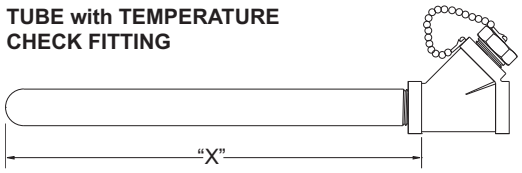
Note: Series 12 tubes "U" dimensions are fixed at approximately 1" less than specified "X" length.

1" x 3/4" Steel Hex Fitting Standard. No optional welded bushings are necessary.

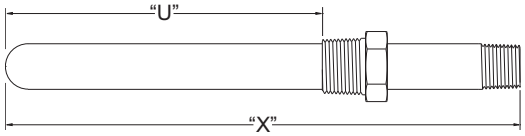
TUBE CODE 41 with FLANGE OPTION CODE H



TUBE with TEMPERATURE CHECK FITTING



TUBE CODE 41 with OPTIONAL BUSHING



ORDER CODES

Example Order Number: 1 **41-75** - 2 **18** - 3 **8E16**

1 Protection Tube NPT Connections

CODE	NPT SIZE (inches)	PIPE SCHED.
HR-160 1204 ºC [2200 ˚F] Max.		
41-50	1/2	40
41-75	3/4	40
41-100	1	40
LT-1 1371 ºC [2500 ˚F] Max.		
12-75	n/a	0.875" OD 0.625" ID

2 Tube "X" Length

LENGTH (inches)
12
18
24
30
36
Specify other lengths in 1 inch increments.

3 Protection Tube Options

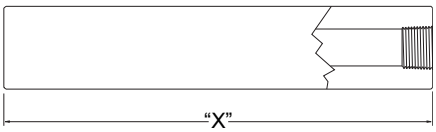
CODE	DESCRIPTION
H	Adjustable steel mounting flange
NT	Supplied without threads
6Y	Steel temperature check fitting

Optional Welded Bushings For Series 41

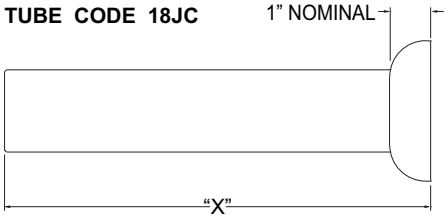
CODE		DESCRIPTION
STEEL	*316 SS*	**BUSHING SIZE (inches)**
6D(U)	8D(U)	3/4 NPT Bushing (50 tubes only)
6E(U)	8E(U)	1 NPT Bushing (50 and 75 tubes only)
6F(U)	8F(U)	1(1/4) NPT Bushing
6G(U)	8G(U)	1(1/2) NPT Bushing
Substitute insertion length, in inches, measured from hot tip to bottom of bushing for (U) above. Insert NW in place of insertion length (U) for bushing supplied loose on tube.		

The Series 11, 13, and 14 protection tubes are used to protect thermocouple elements in molten aluminum and zinc applications such as diecasting, melting, smelting, and high temperature holding furnace environments. Series 18 Silicon Carbide protection tube can also be used in the above applications, however the Series 18 is a refractory silicate bonded tube and generally will not provide a service life equal to silicon nitride bonded silicon carbide protection tubes. The Series 18 is satistactory for use in other molten metals, molten glass, and other high temperature applications. Series 13, 14, and 18 protection tubes should be preheated and slowly immersed into any molten materials.

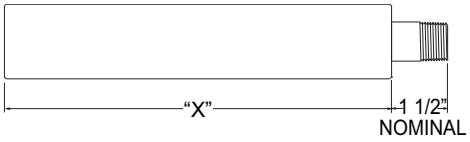
TUBE CODE 11



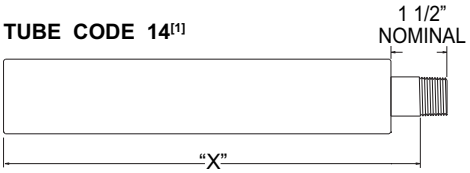
TUBE CODE 18JC



TUBE CODE 13



TUBE CODE 14[1]



[1] Refractory length is 1" shorter than specified length

ORDER CODES

Example Order Number: **11-75 - 24**

1 Protection Tube NPT Connections

CODE	DESCRIPTION	NPT SIZE (inches)	TUBE		MAX. LENGTH (inches)
			OD (inches)	ID (inches)	
CAST IRON 871 ºC [1600 ºF] Max.					
11 - 75	Internally threaded	3/4	1.625	0.875	72
VESUVIUS 927 ºC [1700 ºF] Max.					
13 - 75		3/4	2.00	0.824	48
SILICON CARBIDE 1649 ºC [3000 ºF] Max.					
18J	Plain tube w/o collar	None	1.75	1.00	48
18JC	3" OD collar	None	1.75	1.00	48
CERITE® 815 ºC [1300 ºF] (36" maximum "X" length)					
14-50[1]	Cerite® II	1/2	2.00	0.622	36

[1] For Cerite® protection tubes supplied with 316SS pipe instead of a carbon steel pipe, change model number prefix code 14 to 148. EXAMPLE: 148-50-24

2 Tube "X" Length

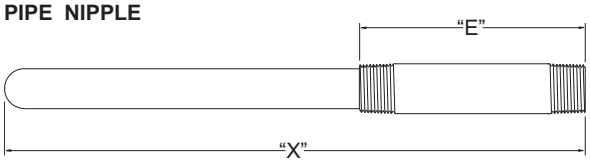
LENGTH (inches)
12
18
24
30
36
42
48

Recommended Applications

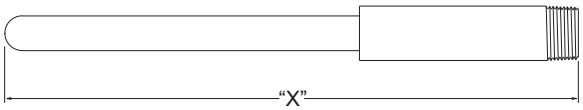
CAST IRON	Aluminum
VESUVIUS	Aluminum
SILICON CARBIDE (Silicate Bonded)	Aluminum (see comments above for Series 18 Tube), molten ferrous and non-ferrous metals, glass processing, kilns, incinerators, and other high temperature processes
CERITE®	Aluminum, Zinc

The thermocouple protection tubes illustrated on this catalog page are replacement tubes for Pyromation's complete ceramic protection tube thermocouple assemblies as found elsewhere in this catalog section, and they are compatible replacements for other manufacturers' protection tubes. The Series 16 mullite tubes are composed of 63% alumina, and have slightly more porosity than the Series 17 alumina tube composed of 99.7% alumina, which is considered to be more gas tight.

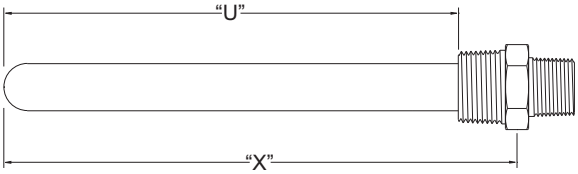
PIPE NIPPLE



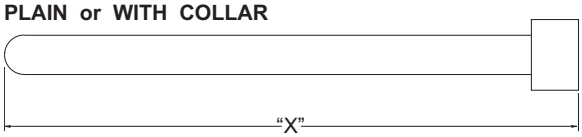
BRASS FERRULE for OPEN STYLE HEAD or NT OPTION



HEX FITTING



PLAIN or WITH COLLAR



ORDER CODES

Example Order Number: 1 **17A4** - 2 **18** - 3 **8**

1 Ceramic Protection Tube Materials - Sizes - Fittings

TUBE MATERIAL CODE		TUBE SIZE		COLLAR or FITTING STYLE and DESCRIPTION	FITTING TYPE - SIZE	
MULLITE 1482 ºC [2700 ºF]	*ALUMINA 1871 ºC [3400 ºF]*	ID (inches)	OD (inches)		PROCESS THREAD (inches)	TERM. THREAD (inches)
16AH	17AH	1/4	3/8	Steel hex fitting	1/2 NPT	1/2 NPT
16A1	17A1	1/4	3/8	Steel close nipple	1/2 NPT	1/2 NPT
16A(E)	17A(E)	1/4	3/8	Specify "E length" steel nipple	1/2 NPT	1/2 NPT
16AF	17AF	1/4	3/8	7/8" OD x 2" L brass ferrule for open head	None	7/8 x 27 UNS
16A	17A	1/4	3/8	Plain tube	None	None
16AC	N/A	1/4	3/8	Tube with 5/8" OD x 1/2" L collar	None	None
16BH	17BH	7/16	11/16	Steel hex fitting	3/4 NPT	1/2 NPT
16B1	17B1	7/16	11/16	Steel close nipple	3/4 NPT	3/4 NPT
16B(E)	17B(E)	7/16	11/16	Specify "E length" steel nipple	3/4 NPT	3/4 NPT
16BF	17BF	7/16	11/16	7/8" OD x 2" L brass ferrule for open head	None	7/8 x 27 UNS
16B	17B	7/16	11/16	Plain tube	None	None
16BC	N/A	7/16	11/16	Tube with 1" OD x 1/2" L collar	None	None
16CH	17CH	1/2	3/4	Steel hex fitting	3/4 NPT	1/2 NPT
16C1	17C1	1/2	3/4	Steel close nipple	3/4 NPT	3/4 NPT
16C(E)	17C(E)	1/2	3/4	Specify "E length" steel nipple	3/4 NPT	3/4 NPT
16C	17C	1/2	3/4	Plain tube	None	None
16CC	N/A	1/2	3/4	Tube w/1(1/8)" OD x 1/2" L collar	None	None
16WH	17WH	5/8	7/8	Steel hex fitting	1 NPT	3/4 NPT
16W1	17W1	5/8	7/8	Steel close nipple	1 NPT	1 NPT
16W(E)	17W(E)	5/8	7/8	Specify "E length" steel nipple	1 NPT	1 NPT
16W	17W	5/8	7/8	Plain tube	None	None
16EH	17EH	1	1(1/4)	Steel hex fitting	1(1/4) NPT	1 NPT
16E1	17E1	1	1(1/4)	Steel close nipple	1(1/4) NPT	1(1/4) NPT
16E(E)	17E(E)	1	1(1/4)	Specify "E length" steel nipple	1(1/4) NPT	1(1/4) NPT
16E	17E	1	1(1/4)	Plain tube	None	None

3 Options

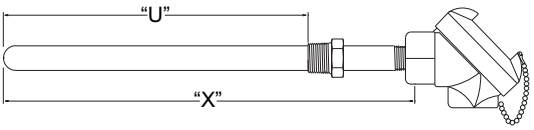
CODE	DESCRIPTION
8	316 SS nipple or hex tube fitting
NT	No process mtg. threads on pipe nipples

2 Tube "X" Length

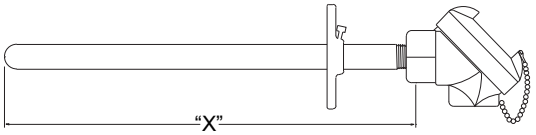
LENGTH (inches)
12
18
24
30
36
Specify other lengths in 1 inch increments.

The straight base metal thermocouple assemblies illustrated on this page are those most commonly used in medium to high temperature low corrosion industrial process heating applications. All listed assemblies are provided with schedule 40 protection tubes, and are available with listed options. Heavier pipe schedule protection tubes and special construction designs are also available. **Note: Welded bushings will be welded at maximum length possible when X and U dimensions are specified as the same length. Actual U dimension will be 1 to 2 inches shorter than specified depending on bushing size.**

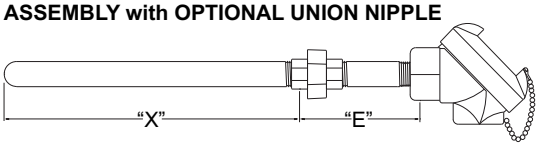
ASSEMBLY with WELDED BUSHING



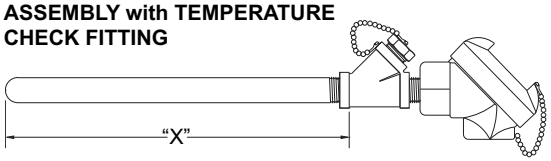
ASSEMBLY with OPTIONAL FLANGE



ASSEMBLY with OPTIONAL UNION NIPPLE



ASSEMBLY with TEMPERATURE CHECK FITTING



ORDER CODES

Example Order Number:

1		2	3		4		5		6
K8C	-	7	- 50	-	24	-	6E20	-	34

1 Thermocouple Type + Wire Gauge Size

CODE		
J8C J11C J14C	K8C K11C K14C	N8C N14C
Thermocouples of 8 ga. wire require minimum of 1/2" NPT tube		
DUPLEX T/C ASSEMBLIES		
For duplex assemblies use the T/C type code letter twice. Example: K8C - 7 - 75 becomes KK8C - 7 - 75		

2 Protection Tube Material 3 NPT Thread Size

CODE	MATERIAL	CODE (inches)			
		1/4	1/2	3/4	1
6	*CARBON STEEL*	25	50	75	100
8	*316 SS*	25	50	75	100
5	*446 SS*		50	75	100
3	*INCONEL 600*		50	75	
7	*INCONEL 601*		50	75	100

4 Tube "X" Length

LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	
Specify other lengths in 1 inch increments.	

Duplex 8, 11, and 14 ga. assemblies require a minimum 1/2" NPT protection tube size (size codes 50 and larger).

8 gauge duplex thermocouple elements supplied in 1/2" NPT protection tubes will be supplied with round insulators.

5 Optional Welded Bushings

CODE		DESCRIPTION
STEEL	*316SS*	**BUSHING SIZE (inches)**
6C(U)	8C(U)	1/2 NPT Bushing (25 tubes only)
6D(U)	8D(U)	3/4 NPT Bushing (25 and 50 tubes only)
6E(U)	8E(U)	1 NPT Bushing (25, 50 and 75 tubes only)
6F(U)	8F(U)	1(1/4) NPT Bushing
6G(U)	8G(U)	1(1/2) NPT Bushing
Substitute insertion length, in inches, measured from hot tip to bottom of bushing for (U) above. Insert NW in place of insertion length (U) for bushing supplied loose on tube.		
Optional Union and Nipple Head Connection		
STEEL	*316 SS*	Union-nipple supplied as material specified
6PU(E)[1]	8PU(E)[1]	
[1] Insert extension length, in inches, for (E) above.		

6 Head Terminations

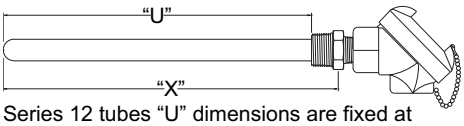
CODE	DESCRIPTION
31	Aluminum screw cover head
34	Cast iron screw cover head
49	Flip top aluminum head
71[1]	Cast iron aluminum explosion proof head
81[1]	316L SS explosion proof head
91[1]	316L SS head
[1] Not available with 1" NPT protection tubes.	

6-1 Assembly Options

CODE	DESCRIPTION
GS	Ground screw
H	Adjustable steel mounting flange
I	Stainless tag
6Y	Steel temperature check fitting
L	Insulated hot junction

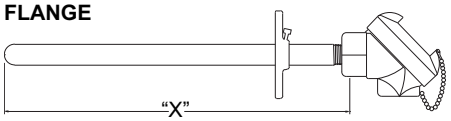
The straight base metal thermocouple assemblies illustrated on this page are typically used in high temperature and highly corrosive applications commonly found in waste incinerators, cement and lime kilns, utility and waste recovery boilers, and other severe process environments. Special construction designs are also available. **Note: Welded bushings will be welded at maximum length possible when X and U dimensions are specified as the same length. Actual U dimension will be 1 to 2 inches shorter than specified depending on bushing size.**

SERIES 12 ASSEMBLY with 1" STEEL HEX FITTING STD.

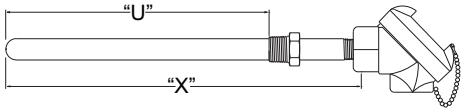


Series 12 tubes "U" dimensions are fixed at approximately 1" less than specified "X" length

SERIES 41 ASSEMBLY with OPTIONAL FLANGE



ASSEMBLY with WELDED BUSHING



ORDER CODES

Example Order Number: **K8C - 41-75 - 24 - 6E20 - 34, I**

(1) (2) (3) (4) (5) (5-1)

1 Thermocouple Type + Wire Gauge Size

CODE	
K8C	N8C
DUPLEX T/C ASSEMBLIES	
For duplex assemblies use the T/C type code letter twice. Example: K8C - 41 - 75 becomes KK8C - 41 - 75 8 gauge duplex thermocouple elements supplied in 41-50 and 12-75 protection tubes will be supplied with round insulators.	

2 Protection Tube Material NPT Connection

CODE	NPT SIZE (inches)	PIPE SCHED.
HR - 160		
41 - 50	1/2	40
41 - 75	3/4	40
41 - 100	1	40
LT - 1		
12 - 75	3/4	0.875" OD 0.625" ID

3 Tube "X" Length

LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	
Specify other lengths in 1 inch increments.	

4 Optional Welded Bushings

CODE		DESCRIPTION
STEEL	*316SS*	**BUSHING SIZE (inches)**
6D(U)	8D(U)	3/4 NPT Bushing (25 and 50 tubes only)
6E(U)	8E(U)	1 NPT Bushing (50 and 75 tubes only)
6F(U)	8F(U)	1(1/4) NPT Bushing
6G(U)	8G(U)	1(1/2) NPT Bushing
Substitute insertion length, in inches, measured from hot tip to bottom of bushing for (U) above. Insert NW in place of insertion length (U) for bushing supplied loose on tube.		
Optional Union and Nipple Head Connection		
STEEL	*316 SS*	Union-nipple supplied as material specified
6PU(E)	8PU(E)	
Insert extension length, in inches, for (E) above.		

5 Head Terminations

CODE	DESCRIPTION
31	Aluminum screw cover head
34	Cast iron screw cover head
49	Flip top aluminum head
71[1]	Cast iron aluminum explosion proof head
81[1]	316L SS explosion proof head
91[1]	316L SS head
[1] Not available with 1" NPT protection tubes.	

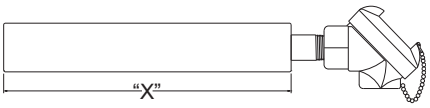
5-1 Assembly Options

CODE	DESCRIPTION
GS	Ground screw
H	Adjustable steel mounting flange
I	Stainless tag
6Y	Steel temperature check fitting
L	Insulated hot junction

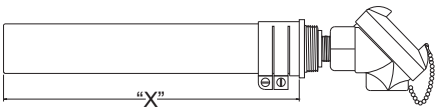
Configuration Code ID12
Thermocouple Assemblies with Protection Tubes for Molten Aluminum

The Series 11, 13 and 14 assemblies are used to protect thermocouple elements in molten aluminum and zinc applications such as diecasting, melting, smelting and high temperature holding furnace environments. The Series 18 silicon carbide assembly can also be used in the above mentioned applications, however the Series 18 is a refractory silicate bonded tube and generally will not provide a service life equal to silicon nitride bonded silicon carbide assemblies. The Series 18 is satisfactory for use in other molten metals, molten glass, and other high temperature applications. Series 13, 14, and 18 assemblies should be preheated and slowly immersed into any molten materials.

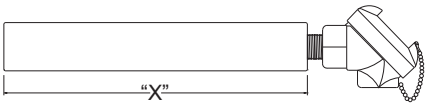
SERIES 13 PROTECTION TUBE ASSEMBLIES FIG. 1



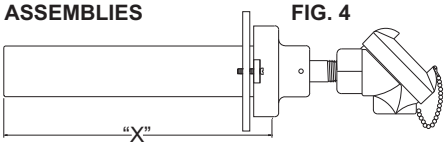
SERIES 18J PROTECTION TUBE ASSEMBLIES FIG. 2



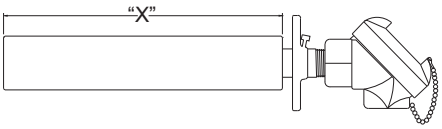
SERIES 11 PROTECTION TUBE ASSEMBLIES FIG. 3



SERIES 18JC PROTECTION TUBE ASSEMBLIES FIG. 4



CERITE®II 14 PROTECTION TUBE ASSEMBLY FIG. 5



ORDER CODES

Example Order Number:

1		2		3		4	4-1
K8C	-	13-75	-	24	-	31,	H

1 Thermocouple Type + Wire Gauge Size

CODE	
K8C	N8C
DUPLEX T/C ASSEMBLIES	
For duplex assemblies use the T/C type code letter twice. Example: K8C - 13 - 75 becomes KK8C - 13 - 75.	
For additional types and sizes consult factory.	

2 Protection Tube Material

CODE	FIGURE NUMBER
CAST IRON	
11-75	3
VESUVIUS	
13-75	1
SILICON CARBIDE	
18J-75	2
18JC-75	4
CERITE® II	
14-50[1]	5
[1] For protection tubes supplied with a 316SS pipe instead of a carbon steel pipe, change order number 14 to 148. EXAMPLE: K8C-148-50-24-31	

Protection Tube Dimensions

CODE	ID x OD (inches)
11	0.875 x 1.625
13	0.824 x 2.00
18J	1.00 x 1.75
18JC	1.00 x 1.75
14	0.622 x 2.00

3 Tube "X" Length

LENGTH (inches)	LENGTH (inches)
12	36
18	42[1]
24	48[1]
30	
Consult factory for other lengths.	
[1] 42 & 48 not available in 14 Series tubes.	

4 Head Terminations

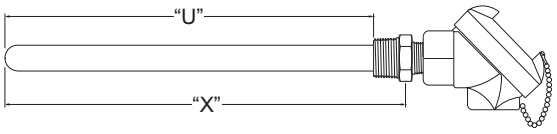
CODE	DESCRIPTION
31	Aluminum screw cover head
34	Cast iron screw cover head
49	Flip top aluminum head
91	316L SS head

4-1 Assembly Options

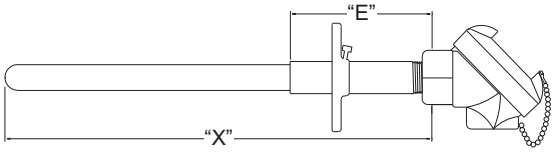
CODE	DESCRIPTION
GS	Ground screw
H	Adjustable steel mounting flange
I	Stainless tag
L	Insulated hot junction

The straight noble and base metal thermocouple assemblies, with Series 16 mullite and Series 17 alumina protection tubes, illustrated on this catalog page are those most commonly used in high temperature process heating applications. These assemblies are available with a variety of process mounting fittings and assembly options as listed below. Special construction designs are also available.

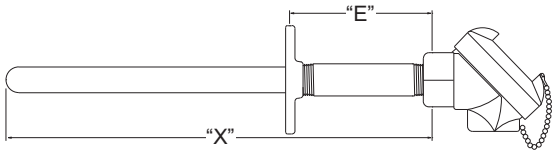
HEX FITTING



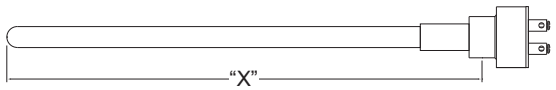
PIPE NIPPLE with NT OPTION and FLANGE



PIPE NIPPLE with HT OPTION



OPEN TERMINAL HEAD (OPT. N)



ORDER CODES

Example Order Number: **R24R - 17BH - 18 - 31, 8**

(1) (2) (3) (4) (4-1)

1 Thermocouple Type + Wire Gauge Size

CODE		
B24R R24R R26R S24R S26R	K8R[1] N8R[1] ***[1] Use only with 16C or 16W series tubes***	K11C[2] N14C[2] ***[2] Use only with 16B or 16C series tubes***
8ga. duplex elements only available in W series tubes. For duplex T/C's, use element type twice. Example: RR24R		

2 Protection Tube

TUBE MATERIAL AND SIZE				
CODE		TUBE OD (inches)	NPT SIZE (inches)	PROCESS MOUNTING FITTING
MULLITE 1482 ºC [2700 ºF]	*ALUMINA 1871 ºC [3400 ºF]*			
16AH[1]	17AH[1]	3/8	1/2	Steel hex fitting
16A1[1]	17A1[1]	3/8	1/2	Steel close nipple
16A(E)[1]	17A(E)[1]	3/8	1/2	Specify nipple "E" length
16AF[1]	17AF[1]	3/8	None	7/8" OD x 2" L open head ftg
16BH	17BH	11/16	3/4	Steel hex fitting
16B1	17B1	11/16	3/4	Steel close nipple
16B(E)	17B(E)	11/16	3/4	Specify nipple "E" length
16BF	17BF	11/16	None	7/8" OD x 2" L open head ftg
16CH		3/4	3/4	Steel hex fitting
16C1		3/4	3/4	Steel close nipple
16C(E)		3/4	3/4	Specify nipple "E" length
16WH		7/8	1	Steel hex fitting
[1] All assemblies with a 3/8" OD tube should be ordered with an aluminum termination head.				

4 Head Terminations

CODE	DESCRIPTION
31	Aluminum screw cover head
34	Cast iron screw cover head
49	Flip top aluminum head
91	316L SS head
N	Open terminal head - R, S, B only (require AF or BF protection tubes)

4-1 Assembly Options

CODE	DESCRIPTION
GS	Ground screw
NT	No process threads on pipe nipple
HT	Threaded flange on nipple
I	Stainless tag
8	316SS nipple or hex tube fitting
H	Adjustable steel mtg. flange

3 Tube "X" Length

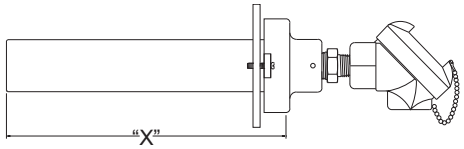
LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	
Specify other lengths in 1 inch increments.	

Configuration Code ID14

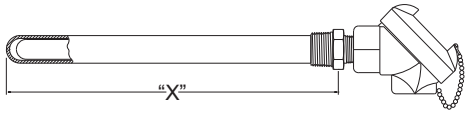
Thermocouple Assemblies with Double Protection Tubes

The straight noble metal thermocouple assemblies illustrated on this catalog page are provided with double protection tubes. Outer protection tube choices of ceramic materials, metal alloys, or composite materials offer thermocouple protection from a variety of high temperature process heating environments. All assemblies are provided with a ceramic inner tube. These assemblies are available with a variety of process mounting fittings and assembly options as listed below. Special construction designs are also available. **Note: Welded bushings will be welded at maximum length possible when X and U dimensions are specified as the same length. Actual U dimension will be 1 to 2 inches shorter than specified depending on bushing size.**

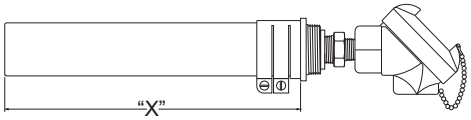
FLANGED ASSEMBLY **FIG. 1**



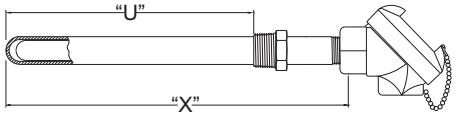
HEX FITTING **FIG. 2**



CLAMP ASSEMBLY **FIG. 3**



WELDED BUSHING **FIG. 4**



ORDER CODES

Example Order Number: **S24R - 16BH-18J - 36 - 31, H**

(1 = S24R, 2 = 16BH-18J, 3 = 36, 5 = 31, 5-1 = H)

1 Thermocouple Type + Wire Gauge Size

CODE	
B24R R24R S24R	R26R S26R
For duplex T/C's, use element type twice. Example: RR24R	

2 Protection Tubes (Inner and Outer)

CODE	MATERIAL TYPE		SIZE	PROCESS MOUNTING FITTING	
	INNER	OUTER	O.D. (inches)	NPT. THREAD (inches)	FITTING TYPE
17A-17BH	Alumina	Alumina	11/16	3/4	Figure 2
17A-17B1	Alumina	Alumina	11/16	3/4	1" steel nipple
17A-17B(E)	Alumina	Alumina	11/16	3/4	Nipple (specify length)
17A-12-75	Alumina	LT-1	7/8	1	Figure 2
17BH-18J	Alumina	Silicon Carbide	1(3/4)	None	Figure 3
17BH-18JC	Alumina	Silicon Carbide	1(3/4)	None	Figure 1
16A-16BH	Mullite	Mullite	11/16	3/4	Figure 2
16A-16B1	Mullite	Mullite	11/16	3/4	1" steel nipple
16A-16B(E)	Mullite	Mullite	11/16	3/4	Nipple (specify length)
16A-12-75	Mullite	LT-1	7/8	1	Figure 2
16BH-18J	Mullite	Silicon Carbide	1(3/4)	None	Figure 3
16BH-18JC	Mullite	Silicon Carbide	1(3/4)	None	Figure 1
16B-41-75	Mullite	HR-160	1.050	None	Figure 4
16B-7-75	Mullite	Inc.601	1.050	None	Figure 4
The inner protection tubes are cemented to the outer tube and are not replaceable as separate items, except for Silicon Carbide assemblies.					

Optional Welded Bushings

(only on HR-160 and Inconel Tubes)

CODE		DESCRIPTION
STEEL	*316 SS*	**BUSHING SIZE (inches)**
6E(U)	8E(U)	1 NPT Bushing
6F(U)	8F(U)	1 (1/4) NPT Bushing
6G(U)	8G(U)	1 (1/2) NPT Bushing
Substitute insertion length, in inches, measured from hot tip to bottom of bushing for (U) above. Insert NW in place of insertion length (U) for bushing supplied loose on tube.		

5 Head Terminations

CODE	DESCRIPTION
31	Aluminum screw cover head
34	Cast iron screw cover head
49	Flip top aluminum head
91	316L SS head

5-1 Assembly Options

CODE	DESCRIPTION
GS	Ground screw
NT	No mounting threads on pipe nipple
HT	Threaded flange on nipple
I	Stainless tag
8	316SS nipple or hex tube fitting
H	Adjustable steel mtg. flange

3 Tube "X" Length

LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	
Specify other lengths in 1 inch increments.	

Configuration Code ID07

Angle Thermocouples with Standard Service Protection Tubes

Angle thermocouple assemblies are most commonly used in general process heating applications requiring the use of "over-the-side" temperature sensors with metal alloy protection tubes. Special construction designs are available. Assemblies may be shipped with the hot leg unattached for assembly at time of installation due to size limitations. Cold leg as standard is supplied as carbon steel.

FIG. 1

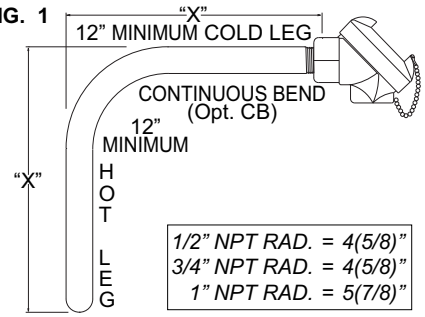


FIG. 2

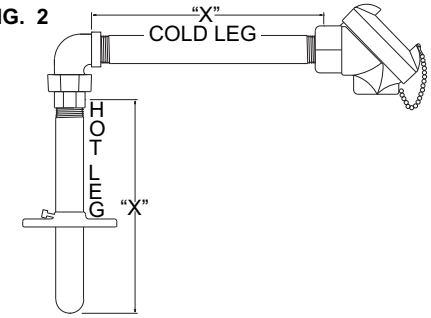
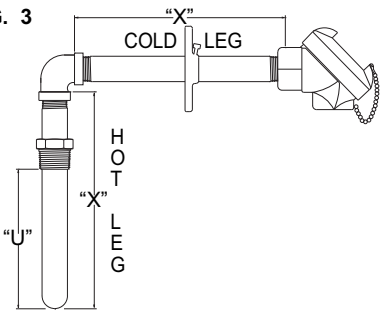


FIG. 3



ORDER CODES

Example Order Number: **K8A - 8 -75 - 18 - 18 - 8E16 - 34, GS**

(1) (2) (3) (4) (5) (6) (7) (7-1)

1 Thermocouple Type + Wire Gauge Size

CODE		
J8A J11A J14A	K8A K11A K14A	N8A N14A
For duplex assemblies use the T/C type code letter twice. Example: J8A - 7 - 75 becomes JJ8A - 7 - 75		

2 Hot Leg Protection Tube Material / 3 Hot Leg NPT Thread Pipe Size

CODE	MATERIAL	CODE (inches)		
		1/2	3/4	1
6	*CARBON STEEL*	50	75	100
8	*316 SS*	50	75	100
5	*446 SS*	50	75	100
3	*INCONEL 600*	50	75	
7	*INCONEL 601*	50	75	100

4 Hot Leg X Length

LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	
Specify other lengths in 1 inch increments.	

5 Cold Leg X Length

LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	
Specify other lengths in 1 inch increments.	

6 Optional Welded Bushings

CODE		DESCRIPTION
STEEL	*316SS*	**BUSHING SIZE (inches)**
6D(U)	8D(U)	3/4 NPT Bushing (50 tubes only)
6E(U)	8E(U)	1 NPT Bushing (50 and 75 tubes only)
6F(U)	8F(U)	1(1/4) NPT Bushing
6G(U)	8G(U)	1(1/2) NPT Bushing
Substitute insertion length, in inches, measured from hot tip to bottom of bushing for (U) above. Insert NW in place of insertion length (U) for bushing supplied loose on tube.		

7 Head Terminations

CODE	DESCRIPTION
31	Aluminum screw cover head
34	Cast iron screw cover head
49	Flip top aluminum head

7-1 Assembly Options

CODE	DESCRIPTION
GS	Ground screw
H	Adjustable steel mounting flange
HC	Adjustable steel flange (cold leg)
L	Insulated hot junction
I	Stainless tag
UL	Steel union elbow
CB	Continuous bend angle assembly

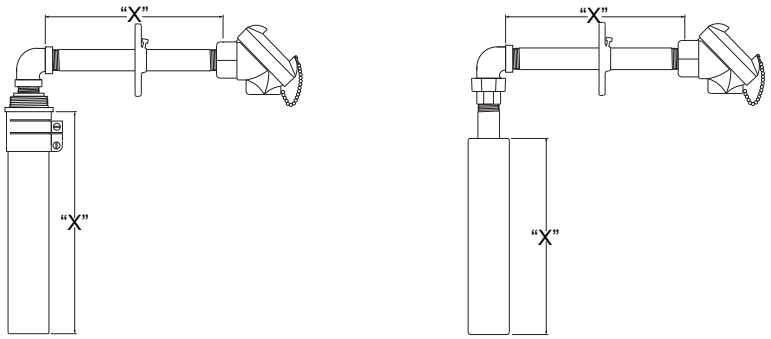
Standard Assembly Specifications

ELEMENT	HOT LEG TUBE CODE AVAIL.	COLD LEG SUPPLIED
SINGLE		
8, 11, 14 GA.	50, 75, 100	3/4" NPT on HL tube codes 50, 75. 1" NPT on HL tube codes 100. 1" NPT on duplex 8 and 11 gauge assemblies.
DUPLEX		
8, 11 GA.	75, 100	
14 GA.	50, 75, 100	

Configuration Code ID08

Angle Thermocouples with Special Service Protection Tubes

Angle thermocouple assemblies are those commonly used in industrial process heating applications requiring the use of "over-the-side" temperature sensors with special metal alloy, composite material, or silicon carbide protection tubes. Special construction designs are available. Assemblies may be shipped with the hot leg unattached for assembly at time of installation due to size limitations. Cold leg as standard is supplied as carbon steel.



ORDER CODES

Example Order Number:

1		2		3		4		5	5-1
K8A	-	14-50	-	18	-	18	-	49,	L

1 Thermocouple Type + Wire Gauge Size

CODE	
K8A K11A K14A	N8A N14A
For duplex assemblies use the T/C type code letter twice. Example: K14A - 12 - 75 becomes KK14A - 12 - 75.	

2 Protection Tube Material NPT Connection

CODE	HOT LEG PROT. TUBE	TUBE OD or NPT SIZE (inches)
11 - 75	Cast Iron	1.625
12 - 75	Metal Ceramic	0.875
13 - 75	Vesuvius	2.000
18J - 75	Silicone Carbide	1.750
14 - 50[1]	Cerite® II	1/2 NPT
[1] For protection tubes with 316SS pipe instead of a carbon steel pipe, change order number to 148. Example: K8A-148-50-24-K.		

3 Hot Leg X Length

LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	

4 Cold Leg X Length

LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	
Specify other lengths in 1 inch increments.	
Code 14 Cerite® II actual length is one inch shorter than above.	

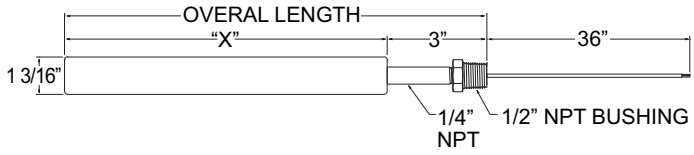
5 Head Terminations

CODE	DESCRIPTION
31	Aluminum screw cover head
34	Cast iron screw cover head
49	Flip top aluminum head
91	316L SS head

5-1 Assembly Options

CODE	DESCRIPTION
GS	Ground screw
H	Adjustable steel mounting flange
HC	Adjustable steel flange (cold leg)
L	Insulated hot junction
UL	Steel union elbow
I	Stainless tag

Cerite® III thermocouples are provided with a protection tube, integral thermocouple element with 36" of high temperature 704 ºC [1300 °F] fiberglass leads, and a 1/2" NPT steel male face bushing for use in mounting. They are constructed by casting a phosphate bonded refractory material containing 85% alumina, 4% silica, and other trace elements around a 1/4" NPT steel pipe, containing an integral stainless steel sheathed magnesium oxide (MgO) insulated thermocouple element. The cast refractory material was developed for use in molten non-ferrous metals, specifically molten aluminum and zinc. It has excellent non-wetting properties, allowing easy slag removal, and the small diameter provides fast thermal response to process temperature changes. These assemblies provide good resistance to thermal shock and mechanical breakage. The refractory material is rated at 1538 ºC [2800 °F] however, its use as a Cerite® III thermocouple assembly is generally limited to 815 °C [1500 °F] maximum. Protection tube pre-heating and slow immersion into the process is recommended.



ORDER CODES

Example Order Number: **K39G - 15 - 25 - 24 - 36 - 4** (1 = K39G - 15 - 25 - 24 - 36, 2 = 4)

1 Cerite® Thermcouple Specifications

CODE *SINGLE*	T/C TYPE	X DIMENSION IMMERSION LENGTH (inches)	OVERALL LENGTH (inches)	LEAD LGTH. (inches)	APPROX. WGHT. (LBS.)
K39G-15-25-12-36	K	12	15	36	1.75
K39G-15-25-18-36	K	18	21	36	2.50
K39G-15-25-24-36	K	24	27	36	3.25
K39G-15-25-30-36	K	30	33	36	4.00
K39G-15-25-36-36	K	36	39	36	4.75

2 Terminations

CODE	DESCRIPTION
0	No lead termination
2	2" split leads with 1/4" stripped leads
4	Standard plug
Options	
MC	Mating connector

For duplex assemblies use thermocouple letter twice. **Example: KK39U - 15 - 25 - 24 - 36 - 0**
For assemblies with ungrounded junctions, substitute U for G in order code number. **Example: K39U - 15 - 25 - 24 - 36 - 0**
For additional lead length, change the last 2 digits of the order code number to desired length. **Example: K39G - 15 - 25 - 24 - 48 - 0**
For assemblies supplied with optional 316SS pipe insert, change order code number 15 to 158. **Example: K39G - 158 - 25 - 24 - 36 - 0**

Configuration Code ID09

Cerite® III Thermocouple Assemblies for Molten Aluminum

Cerite® III thermocouple assemblies are complete thermocouple and protection tube assemblies. These Cerite® III assemblies are constructed by casting a phosphate bonded refractory material containing 85% alumina, 4% silica, and other trace elements around a 1/4" NPT steel pipe containing an integral stainless steel sheathed magnesium oxide (MgO) insulated thermocouple element. The cast refractory material was developed for use in molten non-ferrous metals, specifically molten aluminum and zinc. It has excellent non-wetting properties allowing easy slag removal, and the small diameter provides fast thermal response to process temperature changes. These assemblies also provide good resistance to thermal shock and mechanical breakage. The refractory material is rated at 1538 ºC [2800 ºF] however its use as a Cerite®III thermocouple assembly is generally limited to 815 ºC [1500 ºF] maximum. Cold leg as standard is supplied as carbon steel. ***Protection tube pre-heating and slow immersion into the process is recommended.***

FIG. 1

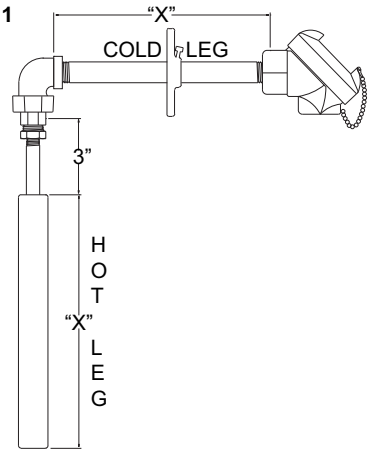
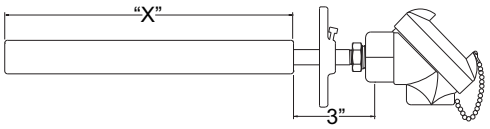


FIG. 2



ORDER CODES

Example Order Number:

1		2		3		4	4.1	
K39GS-15-25	-	**24**	-	**—**	-	**34,**	**H**	***Straight Assembly, Single***
K39GA-15-25	-	**24**	-	**24**	-	**49,**	**HC**	***Angle Assembly, Single***

1 Thermocouple Type and Assembly Style

CODE	STYLE	CODE	STYLE
SINGLE ELEMENT		***DUPLEX ELEMENT***	
K39GS-15-25	Straight	KK39GS-15-25	Straight
K39GA-15-25	Angle	KK39GA-15-25	Angle
For ungrounded hot junctions change above letter code "G" to letter code "U". Example: K39US			
For assemblies supplied with optional 316SS pipe insert, change order code number 15 to 158. Example: K39G-158-25-24-36-34			

2 Straight or Angle Hot Leg Length

X LENGTH (inches)	X LENGTH (inches)
12	30
18	36
24	

4 Head Terminations

CODE	DESCRIPTION
31	Aluminum screw cover head
34	Cast iron screw cover head
49	Flip top aluminum head

4-1 Assembly Options

CODE	DESCRIPTION
GS	Ground screw
H	Adjustable steel mounting flange
HC	Adjustable steel flange (cold leg)
I	Stainless tags

3 Angle Assembly Cold Leg Length

X LENGTH (inches)	X LENGTH (inches)
12	30
18	36
24	

The preceeding catalog pages have provided order code numbers for thermocouple elements, protection tubes, and the most commonly used industrial thermocouple assemblies. Non-standard assemblies can be designated by selecting the proper thermocouple element(s) and protection tube(s) from the appropriate pages in this catalog section. Component part order code numbers selected from those pages, and assembled as described below, with desired options from below, will provide the part number for a complete industrial thermocouple assembly. Special construction designs, using non-cataloged components, are also available. Consult factory for details.

ORDER CODES

Example Order Number:

1		2		3		4			
K8C	-	7-75	-	18	-	6E16	-	34	***Straight Assembly***
K8A	-	7-75	-	18-24	-	31, H			***Angle Assembly***
R24R	-	17A-17BH	-	24	-	49			***Double Tube Assembly***
K8E	-	18J	-	18-12	-	34			***Pipe Extended Assembly***

1 Thermocouple Element

Insert **order code** for thermocouple type, wire gauge size, and insulator type from the appropriate thermocouple element pages located in this catalog section.

2 Protection Tube

Insert **order code** for tube material and size from the appropriate protection tube pages located in this catalog section.

Double protection tube assemblies require selection of 2 tubes. **Example: 17A - 17BH**

3 Protection Tube Length

STRAIGHT ASSEMBLIES: Insert the desired protection tube "X" length in inches.

ANGLE ASSEMBLIES: Requires specifying **hot** and **cold** leg length in inches.

PIPE EXTENDED ASSEMBLIES: (Supplied with steel coupling and pipe extension beyond protection tube) Insert letter code 'E' after wire gauge and specify extension length in inches.

4 Optional Welding Bushings (Applies to Metal Alloy Tubes only)

CODE		DESCRIPTION
STEEL	*316SS*	**BUSHING SIZE (inches)**
6C(U)	8C(U)	1/2 NPT bushing (25 tubes)
6D(U)	8D(U)	3/4 NPT bushing (25 and 50 tubes)
6E(U)	8E(U)	1 NPT bushing (25, 50, 75 tubes)
6F(U)	8F(U)	1(1/4) NPT bushing (50, 75, 100 tubes)
6G(U)		1(1/2) NPT bushing (50, 75, 100 tubes)
Substitute insertion length, in inches, measured from hot tip to bottom of bushing for (U) above. Insert NW in place of insertion length (U) for bushing supplied loose on tube.		

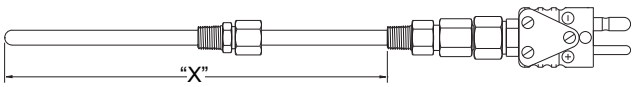
Optional Union and Nipple Connections

CODE		DESCRIPTION
STEEL	*316SS*	Both union and nipple supplied as material specified
6PU(E)	8PU(E)	
Insert extension length, in inches, for (E)		

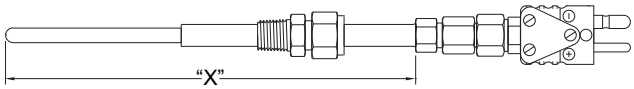
Head Terminations		Assembly Options	
CODE	**DESCRIPTION**	**CODE**	**DESCRIPTION**
31	Aluminum screw cover head	A	Open end protection tube
34	Cast iron screw cover	CB	Continuous bend angle assembly
49	Flip top aluminum head	GS	Ground screw
71[1]	Cast iron/aluminum explosion proof head Group C	6Y	Steel temperature check fitting
72[1]	DIN form B aluminum explosion proof head Group B	H	Adjustable steel mounting flange
81[1]	316L SS explosion proof head	HC	Adjustable steel flange (cold leg)
82[1]	DIN form B 316SS explosion proof head Group B	HT	Threaded flange on nipple
91[1]	316L SS head	I	Stainless tags
92[1]	DIN form B 316SS head	L	Insulated hot junction or recessed junction
N	Open type terminal head (B,R,S) with 16AF, 16BF, 17AF, 17BF tubes only	NT	Supplied without threads
[1] Not Available with 1" NPT protection tubes		UL	Steel union elbows
		SB	1/2" NPT Conduit Reducer Bushing

Pyromation's high temperature thermocouples are designed to operate in a temperature range of (982 to 1871) ºC [1800 to 3400] ºF. They are designed for use in vacuum furnaces and other applications requiring high temperature measurement in controlled atmospheric conditions. Metal sheaths of Inconel® 600 and molybdenum are available as well as alumina ceramic sheaths. All assemblies are supplied with ungrounded isolated hot junctions. The construction style consists of an alumina insulated element inside the tube of choice as listed below. Special construction designs are also available.

METAL SHEATHED ASSEMBLY **FIG. 1**



ALUMINA SHEATHED ASSEMBLY **FIG. 2**



ORDER CODES

Example Order Number:

1		2		3		4		5		6		7
R24U	-	**403**	-	**24**	-	**05A**	-	**TBL. 5**	-	**TBL. 6**	-	**TBL. 7**

Select from following page

1 Single Elements

TYPE AND WIRE GAUGE CODE	
INCONEL 600	
B24U	
C24U	
R24U	R26U
S24U	S26U
B24U	
C24U	
R24U	R26U
S24U	S26U
MOLYBDENUM	
B24U	
C24U	
R24U	R26U
S24U	S26U
B24U	
C24U	
R24U	R26U
S24U	S26U
ALUMINA	
B24U	
C24U	
R24U	R26U
S24U	S26U

For duplex elements use order code pre-fix letter twice.
Example: RR24U

CC24 assemblies not available in 0.188" OD sheath diameter.

2 Sheath Size and Material

CODE	SHEATH DIA. (inches)	MAX. TEMP.	ATMOSPHERE
INCONEL 600			
303	0.188	1149 ºC [2100 ºF]	Oxidizing, Inert or Vacuum
303	0.188		
303	0.188		
303	0.188		
403	0.250	1149 ºC [2100 ºF]	
403	0.250		
403	0.250		
403	0.250		
MOLYBDENUM			
302	0.188	1704 ºC [3100 ºF]	Inert or Vacuum
302	0.188	1871 ºC [3400 ºF]	
302	0.188	1482 ºC [2700 ºF]	
302	0.188	1482 ºC [2700 ºF]	
402	0.250	1704 ºC [3100 ºF]	
402	0.250	1871 ºC [3400 ºF]	
402	0.250	1482 ºC [2700 ºF]	
402	0.250	1482 ºC [2700 ºF]	
ALUMINA			
617	0.275[1]	1704 ºC [3100 ºF]	Oxidizing, Inert or Vacuum
617	0.275[1]	1871 ºC [3400 ºF]	
617	0.275[1]	1482 ºC [2700 ºF]	
617	0.275[1]	1482 ºC [2700 ºF]	

[1] Sheath supplied with 3/8" OD x 4" long stainless steel sleeve on tube cold end.
Only available with size B and C compression fittings.

Consult factory for availability of other diameters or insulations.

4 Sheath Mounting Fittings

CODE	TYPE	NPT SIZE (inches)	AVAILABLE SHEATH DIA. (inches)
00	No sheath mounting fitting		
One Time Adjustable Compression Fittings			
05A	Stainless steel	1/8	3/16, 1/4
05B	Stainless steel	1/4	3/16, 1/4, 3/8
05C	Stainless steel	1/2	1/4, 3/8
Re-Adjustable Compression Fittings			
12A	Stainless steel	1/8	3/16, 1/4
12B	Stainless steel	1/4	1/4, 3/8
12C	Stainless steel	1/2	1/4, 3/8
Teflon® gland standard (400 °F max.)			

3 Sheath X Length

LENGTH (inches)	LENGTH (inches)
12	30
18	36
24	
Specify other lengths in 1 inch increments.	

[2] All assemblies are provided with wire seal fitting except platinum element assemblies in inconel protection tubes.
[3] All C24 assemblies in alumina protection tubes can only be used in inert or vacuum atmospheres.

FIG. 3

FIG. 4

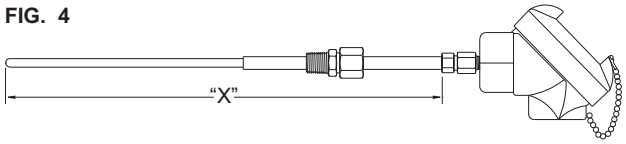
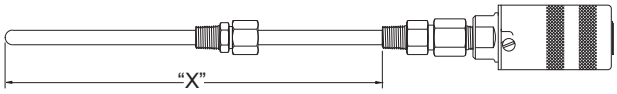


FIG. 5



ORDER CODES

Example Order Number:

1		2		3		4		5		6		7
R24U	-	**403**	-	**24**	-	**05A**	-	**15**	-	**F1A036**	-	**4**

Select from preceeding pages

5 Plug and Jack Terminations

CODE	DESCRIPTION	SHEATH OD (inches)
4	Standard plug	3/16 thru 3/8
4,HT	Standard hi-temp plug 385 ºC [725 °F]	3/16 thru 3/8
MC	Mating Connector	

Head Terminations

CODE	DESCRIPTION
9CF31	Cast aluminum screw cover head secured to sheath with SS compression fitting
8HN31[1]	Cast aluminum screw cover head with 1/2" NPT stainless steel hex fitting
9CF25	Mini nickel plated steel head

Leadwire Transitions
(requires leadwire selections)

CODE	DESCRIPTION
15[1]	Extension leadwire transition fitting with relief spring as per Fig. 3 above 204 ºC [400 °F]
15HT[1]	Extension leadwire transition fitting with relief spring and High temperature potting 538 ºC [1000 °F]

[1] Only with platinum elements in 303-403 sheaths.

7 Terminations

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4", stripped
3	2" split leads with spade lugs
4[1]	Standard plug
6[1]	Miniature plug

Options

CODE	DESCRIPTION
MC[1]	Mating connector

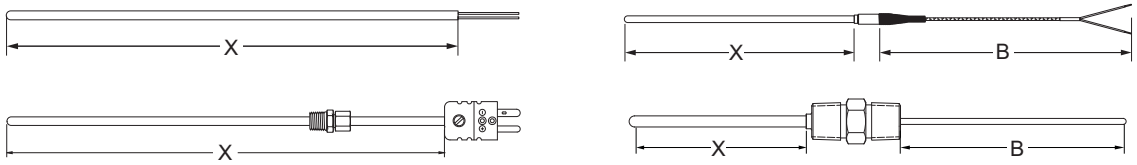
6 Extension Leadwire

CODE	WIRE GAUGE INSULATION DESCRIPTION	T/C AVAILABLE
F1	Solid; fiberglass insulation	R,S,B
F1A	Solid; fiberglass insulation with flexible S.S. armor	R,S,B
T1	Solid; Teflon® insulation	R,S
T1A	Solid; Teflon® insulation with flexible S.S. armor	R,S
To complete order code, insert wire code and 3 digit "B" length code. Example: F1A036=36" B length		

MgO

Configuration Code Mg01
MgO Insulated Thermocouples with Extension Leadwire
Configuration Code Mg02
MgO Insulated Thermocouples with Sheath Terminations

A Pyromation MgO thermocouple assembly consists of a thermocouple element swaged in hard-packed standard purity (96%) Magnesium Oxide mineral insulation and encased in a metal sheath. Thermocouple sheaths have been fully annealed; they can be formed into many configurations, and can be bent into a radius of twice the size of its outer sheath. The tables found on this page and the following pages allow customer selection of standard thermocouple types as listed in the General Information section, sheath diameters, mounting fittings and terminations. Custom built products are available upon request.



ORDER CODES

Example Order Number:

1-1	1-2	1-3	1-4	1-4 A		1-5		
K	4	8	G	M	-	012	-	For Optional Sheath Mounting Fittings See Page MgO-2

1-1 Thermocouple Types

CODE	
SINGLE	***DUPLEX***
E	EE
J	JJ
K	KK
T	TT
N	NN

1-2 Sheath Diameters

CODE	DIAMETER (inches)
1	1/16 [1]
2	1/8
3	3/16
4	1/4
6	3/8
[1] 1/16” will be coiled unless otherwise specified for 36” and longer lengths.	

1-3 Sheath Materials

CODE	MATERIAL	STANDARD AVAILABLE TYPES
3	Inconel 600	K, N
4	310 Stainless steel	K
5	446 Stainless steel	K[1]
8	316 Stainless steel	E, J, K, T
[1] All sensors with 446SS sheaths must have an ungrounded measuring junction.		

1-5 ‘X’ Dimension

Insert three digit sheath length (X Dimension) in inches
Sheath lengths over 72" will be shipped in a coiled configuration unless otherwise specified.

1-4 A Special Options

CODE	DESCRIPTION
M	Special limits of error
H	High Purity MgO Insulation (99.6% Pure)
Use this table only if options are desired.	

1-4 Measuring Junctions

CODE	DESCRIPTION
G	Grounded junction
U	Ungrounded junction
E[1]	Exposed junction
S	Exposed shielded junction
[1] Not available with 1/16” OD.	

1-2 A Reduced Tip MgO Thermocouples

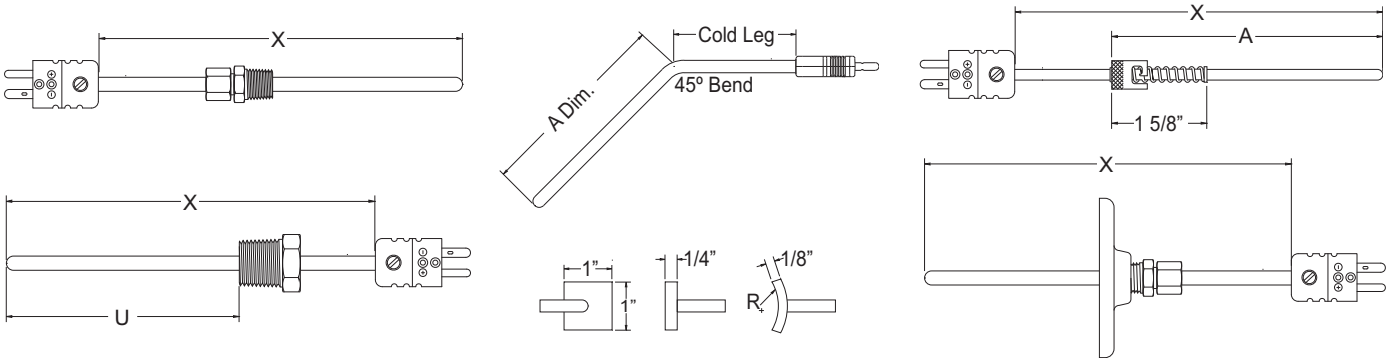
CODE	NORMAL SHEATH DIA. OD (inches)	TIP DIA. (inches)	TIP LENGTH (inches)	MATERIAL
88R48	1/2	1/4	1 (1/4)	316 SS
68R38	3/8	3/16	1 (1/4)	316 SS
48R28	1/4	1/8	1 (1/4)	316 SS

Table 1-2 A lists thermocouple elements with reduced tip sheaths. To order, use order code numbers from Tbl. 1-2 A in place of straight sheath order code numbers from Tbl. 1-2 and 1-3. EXAMPLE: J88R48

Configuration Code Mg01
Configuration Code Mg02

Optional Sheath Mounting Fittings and Bends

Select Sheath Mounting or Bend Options as desired from tables below.



ORDER CODES

Example Order Number: **K48GM - 012 - 01A,306 - Page MgO-3 - Page MgO-4 - Page MgO-5**

(2)

2-1 No Fitting or Bend Options

CODE	00

2-2 One-Time Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	PRESSURE RATED	AVAILABLE SHEATH DIAMETERS (inches)
01A	303 Stainless steel	1/8	NO	1/16, 1/8, 3/16, 1/4
05A	316 Stainless steel	1/8	YES	1/16, 1/8, 3/16, 1/4
05B	316 Stainless steel	1/4	YES	1/8, 3/16, 1/4, 3/8
05C	316 Stainless steel	1/2	YES	1/8, 1/4, 3/8
15A	Brass	1/8	NO	1/8, 3/16, 1/4
15B	Brass	1/4	NO	3/16, 1/4, 3/8
15C	Brass	1/2	NO	1/4, 3/8

2-3 Re-Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	AVAILABLE SHEATH DIAMETERS (inches)
10A	303 Stainless steel	1/8	1/16, 1/8, 3/16
10B	303 Stainless steel	1/4	1/4, 3/8
10C	303 Stainless steel	1/2	1/4, 3/8
12A	316 Stainless steel	1/8	1/16, 1/8, 3/16, 1/4
12B	316 Stainless steel	1/4	1/8, 3/16, 1/4, 3/8
12C	316 Stainless steel	1/2	1/8, 1/4, 3/8
11A	Brass	1/8	1/16, 1/8, 3/16, 1/4
11B	Brass	1/4	1/8, 3/16, 1/4, 3/8
11C	Brass	1/2	1/4, 3/8
19C	Spring-loaded SS well fitting	1/2	3/16, 1/4

Teflon® gland standard 204 ºC [400 ºF] max. For lava gland 649 ºC [1200 ºF] max. opt. 10A and 10B only use letter suffix "L" after compression fitting order code. EXAMPLE: 10AL for lava gland.

2-4 Fixed Bushings

CODE *316 SS*	MOUNTING THREAD NPT (inches)	AVAILABLE SHEATH DIAMETERS (inches)
8A _ _ [1]	1/8	1/16, 1/8, 3/16, 1/4
8B _ _ [1]	1/4	1/16, 1/8, 3/16, 1/4, 3/8
8C _ _ [1]	1/2	1/8, 3/16, 1/4, 3/8
8D _ _ [1]	3/4	1/8, 3/16, 1/4, 3/8

[1] When ordering fixed bushings, specify order code above plus inserting length "U", as measured from hot tip to bottom of threaded bushing. EXAMPLE: order code 8A06 is 1/8" NPT, 316 SS bushing located 6" from hot tip.

2-5 Sheath Bends

CODE	DESCRIPTION
2 _ _	Sheath bent 45º
3 _ _	Sheath bent 90º

When ordering bend options, specify hot leg dim. "A". EX: order code 206 is a 45º bend with 6" hot leg. Total sheath length in Table 1 "X" length = hot leg plus cold leg.

2-6 Weld Pads

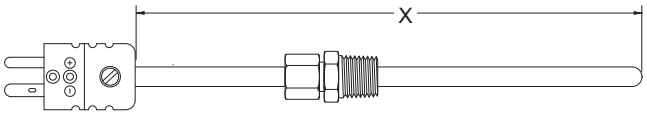
CODE	DESCRIPTION
17	304 SS weld pad 1" x 1" x 1/4" thick perpendicular mount
18	304 SS weld pad 1" x 1" x 1/4" thick horizontal mount
17R[1]	304 SS weld pad 1" x 1" x 1/8" thick perpendicular mount with radius bend [1] (specify radius)
18R[1]	304 SS weld pad 1" x 1" x 1/8" thick horizontal mount with radius bend [1] (specify radius)

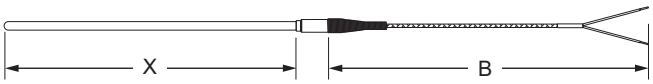
2-7 Miscellaneous Options

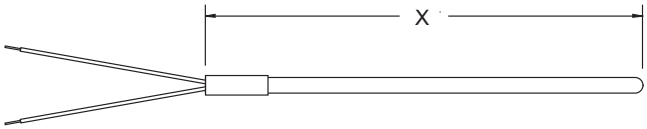
CODE	DESCRIPTION	AVAILABLE SHEATH DIAMETERS (inches)
13A _ _ [1]	Spring-loaded bayonet fitting	1/8, 3/16
14	Adjustable flange with brass compression fitting	1/8, 3/16, 1/4, 3/8
16A	Compression fitting with bayonet cap and spring	1/8 (2 5/8" min. "A" dim.)

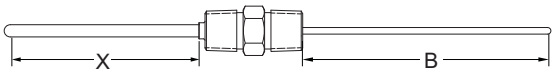
[1] When ordering fixed bayonet fitting specify hot leg dimension "A". EXAMPLE: order code 13A06 for a fixed bayonet adapter with 6" hot leg. Total sheath length is Table 1 "X" length = hot leg plus cold leg.

MgO









MgO2 ORDER CODES MgO1

Example Order Number: **K48GM - 012 - 15C - 4, MC or K48GM - 012 - 00 - 16 - Page MgO-4 - Page MgO-5**

(3-1 → 4, MC; 3-2 → 16)

3-1 Plug and Jack Sheath Terminations

CODE	DESCRIPTION
4[1]	Standard plug
5[1]	Standard jack
6[2]	Miniature plug
7[2]	Miniature jack
	Options
MC	Mating connector
HT	High temp connector 385 ºC [725 ºF]
SP[3]	Solid pin plug
CL	Compression L bracket to hold plug to sheath

[1] If used with a 3/8” OD sheath an option CL must be specified.
[2] Not available with 1/4 or 3/8” OD sheath.
[3] Standard with 385 °C [725 °F]

3-1 Sheath Terminations

CODE	DESCRIPTION
10	2” stripped leads (insert two digit strip length for other lengths - ex. 10(03”)
14[1]	Ceramic wafer block
22	Leadwire transition with 3” individual leads and terminal pins

[1] Only available on 1/8, 3/16, 1/4” OD sheath.

3-2 Leadwire Transitions

(Requires Tbl. 4 and 5 selections)

CODE	DESCRIPTION
15	Extension leadwire transition with relief spring 204 ºC [400 °F]
16	Extension leadwire transition with heat shrink tubing 104 ºC [220 °F]
13[1]	Same size transition with heat shrink tubing 204 ºC [400 °F]
18[1]	Same size transition without heat shrink tubing 204 ºC [400 °F]
19	Extension leadwire transition w/o spring or heat shrink 204 ºC [400 °F]
	Options
HT[2]	High temperature potting 538 ºC [1000 ºF]

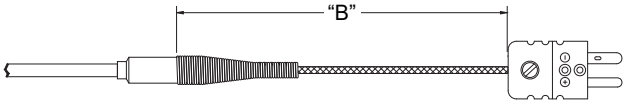
[1] Not available with Flex Armor
[2] Not available with option 13 or 16. When specifying high temp potting with Flex Armor Option 19 must be selected.

3-2 Threaded Fittings with Extension Leadwire

(Requires Tbl. 4 and 5 selections)

CODE	DESCRIPTION
6HN23	1/2” x 1/2” NPT steel hex nipple
8HN23	1/2” x 1/2” NPT stainless steel hex nipple
9HP23	1/2” NPT stainless steel bushing (no process threads)
8RNDC23	3/4” process x 1/2” NPT stainless steel hex nipple

Select desired leadwire type by order code number, followed by desired length in inches



ORDER CODES

Example Order Number: **K48GM - 012 - 01A,306 - 15 - F1048 - Page MgO-5**

4 5

4

	CODE	DESCRIPTION	AVAILABLE CALIBRATIONS					TEMP RATING
Fiberglass	F1	Fiberglass insulation - solid conductor	J	K	T	E	N	482 ºC [900 ºF]
	F1A	Fiberglass insulation - solid conductor - flexible armor	J	K	T	E	N	482 ºC [900 ºF]
	F1B	Fiberglass insulation - solid conductor - stainless steel overbraid	J	K	T			482 ºC [900 ºF]
	F3	Fiberglass insulation - stranded conductor	J	K	T			482 ºC [900 ºF]
	F3A	Fiberglass insulation - stranded conductor - flexible armor	J	K	T			482 ºC [900 ºF]
	F3B	Fiberglass insulation - stranded conductor - stainless steel overbraid	J	K	T			482 ºC [900 ºF]
	H1	Hi-temp fiberglass insulation - solid conductor	J	K				704 ºC [1300 ºF]
	H1A	Hi-temp fiberglass insulation - solid conductor - flexible armor	J	K				704 ºC [1300 ºF]
	H1B	Hi-temp fiberglass insulation - solid conductor - stainless steel overbraid	J	K				704 ºC [1300 ºF]
Teflon®	T3J	Individual stranded Teflon® leads - 12 inch limit	J	K				204 ºC [400 ºF]
	T1	Teflon® insulation - solid conductor	J	K	T	E		204 ºC [400 ºF]
	T1A	Teflon® insulation - solid conductor - flexible armor	J	K	T	E		204 ºC [400 ºF]
	T1B	Teflon® insulation - solid conductor - stainless steel overbraid	J	K				204 ºC [400 ºF]
	T1M	Teflon® insulation - solid conductor - mylar shield	J	K				204 ºC [400 ºF]
	T3	Teflon® insulation - stranded conductor	J	K	T			204 ºC [400 ºF]
	T3A	Teflon® insulation - stranded conductor - flexible armor	J	K	T			204 ºC [400 ºF]
	T3B	Teflon® insulation - stranded conductor - stainless steel overbraid	J	K				204 ºC [400 ºF]
PVC	P5	PVC insulation - solid conductor	J	K	T	E	N	105 ºC [221 ºF]
	P7	PVC insulation - stranded conductor	J	K	T			105 ºC [221 ºF]
	P5M	PVC insulation - solid conductor - aluminum/mylar shield	J	K	T			105 ºC [221 ºF]
	P7M	PVC insulation - stranded conductor - mylar shield	J	K				105 ºC [221 ºF]
	C3060	PVC insulated coil cord - stranded; 60" extended	J	K	T	E		105 ºC [221 ºF]
	C3120	PVC insulated coil cord - stranded; 120" extended	J	K	T			105 ºC [221 ºF]
Kapton®	K1	Kapton® insulation - solid conductor	J	K				316 ºC [600 ºF]
	K1A	Kapton® insulation - solid conductor - flexible armor	J	K				316 ºC [600 ºF]
	K3	Kapton® insulation - stranded conductor	J	K				316 ºC [600 ºF]
	K3A	Kapton® insulation - stranded conductor - flexible armor	J	K				316 ºC [600 ºF]

Insert wire code number and 3 digit "B" length code. **Example: F1036 = 36" B length.**

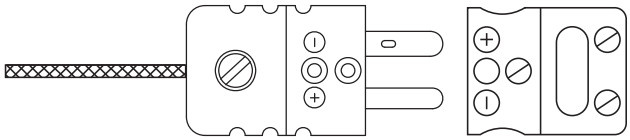
For assemblies requiring leadwire beyond the flexible armor, illustrated as "C" in drawing, insert 3 digit "C" length after armor length. **Example: T1A036-012 = 36" B length with additional 12" C length leads beyond armor.**

Insulated leadwires in flexible armor are available with either extruded PVC or Teflon® covering over the flexible armor. Substitute suffix codes T (Teflon®) or P (PVC) for the suffix "A" code above. **Example: T3T is Teflon® covered armor.**

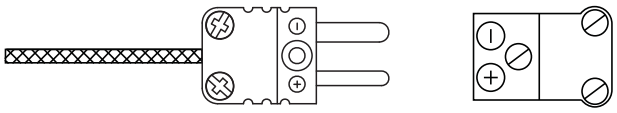
Duplex elements supplied with individual leads.

Select desired leadwire termination and options (if desired) by order code numbers below

OPTIONS 4 OR 4,MC



OPTIONS 6 OR 6,CC,MC



OPTION 3

OPTION 8

ORDER CODES

Example Order Number: **K48GM - 012 - 01A,306 - 15 - F1048 - 4, CC**

5-1 5-2

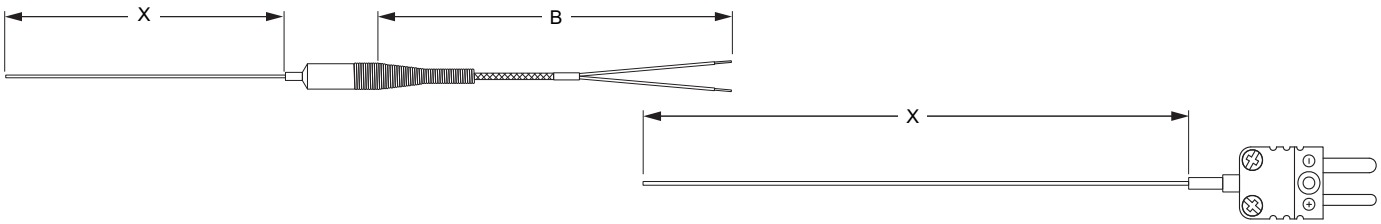
5-1 Terminations

CODE	DESCRIPTION
0	Leads not stripped
2	2” split leads, 1/4” stripped
3	2” split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2” split leads with 1/4" quick disconnect female terminal lugs

5-2 Options

CODE	DESCRIPTION
BX	1/2" NPT Bx connector with Opt. 0, 2, 3, or 8
CC	Plug or jack secured to leads with cable clamp
RB	Rubber Boot
SP[1]	Solid pin plug
CG	Cord grip (1/2" NPT weatherproof PVC connector)
MC	Mating connector
HT	High temp. connector 385 °C [725 °F]
[1] Standard with 385 °C [725 °F]	

Miniature thermocouple assemblies have very small swaged sheath diameters containing containing standard purity MgO (96%) insulated thermocouple elements. The small sheath size provides accurate and fast response time temperature measurement in a variety of laboratory, process, and special applications. These units are only offered with ungrounded junctions to prolong their useful life. Illustrated below are the most commonly used assemblies, however, other sensor configurations are available upon request.



ORDER CODES

Example Order Number:

1-1	1-2	1-3	1-4		2		3		4		5
J	040	8	U	-	012	-	00	-	16	-	PAGE MGO-7	-	PAGE MGO-7

1-1 Thermocouple Types

CODE
J
K

1-2 Sheath Diameter

CODE	DIAMETER (INCHES)
032	0.032
040	0.040

1-3 Sheath Material

CODE	MATERIAL
3	Inconel 600
8	316 Stainless steel

1-4 Measuring Junction

CODE	MATERIAL
U	Ungrounded junction
M	Special limits (consult factory)

2 'X' Dimension

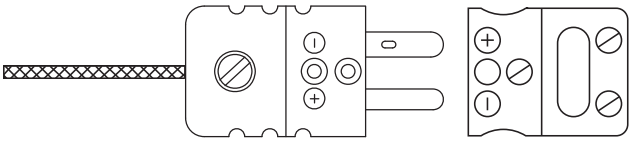
Insert three digit sheath length **(X Dimension) in inches**

3 Sheath Terminations

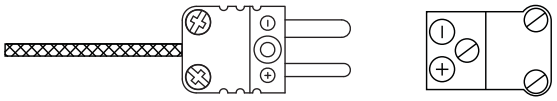
CODE	DESCRIPTION
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
Options	
MC	Mating Connector
	Leadwire Transitions
15	Extension leadwire transition fitting with relief spring 204 ºC [400 °F]
16	Extension leadwire transition fitting with heat shrink 204 ºC [400 °F]
19	Extension leadwire transition ftg. w/o relief spring or heat shrink 204 ºC [400 °F]
Options	
HT[1]	High Temperature Potting 538 ºC [1000 °F]

Select desired extension leadwire type (in inches) and leadwire termination and options (if desired) by order code number from the tables below.

OPTIONS 4 OR 4,MC



OPTIONS 6 OR 6,MC,CC



OPTION 3

OPTION 8

ORDER CODES

Example Order Number: **J0408UM - 012 - 00 - 16 - F1048 - 6**

(4 = F1048, 5 = 6)

4 Extension Leadwire

	CODE	DESCRIPTION	AVAILABLE CALIBRATIONS		TEMP RATING
Fiberglass	F1	Fiberglass insulation - solid conductor	J	K	482 ºC [900 ºF]
	F1A	Fiberglass insulation - solid conductor - flexible armor	J	K	482 ºC [900 ºF]
	F1B	Fiberglass insulation - solid conductor - stainless steel overbraid	J	K	482 ºC [900 ºF]
	F3	Fiberglass insulation - stranded conductor	J	K	482 ºC [900 ºF]
	F3B	Fiberglass insulation - stranded conductor - stainless steel overbraid	J	K	482 ºC [900 ºF]
Teflon®	T1	Teflon® insulation - solid conductor	J	K	204 ºC [400 ºF]
	T1A	Teflon® insulation - solid conductor - flexible armor	J	K	204 ºC [400 ºF]
	T3	Teflon® insulation - stranded conductor	J	K	204 ºC [400 ºF]
PVC	P5	PVC insulation - solid conductor	J	K	105 ºC [221 ºF]

Insert wire code number and 3 digit “B” length code.
Example: F1036 = 36” B Length

5 Terminations

CODE	DESCRIPTION
0	Leads not stripped
2	2” split leads, 1/4” stripped
3	2” split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
Options	
MC	Mating connector
CC	Plug or jack secured to leads with cable clamp

General MgO Specifications

The information contained in the following pages is intended as a guideline only for general sensor usage. The specific application and the environmental conditions may require that other sensor sheath materials, diameters, or construction styles be used to provide optimum temperature measurement results. The dimensions, temperature ratings, and response times indicated are nominal and they may vary in actual practice. For further information and recommendations on specific applications, please consult with the factory.

Table 1
Thermocouple Types and Sizes

SHEATH DIAMETER (inches) - A.W.G. WIRE SIZE									
TYPE	**MATERIAL**	0.020 OD	0.032 OD	0.040 OD	1/16 OD	1/8 OD	3/16 OD	1/4 OD	3/8 OD
E	Chromel-Constantan	38	35	32	30	24	21	19	15
J	Iron-Constantan	38	35	32	30	24	21	19	15
K	Chromel-Alumel	38	35	32	30	24	21	19	15
T	Copper-Constantan	38	35	32	30	24	21	19	15
N	Nicrosil-Nisil	38	35	34	-	29	21	19	15

Table 2
Sheath Materials

MATERIAL	CODE	MAX TEMP. RATING	APPLICATION DATA (Other Date Available)
304 SS	9	899 °C [1650 °F]	General purpose stainless steel - good corrosion resistance
316 SS	8	927 °C [1700 °F]	Superior corrosion resistance
310 SS	4	1149 °C [2100 °F]	Same as 316 SS - higher temperature rating
446 SS	5	1038 °C [1900 °F]	Used in sulphur atmospheres
INCONEL 600	3	1149 °C [2100 °F]	Excellent oxidation and corrosion resistance at high temperature. Not to be used in sulphur atmosphere

Table 3
Recommended Upper Temperature Limits For Protected Thermocouples
Upper Temperature Limit (F.) For Various Sheath & Diameter

SHEATH TYPE	SHEATH MATERIAL	SHEATH DIAMETER (inches)				
		1/16	**1/8**	**3/16**	**1/4**	**3/8**
		TEMPERATURE RANGE				
J	*316 S.S.*	(0 to 441) °C [32 to 825] °F	(0 to 521) °C [32 to 970] °F	(0 to 621) °C [32 to 1150] °F	(0 to 721) °C [32 to 1330] °F	(0 to 721) °C [32 to 1330] °F
K		(-200 to 921) °C [-328 to 1690] °F	(-200 to 927) °C [-328 to 1700] °F	(-200 to 927) °C [-328 to 1700] °F	(-200 to 927) °C [-328 to 1700] °F	(-200 to 927) °C [-328 to 1700] °F
E		(-200 to 510) °C [-328 to 950] °F	(-200 to 649) °C [-328 to 1200] °F	(-200 to 732) °C [-328 to 1350] °F	(-200 to 821) °C [-328 to 1510] °F	(-200 to 821) °C [-328 to 1510] °F
N		(0 to 921) °C [32 to 1690] °F	(0 to 921) °C [32 to 1700] °F	(0 to 921) °C [32 to 1700] °F	(0 to 921) °C [32 to 1700] °F	(0 to 921) °C [32 to 1700] °F
T		(-200 to 260) °C [-328 to 500] °F	(-200 to 371) °C [-328 to 700] °F	(-200 to 371) °C [-328 to 700] °F	(-200 to 371) °C [-328 to 700] °F	(-200 to 371) °C [-328 to 700] °F
J	*INCONEL 600*	(0 to 441) °C [32 to 825] °F	(0 to 521) °C [32 to 970] °F	(0 to 621) °C [32 to 1150] °F	(0 to 721) °C [32 to 1330] °F	(0 to 721) °C [32 to 1330] °F
K		(-200 to 921) °C [-328 to 1690] °F	(-200 to 1071) °C [-328 to 1960] °F	(-200 to 1149) °C [-328 to 2100] °F	(-200 to 1149) °C [-328 to 2100] °F	(-200 to 1149) °C [-328 to 2100] °F
E		(-200 to 510) °C [-328 to 950] °F	(-200 to 649) °C [-328 to 1200] °F	(-200 to 732) °C [-328 to 1350] °F	(-200 to 821) °C [-328 to 1510] °F	(-200 to 821) °C [-328 to 1510] °F
N		(0 to 921) °C [32 to 1690] °F	(0 to1071) °C [32 to 1960] °F	(0 to 1149) °C [32 to 2100] °F	(0 to 1149) °C [32 to 2100] °F	(0 to 1149) °C [32 to 2100] °F
T		(-200 to 260) °C [-328 to 500] °F	(-200 to 316) °C [-328 to 600] °F	(-200 to 371) °C [-328 to 700] °F	(-200 to 371) °C [-328 to 700] °F	(-200 to 371) °C [-328 to 700] °F

Table 4
Flexible Armor Tubing

DESCRIPTION	DIMENSIONS (inches)	MAX TEMP. RATING
300 Series SS flexible armored tubing	0.188 ID x 0.275 OD	871 °C [1600 °F]
PVC covered 300 Series SS flexible armored tubing	0.188 ID x 0.320 OD	100 °C [212 °F]
Teflon® covered 300 Series SS flexible armored tubing	0.188 ID x 0.313 OD	204 °C [400 °F]

Table 5
Typical Junction Response Times
(63.2% of a (25 to 100) ºC Step Change)

SHEATH OD (inches)	'E' JUNCTION (seconds)	'G' JUNCTION (seconds)	'U' JUNCTION (seconds)
0.020	0.02 s	0.03 s	0.24 s
0.032	0.03 s	0.05 s	0.26 s
0.040	0.03 s	0.06 s	0.28 s
1/16	0.01 s	0.3 s	0.4 s
1/8	0.1 s	0.6 s	1.6 s
3/16	0.2 s	0.9 s	2.4 s
1/4	0.3 s	1.3 s	2.9 s
3/8	0.4 s	3.5 s	7.2 s

HOT or MEASURING JUNCTIONS

UNGROUNDED JUNCTION (U)
The welded thermocouple junction is fully isolated from the welded closure of the sheath. This junction provides electrical isolation to reduce problems associated with electrical interference. Ungrounded junctions are also recommended for use in extreme positive or negative temperatures, rapid thermal cycling and for ultimate corrosion resistance of the sheath alloy. All ungrounded junctions exceed 1000 MΩ resistance @ 500 V dc at ambient room temperatures.

EXPOSED JUNCTION (E)
The thermocouple wires are welded and exposed. The insulation is not sealed against liquid or gas penetration. Recommended where fast response is desired, and corrosive conditions are nonexistent. The exposed hot junction length for 1/8-inch diameter sheaths and above is typically 3/16" past sheath. The exposed junctions for sheath diameters less than 1/8-inch diameter are supplied as shielded junctions.

GROUNDED JUNCTION (G)
The thermocouple junction is welded securely into the closure end of the sheath, becoming an integral part of the weld. This is a good general purpose, low cost junction providing faster response times than an un-grounded junction of similar sheath diameter. Grounded junctions should not be used with Type T thermocouples, due to the copper wire.

SHIELDED JUNCTION (S)
The thermocouple wires are welded and recessed inside the sheath with the tip of the sheath open. Insulation is not sealed against liquid or a penetration.

Table 6
Sheath Mounting Fitting Dimensions

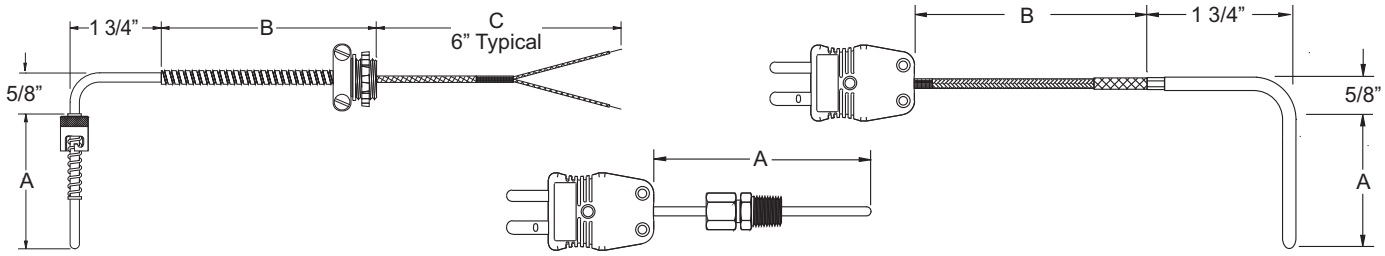
CODE	STYLE	SHEATH OD (inches)	NPT SIZE (inches)	LENGTH (inches)
01A	303 SS one-time adjustable	1/16, 1/8, 3/16, 1/4	1/8	1 5/16
05A	316 SS one-time adjustable	1/16, 1/8, 3/16, 1/4	1/8	1 1/4
05B	316 SS one-time adjustable	1/8, 3/16, 1/4, 3/8	1/4	1 7/8
05C	316 SS one-time adjustable	1/8, 1/4, 3/8	1/2	1 13/16
15A	Brass one-time adjustable	1/8, 3/16, 1/4	1/8	1 1/4
15B	Brass one-time adjustable	3/16, 1/4, 3/8	1/4	1 3/8
15C	Brass one-time adjustable	1/4, 3/8	1/2	1 1/2
10A	303 SS re-adjustable	1/16, 1/8, 3/16	1/8	1 1/4
10B	303 SS re-adjustable	1/4, 3/8	1/4	2 7/16
10C	303 SS re-adjustable	1/4, 3/8	1/2	2 7/16
12A	316 SS re-adjustable	1/16, 1/8, 3/16, 1/4	1/8	1 1/4
12B	316 SS re-adjustable	1/8, 3/16, 1/4, 3/8	1/4	1 1/2
12C	316 SS re-adjustable	1/8, 1/4, 3/8	1/2	1 3/4
11A	Brass re-adjustable	1/16, 1/8, 3/16, 1/4	1/8	1 19/64
11B	Brass re-adjustable	1/8, 3/16, 1/4, 3/8	1/4	1 9/16
11C	Brass re-adjustable	1/4, 3/8	1/2	1 13/16
19C	303 SS spring-loaded well ftg.	3/16, 1/4	1/2	2 1/4
8A	316 SS fixed bushing	All sizes	1/8	5/8
8B	316 SS fixed bushing	All sizes	1/4	11/16
8C	316 SS fixed bushing	All sizes	1/2	15/16
8D	316 SS fixed bushing	All sizes	3/4	1
6HN	Steel hex fitting	1/8, 3/16, 1/4, 3/8	1/2	2
8HN	316 SS hex fitting	1/8, 3/16, 1/4, 3/8	1/2	2
8RNDC	316 SS reducing hex fitting	1/8, 3/16, 1/4, 3/8	1/2 x 3/4	2
9HNB	303 SS hex fitting	1/8, 3/16, 1/4, 3/8	1/4	1 3/16
13A	Fixed bayonet fitting	1/8, 3/16	n/a	1 5/8
14	Adjustable flange	1/8, 3/16, 1/4, 3/8	n/a	1 1/2
16A	Adjustable bayonet fitting	1/8	n/a	1 5/8

Table 7
Leadwire Transition Fitting Dimensions

CODE	SHEATH DIAMETERS (inches)	FITTING OD (inches)	FITTING LENGTH	
			W/SPRING (inches)	W/O SPRING (inches)
15,16,19	0.020	3/8	2 (1/2)	1 (1/4)
15,16,19	0.032	3/8	2 (1/2)	1 (1/4)
15,16,19	0.040	3/8	2 (1/2)	1 (1/4)
15,16,19	1/16	1/4	2 (1/2)	1 (1/4)
15,16,19	1/16[1]	3/8	2 (1/2)	1 (1/4)
15,16,19	1/8	1/4	2 (1/2)	1 (1/4)
15,16,19	1/8[1]	3/8	2 (1/2)	1 (1/4)
15,16,19	3/16	3/8	2 (1/2)	1 (1/4)
15,16,19	1/4	3/8	2 (1/2)	1 (1/4)
15,16,19	3/8	7/16	2 (1/4)	1 (1/2)

[1] Used with flexible armor tubing, duplex T/C's, and wire codes P3, P1, and F3

The thermocouples described below are commonly used in the plastic process industry. These assemblies can be used in many general applications where a 1/8" NPT fitting is preferred by utilizing either a compression fitting or a bayonet adapter. These sensors are constructed using a 316 stainless steel sheath. See General Thermocouple Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number:

1-1	1-2	1-3		2		3		4		5
JP3	3	U	-	04	-	13A	-	F1A012	-	2, BX

1-1 Thermocouple Type

CODE		SHEATH OD (inches)
SINGLE	*DUPLEX*	
JP2		1/8
JP3	JJP3	3/16
JP4	JJP4	1/4
Other Element Types		
For type E, K or T thermocouples, replace J in order code with required letter designation.		

1-2 Bend Angle

CODE	DESCRIPTION
1	Straight
2	45 degree bend
3	90 degree bend

1-3 Junction

Grounded junctions supplied as standard. Insert 'U' only when requiring an ungrounded junction.

2 ‘A’ Dimension

Insert 2 digit 'A' length in inches (1" min).
EX: 04 = 4 inch 'A' dimension.

3 Sheath Fittings

CODE	DESCRIPTION	NOM. LENGTH (inches)
00	No fitting	
13A[1]	7/16" ID single slot spring-loaded bayonet fitting	1 5/8
15A	1/8" NPT brass one time adjustable comp. fitting	1 1/8
01A	1/8" NPT SS one time adjustable comp. fitting	1 1/4
16A	Comp. fitting with bayonet cap and spring - 1/8" OD sheaths only (2 5/8" min. 'A' dimension)	2 3/8
[1] 13A are not available with 1/4” OD sheaths		

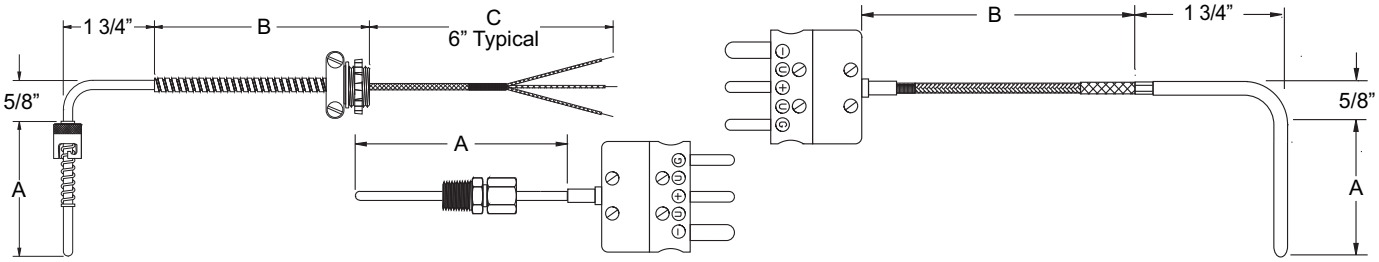
4 Extension Leadwire Type and B+C Dimension

CODE[1]	DESCRIPTION
000	No leadwire, connector attached to sheath
F1 _ _ _	Fiberglass insulation - solid conductor
F1A _ _ _	Fiberglass insulation - solid conductor - flexible armor
F1B _ _ _	Fiberglass insulation - solid conductor - stainless steel overbraid
F3 _ _ _	Fiberglass insulation - stranded conductor
F3A _ _ _	Fiberglass insulation - stranded conductor - flexible armor
F3B _ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
T1 _ _ _	Teflon® insulation - solid conductor
T1A _ _ _	Teflon® insulation - solid conductor - flexible armor
T3 _ _ _	Teflon® insulation - stranded conductor
T3A _ _ _	Teflon® insulation - stranded conductor - flexible armor
[1] Insert 3 digit B length in inches. EX: F1036=36” B length; for assemblies requiring other than the standard 6” C dimension, insert 3 digit C length in inches after B dimension. EX: F1A036-012=36” B length with additional 12” leads beyond armor.	

5 Terminations and Options

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnect lugs
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector

The RTDs described below are those most commonly used, in the plastic process industry. These assemblies can be used in many general applications where a 1/8" NPT fitting is preferred by utilizing either a compression fitting or a bayonet adapter. These assemblies are supplied standard using 316 stainless steel sheath material and a 100 Ω platinum element with a temperature coefficient of 0.003 85 ºC $^{-1}$ and an accuracy of ± 0.3 °C @ 0 °C (DIN Class B). Note: Accuracy statement for 3-wire assemblies only. Elements of other materials, values, and accuracies are available upon request. See General RTD Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number:

1-1	1-2	1-3		2		3		4		5	
RBF1853P	3	3	-	06	-	13A	-	F3B012	-	2,	BX

1-1 RTD Element

CODE		ELEMENT CONNECTION
SINGLE	***DUPLEX*** [1]	
RBF1853P	RBF2853P	3 wire
RBF1852P	RBF2852P	2 wire
[1] Duplex: no 1/8" OD; 3/16" OD limited to Kapton® or Teflon® leadwire.		

1-2 Sheath Diameter

CODE	DESCRIPTION (inches)
2[1]	1/8
3	3/16
4	1/4
[1] Only available with Kapton® or Teflon® leads.	

1-3 Bend Angle

CODE	DESCRIPTION
1	Straight
2	45 degree bend
3	90 degree bend

2 'A' Dimension

Insert 2 digit 'A' length in inches (1" min). EX: 06 = 6 inch 'A' dimension.

3 Sheath Fittings

CODE	DESCRIPTION	NOM. LENGTH (inches)
00	No fitting	
13A[1]	7/16" ID single slot spring loaded bayonet ftg	1 5/8
15A	1/8" NPT brass one time adjustable comp. ftg	1 1/8
01A	1/8" NPT SS one time adjustable comp. fitting	1 1/4
16A	Comp. fitting with bayonet cap and spring - 1/8" OD sheaths only (2 5/8" min. 'A' dimension)	2 3/8
[1] 13A are not available with 1/4" OD sheaths		

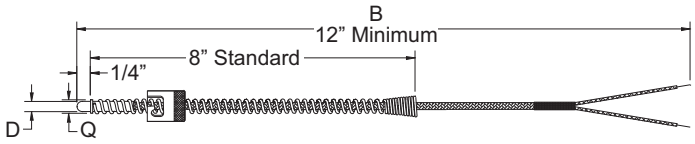
4 Extension Leadwire Type and B+C Dimension

CODE[1]	DESCRIPTION
000	No leadwire, connector attached to sheath
F3 _ _ _	Fiberglass insulation - stranded conductor
F3A _ _ _	Fiberglass insulation - stranded conductor - flexible armor
F3B _ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
F3J _ _ _	Fiberglass insulation - individual leads - stranded conductor (12" limit)
T3 _ _ _	Teflon® insulation - stranded conductor
T3A _ _ _	Teflon® insulation - stranded conductor - flexible armor
K3 _ _ _	Kapton® insulation - stranded conductor
K3A _ _ _	Kapton® insulation - stranded conductor - flexible armor
K3B _ _ _	Kapton® insulation - stranded conductor - stainless steel overbraid
[1] Insert 3 digit B length in inches. EX: F1036=36" B length; for assemblies requiring other than the standard 6" C dimension, insert 3 digit C length in inches after B dimension. EX: F1A036-012=36" B length with additional 12" leads beyond armor.	

5 Terminations and Options

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnect lugs
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector

The JB series spring adjustable immersion thermocouple has a bayonet cap on an 8" spring (standard) to allow for immersion depths of 1/2" to 7". This assembly is used in a variety of applications (with a bayonet adapter) where ease of installation and quick disconnect is preferred. A wide array of standard and metric size bayonet caps and adapters are available. See specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number:

1-1	1-2	1-3	1-4		2		3
JB	A	3	U	-	F3B024	-	2, LS

1-1 Thermocouple Type

CODE		TYPE
SINGLE	*DUPLEX*[1]	
JB	JJB	J
Other Element Types		
For type K or T thermocouples replace J in order code with required letter designation. [1] Duplex not available with 1/8" OD tip.		

1-2 Bayonet Cap Style

CODE	DESCRIPTION
A	7/16" ID single slot (standard) (not available with Opt. 4 tip)
B	12 mm ID dual slot
C	12 mm OD dual pin
E	15 mm ID dual slot

1-3 Tip and Spring Diameters

CODE	TIP OD 'D' DIM. (inches)	SPRING OD 'Q' DIM. (inches)
2	0.125	0.203
3	0.188	0.263
4	0.250	0.324

1-4 Junction

Grounded junctions supplied as standard. Insert 'U' only when requiring an ungrounded junction.

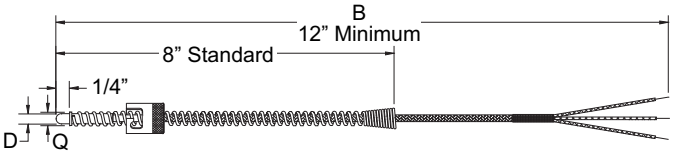
3 Terminations and Options

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnects
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector
LS	12" long spring (3/16" OD only)

2 Extension Leadwire B

CODE[1]	DESCRIPTION
F3B_ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
[1] Insert 3 digit B length in inches. EX: F3B024=24" B length.	

This RTD spring adjustable immersion sensor has a bayonet cap on an 8" spring (standard) to allow for immersion depths of 1/2" to 7". This assembly is used in a variety of applications (with a bayonet adapter) where ease of installation and quick disconnect is preferred. A wide array of standard and metric size bayonet caps and adapters are available. These assemblies are supplied standard using 316 stainless steel sheath material and a 100 Ω platinum element with a temperature coefficient of 0.003 85 ºC^{-1} and an accuracy of ± 0.3 °C @ 0 °C (DIN Class B). Note: Accuracy statement for 3-wire assemblies only. Elements of other materials, values, and accuracies are available upon request. See specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number:

1-1	1-2	1-3		2		3
RBF1853B	A	3	-	F3B024	-	2

1-1 RTD Element Type

CODE		ELEMENT CONNECTION
SINGLE	*DUPLEX[1]*	
RBF1853B	RBF2853B	3 wire
RBF1852B	RBF2852B	2 wire
[1] Duplex assemblies available, with Kapton® wire only.		

1-2 Bayonet Cap Style

CODE	DESCRIPTION
A	7/16" ID single slot (standard) (not available with Opt. 4 tip)
B	12 mm ID dual slot
C	12 mm OD dual pin
E	15 mm ID dual slot

1-3 Tip and Spring Diameters

CODE	TIP OD 'D' DIM. (inches)	SPRING OD 'Q' DIM. (inches)
3	0.188	0.263
4	0.250	0.324

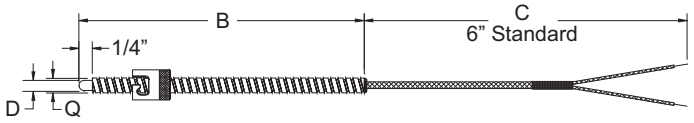
2 Extension Length B

CODE[1]	DESCRIPTION
F3B_ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
K3B _ _ _	Kapton® insulation - stranded conductor - stainless steel overbraid
[1] Insert 3 digit B length in inches. EX: F3B024=24" B length.	

3 Terminations and Options

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnects
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector
LS	12" long spring (3/16" OD only)

The JA series armor adjustable immersion thermocouple has a bayonet cap on the flexible armor and allows for immersion for the entire specified 'B' dimension. This assembly is used in a variety of applications (with a bayonet adapter) where ease of installation and quick disconnect is preferred. A wide array of standard and metric size bayonet caps and adapters are available. See General Thermocouple Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number:

1-1	1-2	1-3	1-4		2		3
JA	A	3	U	-	F3A024	-	2, BX

1-1 Thermocouple Type

CODE		TYPE
SINGLE	*DUPLEX*	
JA	JJA	J
KA	KKA	K
Other Element Types		
For type E and T thermocouples replace J in order code with required letter designation.		

1-2 Bayonet Cap Style

CODE	DESCRIPTION
A	7/16" ID single slot (standard)
B	12 mm ID dual slot
C	12 mm OD dual pin
D	Positive seat indicating
E	15 mm ID dual slot

1-3 Tip and Flex Armor Diameters

CODE	TIP OD 'D' DIM. (inches)	FLEX OD 'Q' DIM. (inches)
2	0.125	0.210
3	0.188	0.275

1-4 Junction

Grounded junctions supplied as standard. Insert 'U' only when requiring an ungrounded junction.

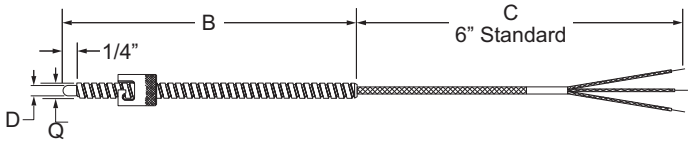
3 Terminations and Options

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnects
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector

2 Extension Leadwire B + C

CODE[1]	DESCRIPTION
F1A_ _ _	Fiberglass insulation - solid conductor - flexible armor
F3A_ _ _	Fiberglass insulation - stranded conductor - flexible armor
[1] Insert 3 digit B length in inches. EX" F1036=36" B length; for assemblies requiring other than the standard 6" C dimension, insert 3 digit C length in inches after B dimension. EX: F1A036-012=36" B length with additional 12" leads beyond armor.	

The RTD version of an armor adjustable immersion sensor has a bayonet cap on the flexible armor and allows for immersion for the entire specified 'B' dimension. This assembly is used in a variety of applications (with a bayonet adapter) where ease of installation and quick disconnect is preferred. A wide array of standard and metric size bayonet caps and adapters are available. These assemblies are supplied standard using 316 stainless steel sheath material and a 100 Ω platinum element with a temperature coefficient of 0.003 85 $ºC^{-1}$ and an accuracy of ± 0.3 °C @ 0 °C (DIN Class B). Note: Accuracy statement for 3-wire assemblies only. Elements of other materials, values, and accuracies are available upon request. See General RTD Specifications later in this section for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number:

1-1	1-2	1-3		2		3
RBF1853A	A	3	-	F3A012	-	3

1-1 RTD Element Type

CODE		ELEMENT CONNECTION
SINGLE	*DUPLEX*[1]	
RBF1852A	RBF2852A	2 wire
RBF1853A	RBF2853A	3 wire
[1] Duplex not available with 1/8" OD; 3/16" OD limited to Kapton® leadwire.		

1-2 Bayonet Cap Style

CODE	DESCRIPTION
A	7/16" ID single slot (standard)
B	12 mm ID dual slot
C	12 mm OD dual pin
D	Positive seat indicating
E	15 mm ID dual slot

1-3 Tip and Flex Armor Diameters

CODE	TIP OD 'D' DIM. (inches)	FLEX OD 'Q' DIM. (inches)
2	0.125	0.210
3	0.188	0.275

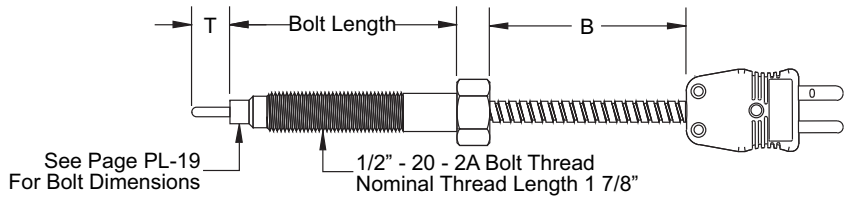
2 Extension Leadwire B + C

CODE[1]	DESCRIPTION
F3A_ _ _	Fiberglass insulation - stranded conductor - flexible armor
K3A_ _ _	Kapton® insulation - stranded conductor - flexible armor
[1] Insert 3 digit B length in inches. EX: F3B036=36" B length; for assemblies other than standard that require leadwire beyond the flexible armor, insert 3 digit C length after armor length. EX: F3A036-012=36" B length with additional 12" leads beyond armor.	

3 Terminations and Options

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnects
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector

The melt bolt thermocouple illustrated below is made of 304 stainless steel and is constructed using a fiberglass insulated element. This style of thermocouple is used on extruders and injection molding machines to directly measure the melt temperature of plastic as it moves down the extruder barrel. See General Thermocouple Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number:

1-1	1-2	1-3		2		3		4
JFMB2	3	U	-	02	-	F1A006	-	4

1-1 Thermocouple Type

CODE		TIP DIAMETER (inches)
SINGLE	*DUPLEX*	
JFMB2		1/8
JFMB3	JJFMB3	3/16
Other Element Types		
For type E, K, or T thermocouples replace J in order code with required letter designation.		

1-2 Bolt Length

CODE	LENGTH (inches)
3	3
4	4
6	6
Consult factory for other lengths.	

1-3 Junction

Grounded junctions supplied as standard. Insert 'U' only when requiring an ungrounded junction.

2 Tip Length

CODE	'T' TIP LENGTH (inches)	CODE	'T' TIP LENGTH (inches)
00	Flush	08	1/2
02	1/8	12	3/4
04	1/4	16	1
Consult factory for other lengths.			

3 Extension Leadwire B

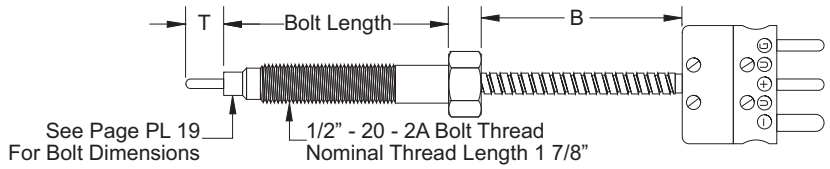
CODE[1]	DESCRIPTION
000	No leadwire, connector attached to sheath
F1A_ _ _	Fiberglass insulation - solid conductor - flexible armor
F3A_ _ _	Fiberglass insulation - stranded conductor - flexible armor

[1] Insert 3 digit B length in inches. EX: F1A012=12" B length; for assemblies requiring other than the standard 6" C dimension, insert 3 digit C length in inches after B dimension. EX: F1A036-012=36" B length with additional 12" C length.

4 Terminations and Options

CODE	DESCRIPTION
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
Options	
MC	Mating connector

The melt bolt RTD sensor illustrated below is used on extruders and injection molding machines to directly measure the melt temperature of plastic as it moves down the extruder barrel. This sensor is made of 304 stainless steel and is constructed using a 100 Ω platinum element with a temperature coefficient of 0.003 85 ºC^{-1} and an accuracy of ± 0.3 °C @ 0 °C (DIN Class B). Note: Accuracy statement for 3-wire assemblies only. Elements of other materials, values, and accuracies are available upon request. See General RTD Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number:

1-1	1-2	1-3		2		3		4
RBF1852MB	2	3	-	02	-	F3A012	-	4

1-1 RTD Element Type

CODE		ELEMENT CONNECTION
SINGLE	*DUPLEX[1]*	
RBF1853MB	RBF2853MB	3 wire
RBF1852MB	RBF2852MB	2 wire
Other Element Types		
[1] Duplex not available with 1/8" OD; 3/16" OD limited to Kapton® leadwire.		

1-2 Tip Diameter

CODE	DIAMETER (inches)
2	1/8
3	3/16

1-3 Bolt Length

CODE	LENGTH (inches)
3	3
4	4
6	6
Consult factory for other lengths.	

2 Tip Length

CODE	'T' TIP LENGTH (inches)	CODE	'T' TIP LENGTH (inches)
00	Flush	08	1/2
02	1/8	12	3/4
04	1/4	16	1
Consult factory for other lengths.			

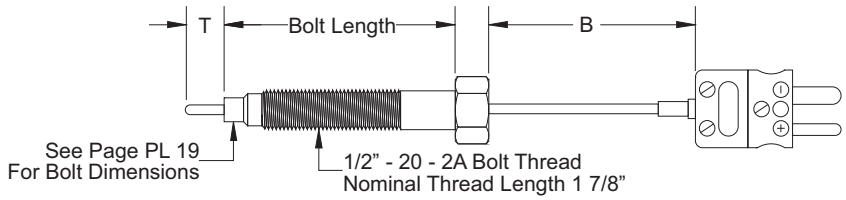
3 Extension Leadwire

CODE[1]	DESCRIPTION
000	No leadwire, connector attached to sheath
F3A_ _ _	Fiberglass insulation - stranded conductor - flexible armor
K3A_ _ _	Kapton® insulation - stranded conductor - flexible armor
[1] Insert 3 digit B length in inches. EX: F1A012=12" B length; for assemblies requiring other than the standard 6" C dimension. EX: F1A036-012=36" B length with additional 12" C length.	

4 Terminations and Options

CODE	DESCRIPTION
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnects
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector

The melt bolt thermocouple illustrated below is used on extruders and injection molding machines to directly measure the melt temperature of plastic as it moves down the extruder barrel. This heavy-duty style of melt bolt is made with 300 series stainless steel and is constructed using a metal sheathed MgO element. See General Thermocouple Specifications, later in this section for other construction specifications.



ORDER CODES

ExampleOrder Number:

1-1	1-2	1-3		2		3		4
JMMB2	3	U	-	02	-	004	-	4

1-1 Thermocouple Type

CODE		TIP DIAMETER (inches)
SINGLE	***DUPLEX***	
JMMB2	JJMMB2	1/8
JMMB3	JJMMB3	3/16
Other Element Types		
For type E, K or T thermocouples replace J in order code with required letter designation.		

1-2 Bolt Length

CODE	LENGTH (inches)
3	3
4	4
6	6
Consult factory for other lengths.	

1-3 Junction

Grounded junctions supplied as standard. Insert 'U' only when requiring an ungrounded junction.

2 Tip Length

CODE	'T' TIP LENGTH (inches)	CODE	'T' TIP LENGTH (inches)
00	Flush	08	1/2
02	1/8	12	3/4
04	1/4	16	1
Consult factory for other lengths.			

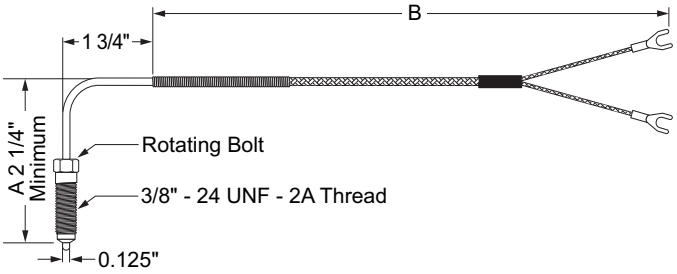
3 MgO Extension B

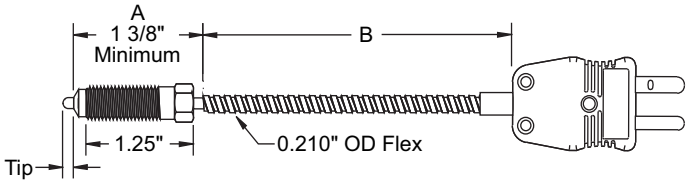
CODE	DESCRIPTION
000	Connector 1/2" from bolt
_ _ _	Insert "B" length in inches using 3 digits

4 Terminations and Options

CODE	DESCRIPTION
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
Options	
MC	Mating connector
CL	Compression L bracket

This nozzle melt thermocouple is placed into the nozzle of a plastic injection molding machine and senses the actual temperature of the molten plastic prior to being injected into the mold. See General Thermocouple Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.





ORDER CODES

Example Order Number: **JNM32 - 04 - F3B036 - 3, BX**

1 Thermocouple Type

CODE	INSULATION	BEND	TIP LENGTH (inches)
JNM12	Fiberglass	Straight	1/8
JNM14	Fiberglass	Straight	1/4
JNM22	Fiberglass	45º	1/8
JNM24	Fiberglass	45º	1/4
JNM32	Fiberglass	90º	1/8
JNM34	Fiberglass	90º	1/4
Other Element Types			
For type E, K, or T thermocouples replace J in order code with required letter designation.			

2 Sheath extension A

Insert 'A' dimension in inches using 2 digits.

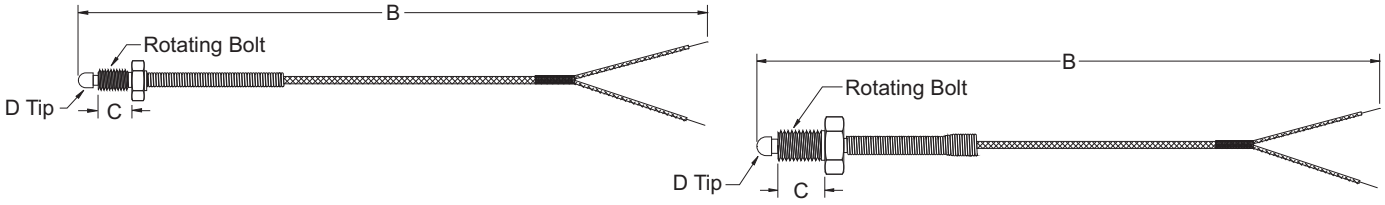
3 Extension Length B

CODE[1]	DESCRIPTION
000	No leadwire, connector attached to sheath
F1_ _ _	Fiberglass insulation - solid conductor
F1A _ _ _	Fiberglass insulation - solid conductor - flexible armor
F3_ _ _	Fiberglass insulation - stranded conductor
F3A _ _ _	Fiberglass insulation - stranded conductor - flexible armor
F3B _ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
[1] Insert 3 digit B length in inches. EX: F1A012=12" B length; for assemblies requiring other than the standard 6" C dimension, insert 3 digit C length in inches after B dimension. EX: F1A036-012=36" B length with additional 12" C length.	

4 Terminations and Options

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnects
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector

The threaded nozzle thermocouple illustrated below is generally used to measure the temperature of the nozzle of an injection molding machine. This style is not in direct contact with the molten plastic. Due to the relatively small size of this sensor, other general areas of use include mounting in bearing housings, sealing bars, heat plates, and other limited space applications. See General Thermocouple Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number: 1-1 **JTN** | 1-2 **U** - 2 **F6** - 3 **F1B024** - 4 **2**

1-1 Thermocouple Type

CODE	DESCRIPTION
JTN	Iron - Constantan
Other Element Types	
For type E, K or T thermocouples replace J in order code with required letter designation.	

1-2 Junction

Grounded junctions supplied as standard. Insert 'U' only when requiring an ungrounded junction.

2 Bolt Designation

CODE	NOZZLE SIZE		
	THREADS	'D' TIP (inches)	'C' LENGTH
F6	1/4" - 28	3/16	3/8"
G8	3/8" - 24	1/4	1/2"
I6	6 mm x 1 mm	3/16	10 mm
K6	8 mm x 1.25 mm	1/4	10 mm
M10	10 mm x 1.50 mm	1/4	16 mm
Other bolt sizes available consult factory.			

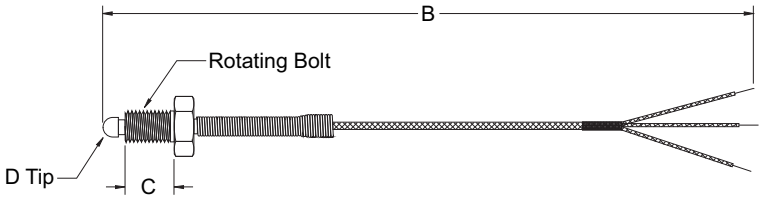
3 Extension Length B

CODE[1]	WIRE DESCRIPTION
F1 _ _ _	Fiberglass insulation - solid conductor
F1B_ _ _	Fiberglass insulation - solid conductor - stainless steel overbraid
F3_ _ _	Fiberglass insulation - stranded conductor
F3B_ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
[1] Insert 3 digit B length in inches. EX: F3B024=24" B length.	

4 Terminations and Options

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Minature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnects
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector

The threaded nozzle RTD illustrated below is generally used to measure the temperature of the nozzle of an injection molding machine. This style is not in direct contact with the molten plastic. Due to the relatively small size of this sensor, other general areas of use include mounting in bearing housings, sealing bars, heat plates, and other limited space applications. These assemblies are supplied standard using a 100 ohm platinum element with a temperature coefficient of 0.003 85 $ºC^{-1}$ and an accuracy of ± 0.3 °C @ 0 °C (DIN Class B). Note: Accuracy statement for 3-wire assemblies only. Elements of other materials, values, and accuracies are available upon request. See General RTD Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number:

1		2		3		4
RBF1852TN	-	**F6**	-	**F3B012**	-	**2**

1 RTD Element Type

CODE	ELEMENT CONNECTION
RBF1853TN	3 wire
RBF1852TN	2 wire

2 Bolt Designation

CODE	NOZZLE SIZE		
	THREADS	'D' TIP (inches)	'C' LENGTH
F6	1/4" - 28	3/16	3/8"
G8	3/8" - 24	1/4	1/2"
I6	6 mm x 1 mm	3/16	10 mm
K6	8 mm x 1.25 mm	1/4	10 mm
M10	10 mm x 1.50 mm	1/4	16 mm
Other bolt sizes available consult factory.			

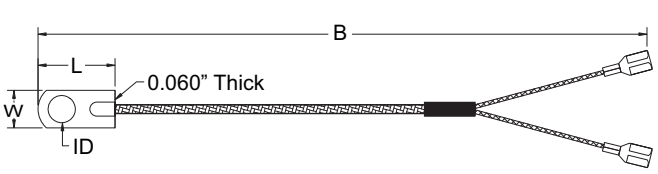
3 Extension Length B

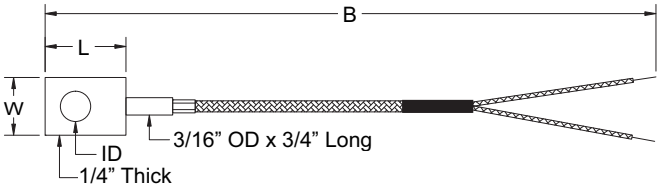
CODE[1]	WIRE DESCRIPTION
F3_ _ _	Fiberglass insulation - stranded conductor
F3B_ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
K3_ _ _	Kapton® insulation - stranded conductor
K3B _ _ _	Kapton® insulation - stranded conductor - stainless steel overbraid
[1] Insert 3 digit B length in inches. EX: F3B024=24" B length	

4 Terminations and Options

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnects
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector

The ring type assemblies pictured below have the thermocouples embedded either into a stainless steel stamping for grounded junctions (fig.1) or a brass ring for ungrounded junctions (fig. 2). Various ring sizes are available to measure the surface temperature of nozzles, extruder barrels, die heads, molds, and many other applicable surfaces. See General Thermocouple Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.





ORDER CODES

Example Order Number: 1 **JRS1** - 2 **F3012** - 3 **8**

FIG. 1

1 Grounded Thermocouples - Ring Size

CODE	RING SIZE			SCREW or BOLT SIZE
	ID (inches)	W (inches)	L (inches)	
JRS1	0.20	3/8	7/8	#6 - #10 4mm-5mm
JRS2	0.33	7/16	1	#12, 1/4" - 5/16" 5mm - 8mm
JRS3	0.40	9/16	1 1/8	5/16" - 3/8" 8mm - 10mm

FIG. 2

1 Ungrounded Thermocouples - Ring Size

CODE	RING SIZE			SCREW SIZE
	ID (inches)	W (inches)	L (inches)	
JRB1U	0.20	3/8	5/8	#6 - #10 4mm-5mm
JRB2U	0.33	5/8	7/8	#12, 1/4" - 5/16" 5mm - 8mm
JRB3U	0.40	5/8	7/8	5/16" - 3/8" 8mm - 10mm

Other Element Types

For type E, K, or T thermocouples replace J in order code with required letter designation.

2 Extension Leadwire B

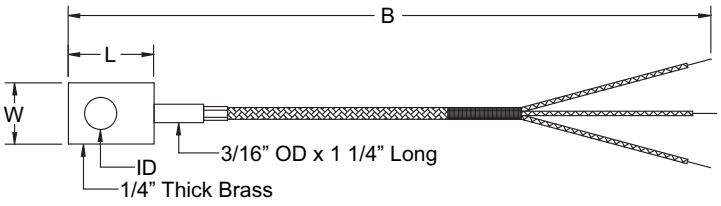
CODE[1]	DESCRIPTION
F1_ _ _	Fiberglass insulation - solid conductor
F1B _ _ _	Fiberglass insulation - solid conductor - stainless steel overbraid
F3_ _ _	Fiberglass insulation - stranded conductor
F3B _ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
T1 _ _ _	Teflon® insulation - solid conductor
T3 _ _ _	Teflon® insulation - stranded conductor
K1 _ _ _	Kapton® insulation - solid conductor

[1] Insert 3 digit B length in inches. EX: F3B024=24" B length.

3 Terminations and Options

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnect lugs
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector

The ring type assembly pictured below has the RTD element embedded into a brass ring. Various ring sizes are available to measure the surface temperature of nozzles, extruder barrels, die heads, molds, and many other applicable surfaces. This assembly is supplied standard using a 100 Ω platinum element with a temperature coefficient of 0.003 85 °C^{-1} and an accuracy of ± 0.3 °C @ 0 °C (DIN Class B). Note: Accuracy statement for 3-wire assemblies only. Elements of other materials, values, and accuracies are available upon request. See General RTD Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number:

1	1-2		2		3
RBF1853RB	**2**	**-**	**F3B012**	**-**	**2**

1-1 RTD Element Type

CODE		ELEMENT CONNECTION
SINGLE	***DUPLEX[1]***	
RBF1853RB	RBF2853RB	3 wire
RBF1852RB	RBF2852RB	2 wire
[1] Duplex assemblies available with Kapton® or Teflon® wire only.		

1-2 Ring Size

CODE	ID (inches)	W (inches)	L (inches)	SCREW SIZE
1	0.20	3/8	5/8	#6 - #10 4mm - 5mm
2	0.33	5/8	7/8	#12, 1/4" - 5/16" 5mm - 8mm
3	0.40	5/8	7/8	5/16" - 3/8" 8mm - 10mm

2 Extension Leadwire Type and B + C Dimension

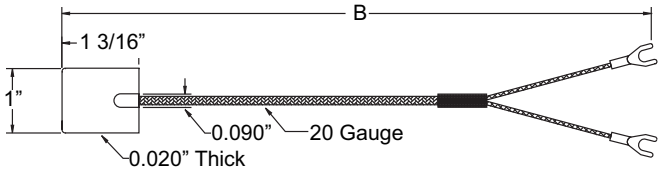
CODE[1]	WIRE DESCRIPTION
F3_ _ _	Fiberglass insulation - stranded conductor
F3A_ _ _	Fiberglass insulation - stranded conductor - flexible armor
F3B_ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
T3_ _ _	Teflon® insulation - stranded conductor
T3A_ _ _	Teflon® insulation - stranded conductor - flexible armor
K3_ _ _	Kapton® insulation - stranded conductor
K3A_ _ _	Kapton® insulation - stranded conductor - flexible armor
K3B _ _ _	Kapton® insulation - stranded conductor - stainless steel overbraid
[1] Insert 3 digit B length in inches. EX: F1A012=12" B length; for assemblies requiring other than the standard 6" C dimension, insert 3 digit C length in inches after B dimension. EX: F1A036-012=36" B length with additional 12" C length.	

3 Terminations and Options

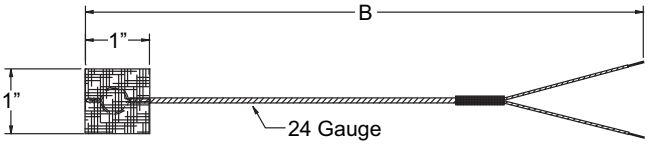
CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnects
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector

The thermocouples illustrated below are generally used for surface temperature measurement. The spade has the thermocouple sandwiched between two thin shims of either stainless steel or fiberglass. Using a worm drive hose clamp the spade can be formed and secured to the outside of any size tube or pipe. It can be strapped in place on the barrel of an extruder, or it can be used under heater bands. See General Thermocouple Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.

STAINLESS STEEL SPADE THERMOCOUPLE



FLEXIBLE FIBERGLASS SPADE THERMOCOUPLE



ORDER CODES

Example Order Number: 1 **JSS** - 2 **F1B036** - 3 **3**

1 Thermocouple Type

CODE	DESCRIPTION
JSS	Stainless steel spade
JST	Flexible fiberglass spade 204 °C [400 °F] max
Nominal spade thickness is 0.020" min to 0.090" max	
Other Element Types	
For type E, K, or T thermocouples replace J in order code wtih required letter designation.	

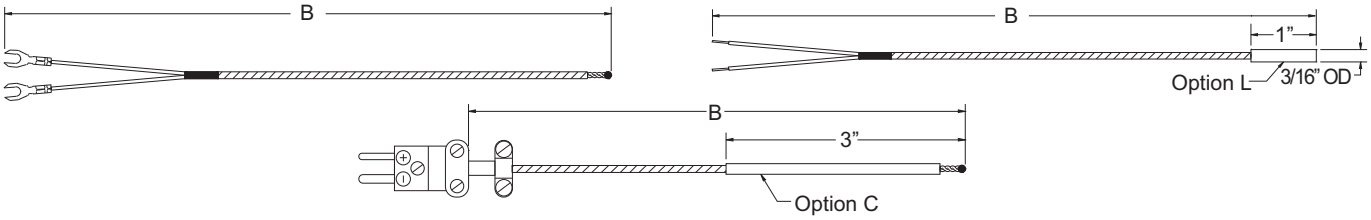
2 Extension Leadwire B

CODE[1]	DESCRIPTION
F1_ _ _	Fiberglass insulation - solid conductor
F1B _ _ _	Fiberglass insulation - solid conductor - stainless steel overbraid
F3_ _ _	Fiberglass insulation - stranded conductor
F3B _ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
T1 _ _ _	Teflon® insulation - solid conductor
T3 _ _ _	Teflon® insulation - stranded conductor
K1 _ _ _	Kapton® insulation - solid conductor
[1] Insert 3 digit B length in inches. EX: F3B024=24" B length.	

3 Terminations and Options

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnects
Options	
MC	Mating connector
CC	Cable clamp
BX	Box connector

The multiple purpose thermocouples listed below are constructed with insulated thermocouple wire and provided with twisted and TIG welded hot junctions. A variety of insulations and overbraids are offered to satisfy many industrial processes, furnace certification, load checking, and laboratory test temperature measurement applications.



ORDER CODES

Example Order Number: **K20-1-S-304 - 072 - 4**

1 Thermocouple and Insulation Type

CODE (Insert T/C Type Prefix Letter)	WIRE GA.	COND. TYPE	INSULATION[1]	INSULATION TEMP RATING ºF	LIMITS OF ERROR[2]
(J,K,E) 20-1-304	20	Solid	Fiberglass	482 ºC [900 ºF]	Standard
(J,K) 20-1-S-304	20	Solid	Fiberglass/SS ovb.	482 ºC [900 ºF]	Standard
(K) 20-3-302	20	Strnd	Fiberglass	482 ºC [900 ºF]	Standard
(J,K) 20-3-S-317	20	Strnd	Fiberglass/SS ovb.	482 ºC [900 ºF]	Standard
(J,K) 20-2-321	20	Solid	Hi-temp fiberglass	704 ºC [1300 ºF]	Special
(J,K,E) 20-1-508	20	Solid	Teflon® (TFE)	260 ºC [500 ºF]	Standard
(J,K) 20-2-513	20	Solid	Kapton®	316 ºC [600 ºF]	Special
(K) 20-2-301	20	Solid	Vitreous sil. fiber	871 ºC [1600 ºF]	Special
(K) 20-2-350	20	Solid	Ceramic fiber	1204 ºC [2200 ºF]	Special
(K) 20-2-N-350	20	Solid	Cer.fiber/Inc. ovb.	1204 ºC [2200 ºF]	Special
(J,K) 24-1-304	24	Solid	Fiberglass	482 ºC [900 ºF]	Standard
(J,K,T) 24-1-508	24	Solid	Teflon® (TFE)	260 ºC [500 ºF]	Standard
(J,K) 30-1-305	30	Solid	Fiberglass	482 ºC [900 ºF]	Standard
(J,K,T) 30-2-506	30	Solid	Teflon® (FEP)	204 ºC [400 ºF]	Special

[1] See Wire Section, for add'l. insulation specifications.
[2] Consult factory for availability of non-listed Special Limits of Error wire.

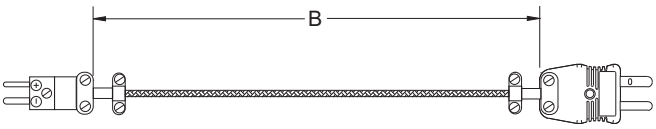
3 Terminations and Options

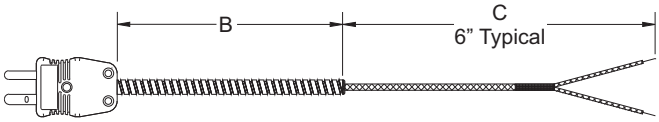
CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads, 1/4" stripped
3	Leads split 2" with spade lugs
4	Standard plug
6	Miniature plug
Options	
MC	Mating connector
CC	Cable clamp
L	Ungrounded hot junction
C	3" ceramic insulator at hot junction

2 Length

Insert 3 Digit Length Order Code in Inches.

The flexible thermocouple extensions illustrated below are constructed using thermocouple wire or thermocouple extension wire. They are used as extension cords to provide suitable connections between sensors, jack panels, or instrumentation. See General Thermocouple Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.





ORDER CODES

Example Order Number: **JE6, CC - F1B036 - 4, CC**

1 Terminations and Options

CODE	DESCRIPTION
JE1	2" split leads with compensated spade lugs
JE2	2" split leads, 1/4" stripped
JE3	2" split leads with spade lugs
JE4	Standard plug
JE5	Standard jack
JE6	Miniature plug
JE7	Miniature jack
JE8	2" split leads with 1/4" female disconnects
For type E, K, or T thermocouples replace J in order code with required letter designation.	
Options	
BX	Box connector
CC	Cable clamp
CG	1/2" NPT plastic cord grip
MC	Mating connector
RB	Rubber boot
SP	Solid pin plug

2 Extension Leadwire B + C Dimension

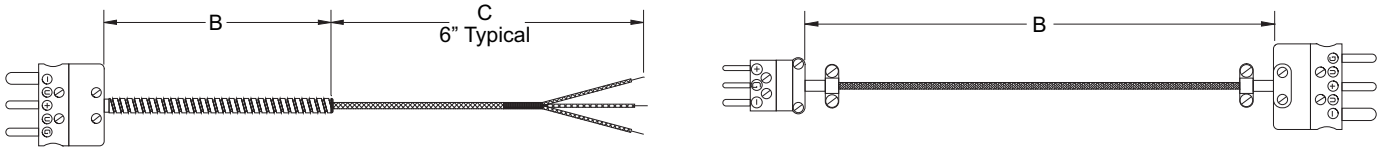
CODE[1]	DESCRIPTION
F1_ _ _	Fiberglass insulation - solid conductor
F1A _ _ _	Fiberglass insulation - solid conductor - flexible armor
F1B _ _ _	Fiberglass insulation - solid conductor - stainless steel overbraid
F3_ _ _	Fiberglass insulation - stranded conductor
F3A _ _ _	Fiberglass insulation - stranded conductor - flexible armor
F3B _ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
T1 _ _ _	Teflon® insulation - solid conductor
T1A _ _ _	Teflon® insulation - solid conductor - flexible armor
T3 _ _ _	Teflon® insulation - stranded conductor
T3A _ _ _	Teflon® insulation - stranded conductor - flexible armor
C3 _ _ _	PVC insulated - stranded conductor - coil cord (only available in 60" and 120" extended lengths)

[1] Insert 3 digit B length in inches. EX: F1A012=12" B length; for assemblies requiring other than the standard 6" C dimension, insert 3 digit C length in inches after B dimension. EX: F1A036-012=36" B length with additional 12" C length.
For PVC or Teflon® coated flex, substitute suffix code A with P for PVC and T for Teflon® coating. Example: F3P is stranded fiberglass leads with PVC flex.

3 Terminations and Options

CODE	DESCRIPTION
0	No termination
1	2" split leads with compensated spade lugs
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnect lugs
Options	
BX	Box connector
CC	Cable clamp
CG	1/2" NPT plastic cord grip
MC	Mating connector
RB	Rubber boot
SP	Solid pin plug

The flexible RTD extensions illustrated below are constructed using stranded copper wire with various insulations. They are used as extension cords to provide suitable connections between sensors, jack panels, or instrumentation. See General RTD Specifications, later in this section, for temperature ratings on selected wire type and other construction specifications.



ORDER CODES

Example Order Number: **RT3E4, CC - F3B036 - 2**

1 Terminations and Options

CODE		DESCRIPTION
2 WIRE	*3 WIRE*	
RT2E2	RT3E2	2" split leads, 1/4" stripped
RT2E3	RT3E3	2" split leads with spade lugs
RT2E4	RT3E4	Standard plug
RT2E5	RT3E5	Standard jack
RT2E6	RT3E6	Miniature plug
RT2E7	RT3E7	Miniature jack
RT2E8	RT3E8	2" split leads with 1/4" female disconnects
Options		
BX	Box connector	
CC	Cable clamp	
CG	1/2" NPT plastic cord grip	
MC	Mating connector	
RB	Rubber boot	

2 Extension Leadwire and B + C Dimension

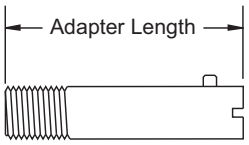
CODE[1]	DESCRIPTION
F3_ _ _	Fiberglass insulation - stranded conductor
F3A _ _ _	Fiberglass insulation - stranded conductor - flexible armor
F3B _ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid
T3 _ _ _	Teflon® insulation - stranded conductor
T3A _ _ _	Teflon® insulation - stranded conductor - flexible armor
K3_ _ _	Kapton® insulation - stranded conductor
K3A_ _ _	Kapton® insulation - stranded conductor - flexible armor
K3B _ _ _	Kapton® insulation - stranded conductor - stainless steel overbraid
C3 _ _ _	PVC insulated - stranded conductor - coil cord (only available in 60" and 120" extended lengths)

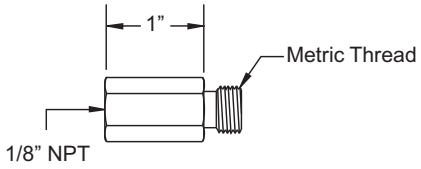
[1] Insert 3 digit B length in inches. EX: F1036=36" B length; for assemblies requiring other than the standard 6" C dimension, insert 3 digit C length in inches after B dimension. EX: F1A036-012=36" B length with additional 12" leads beyond armor.

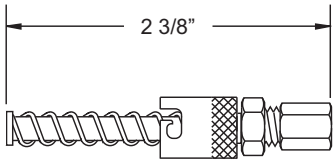
For PVC or Teflon® coated flex, substitute suffix code A with P for PVC and T for Teflon® coating. Example: T3P is stranded Teflon® leads with PVC flex.

3 Terminations and Options

CODE	DESCRIPTION
0	No termination
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2" split leads with 1/4" female disconnects
Options	
BX	Box connector
CC	Cable clamp
CG	1/2" NPT plastic cord grip
MC	Mating connector
RB	Rubber boot







Bayonet Fitting Adapters

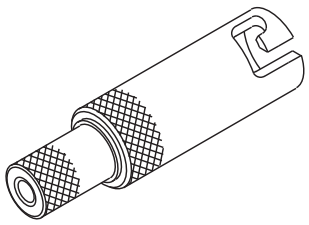
CODE	LENGTH (inches)	THREAD (inches)
705-0.88	7/8	1/8 NPT
705-1.25	1 1/4	1/8 NPT
705-1.5	1 1/2	1/8 NPT
705-2	2	1/8 NPT
705-2.25	2 1/4	1/8 NPT
705-2.5	2 1/2	1/8 NPT
705-3.5	3 1/2	1/8 NPT
735-0.88	7/8	3/8 - 24
735-1.5	1 1/2	3/8 - 24
735-2.5	2 1/2	3/8 - 24
735-3.5	3 1/2	3/8 - 24
745-1	1	12mm x 1
The plated steel bayonet adapter accommodates the bayonet lock cap assembly to bottom the hot junction in holes in machine walls, cylinder, or dies.		

Metric To 1/8” NPT Adapters

CODE	METRIC THREADS (mm)
40001	10 x 1.5
40002	12 x 1
40003	12 x 1.5
40004	14 x 1.5
40005	14 x 2
Adds 1" to bayonet adapter length.	

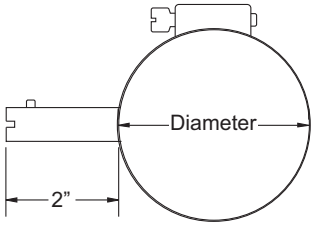
Adjustable Bayonet Cap

CODE	SHEATH SIZE (inches)	DESCRIPTION
718	1/16	Adjustable bayonet cap and spring
728	1/8	



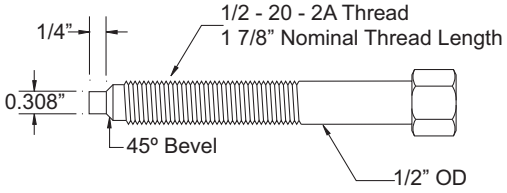
Positive Bottoming Indicating Bayonet Cap

CODE	DESCRIPTION
D702 - A - 2	Adjustable bayonet cap for 0.210"OD flex with red bottoming indication



Pipe Clamp Adapters

CODE	CLAMP DIA. MIN. / MAX. (inches)	JPS PIPE SIZE (inches)	PIPE DIAMETER (inches)
PCA-075	11/16 - 1 1/4	1/2 - 3/4 IPS	0.840 - 1.050
PCA-150	1 1/16 - 2	1 - 1 1/2 IPS	1.315 - 1.900
PCA-250	2 1/16 - 3	2 - 2 1/2 IPS	2.375 - 2.875
PCA-350	3 5/16 - 4 1/4	3 - 3 1/2 IPS	3.500 - 4.000
PCA-400	4 1/8 - 5	4 IPS	4.500
Use 2(3/4)" sensor 'A' dimension when using fixed bayonet type thermocouples with above adapters.			



Blank Melt Bolts

CODE	DESCRIPTION (inches)
743	3 blank bolt
746	6 blank bolt

Thermocouple Leadwire Table

WIRE CODE	CONDUCTOR	T/C AVAILABILITY	INSULATION	OUTER COVERING	MAXIMUM TEMP.
F1	Solid	J, K, T, E	Fiberglass	None	482 °C [900 °F]
F1A	Solid	J, K, T, E	Fiberglass	Stainless steel flex armor	482 °C [900 °F]
F1B	Solid	J, K, T, E	Fiberglass	Stainless steel overbraid	482 °C [900 °F]
F3	Stranded	J, K, T, E	Fiberglass	None	482 °C [900 °F]
F3A	Stranded	J, K, T, E	Fiberglass	Stainless steel flex armor	482 °C [900 °F]
F3B	Stranded	J, K, T, E	Fiberglass	Stainless steel overbraid	482 °C [900 °F]
T1	Solid	J, K, T, E	Teflon®	None	204 °C [400 °F]
T1A	Solid	J, K, T, E	Teflon®	Stainless steel flex armor	204 °C [400 °F]
T3	Stranded	J, K, T, E	Teflon®	None	204 °C [400 °F]
T3A	Stranded	J, K, T, E	Teflon®	Stainless steel flex armor	204 °C [400 °F]
K1	Solid	J, K, E	Kapton®	None	316 °C [600 °F]
K1A	Solid	J, K, E	Kapton®	Stainless steel flex armor	316 °C [600 °F]
C3	Stranded	J, K, T, E	Polyurethane cord set	None	104 °C [220 °F]

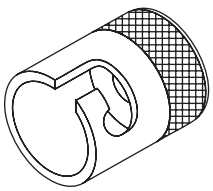
All sensors are constructed in accordance with the above wire code table using 20 ga. thermocouple wire. Exceptions are 1/8" sheath diameters and duplex elements which are constructed with 24 ga. wire, as required.
Type T thermocouples rated to 700 °F maximum.
Standard limits of error is supplied as standard in all order numbers. Consult factory for availability of special limits of error wire.

Thermocouple Color Codes: Wire-Connectors

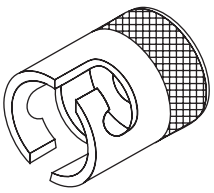
T/C TYPE	POSITIVE (+) LEG	NEGATIVE (-) LEG	T/C WIRE OVERALL	EXT. WIRE OVERALL	PLUGS & JACKS
E	Purple	Red	Brown	Purple	Purple
J	White	Red	Brown	Black	Black
K	Yellow	Red	Brown	Yellow	Yellow
T	Blue	Red	Brown	Blue	Blue

Bayonet Caps

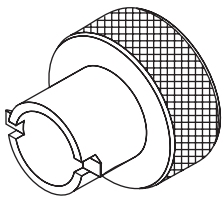
7/16" ID SINGLE SLOT
ORDER CODE: A



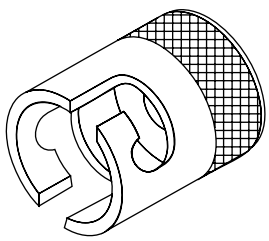
12MM ID DOUBLE SLOT
ORDER CODE: B



12MM OD DUAL PIN
ORDER CODE: C



15MM ID DOUBLE SLOT
ORDER CODE: E



CONSTRUCTION SPECIFICATIONS

SHEATHS: Sheaths are 316 stainless steel and are available in 1/8", 3/16", and 1/4" OD tube diameters.
PLUGS and JACKS: Both standard and miniature size plugs and jacks are rated at 350 °F maximum temperature.
FLEXIBLE ARMOR: Constructed of 302 stainless steel with diameters of 0.275" OD on standard size and 0.207" OD on small flex.

RTD SPECIFICATIONS

Standard RTD Element Availability

MATERIAL	TYPE	RESISTANCE @ 0 ºC	TEMP. COEF.	ACCURACY @ 0 ºC
Platinum	Thin film	100 Ω	0.003 85 $ºC^{-1}$	± 0.12%

Above table indicates initial accuracy only. Lead resistance has a large effect on RTD temperature measurement accuracy. A two wire circuit provides no compensation and can provide large measurement errors. The leadwire resistance table shows the effects of leadwire resistance on a two wire circuit using copper leadwire.

Leadwire Resistance

LEADWIRE GAUGE	RESISTANCE OHMS PER FOOT	UNCOMPENSATED 2 WIRE CIRCUITS	
		MAX. LENGTH FOR 1 ºF ERROR	ERROR IN ºF PER DOUBLE FT.
30	0.110	0.97 Ft.	1.03 °F
28	0.0679	1.58 Ft.	0.63 °F
24	0.0259	4.13 Ft.	0.24 °F
22	0.0160	6.68 Ft.	0.15 °F
20	0.0097	11.03 Ft.	0.09 °F

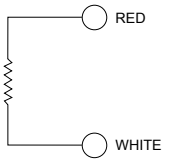
RTD Leadwire Table

WIRE CODE	CONDUCTOR	INSULATION	OUTER COVERING	MAXIMUM TEMP.
F3	Stranded	Fiberglass	None	482 °C [900 °F]
F3A	Stranded	Fiberglass	Stainless steel flex armor	482 °C [900 °F]
F3B	Stranded	Fiberglass	Stainless steel overbraid	482 °C [900 °F]
F3J	Stranded	Fiberglass	None (individual leads)	482 °C [900 °F]
T3	Stranded	Teflon®	None	204 °C [400 °F]
T3A	Stranded	Teflon®	Stainless steel flex armor	204 °C [400 °F]
T3J	Stranded	Teflon®	None (individual leads)	204 °C [400 °F]
K3	Stranded	Kapton®	None	316 °C [600 °F]
K3A	Stranded	Kapton®	Stainless steel flex armor	316 °C [600 °F]
K3B	Stranded	Kapton®	Stainless steel overbraid	316 °C [600 °F]
C3	Stranded	Polyurethane cord set	None	104 °C [220 °F]

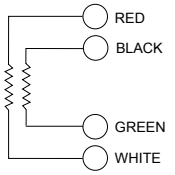
All sensors are constructed in accordance with the above wire code table using 24 ga. leadwire. Exceptions are duplex elements which use 28 ga. leadwire.

RTD WIRING DIAGRAMS

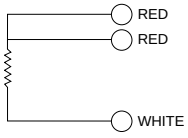
2 WIRE SINGLE



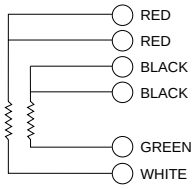
2 WIRE DUPLEX



3 WIRE SINGLE



3 WIRE DUPLEX



CONSTRUCTION SPECIFICATIONS

SHEATHS: Sheaths are 316 stainless steel and are available in 1/8", 3/16", and 1/4" OD tube diameters.

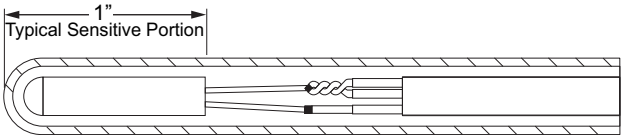
PLUGS and JACKS: Both standard and miniature size plugs and jacks are rated at 350 °F maximum temperature.

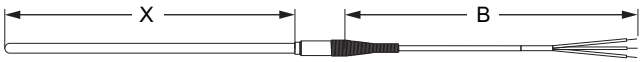
FLEXIBLE ARMOR: Constructed of 300 Series stainless steel with diameters of 0.275" OD on 3/16" and 1/4" OD sheath sizes and 0.207" OD on 1/8" OD sheath size.

RTD

Configuration Code RT01
RTD Assemblies with Extension Leadwire
Configuration Code RT02
RTD Assemblies with Sheath Terminations

The RTD elements illustrated and described on this page are designed to measure temperature in a variety of process and laboratory applications. These RTDs are specifically designed for use in two different process temperature ranges and will provide accurate and repeatable temperature measurement through a broad range. Low range RTDs are constructed using Teflon® insulated silver plated copper internal leads, with potting compounds to resist moisture penetration. High range RTDs are constructed with nickel internal leads inside swaged MgO insulated cable to allow higher temperature measurements at the RTD element and to provide higher temperature lead protection along the sheath. The following tables allow customer selection of standard element materials, initial accuracies, sheath materials and diameters, mounting fittings and terminations. Custom built assemblies with non-standard specifications are available upon request.





ORDER CODES

Example Order Number: **R5T185L** (1-1) **48** (1-2) **3** (1-3) **-** **006** (1-4) **-** Page RTD-2 **-** Page RTD-3 **-** Page RTD-4 **-** Page RTD-5

1-1 Single Platinum RTD Elements — **1-2 Available Sheath Diameters 316SS**

CODE	INITIAL ELEMENT ACCURACY @ 0 ºC	BASE RESISTANCE @ 0 ºC	TEMPERATURE COEFFICIENT	CODE			
LOW RANGE WIRE WOUND (-200 to 204) ºC [-328 to 400] ºF				*1/8" OD*	*3/16" OD*	*1/4" OD*	*3/8" OD*
R1T185L	± 0.1%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	28	38	48	68
R3T185L	± 0.03%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	28	38	48	68
R5T185L	± 0.01%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	28	38	48	68
R1T192L	± 0.1%	100 Ω	$\alpha = 0.003\ 92\ ºC^{-1}$	28	38	48	68
R3T192L	± 0.03%	100 Ω	$\alpha = 0.003\ 92\ ºC^{-1}$	28	38	48	68
R1T125L	± 0.1%	200 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	N/A	38	48	68
LOW RANGE THIN FILM (-40 to 204) ºC [-40 to 400] ºF							
RBF185L	± 0.12%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	28	38	48	68
RAF185L	± 0.06%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	28	38	48	68
RBF155L	± 0.12%	500 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	28	38	48	68
RBF195L	± 0.12%	1000 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	28	38	48	68
HIGH RANGE WIRE WOUND (-200 to 600) ºC [-328 to 1112] ºF							
R1T185H	± 0.1%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	28	38	48	68
R1T192H	± 0.1%	100 Ω	$\alpha = 0.003\ 92\ ºC^{-1}$	28	38	48	68

1-4 Length

CODE
3 Digit 'X' Length

1-3 Element Connection

CODE	DESCRIPTION
2	2 wire
3	3 wire
4[1]	4 wire
[1] Not available in duplex	

1-1 Duplex Platinum RTD Elements — **1-2 Available Sheath Diameters 316SS**

CODE	INITIAL ELEMENT ACCURACY @ 0 ºC	BASE RESISTANCE @ 0 ºC	TEMPERATURE COEFFICIENT	CODE		
LOW RANGE WIRE WOUND (-200 to 204) ºC [-328 to 400] ºF				*3/16" OD*	*1/4" OD*	*3/8" OD*
R1T285L	± 0.1%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	38	48	68
R3T285L	± 0.03%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	38	48	68
R5T285L	± 0.01%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	38	48	68
R1T292L	± 0.1%	100 Ω	$\alpha = 0.003\ 92\ ºC^{-1}$	38	48	68
R3T292L	± 0.03%	100 Ω	$\alpha = 0.003\ 92\ ºC^{-1}$	38	48	68
LOW RANGE THIN FILM (-40 to 204) ºC [-40 to 400] ºF						
RBF285L	± 0.12%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	38	48	68
RAF285L	± 0.06%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	38	48	68
RBF295L	± 0.12%	1000 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	38	48	68
HIGH RANGE WIRE WOUND (-200 to 600) ºC [-328 to 1112] ºF						
R1T285H	± 0.1%	100 Ω	$\alpha = 0.003\ 85\ ºC^{-1}$	38	48	68
R1T292H	± 0.1%	100 Ω	$\alpha = 0.003\ 92\ ºC^{-1}$	38	48	68
Consult factory for other RTD types.						

1-2A

CODE	NOMINAL SHEATH DIAMETER (inches)	TIP DIA. OD (inches)	TIP LENGTH (inches)
88R48	1/2	1/4	1 1/4
68R38	3/8	3/16	1 1/4
48R28	1/4	1/8	1 1/4

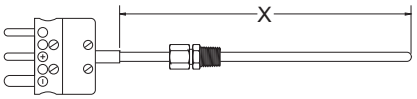
REDUCED TIP RTD's

Table 1-2A lists RTD elements with reduced tip sheaths. To order, use order code numbers from Tbl. 1-2A in place of straight sheath order code numbers from Tbl. 1-2. Other reduced tips are available upon request. EXAMPLE: R1T185L**88R483**-006.

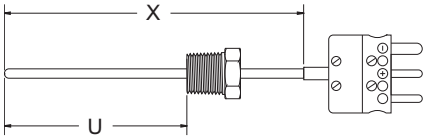
Optional Sheath Mounting Fittings and Bends

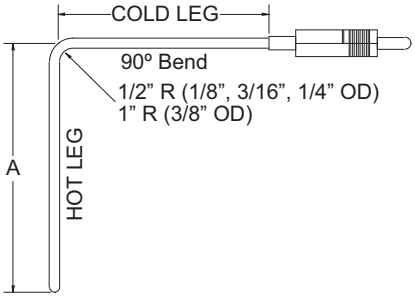
Select Sheath Mounting or Bend Options as desired from tables below.

COMPRESSION FITTING

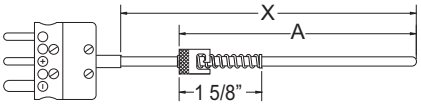


FIXED BUSHING

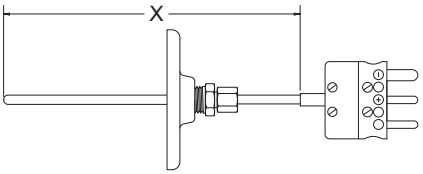




BAYONET CAP and SPRING (OPTION 13A)



ADJUSTABLE FLANGE (OPTION 14)



ORDER CODES

Example Order Number: **R5T185L483-006 - 01A,304 - PAGE RTD 3 - PAGE RTD 4 - PAGE RTD 5**

2

2-1 No Fitting or Bend Options

CODE	00

2-2 One-time Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	PRESSURE RATED	AVALABLE SHEATH DIAMETERS (inches)
01A	303 stainless steel	1/8	NO	1/8, 3/16, 1/4
05A	316 stainless steel	1/8	YES	1/8, 3/16, 1/4
05B	316 stainless steel	1/4	YES	1/8, 3/16, 1/4, 3/8
05C	316 stainless steel	1/2	YES	1/8, 1/4, 3/8
15A	Brass	1/8	NO	1/8, 3/16, 1/4
15B	Brass	1/4	NO	3/16, 1/4, 3/8
15C	Brass	1/2	NO	1/4, 3/8

2-3 Re-adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	AVALABLE SHEATH DIAMETERS (inches)
10A	303 stainless steel	1/8	1/8, 3/16
10B	303 stainless steel	1/4	1/4, 3/8
10C	303 stainless steel	1/2	1/4, 3/8
12A	316 stainless steel	1/8	1/8, 3/16, 1/4
12B	316 stainless steel	1/4	1/8, 3/16, 1/4, 3/8
12C	316 stainless steel	1/2	1/8, 1/4, 3/8
11A	Brass	1/8	1/8, 3/16, 1/4
11B	Brass	1/4	1/8, 3/16, 1/4, 3/8
11C	Brass	1/2	1/4, 3/8
19C	Spring loaded SS well fitting	1/2	3/16, 1/4

Teflon® gland standard 204 ºC [400 °F] max. For lava gland 649 ºC [1200 °F] max. opt. 10A and 10B only use letter suffix "L" after compression fitting order code. EX: 10AL for lava gland.

2-6 Miscellaneous Options

CODE	TYPE	AVALABLE SHEATH DIAMETER (inches)
13A _ _ [1]	Spring-loaded bayonet fitting	1/8, 3/16
14	Adjustable flange with brass compression fitting	1/8, 3/16, 1/4, 3/8
16A	Spring-loaded adjustable bayonet compression fitting	1/8

[1] When ordering fixed bayonet fitting specify dimension "A". EX: order code 13A06 is for a fixed bayonet adapter with 6" A Dimension.

2-5 Fixed Bushings

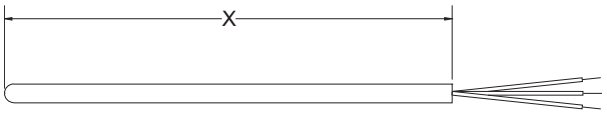
CODE 316 SS	MOUNTING THREAD NPT (inches)	AVALABLE SHEATH DIAMETERS (inches)
8A _ _ [1]	1/8	1/8, 3/16, 1/4
8B _ _ [1]	1/4	1/8, 3/16, 1/4, 3/8
8C _ _ [1]	1/2	1/8, 3/16, 1/4, 3/8
8D _ _ [1]	3/4	1/8, 3/16, 1/4, 3/8

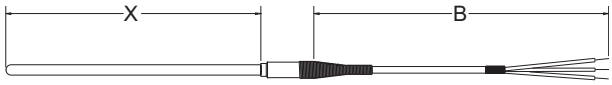
[1] When ordering fixed bushings, specify order code above, plus insertion length "U", as measured from hot tip to bottom of threaded bushing. EX: order code 8A06 is 1/8" NPT, 316 SS bushing located 6" from hot tip.

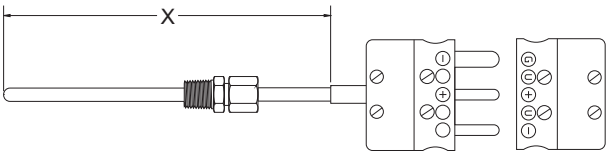
2-4 Sheath Bends

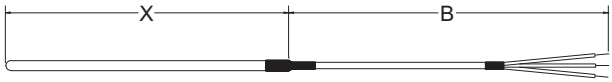
CODE	DESCRIPTION
2 _ _	Sheath bent 45º
3 _ _	Sheath bent 90º
2" minimum hot leg length	

When ordering bend options, specify hot leg dim. "A". Ex :order code 206 is a 45° bend with 6" hot leg. Total sheath length is Table 1 "X" length = hot leg plus cold leg.









RT02 ORDER CODES RT01

Example Order Number:

R5T185L483-006-00 - 4, MC or R5T185L483-006-01A,304 - 16 - PAGE RTD-5 - PAGE RTD-6

(3-1: 4, MC; 3-2: 16)

3-1 Plug and Jack Sheath Terminations

CODE	DESCRIPTION
4[1]	Standard plug
5[1]	Standard jack
6[2]	Miniature plug
7[2]	Miniature jack
	Options
MC	Mating connector
CL	Compression L bracket to hold plug to sheath
[1] If used with 3/8" OD option CL must be specified [2] Not available with 1/4" OD or 3/8" OD sheath	

3-1 Sheath Terminations

CODE	DESCRIPTION
14[1]	Ceramic wafer block
22[2]	3" individual leads with terminal pins
[1] Duplex available in 2 wire only [2] High temp RTD's are supplied with 1" long transition	

3-2 Leadwire transitions

(Requires Tbl. 4 and 5 selections)

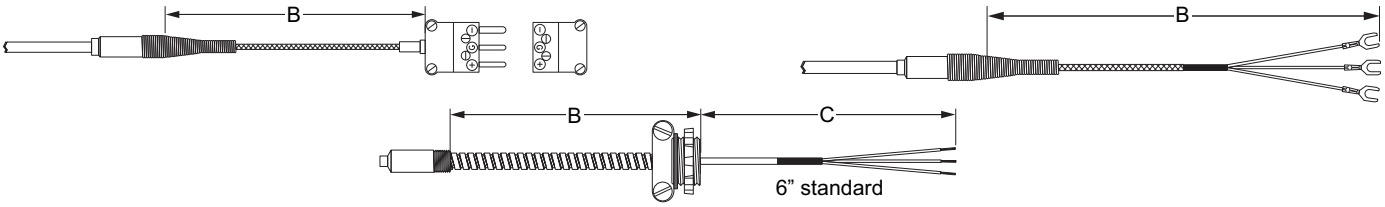
CODE	DESCRIPTION
13[1]	Same size transition with heat shrink tubing 104 ºC [220 ºF]
15	Extension leadwire transition with relief spring 204 ºC [400 ºF]
16	Extension leadwire transition with heat shrink tubing 104 ºC [220 ºF]
18[1]	Same size transition without heat shrink tubing 204 ºC [400 ºF]
19	Extension leadwire transition without spring or heat shrink 204 ºC [400 ºF]
	Options
HT [2]	High temperature potting 538 ºC [1000 ºF] not available with option 13 or 16
[1] Not available with flex armor	
[2] Not available with option 13 or 16. When specifying high temp potting with Flex Armor option 19 must be selected.	

3-2 Threaded Fittings with Extension Leadwire

(Requires Tbl. 4 and 5 selections)

CODE	DESCRIPTION
6HN23	1/2" x 1/2" NPT steel hex nipple
8HN23	1/2" x 1/2" NPT stainless steel hex nipple
9HP23	1/2" NPT stainless steel bushing (no process threads)
8RNDC23	3/4" process x 1/2" NPT stainless steel hex nipple

Select desired leadwire type by order code number, followed by desired length in inches.



ORDER CODES

Example Order Number: **R5T185L483-006-01A,304-16 - T3 036 -** PAGE RTD 5

(4 = T3 036)

4 Extension Leadwire Type and B + C Dimension

CODE	DESCRIPTION	TEMP. RATING
FIBERGLASS		
F3J_ _ _	Fiberglass insulation - individual leads - stranded conductor (12" limit)	482 ºC [900 ºF]
F3_ _ _	Fiberglass insulation - stranded conductor	
F3A_ _ _	Fiberglass insulation - stranded conductor - flexible armor	
F3B_ _ _	Fiberglass insulation - stranded conductor - stainless steel overbraid	
TEFLON®		
T3J_ _ _	Teflon® insulation - individual leads - stranded conductor (12" limit)	204 ºC [400 ºF]
T3_ _ _	Teflon® insulation - stranded conductor	
T3A_ _ _	Teflon® insulation - stranded conductor - flexible armor	
T3B_ _ _	Teflon® insulation - stranded conductor - stainless steel overbraid	
M3_ _ _	Teflon® insulation - stranded conductor - stainless steel overbraid - Teflon® insulation	
T3M_ _ _	Teflon® insulation - stranded conductor - mylar shield	
T3MA_ _ _	Teflon® insulation - stranded conductor - mylar shield - flexible armor	
KAPTON®		
K3_ _ _	Kapton® insulation - stranded conductor	316 ºC [600 ºF]
K3A_ _ _	Kapton® insulation - stranded conductor - flexible armor	
K3B_ _ _	Kapton® insulation - stranded conductor - stainless steel overbraid	
SILICON RUBBER		
S3_ _ _	Teflon® insulation - stranded conductor - silicon rubber	204 ºC [400 ºF]
COIL CORDS		
C3060	PVC insulation - stranded conductor - coil cord - 60" extended length	104 ºC [220 ºF]
C3120	PVC insulation - stranded conductor - coil cord - 120" extended length	

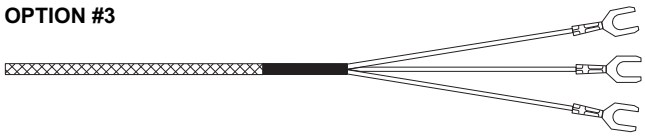
Insert wire code number and 3 digit 'B' length in inches EX: T3036 = 36" B length

For assemblies requiring leadwire beyond the flexible armor (illustrated in 'C' in drawing), insert 3 digit 'C' length after armor length.
EX: F3A036 -012 = 36" B length with additional 12" 'C' length leads beyond armor.

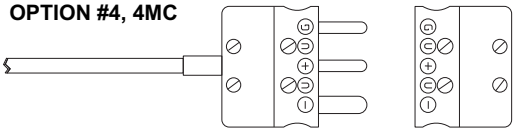
All insulated leadwires in flexible armor are available with either extruded PVC or Teflon® covering over the flexible armor.
Substitute suffix codes T (Teflon®) or P (PVC) for the suffix 'A' code above. EXAMPLE: T3T is Teflon® covered armor.

Select desired leadwire termination and options (if desired), by order code numbers below.

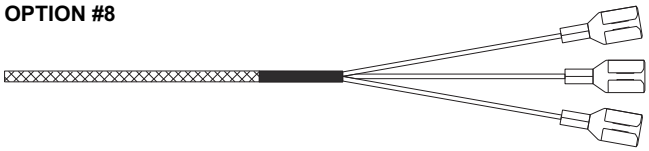
OPTION #3



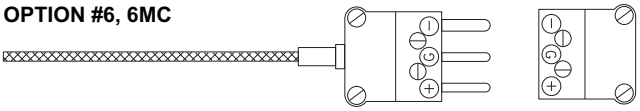
OPTION #4, 4MC



OPTION #8



OPTION #6, 6MC



ORDER CODES

Example Order Number: **R5T185L483-006-01A,304-16-T3036 - 4, MC**

5-1 5-2

5-1 Terminations

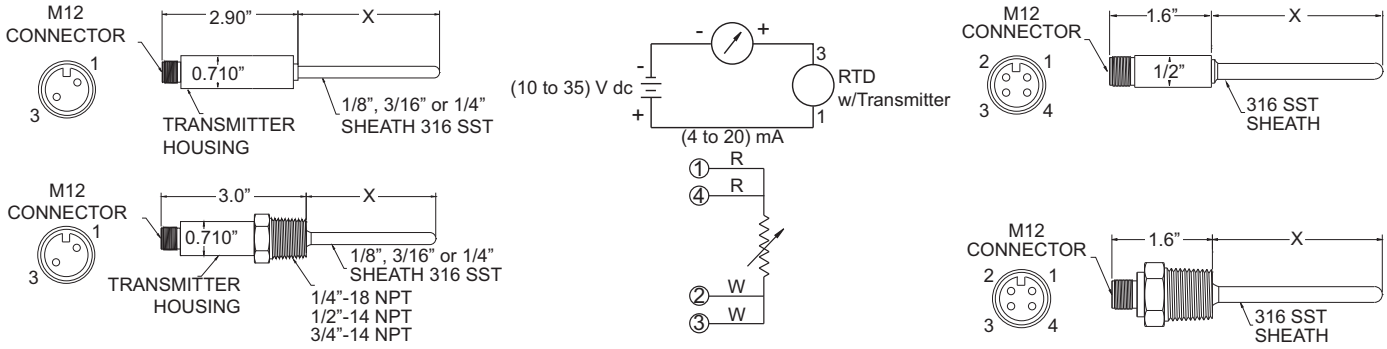
CODE	DESCRIPTION
0	Leads not stripped
2	2” split leads, 1/4” stripped
3	2” split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2” split leads with 1/4” female quick disconnects

5-2 Options

CODE	DESCRIPTION
BX	1/2” NPT BX connector with Options 0, 2, 3, or 8
CC	Plug or jack secured to leads with cable clamp
CG	Cord Grip (1/2” NPT PVC)
MC	Mating connector
RB	Rubber boot

Configuration Code RT03
Water-Tight RTD Assembly
With Optional Series 450 Temperature Transmitter

RTD Assemblies house an optional Series 450 Temperature Transmitter (no connection head is required) that is ideal for monitoring temperature in small areas such as tanks and pipes. The water-tight construction meets the NEMA 6P, IP68 Protection Rating requirements. Standard units include a sensor, an M12 process connection housing, and optional transmitter. The transmitter is a 2-wire unit with an analog output. It has measurement input for Pt100 resistance thermometers (RTD) in 4 wire connections. Transmitters can be ranged from (-51 to 160) ºC [-60 to 320] ºF. With a 10 ºC [18 ºF] minimum span requirement. **The ambient temperature limits for the M12 connector is (-40 to 85) ºC.**



ORDER CODES

Example Order Number: **R1T185L | 484 - 06 - 00 - C45, T - 450 - U - S(0-200) F**

(1 = R1T185L, 2 = 484, 3 = 06, 4 = 00, 5 = C45, T, 6 = 450, 7 = U, 8 = S(0-200), 9 = F)

1 Pt100 (α=0.003 85 ºC^{-1}) RTD Assemblies

CODE	INITIAL ELEMENT ACCURACY @ 0 ºC
R1T185L	± 0.1%
R3T185L	± 0.03%
R5T185L	± 0.01%
RAF185L	± 0.06%
RBF185L	± 0.12%
See Instrument Section for total sensor and transmitter output accuracy.	

2 316 S.S. Sheath

CODE	DIAMETER OD (inches)
284	1/8
384	3/16
484	1/4

3 Immersion Length "X"

Specify "X" length in inches using 2 digits, plus any fractional length desired. Examples: 04 = 4", 04(1/2) = 4.5"

4.1 Sheath Fittings

CODE	
00	No Fitting

4.2 Re-Adjustable Compression Fittings

CODE	DESCRIPTION	NPT (inches)	AVAILABLE SHEATH DIAMETERS (inches)
12A	Stainless Steel	1/8	1/8, 3/16
12B	Stainless Steel	1/4	3/16, 1/4
12C	Stainless Steel	1/2	1/8, 1/4
Teflon® gland standard 204 ºC [400 ºF] max.			

4.3 One-Time Adjustable Compression Fittings

CODE	DESCRIPTION	NPT (inches)	AVAILABLE SHEATH DIAMETERS (inches)
05A	Stainless Steel	1/8	1/8, 3/16, 1/4
05B	Stainless Steel	1/4	1/8, 3/16, 1/4
05C	Stainless Steel	1/2	1/8, 1/4

4.4 316SS Fixed Bushings

CODE	MOUNTING THREAD NPT (inches)	AVAILABLE SHEATH DIAMETERS (inches)
8A_ _	1/8	1/8, 3/16, 1/4
8B_ _	1/4	1/8, 3/16, 1/4
8C_ _	1/2	1/8, 3/16, 1/4
8D_ _	3/4	1/8, 3/16, 1/4
When ordering fixed bushings, specify order code above plus insertion length "U", as measured from hot tip to bottom of threaded bushing. EX: code 8A06 is 1/8" NPT, 316 SS bushing located 6" from hot tip.		

5 M12 Connector Termination

CODE	DESCRIPTION
45	No Process Connection
C45	1/2" NPT Process Connection
B45	1/4" NPT Process Connection
D45	3/4" NPT Process Connection
OPTIONAL TRANSMITTER	
T	4 to 20 mA Temperature Transmitter (Requires Table 6 selection)

6 Transmitter

CODE	DESCRIPTION
450-00	Programmable Transmitter Unconfigured
450	Programmable Transmitter Configured

7 Fault Signal

CODE	DESCRIPTION
U	Upscale Burnout
D	Downscale Burnout

8 Range

CODE	DESCRIPTION
S	(lower limit - upper limit)

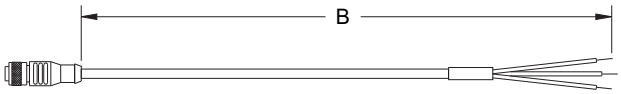
9 Units

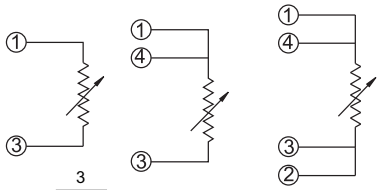
CODE	DESCRIPTION
C	Celsius
F	Fahrenheit

M12 Molded and Field Wireable cables are available for connection to Pyromation Water-Tight Assemblies with Optional Series 450 Transmitters. The M12 quick disconnect plug eliminates all external screw connections simplifying the electrical installation process and solving the problems caused by moisture, loose connections, and corrosion. They are faster to install and more secure than conventional field wired connections. Both are available in 2, 3, and 4 wire connection options and in straight or 90º angle styles. Molded cables are PVC insulated and meet NEMA 1, 3, 4, 6P and IEC IP68. Field Wireable Cable insulations are listed below and meet IP67 requirements. Cable lengths are manufactured to customer specifications. All M12 Molded Cables are supplied as 4 wire and are terminated as specified in part number.

ORDER CODES

M12 MOLDED CABLE





Example Order Number: **RT3E46MS - P3072 - 2**

1 M12 Connector Options

CODE	NUMBER OF WIRES	DESCRIPTION
RT2E46MS	2	Straight M12 Molded Connector
RT3E46MS	3	
RT4E46MS	4	
RT2E46MA	2	90º Angle M12 Molded Connector
RT3E46MA	3	
RT4E46MA	4	

2 Extension Cable

CODE	DESCRIPTION
P3_ _ _ [1]	22 AWG PVC insulation

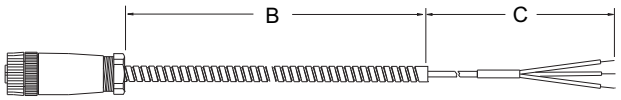
[1] Insert length in inches

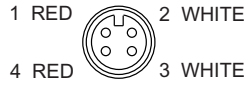
3 Terminations and Options

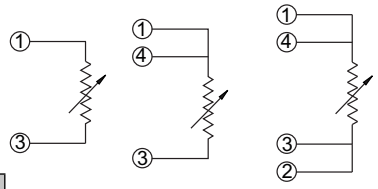
CODE	DESCRIPTION
0	No termination
2	2” split leads, 1/4” stripped
3	2” split leads with spade lugs
4	Standard plug
5	Standard Jack
Options	
BX	Box connector
CC	Cable clamp
CG	1/2” NPT plastic cord grip
MC	Mating connector
RB	Rubber boot

ORDER CODES

M12 FIELD WIREABLE CABLES







Example Order Number: **RT3E46S - T3072 - 2**

1 M12 Connector Options

CODE	NUMBER OF WIRES	DESCRIPTION
RT2E46S	2	Straight M12 Connector
RT3E46S	3	
RT4E46S	4	
RT2E46A	2	90º Angle M12 Connector
RT3E46A	3	
RT4E46A	4	

2 Extension Leadwire and B + C Dimension

CODE*	WIRE DESCRIPTION
P3 _ _ _	Stranded; PVC insulation
P3A _ _ _	Stranded; PVC insulation w/flex armor
T3 _ _ _	Stranded; Teflon® insulation
T3M_ _ _	Stranded; Teflon® with aluminum mylar shield and drain
T3A _ _ _	Stranded; Teflon® insulation w/flex armor

*Insert 3 digit B length in inches. EXAMPLE: T3036=36” B length; for assemblies requiring leadwire beyond the flexible armor, insert 3 digit C length after armor length. EXAMPLE: T3A036-012=36” B length with additional 12” leads beyond armor.

3 Terminations and Options

CODE	DESCRIPTION
0	No termination
2	2” split leads, 1/4” stripped
3	2” split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
8	2” split leads with 1/4” female disconnects
Options	
BX	Box connector
CC	Cable clamp
CG	1/2” NPT plastic cord grip
MC	Mating connector
RB	Rubber boot

The information contained in the following pages is intended as a guideline for general RTD sensor useage. Specific applications and environmental conditions may require that other sensor element types, element materials, or construction styles be used to provide optimum temperature measurement results. The dimensions, temperature ratings, accuracies, and other specifications may vary to satisfy a particular application requirement. For further information and recommendations on specific applications, please consult with the factory.

RTD ELEMENTS

Elements of several different materials, base resistances, temperature coefficients, accuracies, and construction styles are available for installation into final RTD temperature sensor assemblies to meet customer specifications. The most commonly used element throughout the USA and Europe is a wire-wound or thin film platinum with a base resistance of 100 Ω at 0 °C [32 ºF] and with a 0.003 85 $ºC^{-1}$ temperature coefficient.

A few USA companies, and most Japanese companies, use a similar 100 Ω platinum element, but with a 0.003 92 $ºC^{-1}$ temperature coefficient.

Pyromation's standard element for either of these specified assemblies is a wire-wound type, in which the platinum winding is supported inside a ceramic body, although other process considerations may sometimes require the use of a thin film or "glassed-in" type of element. Elements of materials other than platinum are typically wire-wound on a core and covered with an insulating material such as Kapton®.

The platinum elements used in Pyromation RTD assemblies are in accordance with the specifications set forth in the following standards:

STANDARDS for 0.003 85 $ºC^{-1}$ TEMPERATURE COEFFICIENT ELEMENTS

1. American Society For Testing and Materials. (ASTM) E 1157 - 97
2. International Electrotechnical Commission. IEC 60751 - 1995

STANDARDS for 0.003 92 $ºC^{-1}$ TEMPERATURE COEFFICIENT ELEMENTS

1. American Scientific Apparatus Manuf. Association: SAMA RC 21.4 - 1966
2. Japanese Standard: JIS C 1604 - 1997

RTD ELEMENT TERMINOLOGY and SPECIFICATIONS

Temperature Coefficient: Known as the "Alpha" value, and it is the average fractional change of element resistance per a 1 °C change in the element temperature over the range of (0 to 100) °C [32 to 212] ºF. The temperature coefficient of resistance is expressed as ohms/ohm/°C or $°C^{-1}$.

Accuracy: A statement of the initial element accuracy when its base resistance value is measured at **one point only**, usually 0 °C.

Repeatability-Stability: The ability of an element to reproduce the same resistance or temperature reading each time it is at equilibrium at a given repeated temperature. Expressed as a ± resistance or temperature value over a given temperature range. May also be expressed as the stability of its resistance. Typically platinum elements will not change more than 0.04% at 0 °C [32 ºF] after receiving ten consecutive shocks from (-200 to 600) °C [-328 to 1112] ºF.

Self-Heating: RTD elements are not self-powered and require a small current be passed through the device to provide a voltage that can be measured. Self-heating is the rise of temperature within the element itself, caused by the current flowing through the element. This self-heating appears as a measurement error and is affected by the thermal conductivity and velocity of the process being measured; it is negligible for most applications. Typical platinum resistance elements would require 60 mV of power dissipation to cause a 1 °C [1.8 °F] temperature measurement error when tested in water flowing at 3 ft/s.

Time Constant: The time required to sense 63% of a step temperature change from (25 to 80) °C [77 to 176] ºF in water flowing at 3 ft/s.

Interchangeability: The amount of allowable difference in readings between two RTD's when placed side by side in a process at the same temperature. Determined by the allowable RTD tolerance at that particular temperature.

Tolerance: The amount of resistance error tolerated when the elements are measured at various temperature points. Pyromation 100 and 200 ohm platinum elements are offered in three base resistance tolerance bands as follows:

Band 1: ± 0.1% @ 0 ºC (Actual Elements Used Exceed DIN Class B Tolerances)
Band 3: ± 0.03% @ 0 ºC (Actual Elements Used Exceed DIN Class A Tolerances)
Band 5: ± 0.01% @ 0 ºC (Actual Elements Used Exceed DIN Class A Tolerances)

Elements of other values and of other materials are offered in the following base resistance tolerance bands:

DIN Class A	± 0.06%	@ 0 °C
DIN Class B	± 0.12%	@ 0 °C
Class C	± 0.2%	@ 0 °C
Class D	± 0.5%	@ 0 °C

Vibration: Pyromation's fully assembled sheathed RTD sensors are designed to withstand an average vibration level of 30 G's using random vibrating frequencies from (20 to 2,000) HZ at ambient temperature. Supporting test results indicate that initial RTD tolerances remain as specified when tested at these vibration levels.

Humidity Limits: Sheaths, transition fittings, and lead seals capable of withstanding 100% humidity at normal atmospheric pressure, and at normal ambient temperatures.

Pyromation Standard RTD Element Specifications

ELEMENT MATERIAL [1]	RESISTANCE @ 0 ºC	TEMPERATURE COEFFICIENT	OPPERATING RANGE [2]	AVAILABLE ACCURACIES @ 0 ºC	CATALOG ORDER CODES
Platinum	100 Ω	α = 0.003 85 ºC^{-1}	(-200 to 600) °C [-328 to 1112] °F	± 0.1% ± 0.03% ± 0.01%	R1T R3T R5T
Platinum	100 Ω	α = 0.003 92 ºC^{-1}	(-200 to 600) °C [-328 to 1112] °F	± 0.1% ± 0.03%	R1T R3T
Platinum	100 Ω	α = 0.003 85 ºC^{-1}	(-40 to 200) °C [-40 to 400] °F	± 0.12%	RBF
Platinum	100 Ω	α = 0.003 85 ºC^{-1}	(-40 to 200) °C [-40 to 400] °F	± 0.06%	RAF
Platinum	200 Ω	.α = 0.003 85 ºC^{-1}	(-200 to 600) °C [-328 to 1112] °F	± 0.1% ± 0.03% ± 0.01%	R1T R3T R5T
Platinum	200 Ω	α = 0.003 92 ºC^{-1}	(-200 to 600) °C [-328 to 1112] °F	± 0.1% ± 0.03%	R1T R3T
Platinum	500 Ω	α = 0.003 85 ºC^{-1}	(-40 to 500) °C [-40 to 932] °F	± 0.12%	RBF
Platinum	1000 Ω	α = 0.003 85 ºC^{-1}	(-40 to 500) °C [-40 to 932] °F	± 0.12%	RBF
Copper	10 Ω	α = 0.004 27 ºC^{-1}	(-200 to 204) °C [-328 to 400] °F	± 0.2%	RCT
Nickel	120 Ω	α = 0.006 72 ºC^{-1}	(-200 to 204) °C [-328 to 400] °F	± 0.5%	RDT
Nickel-Iron	604 Ω	α = 0.005 18 ºC^{-1}	(-200 to 204) °C [-328 to 400] °F	± 0.5%	RDT

[1] *Sensing elements of other materials, base values, and temperature coefficients are available upon request.*

[2] *Stated operating ranges are typical values and are dependant upon the sensing element, element substrate, and the construction style of the total sensor assembly. Sensor assemblies to exceed the stated limits may be available upon request.*

Typical 100 OHM Platinum Element Tolerances

TEMPERATURE		CLASS B (0.12%) [1] TOLERANCE ±[0.30 + 0.0050 |t|] °C		BAND 1 (0.1%) [1] TOLERANCE ±[0.26 + 0.0042 |t|] °C		CLASS A (0.06%) [1] TOLERANCE ±[0.15 + 0.0020 |t|] °C		BAND 3 (0.03%) [1] TOLERANCE ±[0.08 + 0.0017 |t|] °C		BAND 5 (0.01%) [2] TOLERANCE ±[0.03 + 0.0017 |t|] °C	
°C	[°F]	°C	[°F]	°C	[°F]	°C	[°F]	°C	[°F]	°C	[°F]
-200	[-328]	1.30	[2.34]	1.10	[1.98]	0.55	[0.99]	0.42	[0.76]	0.37	[0.67]
-100	[-148]	0.80	[1.44]	0.68	[1.22]	0.35	[0.63]	0.25	[0.45]	0.20	[0.36]
0	[32]	0.30	[0.54]	0.26	[0.47]	0.15	[0.27]	0.08	[0.14]	0.03	[0.05]
100	[212]	0.80	[1.44]	0.68	[1.22]	0.35	[0.63]	0.25	[0.45]	0.20	[0.36]
200	[392]	1.30	[2.34]	1.10	[1.98]	0.55	[0.99]	0.42	[0.76]	0.37	[0.67]
300	[572]	1.80	[3.24]	1.52	[2.74]	0.75	[1.35]	0.59	[1.06]	0.54	[0.97]
400	[752]	2.30	[4.14]	1.94	[3.49]	0.95	[1.71]	0.76	[1.37]	0.71	[1.28]
500	[932]	2.80	[5.04]	2.36	[4.25]	1.15	[2.07]	0.93	[1.67]	0.88	[1.58]
600	[1112]	3.30	[5.94]	2.78	[5.00]	1.35	[2.43]	1.10	[1.98]	1.05	[1.89]

where: |t| = value of temperature without regard to sign, °C

[1] The equations represent values for 3 and 4-wire PRTs. Caution must be exercised with 2-wire PRTs due to lead resistance.

[2] This tolerance can only be met with a 4-wire PRT.

RTD ASSEMBLY CONSTRUCTION STYLES

Low Range - Thin Film Construction (L) (-40 °C to 204) °C [-40 °F to 400] °F

The element is welded to teflon insulated silver plated copper leads, and then placed inside a specially cleaned stainless steel sheath. The space surrounding the element and leads is filled and loosely packed with alumina oxide powder to provide good heat transfer times and to provide a damping cushion against vibration and mechanical shock. The filled sheath is then sealed with low temperature epoxies to prevent moisture penetration.

Standard Low Range (L) (-200 °C to 204) °C [-328 °F to 400] °F

The element is welded to teflon insulated silver plated copper leads, and then placed inside a specially cleaned stainless steel sheath. The space surrounding the element and leads is filled and loosely packed with alumina oxide powder to provide good heat transfer times and to provide a damping cushion against vibration and mechanical shock. The filled sheath is then sealed with low temperature epoxies to prevent moisture penetration.

Standard High Range (H) (-200 °C to 600) °C [-328 °F to 1112] °F

The element is welded to nickel leads that are insulated with compacted magnesium oxide (MgO) powder inside the stainless steel sheath. The void surrounding the element is packed with MgO powder and the sheath tip is welded closed with a stainless steel cap. The leads and sheath are sealed with low temperature epoxies to prevent moisture penetration.

MECHANICAL SPECIFICATIONS

The following specifications are those found on standard construction RTD sensor assemblies.

Sheath Materials

MATERIAL	CODE	APPLICATION DATA	NOTES
316 SS	8	Superior Corrosion Resistance	Used as standard sheath material on all but 1/16" OD sheaths
Inconel 600	3	Excellent Corrosion and Oxidation Resistance at High Temperatures	

Sheath Mounting Fitting Dimensions

CODE	STYLE	SHEATH OD (inches)	NPT SIZE (inches)	LENGTH (inches)
01A	303 SS one-time adjustable	1/16, 1/8, 3/16, 1/4	1/8	1 5/16
05A	316 SS one-time adjustable	1/16, 1/8, 3/16, 1/4	1/8	1 1/4
05B	316 SS one-time adjustable	1/8, 3/16, 1/4, 3/8	1/4	1 7/8
05C	316 SS one-time adjustable	1/8, 1/4, 3/8	1/2	1 13/16
15A	Brass one-time adjustable	1/8, 3/16, 1/4	1/8	1 1/4
15B	Brass one-time adjustable	3/16, 1/4, 3/8	1/4	1 3/8
15C	Brass one-time adjustable	1/4, 3/8	1/2	1 1/2
10A	303 SS re-adjustable	1/16, 1/8, 3/16	1/8	1 1/4
10B	303 SS re-adjustable	1/4, 3/8	1/4	2 7/16
10C	303 SS re-adjustable	1/4, 3/8	1/2	2 7/16
12A	316 SS re-adjustable	1/16, 1/8, 3/16, 1/4	1/8	1 1/4
12B	316 SS re-adjustable	1/8, 3/16, 1/4, 3/8	1/4	1 1/2
12C	316 SS re-adjustable	1/8, 1/4, 3/8	1/2	1 3/4
11A	Brass re-adjustable	1/16, 1/8, 3/16, 1/4	1/8	1 19/64
11B	Brass re-adjustable	1/8, 3/16, 1/4, 3/8	1/4	1 9/16
11C	Brass re-adjustable	1/4, 3/8	1/2	1 13/16
19C	303 SS spring-loaded well ftg.	3/16, 1/4	1/2	2 1/4
8A	316 SS fixed bushing	All sizes	1/8	5/8
8B	316 SS fixed bushing	All sizes	1/4	11/16
8C	316 SS fixed bushing	All sizes	1/2	15/16
8D	316 SS fixed bushing	All sizes	3/4	1
6HN	Steel hex fitting	1/8, 3/16, 1/4, 3/8	1/2	2
8HN	316 SS hex fitting	1/8, 3/16, 1/4, 3/8	1/2	2
8RNDC	316 SS reducing hex fitting	1/8, 3/16, 1/4, 3/8	1/2 x 3/4	2
9HNB	303 SS hex fitting	1/8, 3/16, 1/4, 3/8	1/4	1 3/16
13A	Fixed bayonet fitting	1/8, 3/16	N/A	1 5/8
14	Adjustable flange	1/8, 3/16, 1/4, 3/8	N/A	1 1/2
16A	Adustable bayonet fitting	1/8	N/A	1 5/8

Compression Fitting Pressure Rating Table

CODE	05A	05A, 05B 05C	05A, 05B	05A, 05B 05C	05B, 05C
Sheath O.D. & Wall Thickness	1/6" O.D. x 0.0077"	1/8" O.D. x 0.012"	3/16" O.D. x 0.020"	1/4" O.D. x 0.028"	3/8" O.D. x 0.049"
TEMPERATURE	**MAXIMUM ALLOWANCE WORKING PRESSURE (PSIG)**				
(-29 to 149) ºC [-20 TO 300] ºF	3300	2850	3150	3350	3900
204 ºC [400 ºF]	3200	2750	3050	3250	3800
260 ºC [500 ºF]	3000	2550	2850	3000	3500
316 ºC [600 ºF]	2800	2400	2700	2850	3300
371 ºC [700 ºF]	2700	2350	2600	2750	3200
427 ºC [800 ºF]	2650	2300	2550	2650	3100
482 ºC [900 ºF]	2600	2200	2450	2600	3050
538 ºC [1000 ºF]	2400	2100	2300	2450	2850

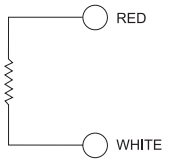
Calculations are based on the following criteria: 316 stainless steel sheath, ultimate tensil stress of 75000 PSI for seamless tube, Conservative Barlow Formula and safety factor of 4.0.

ELEMENT CONNECTIONS

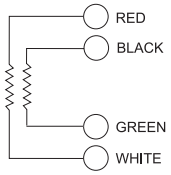
RTD sensor assemblies are available with two, three, and four wire leads. Two wire connected elements do not provide lead resistance compensation for the measuring device. Three and four wire connected elements provide a means for compensating for lead resistance between the sensor and the measuring device.

Two-Wire: Provides one connection to each end of the element. This construction is suitable where the resistance of the lead wire may be considered as an additive constant in the circuit, and particularly where the changes in lead resistance due to ambient temperature changes may be ignored.

2 WIRE SINGLE

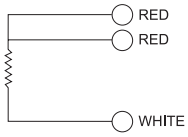


2 WIRE DUPLEX

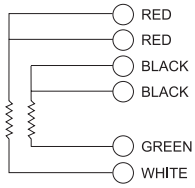


Three-Wire: Provides one connection to one end of the element and two to the other end of the element. Connected to an instrument designed to accept three wire input, sufficient compensation is usually achieved for leadwire resistance and temperature change in leadwire resistance. This is the most commonly used configuration.

3 WIRE SINGLE

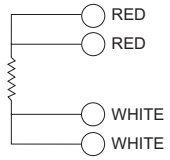


3 WIRE DUPLEX

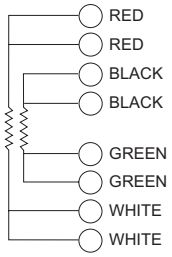


Four-Wire: Provides two connections to each end of the element to completely compensate for leadwire resistance and temperature change in leadwire resistance. This configuration is used where highly accurate temperature measurement is vital.

4 WIRE SINGLE



4 WIRE DUPLEX



LEADWIRE RESISTANCE

Lead resistance has a large effect on RTD temperature measurement accuracy. A two wire circuit provides no compensation and can provide large measurement errors. The following table shows the effects of leadwire resistance on temperature measurements using low temperature RTD assemblies with copper leadwire.

Leadwire Resistance

LEADWIRE WIRE GAUGE	RESISTANCE OHMS PER FOOT	UNCOMPENSATED 2-WIRE CIRCUITS	
		MAX. LENGTH FOR 1 °F ERROR	ERROR IN °F PER DOUBLE FT.
30	0.133	0.81 ft.	1.24 °F
24	0.0333	3.2 ft.	0.31 °F
22	0.0213	5.1 ft.	0.198 °F
20	0.0148	7.27 ft.	0.14 °F
18	0.0083	13.0 ft.	0.077 °F
16	0.0052	20.7 ft.	0.048 °F

Leadwire Transition Fitting Dimensions

CODE	SHEATH DIAMETER (inches)	FITTING OD (inches)	FITTING LENGTH (inches)	
			WITH SPRING	W/O SPRING
15, 16, 19	1/8	1/4	2 1/4	1 1/4
15, 16, 19	1/8 [1]	3/8	2 1/2	1 1/4
15, 16, 19	3/16	3/8	2 1/2	1 1/4
15, 16, 19	1/4	3/8	2 1/2	1 1/4
15, 16, 19	3/8	7/16	2 1/4	1 1/2
[1] Used with flexible armor tubing and duplex RTD's				

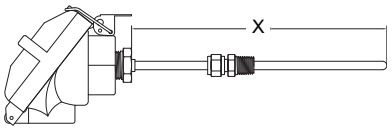
Flexible Armor Tubing

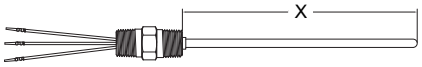
DESCRIPTION	DIMENSIONS (inches)	MAX. TEMP RATING
304 SS Flexible Armored Tubing	0.188 ID x 0.275 OD	1600 °F
PVC Covered 304 SS Flexible Armored Tubing	0.188 ID x 0.343 OD	212 °F
Teflon® Covered 304 SS Flexible Armored Tubing	0.188 ID x 0.313 OD	400 °F

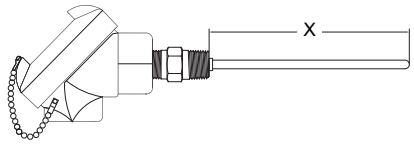
Sensors with Connection Heads

Configuration Code GP01
Fixed Sheath RTD Assemblies with General Purpose Connection Heads

Fixed Sheath RTD Assemblies with General Purpose Connection Heads are provided with head mounting fittings that are welded or brazed to the sheath for direct immersion into a process. To order an assembly with an optional 4-20 mA transmitter, select the assembly below and the transmitter from the back of this section. The RTD assemblies are supplied with a 316 stainless steel sheath in several diameters. They are available in various initial accuracies and temperature ranges as noted below.







ORDER CODES

Example Order Number:

1-0	1-1	1-2		2-0		3		4-0	4-1	4-2		
RBF185L	48	3	-	006(1/2)	-	00	-	8HN	31,	SB,	T-	Select Type and Range from back of section

1-0 100 Ω Platinum RTD Elements

α = 0.003 85 ºC^{-1}

CODE		INITIAL ELEMENT ACCURACY 0 ºC
LOW RANGE WIRE WOUND (-200 - 204) ºC		
SINGLE	***DUPLEX***	
R1T185L	R1T285L	± 0.1%
R5T185L	R5T285L	± 0.01%
LOW RANGE THIN FILM (-40 TO 204) ºC		
RBF185L	RBF285L	± 0.12%
RAF185L	RAF285L	± 0.06%
HIGH RANGE WIRE WOUND (-200 TO 600) ºC		
R1T185H	R1T285H	± 0.1%

1-1 Sheath Diameters

CODE	DIAMETERS (inches) 316 SS
28[1]	1/8
38	3/16
48	1/4
68	3/8
[1] Not available in duplex	

1-2 Element Connection

CODE	DESCRIPTION
2	2 wire element
3	3 wire element
4[1]	4 wire element
[1] Not available in duplex or with 440 Series Transmitter	

2 -0 "X" Dimensions

Insert three digit "X" length in inches.
Sheath lengths over 72" will be shipped in a coiled configuration unless otherwise specified.

3-0 No Fitting or Bend Options

CODE	00

3-1 One-Time Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	PRESSURE RATED	AVAILABLE SHEATH DIAMETERS (inches)
01A	303 SS	1/8	NO	1/8, 3/16, 1/4
05A	316 SS	1/8	YES	1/8, 3/16, 1/4
05B	316 SS	1/4	YES	1/8, 3/16, 1/4, 3/8
05C	316 SS	1/2	YES	1/8, 1/4, 3/8
15A	Brass	1/8	NO	1/8, 3/16, 1/4
15B	Brass	1/4	NO	3/16, 1/4, 3/8
15C	Brass	1/2	NO	1/4, 3/8

3-2 Re-Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	AVAILABLE SHEATH DIAMETERS (inches)
10A	303 SS	1/8	1/8, 3/16
10B	303 SS	1/4	1/4, 3/8
10C	303 SS	1/2	1/4, 3/8
12A	316 SS	1/8	1/8, 3/16, 1/4
12B	316 SS	1/4	1/8, 3/16, 1/4, 3/8
12C	316 SS	1/2	1/8, 1/4, 3/8
11A	Brass	1/8	1/8, 3/16, 1/4
11B	Brass	1/4	1/8, 3/16, 1/4, 3/8
11C	Brass	1/2	1/4, 3/8
19C	Spring-loaded SS well fitting	1/2	3/16, 1/4
Teflon® gland standard 204 ºC [400 ºF] max.			

3-3 Fixed Bushings

CODE *316 SS*	MOUNTING THREAD NPT (inches)	AVAILABLE SHEATH DIAMETERS (inches)
8A _ _ [1]	1/8	1/8, 3/16, 1/4
8B _ _ [1]	1/4	1/8, 3/16, 1/4, 3/8
8C _ _ [1]	1/2	1/8, 3/16, 1/4, 3/8
8D _ _ [1]	3/4	1/8, 3/16, 1/4, 3/8

[1] When ordering fixed bushings, specify order code above plus inserting length "U", as measured from hot tip to bottom of threaded bushing. EXAMPLE: order code 8A06 is 1/8" NPT, 316 SS bushing located 6" from hot tip.

4-0 Head Mounting Fittings

CODE	DESCRIPTION
6HN	1/2" x 1/2" NPT steel hex nipple 1" "E"" length
8HN	1/2" x 1/2" NPT stainless steel hex nipple 1" "E"" length
9HP	1/2" NPT stainless steel bushing (no process threads)
8RNDC	3/4" x 1/2" NPT stainless steel hex nipple

4-1 Head and Sheath Terminations

CODE	DESCRIPTION
22	3" Individual Teflon® leads with terminal pins
31	Aluminum screw cover head
34	Cast iron screw cover head
35T-642A	(4 to 20) mA HART® Field Transmitter with aluminum general purpose housing
49	Flip-top aluminum head
53	Grey Delrin® screw cover head
62	White DIN form B polypropylene head
63	White polypropylene head
91	316 L stainless steel screw cover head
92	DIN form B 316 stainless steel screw cover head

4-2 Options

W[1]	Epoxy Coating
GS	Ground screw
I	Stainless tag
NB	1/2" NPT nylon conduit reducer bushing
SB	1/2" NPT conduit reducer bushing
T-440[2]	(4 to 20) mA head mounted RTD transmitter
T-441[3]	(4 to 20) mA Isolated head mounted transmitter
T-442[3]	(4 to 20) mA Isolated Hart® head mounted transmitter

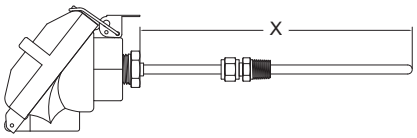
See transmitter ordering information in back of section.

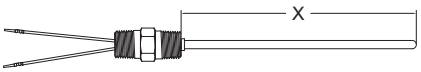
[1] Available with option 31 only.
[2] Available with option 31, 34, 49, 53, 63, 91 only.
[3] Available with option 31, 49, 62, 92 only.

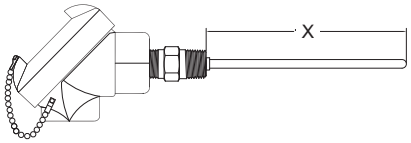
Configuration Code GP02

Fixed Sheath Thermocouple Assemblies with General Purpose Connection Heads

Fixed Sheath Thermocouple Assemblies with General Purpose Connection Heads have head mounting fittings that are welded or brazed to the sheath for direct immersion into a process. To order an assembly with an optional 4-20 mA transmitter, select the assembly below and the transmitter from the back of this section. The MgO insulated thermocouples assemblies are offered in a variety of calibrations, sheath diameters, and sheath materials.







ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3		2-0		3		4-0	4-1	4-2	
J	3	8	U	-	012	-	01A	-	9HP	49,	T-	Select Type and Range from back of section

1-0 Thermocouple Types

CODE	
SINGLE	*DUPLEX*
E	EE
J	JJ
K	KK
T	TT

1-1 Sheath Diameters

CODE	DIAMETER (inches)
2	1/8
3	3/16
4	1/4
6	3/8

1-2 Sheath Materials

CODE	MATERIAL	STANDARD AVAILABLE TYPES
3	Inconel 600	K
4	310 SS	K
5	446 SS	K[1]
8	316 SS	E, J, K, T

[1] All sensors with 446SS sheaths must have an ungrounded measuring junction.

1-3 Measuring Junctions

CODE	DESCRIPTION
G	Grounded junction
U	Ungrounded junction
E	Exposed junction

2-0 'X' Dimension

Insert three digit "X" length in inches

Sheath lengths over 72" will be shipped in a coiled configuration unless otherwise specified.

3-0 No Fitting or Bend Options

CODE	00

3-1 One-Time Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	PRESSURE RATED	AVAILABLE SHEATH DIAMETERS (inches)
01A	303 SS	1/8	NO	1/8, 3/16, 1/4
05A	316 SS	1/8	YES	1/8, 3/16, 1/4
05B	316 SS	1/4	YES	1/8, 3/16, 1/4, 3/8
05C	316 SS	1/2	YES	1/8, 1/4, 3/8
15A	Brass	1/8	NO	1/8, 3/16, 1/4
15B	Brass	1/4	NO	3/16, 1/4, 3/8
15C	Brass	1/2	NO	1/4, 3/8

3-2 Re-Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	AVAILABLE SHEATH DIAMETERS (inches)
10A	303 SS	1/8	1/8, 3/16
10B	303 SS	1/4	1/4, 3/8
10C	303 SS	1/2	1/4, 3/8
12A	316 SS	1/8	1/8, 3/16, 1/4
12B	316 SS	1/4	1/8, 3/16, 1/4, 3/8
12C	316 SS	1/2	1/8, 1/4, 3/8
11A	Brass	1/8	1/8, 3/16, 1/4
11B	Brass	1/4	1/8, 3/16, 1/4, 3/8
11C	Brass	1/2	1/4, 3/8
19C	Spring-loaded SS well fitting	1/2	3/16, 1/4

Teflon® gland standard 204 ºC [400 ºF] max.

3-3 Fixed Bushings

CODE *316 SS*	MOUNTING THREAD NPT (inches)	AVAILABLE SHEATH DIAMETERS (inches)
8A _ _[1]	1/8	1/8, 3/16, 1/4
8B _ _[1]	1/4	1/8, 3/16, 1/4, 3/8
8C _ _[1]	1/2	1/8, 3/16, 1/4, 3/8
8D _ _[1]	3/4	1/8, 3/16, 1/4, 3/8

[1] When ordering fixed bushings, specify order code above plus inserting length "U", as measured from hot tip to bottom of threaded bushing. EXAMPLE: order code 8A06 is 1/8" NPT, 316 SS bushing located 6" from hot tip.

4-0 Head Mounting Fittings

CODE	DESCRIPTION
6HN	1/2" x 1/2" NPT steel hex nipple 1" "E"" length
8HN	1/2" x 1/2" NPT stainless steel hex nipple 1" "E"" length
9HP	1/2" NPT stainless steel bushing (no process threads)
8RNDC	3/4" x 1/2" NPT stainless steel hex nipple

4-1 Head and Sheath Terminations

CODE	DESCRIPTION
22	3" Individual Teflon® leads with terminal pins
31	Aluminum screw cover head
34	Cast iron screw cover head
35T-642A	(4 to 20) mA HART® Field Transmitter with aluminum general purpose housing
49	Flip-top aluminum head
53	Grey Delrin® screw cover head
62	White DIN form B polypropylene head
63	White polypropylene head
91	316 L stainless steel screw cover head
92	DIN form B 316 stainless steel screw cover head
4-2 Options	
W[1]	Epoxy Coating
GS	Ground screw
I	Stainless tag
NB	1/2" NPT nylon conduit reducer bushing
SB	1/2" NPT conduit reducer bushing
T-441[2]	(4 to 20) mA Isolated head mounted transmitter
T-442[2]	(4 to 20) mA Isolated Hart® head mounted transmitter

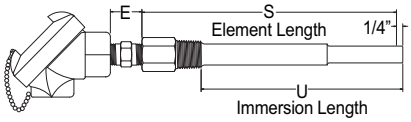
See transmitter ordering information in back of section.

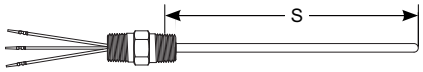
[1] Available with option 31 only.
[2] Available with option 31, 49, 62, 92 only.

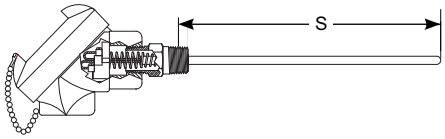
Configuration Code GP03

Spring-Loaded RTD/Thermowell Assemblies with General Purpose Connection Heads

Spring-Loaded RTD Thermowell Assemblies with General Purpose Connection Heads are designed for use with various thermowell types. Complete assemblies can be ordered by selecting the RTD assembly below, the thermowell from the thermowell section of this catalog, and a temperature transmitter from the back of this section. Assemblies without a thermowell can be ordered by selecting the sensor assembly from this page and inserting the "S" length in table 2-0. They are supplied with a 316 stainless steel sheath and are available in various initial accuracies and temperature ranges as noted in the tables below. **Note:** The "S" dimension will measure 1/4" longer than specified when the spring is in the relaxed postition. The "S" dimension is calculated when the sensor is compressed or in the installed position. This design allows 1/4" spring compression to ensure positive contact with the bottom of the thermowell.







ORDER CODES

Example Order Number:

1-0	1-1	1-2		2-0		3-0		4-0	4-1	4-2	
R1T185L	48	3	-	Select Thermowell Part # or Insert 3 Digit Length Code	-	SL	-	8HN	31,	T-	Select Type and Range from back of section

1-0 100 Ω Platinum RTD Elements

α = 0.003 85 ºC^{-1}

CODE		INITIAL ELEMENT ACCURACY 0 ºC
LOW RANGE WIRE WOUND (-200 to 204) ºC		
SINGLE	***DUPLEX***	
R1T185L	R1T285L	± 0.1%
R5T185L	R5T285L	± 0.01%
LOW RANGE THIN FILM (-40 to 204) ºC		
RBF185L	RBF285L	± 0.12%
RAF185L	RAF285L	± 0.06%
HIGH RANGE WIRE WOUND (-200 to 600) ºC		
R1T185H	R1T285H	± 0.1%

1-1 Sheath Diameters

CODE	DIAMETERS (inches) 316 SS
38	3/16
48	1/4

1-2 Element Connection

CODE	DESCRIPTION
2	2 wire
3	3 wire
4[1]	4 wire
[1] Not available in duplex or with 440 Series Transmitter	

2-0

Select thermowell part number from Thermowell Section, or specify 3 digit "S" length in inches if no thermowell is required.

3-0 Element Options

CODE	DESCRIPTION
SL[1]	Spring-loaded element
SC	Self-contained spring-loaded element
SN	Self-contained spring-loaded element with Buna-N oil seal 121°C [250°F] 100 PSI Max.
[1] Not available with option 35T-642A	

4-0 Head Mounting Fittings

CODE	DESCRIPTION	CODE	DESCRIPTION
STEEL FITTINGS		*316SS FITTINGS*	
6HN	1/2" x 1/2" NPT hex nipple 1" length	8HN	1/2" x 1/2" NPT hex nipple 1" length
6PN_	1/2" NPT pipe nipple (specify "E" length in inches)	8PN_	1/2" NPT pipe nipple (specify "E" length in inches)
6PU_ [1]	1/2" NPT union/nipple (specify "E" length in inches)	8PU_ [1]	1/2" NPT union/nipple (specify "E" length in inches)
[1] 4" Minimum length required			

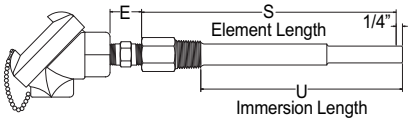
4-1 Head and Sheath Terminations

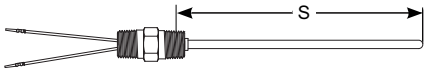
CODE	DESCRIPTION
22	3" Individual Teflon® leads with terminal pins
31	Aluminum screw cover head
34	Cast iron screw cover head
35T-642A	(4 to 20) mA HART® Field Transmitter with aluminum general purpose housing
49	Flip-top aluminum head
53	Grey Delrin® screw cover head
62	White DIN form B polypropylene head
63	White polypropylene head
91	316 L stainless steel screw cover head
92	DIN form B 316 stainless steel screw cover head
4-2	**Options**
W[1]	Epoxy Coating
GS	Ground screw
I	Stainless tag
NB	1/2" NPT nylon conduit reducer bushing
SB	1/2" NPT conduit reducer bushing
T-440[2]	(4 to 20) mA head mounted RTD transmitter
T-441[3]	(4 to 20) mA Isolated head mounted transmitter
T-442[3]	(4 to 20) mA Isolated Hart® head mounted transmitter
See transmitter ordering information in back of section.	
[1] Available with option 31 only. [2] Available with option 31, 34, 49, 53, 63, 91 only. [3] Available with option 31, 49, 62, 92 only.	

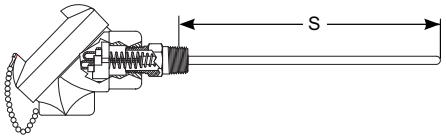
Configuration Code GP04

Spring-Loaded MgO Thermocouple/Thermowell Assemblies with General Purpose Connection Heads

Spring-Loaded MgO Thermocouple/Thermowell Assemblies with General Purpose Connection Heads are designed for use with various thermowell types. Complete assemblies can be ordered by selecting the MgO assembly below, the thermowell from the thermowell section of this catalog, and a temperature transmitter from the back of this section. Assemblies without a thermowell can be ordered by selecting the sensor assembly from this page and inserting the "S" length in table 2-0. They are supplied with a 316 stainless steel sheath and as standard limits of error. **Note:** The "S" dimension will measure 1/4" longer than specified when the spring is in the relaxed position. The "S" dimension is calculated when the sensor is compressed or in the installed position. This design allows 1/4" spring compression to ensure positive contact with the bottom of the thermowell.







ORDER CODES

Example Order Number: **J 48 U - [Select Thermowell Part # or Insert 3 Digit Length Code] - SL - 8PU4 31, T- [Select Type and Range from back of section]**

(1-0: J | 1-1: 48 | 1-2: U | 2-0: Select Thermowell Part # or Insert 3 Digit Length Code | 3-0: SL | 4-0: 8PU4 | 4-1: 31, | 4-2: T- | Select Type and Range from back of section)

1-0 Thermocouple Types

CODE	
SINGLE	***DUPLEX***
E	EE
J	JJ
K	KK
T	TT

1-1 Sheath Diameters

CODE	DIAMETERS (inches) 316 SS
38	3/16
48	1/4

1-2 Measuring Junction

CODE	DESCRIPTION
G	Grounded junction
U	Ungrounded junction

2-0

Select thermowell part number from Thermowell Section, or specify 3 digit "S" length in inches if no thermowell is required.

3-0 Element Options

CODE	DESCRIPTION
SL[1]	Spring-loaded element
SC	Self-contained spring-loaded element
SN	Self-contained spring-loaded element with Buna-N oil seal 121°C [250°F] 100 PSI Max.
[1] Not available with option 35T-642A	

4-0 Head Mounting Fittings

CODE	DESCRIPTION
STEEL FITTINGS	
6HN	1/2" x 1/2" NPT hex nipple 1" E length
6PN_	1/2" NPT pipe nipple (specify "E" length in inches)
6PU_ [1]	1/2" NPT union/nipple (specify "E" length in inches)
316 SS FITTINGS	
8HN	1/2" x 1/2" NPT hex nipple 1" E length
8PN_	1/2" NPT pipe nipple (specify "E" length in inches)
8PU_ [1]	1/2" NPT union/nipple (specify "E" length in inches)
[1] 4" Minimum length required	

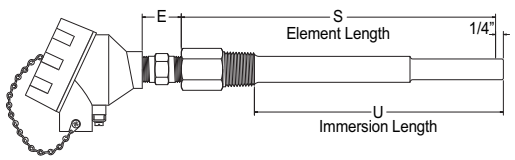
4-1 Head and Sheath Terminations

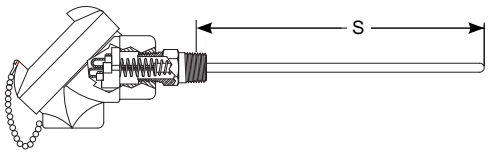
CODE	DESCRIPTION
22	3" Individual Teflon® leads with terminal pins
31	Aluminum screw cover head
34	Cast iron screw cover head
35T-642A	(4 to 20) mA HART® Field Transmitter with aluminum general purpose housing
49	Flip-top aluminum head
53	Grey Delrin® screw cover head
62	White DIN form B polypropylene head
63	White polypropylene head
91	316 L stainless steel screw cover head
92	DIN form B 316 stainless steel screw cover head
4-2	**Options**
W[1]	Epoxy Coating
GS	Ground screw
I	Stainless tag
NB	1/2" NPT nylon conduit reducer bushing
SB	1/2" NPT conduit reducer bushing
T-441[2]	(4 to 20) mA Isolated head mounted transmitter
T-442[2]	(4 to 20) mA Isolated Hart® head mounted transmitter
See transmitter ordering information in back of section.	
[1] Available with option 31 only. [2] Available with option 31, 49, 62, 92 only.	

Configuration Code GP03

Spring-Loaded RTD/Thermowell Assemblies with Explosion Proof Connection Heads

Spring-Loaded RTD/Thermowell Assemblies with Explosion Proof Connection Heads are designed for use with various thermowell types. Complete assemblies can be ordered by selecting the RTD assembly below, the thermowell from the thermowell section of this catalog, and a temperature transmitter from the back of this section. Assemblies without a thermowell can be ordered by selecting the sensor assembly from this page and inserting the "S" length in table 2-0. They are supplied with a 316 stainless steel sheath and are available in various accuracies and temperature ranges as noted in the tables below. **Note:** The "S" dimension will measure 1/4" longer than specified when the spring is in the relaxed position. The "S" dimension is calculated when the sensor is compressed or in the installed position. This design allows 1/4" spring compression to ensure positive contact with the bottom of the thermowell.





ORDER CODES

Example Order Number:

1-0	1-1	1-2		2-0		3-0		4-0	4-1	4-2	
RBF185L	48	3	-	Select Thermowell Part # or Insert 3 Digit Length Code	-	SL	-	8HN	71,	T-	Select Type and Range from back of section

1-0 100 Ω Platinum RTD Elements

α = 0.003 85 ºC^{-1}

CODE		INITIAL ELEMENT ACCURACY 0 ºC
LOW RANGE WIRE WOUND (-200 to 204) ºC		
SINGLE	***DUPLEX***	
R1T185L	R1T285L	± 0.1%
R5T185L	R5T285L	± 0.01%
LOW RANGE THIN FILM (-40 to 204) ºC		
RBF185L	RBF285L	± 0.12%
RAF185L	RAF285L	± 0.06%
HIGH RANGE WIRE WOUND (-200 to 600) ºC		
R1T185H	R1T285H	± 0.1%

1-1 Sheath Diameters

CODE	DIAMETERS (inches) 316 SS
38	3/16
48	1/4

1-2 Element Connection

CODE	DESCRIPTION
2	2 wire
3	3 wire
4[1]	4 wire
[1] Not available in duplex or with 440 Series Transmitter	

2-0

Select thermowell part number from Thermowell Section, or specify 3 digit "S" length in inches if no thermowell is required.

4-1 Head Terminations

CODE	DESCRIPTION
71	Cast iron/aluminum explosion proof head Group C
72	DIN form B aluminum explosion proof head Group B
74	DIN form B aluminum explosion proof head Group A
81	316L stainless steel explosion proof head Group C
82	DIN form B 316 stainless steel explosion proof head Group B
4-2	**Options**
SB	1/2" NPT conduit reducer bushing
I	Stainless tag
T-440[1]	(4 to 20) mA head mounted RTD transmitter
T-441[2]	(4 to 20) mA Isolated head mounted transmitter
T-442[2]	(4 to 20) mA Isolated Hart® head mounted transmitter
See transmitter ordering information in back of section.	
[1] Available with option 71, 81 only. [2] Available with option 72,74,82 only.	

4-0 Head Mounting Fittings

CODE	DESCRIPTION	CODE	DESCRIPTION
STEEL FITTINGS		*316SS FITTINGS*	
6HN	1/2" x 1/2" NPT hex nipple 1" length	8HN	1/2" x 1/2" NPT hex nipple 1" length
6PN_	1/2" NPT pipe nipple (specify "E" length in inches)	8PN_	1/2" NPT pipe nipple (specify "E" length in inches)
6XU_ [1]	1/2" NPT union/nipple (specify "E" length in inches)	8XU_ [1]	1/2" NPT union/nipple (specify "E" length in inches)
[1] 3 1/2" Minimum length required			

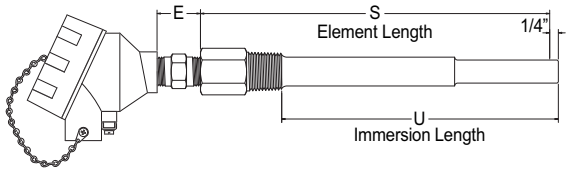
3-0 Element Options

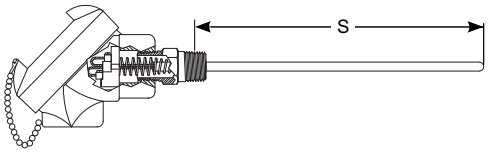
CODE	DESCRIPTION
SL	Spring-loaded element
SC	Self-contained spring-loaded element
SN	Self-contained spring-loaded element with Buna-N oil seal 121°C [250°F] 100 PSI Max.

Configuration Code GP04

Spring-Loaded MgO Thermocouple/Thermowell Assemblies with Explosion Proof Connection Heads

Spring-Loaded MgO/Thermowell Assemblies with Explosion Proof Connection Heads are designed for use with various thermowell types. Complete assemblies can be ordered by selecting the MgO assembly below, the thermowell from the thermowell section of the catalog, and a temperature transmitter from the back of this section. Assemblies without a thermowell can be ordered by selecting the sensor assembly from this page and inserting the "S" length in table 2-0. They are supplied with a 316 stainless steel sheath and as standard limits or error. **Note:** The "S" dimension will measure 1/4" longer than specified when the spring is in the relaxed position. The "S" dimension is calculated when the sensor is compressed or in the installed position. This design allows 1/4" spring compression to ensure positive contact with the bottom of the thermowell.





ORDER CODES

Example Order Number:

1-0	1-1	1-2		2-0		3-0		4-0	4-1	4-2	
J	48	U	-	Select Thermowell Part # or Insert 3 Digit Length Code	-	SL	-	8XU4	71,	T-	Select Type and Range from back of section

1-0 Thermocouple Types

CODE	
SINGLE	*DUPLEX*
E	EE
J	JJ
K	KK
T	TT

1-1 Sheath Diameters

CODE	DIAMETERS (inches) 316 SS
38	3/16
48	1/4

1-2 Measuring Junction

CODE	DESCRIPTION
G	Grounded junction
U	Ungrounded junction

2-0

Select thermowell part number from Thermowell Section, or specify 3 digit "S" length in inches if no thermowell is required.

3-0 Element Options

CODE	DESCRIPTION
SL	Spring-loaded element
SC	Self-contained spring-loaded element
SN	Self-contained spring-loaded element with Buna-N oil seal 121°C [250°F] 100 PSI Max.

4-0 Head Mounting Fittings

CODE	DESCRIPTION
STEEL FITTINGS	
6HN	1/2" x 1/2" NPT hex nipple 1" E length
6PN_	1/2" NPT pipe nipple (specify "E" length in inches)
6XU_ [1]	1/2" NPT union/nipple (specify "E" length in inches)
316 SS FITTINGS	
8HN	1/2" x 1/2" NPT hex nipple 1" E length
8PN_	1/2" NPT pipe nipple (specify "E" length in inches)
8XU_ [1]	1/2" NPT union/nipple (specify "E" length in inches)
[1] 3 1/2" Minimum length required	

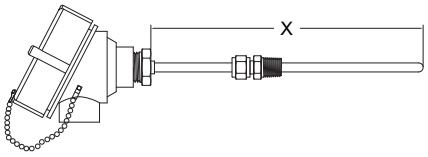
4-1 Head Terminations

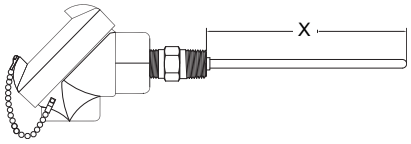
CODE	DESCRIPTION
71	Cast iron/aluminum explosion proof head Group C
72	DIN form B aluminum explosion proof head Group B
74	DIN form B aluminum explosion proof head Group A
81	316L stainless steel explosion proof head Group C
82	DIN form B 316 stainless steel explosion proof head Group B
4-2	**Options**
SB	1/2" NPT conduit reducer bushing
I	Stainless tag
T-441[1]	(4 to 20) mA Isolated head mounted transmitter
T-442[1]	(4 to 20) mA Isolated Hart® head mounted transmitter
See transmitter ordering information in back of section.	
[1] Not available with 71 or 81	

Configuration Code GP01

Fixed Sheath RTD Assemblies with Explosion Proof Connection Heads

Fixed Sheath RTD Assemblies with Explosion Proof Connection Heads are provided with head mounting fittings that are welded or brazed to the sheath for direct immersion into a process. To order an assembly with an option 4-20 mA transmitter, select the assembly below and the transmitter from the back of this section. The RTD assemblies are supplied with a 316 stainless steel sheath in several diameters. They are available in various initial accuracies and temperature ranges as noted below.





ORDER CODES

	1-0	1-1	1-2		2-0		3		4-0	4-1	4-2		
Example Order Number:	**RAF185L**	**48**	**3**	**-**	**012(1/2)**	**-**	**00**	**-**	**8HN**	**72,**	**SB,**	**T-**	Select Type and Range from back of section

1-0 100 Ω Platinum RTD Elements

α = 0.003 85 ºC^{-1}

CODE		INITIAL ELEMENT ACCURACY 0 ºC
LOW RANGE WIRE WOUND (-200 - 204) ºC		
SINGLE	***DUPLEX***	
R1T185L	R1T285L	± 0.1%
R5T185L	R5T285L	± 0.01%
LOW RANGE THIN FILM (-40 TO 204) ºC		
RBF185L	RBF285L	± 0.12%
RAF185L	RAF285L	± 0.06%
HIGH RANGE WIRE WOUND (-200 TO 600) ºC		
R1T185H	R1T285H	± 0.1%

1-1 Sheath Diameters

CODE	DIAMETERS (inches) 316 SS
28[1]	1/8
38	3/16
48	1/4
68	3/8
[1] Not available in duplex	

1-2 Element Connection

CODE	DESCRIPTION
2	2 wire element
3	3 wire element
4[1]	4 wire element
[1] Not available in duplex or with 440 Series Transmitter	

2 -0 "X" Dimensions

Insert three digit "X" length in inches.
Sheath lengths over 72" will be shipped in a coiled configuration unless otherwise specified.

3-0 No Fitting or Bend Options

CODE	00

3-1 One-Time Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	PRESSURE RATED	AVAILABLE SHEATH DIAMETERS (inches)
01A	303 SS	1/8	NO	1/8, 3/16, 1/4
05A	316 SS	1/8	YES	1/8, 3/16, 1/4
05B	316 SS	1/4	YES	1/8, 3/16, 1/4, 3/8
05C	316 SS	1/2	YES	1/8, 1/4, 3/8
15A	Brass	1/8	NO	1/8, 3/16, 1/4
15B	Brass	1/4	NO	3/16, 1/4, 3/8
15C	Brass	1/2	NO	1/4, 3/8

3-2 Re-Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	AVAILABLE SHEATH DIAMETERS (inches)
10A	303 SS	1/8	1/8, 3/16
10B	303 SS	1/4	1/4, 3/8
10C	303 SS	1/2	1/4, 3/8
12A	316 SS	1/8	1/8, 3/16, 1/4
12B	316 SS	1/4	1/8, 3/16, 1/4, 3/8
12C	316 SS	1/2	1/8, 1/4, 3/8
11A	Brass	1/8	1/8, 3/16, 1/4
11B	Brass	1/4	1/8, 3/16, 1/4, 3/8
11C	Brass	1/2	1/4, 3/8
19C	Spring-loaded SS well fitting	1/2	3/16, 1/4
Teflon® gland standard 204 ºC [400 ºF] max.			

3-3 Fixed Bushings

CODE *316 SS*	MOUNTING THREAD NPT (inches)	AVAILABLE SHEATH DIAMETERS (inches)
8A _ _ [1]	1/8	1/8, 3/16, 1/4
8B _ _ [1]	1/4	1/8, 3/16, 1/4, 3/8
8C _ _ [1]	1/2	1/8, 3/16, 1/4, 3/8
8D _ _ [1]	3/4	1/8, 3/16, 1/4, 3/8

[1] When ordering fixed bushings, specify order code above plus inserting length "U", as measured from hot tip to bottom of threaded bushing. EXAMPLE: order code 8A06 is 1/8" NPT, 316 SS bushing located 6" from hot tip.

4-0 Head Mounting Fittings

CODE	DESCRIPTION
6HN	1/2" x 1/2" NPT steel hex nipple 1" "E"" length
8HN	1/2" x 1/2" NPT stainless steel hex nipple 1" "E"" length
9HP	1/2" NPT stainless steel bushing (no process threads)
8RNDC	3/4" x 1/2" NPT stainless steel hex nipple

4-1 Head Terminations

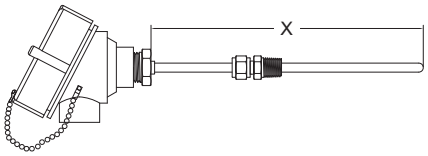
CODE	DESCRIPTION
71	Cast iron/aluminum explosion proof head Group C
72	DIN form B aluminum explosion proof head Group B
74	DIN form B aluminum explosion proof head Group A
81	316L stainless steel explosion proof head Group C
82	DIN form B 316 stainless steel explosion proof head Group B
4-2	**Options**
SB	1/2" NPT conduit reducer bushing
I	Stainless tag
T-440[1]	(4 to 20) mA head mounted RTD transmitter
T-441[2]	(4 to 20) mA Isolated head mounted transmitter
T-442[2]	(4 to 20) mA Isolated Hart® head mounted transmitter
See transmitter ordering information in back of section.	

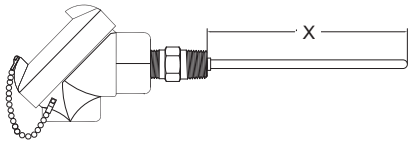
[1] Available with option 71, 81 only.
[2] Available with option 72, 74, 82 only.

Configuration Code GP02

Fixed Sheath Thermocouple Assemblies with Explosion Proof Connection Heads

Fixed Sheath Thermocouple Assemblies with Explosion Proof Connection Heads are provided with head mounting fitting that are welded or brazed to the sheath for direct immersion into a process. To order an assembly with an optional 4-20 mA transmitter, select the assembly below and the transmitter from the back of this section. The MgO insulated thermocouple assemblies are offered in a variety of calibrations, sheath diameters, and sheath materials.





ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3		2-0		3		4-0	4-1	4-2	
J	2	8	U	-	012	-	01A	-	9HP	81,	T-	Select Type and Range from back of section

1-0 Thermocouple Types

CODE	
SINGLE	*DUPLEX*
E	EE
J	JJ
K	KK
T	TT

1-1 Sheath Diameters

CODE	DIAMETER (inches)
2	1/8
3	3/16
4	1/4
6	3/8

1-2 Sheath Materials

CODE	MATERIAL	STANDARD AVAILABLE TYPES
3	Inconel 600	K
4	310 SS	K
5	446 SS	K[1]
8	316 SS	E, J, K, T

[1] All sensors with 446SS sheaths must have an ungrounded measuring junction.

1-3 Measuring Junctions

CODE	DESCRIPTION
G	Grounded junction
U	Ungrounded junction
E	Exposed junction

2-0 'X' Dimension

Insert three digit "X" length in inches

Sheath lengths over 72" will be shipped in a coiled configuration unless otherwise specified.

3-0 No Fitting or Bend Options

CODE	00

3-1 One-Time Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	PRESSURE RATED	AVAILABLE SHEATH DIAMETERS (inches)
01A	303 SS	1/8	NO	1/8, 3/16, 1/4
05A	316 SS	1/8	YES	1/8, 3/16, 1/4
05B	316 SS	1/4	YES	1/8, 3/16, 1/4, 3/8
05C	316 SS	1/2	YES	1/8, 1/4, 3/8
15A	Brass	1/8	NO	1/8, 3/16, 1/4
15B	Brass	1/4	NO	3/16, 1/4, 3/8
15C	Brass	1/2	NO	1/4, 3/8

3-2 Re-Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	AVAILABLE SHEATH DIAMETERS (inches)
10A	303 SS	1/8	1/8, 3/16
10B	303 SS	1/4	1/4, 3/8
10C	303 SS	1/2	1/4, 3/8
12A	316 SS	1/8	1/8, 3/16, 1/4
12B	316 SS	1/4	1/8, 3/16, 1/4, 3/8
12C	316 SS	1/2	1/8, 1/4, 3/8
11A	Brass	1/8	1/8, 3/16, 1/4
11B	Brass	1/4	1/8, 3/16, 1/4, 3/8
11C	Brass	1/2	1/4, 3/8
19C	Spring-loaded SS well fitting	1/2	3/16, 1/4

Teflon® gland standard 204 ºC [400 ºF] max.

3-3 Fixed Bushings

CODE *316 SS*	MOUNTING THREAD NPT (inches)	AVAILABLE SHEATH DIAMETERS (inches)
8A _ _[1]	1/8	1/8, 3/16, 1/4
8B _ _[1]	1/4	1/8, 3/16, 1/4, 3/8
8C _ _[1]	1/2	1/8, 3/16, 1/4, 3/8
8D _ _[1]	3/4	1/8, 3/16, 1/4, 3/8

[1] When ordering fixed bushings, specify order code above plus inserting length "U", as measured from hot tip to bottom of threaded bushing. EXAMPLE: order code 8A06 is 1/8" NPT, 316 SS bushing located 6" from hot tip.

4-0 Head Mounting Fittings

CODE	DESCRIPTION
6HN	1/2" x 1/2" NPT steel hex nipple 1" "E"" length
8HN	1/2" x 1/2" NPT stainless steel hex nipple 1" "E"" length
9HP	1/2" NPT stainless steel bushing (no process threads)
8RNDC	3/4" x 1/2" NPT stainless steel hex nipple

4-1 Head Terminations

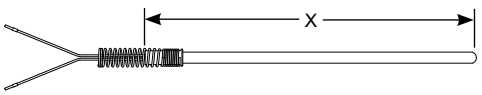
CODE	DESCRIPTION
71	Cast iron/aluminum explosion proof head Group C
72	DIN form B aluminum explosion proof head Group B
74	DIN form B aluminum explosion proof head Group A
81	316L stainless steel explosion proof head Group C
82	DIN form B 316 stainless steel explosion proof head Group B
4-2	**Options**
SB	1/2" NPT conduit reducer bushing
I	Stainless tag
T-441[1]	(4 to 20) mA Isolated head mounted transmitter
T-442[1]	(4 to 20) mA Isolated Hart® head mounted transmitter

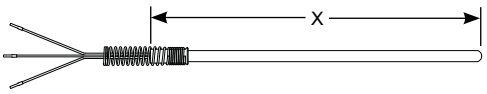
See transmitter ordering information in back of section.

[1] Not available with 71 or 81

Thermocouple and RTD Spring-Loaded Replacement Elements

Thermocouple and RTD spring-Loaded Replacement elements are designed for spring-loaded thermowell assemblies. The replacement elements can be ordered by selecting the sensor type below and inserting the "X" length in table 1-2. The RTD assemblies are supplied with a 316 stainless steel sheath and are available in various initial accuracies and temperature ranges as noted in the tables below. The MgO insulated thermocouple assemblies are supplied with a 316 stainless steel sheath, various calibrations, and as standard limits of error.





See back of page to calculate replacement lengths.

ORDER CODES — Configuration Code GP06

Thermocouple Example Order Number:

1-0	1-1		2-0		3-0		4-0
J48	U	-	012	-	SL	-	22(06)

1-0 Thermocouple Types

CODE		AVAILABLE SHEATH DIAMETERS (316 SS)	
SINGLE	*DUPLEX*	3/16" OD	1/4" OD
E	EE	38	48
J	JJ	38	48
K	KK	38	48
T	TT	38	48

1-1 Measuring Junction

CODE	DESCRIPTION
G	Grounded junction
U	Ungrounded junction

4-0 Sheath Terminations

CODE	DESCRIPTION
22[1]	3" Individual Teflon® leads with terminal pins
[1] For longer leads insert 2 digit length in inches. Example: 22(06)	

3-0 Element Style

CODE	DESCRIPTION
SL	Spring Loaded Element

2-0 Length

CODE
Insert 3 Digit "X" length in inches

ORDER CODES — Configuration Code GP05

RTD Example Order Number:

1-0	1-1	1-2		2-0		3-0		4-0
R1T185L	48	3	-	012(1/2)	-	SL	-	22

1-0 100 Ω Platinum RTD Elements

α = 0.003 85 ºC^{-1}

CODE		INITIAL ELEMENT ACCURACY 0 ºC
LOW RANGE WIRE WOUND (-200 - 204) ºC		
SINGLE	***DUPLEX***	
R1T185L	R1T285L	± 0.1%
R5T185L	R5T285L	± 0.01%
LOW RANGE THIN FILM (-40 TO 204) ºC		
RBF185L	RBF285L	± 0.12%
RAF185L	RAF285L	± 0.06%
HIGH RANGE WIRE WOUND (-200 TO 600) ºC		
R1T185H	R1T285H	± 0.1%

1-1 Sheath Diameters

CODE	DIAMETERS (inches) 316 SS
38	3/16
48	1/4

4-0 Sheath Terminations

CODE	DESCRIPTION
22[1]	3" Individual Teflon® leads with terminal pins
[1] For longer leads insert 2 digit length in inches. Example: 22(06)	

3-0 Element Style

CODE	DESCRIPTION
SL	Spring Loaded Element

2-0 Length

CODE
Insert 3 Digit "X" length in inches

1-2 Element Connection

CODE	DESCRIPTION
2	2 wire
3	3 wire
4	4 wire

ORDER CODES

Example Order Number:

1-0		1-1		1-2	1-3	1-4		1-5		1-6
440	-		-	3	85	U	-	S(0-200)		C

1-0 Transmitter Type

CODE	DESCRIPTION
440[1]	(4 to 20) mA programmable Head mounted RTD Transmitter
441	(4 to 20) mA programmable Head mounted universal Transmitter
442	(4 to 20) mA HART® programmable Head mounted universal Transmitter
35T-642A	(4 to 20) mA HART® Field Transmitter with general purpose aluminum housing
[1] Only available with 2 or 3 wire input connection and Pt100 sensor type	

1-1 Options (For 642 Series only)

CODE	DESCRIPTION
T	Solid cover
D	Glass cover with digital display
Leave blank if using 440, 441, or 442	

1-2 Input Type

CODE	DESCRIPTION
00[1]	Unconfigured
1	Thermocouple (TC)
2	RTD (2-wire)
3	RTD (3-wire)
4	RTD (4-wire)
[1] Default setting supplied as Pt100 (0-100) °C	

1-3 Sensor Type

CODE	DESCRIPTION
J	Type J thermocouple
K	Type K thermocouple
T	Type T thermocouple
N	Type N thermocouple
E	Type E thermocouple
85	100 ohm platinum (α = 0.003 85 ºC)

1-4 Failure Mode

CODE	DESCRIPTION
U	Upscale Burnout ≥ 20.5 mA
D	Downscale Burnout ≤ 3.8 mA

1-5 Range

CODE	DESCRIPTION
S	(lower limit – upper limit)

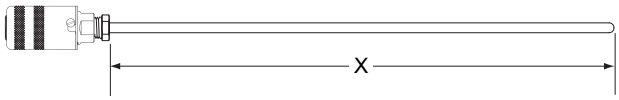
1-6 Unit of Measure

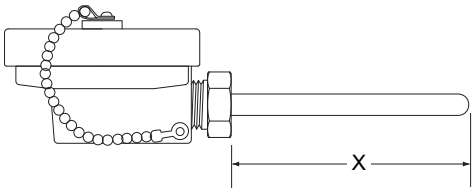
CODE	DESCRIPTION
C	Celsius
F	Fahrenheit

For complete transmitter specifications see Transmitter Section.

Configuration Code GP07
Fixed Sheath RTD Assemblies with Miniature Connection Heads

Fixed length RTD assemblies with miniature heads are offered with mounting fittings that are welded or braze to the sheath for direct immersion into a process. The miniature heads offer a compact design and are ideal for laboratory applications or applications where space is limited. The RTD assemblies are supplied with a 316 stainless steel sheath in several diameters. They are offered in various initial accuracies and temperature ranges as noted below.





ORDER CODES

Example Order Number:

1-0	1-1	1-2		2-0		3		4-0	4-1
RBF185L	48	3	-	006(1/2)	-	00	-	8HPB	25

1-0 100 Ω Platinum RTD Elements
α = 0.003 85 ºC^{-1}

CODE	INITIAL ELEMENT ACCURACY 0 ºC
LOW RANGE WIRE WOUND (-200 - 204) ºC	
SINGLE	
R1T185L	± 0.1%
R5T185L	± 0.01%
LOW RANGE THIN FILM (-40 TO 204) ºC	
RBF185L	± 0.12%
RAF185L	± 0.06%
HIGH RANGE WIRE WOUND (-200 TO 600) ºC	
R1T185H	± 0.1%

1-1 Sheath Diameters

CODE	DIAMETERS (inches) 316 SS
28	1/8
38	3/16
48	1/4
68	3/8

1-2 Element Connection

CODE	DESCRIPTION
2	2 wire element
3	3 wire element
4	4 wire element

2 -0 "X" Dimensions

Insert three digit "X" length in inches.
Sheath lengths over 72" will be shipped in a coiled configuration unless otherwise specified.

3-0 No Fitting or Bend Options

CODE	00

3-1 One-Time Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	PRESSURE RATED	AVAILABLE SHEATH DIAMETERS (inches)
01A	303 SS	1/8	NO	1/8, 3/16, 1/4
05A	316 SS	1/8	YES	1/8, 3/16, 1/4
05B	316 SS	1/4	YES	1/8, 3/16, 1/4, 3/8
05C	316 SS	1/2	YES	1/8, 1/4, 3/8
15A	Brass	1/8	NO	1/8, 3/16, 1/4
15B	Brass	1/4	NO	3/16, 1/4, 3/8
15C	Brass	1/2	NO	1/4, 3/8

3-2 Re-Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	AVAILABLE SHEATH DIAMETERS (inches)
10A	303 SS	1/8	1/8, 3/16
10B	303 SS	1/4	1/4, 3/8
10C	303 SS	1/2	1/4, 3/8
12A	316 SS	1/8	1/8, 3/16, 1/4
12B	316 SS	1/4	1/8, 3/16, 1/4, 3/8
12C	316 SS	1/2	1/8, 1/4, 3/8
11A	Brass	1/8	1/8, 3/16, 1/4
11B	Brass	1/4	1/8, 3/16, 1/4, 3/8
11C	Brass	1/2	1/4, 3/8
19C	Spring-loaded SS well fitting	1/2	3/16, 1/4
Teflon® gland standard 204 ºC [400 ºF] max.			

3-3 Fixed Bushings

CODE *316 SS*	MOUNTING THREAD NPT (inches)	AVAILABLE SHEATH DIAMETERS (inches)
8A _ _ [1]	1/8	1/8, 3/16, 1/4
8B _ _ [1]	1/4	1/8, 3/16, 1/4, 3/8
8C _ _ [1]	1/2	1/8, 3/16, 1/4, 3/8
8D _ _ [1]	3/4	1/8, 3/16, 1/4, 3/8

[1] When ordering fixed bushings, specify order code above plus inserting length "U", as measured from hot tip to bottom of threaded bushing. EXAMPLE: order code 8A06 is 1/8" NPT, 316 SS bushing located 6" from hot tip.

4-0 Head Mounting Fittings

CODE	DESCRIPTION
9HNB	1/4" x 1/4" stainless steel hex nipple
8HPB	1/4" stainless steel hex bushing (no process threads)
8CFB	1/4" NPT 316 stainless steel compression fitting (no process threads)
22CFB	1/4" NPT brass compression fitting (no process threads)

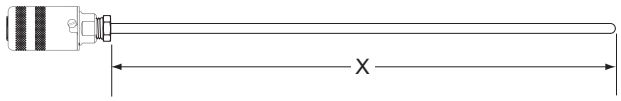
4-1 Miniature Head Terminations

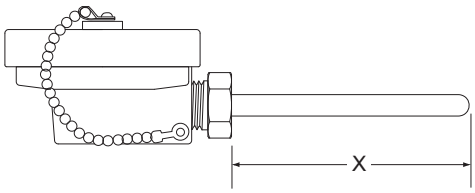
CODE	DESCRIPTION
17	Miniature plastic head (3/8" NPT conduit opening)
25	Miniature nickel-plated head

Configuration Code GP08

Fixed Sheath Thermocouple Assemblies with Miniature Connection Heads

Fixed Sheath Thermocouple Assemblies with miniature connection heads are offered with mounting fitting that are welded or braze to the sheath for direct immersion into a process. The miniature heads offer a compact design and are ideal for laboratory applications or applications where space is limited. The MgO insulated thermocouple assemblies are offered in a variety of calibrations, sheath diameters, and sheath materials.





ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3		2-0		3		4-0	4-1
J	**3**	**8**	**U**	**-**	**012**	**-**	**01A**	**-**	**8HPB**	**25**

1-0 Thermocouple Types

CODE	
SINGLE	***DUPLEX***
E	EE
J	JJ
K	KK
T	TT

1-1 Sheath Diameters

CODE	DIAMETER (inches)
2	1/8
3	3/16
4	1/4
6	3/8

1-2 Sheath Materials

CODE	MATERIAL	STANDARD AVAILABLE TYPES
3	Inconel 600	K
4	310 SS	K
5	446 SS	K[1]
8	316 SS	E, J, K, T

[1] All sensors with 446SS sheaths must have an ungrounded measuring junction.

1-3 Measuring Junctions

CODE	DESCRIPTION
G	Grounded junction
U	Ungrounded junction
E	Exposed junction

2-0 'X' Dimension

Insert three digit "X" length in inches

Sheath lengths over 72" will be shipped in a coiled configuration unless otherwise specified.

3-0 No Fitting or Bend Options

CODE	00

3-1 One-Time Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	PRESSURE RATED	AVAILABLE SHEATH DIAMETERS (inches)
01A	303 SS	1/8	NO	1/8, 3/16, 1/4
05A	316 SS	1/8	YES	1/8, 3/16, 1/4
05B	316 SS	1/4	YES	1/8, 3/16, 1/4, 3/8
05C	316 SS	1/2	YES	1/8, 1/4, 3/8
15A	Brass	1/8	NO	1/8, 3/16, 1/4
15B	Brass	1/4	NO	3/16, 1/4, 3/8
15C	Brass	1/2	NO	1/4, 3/8

3-2 Re-Adjustable Compression Fittings

CODE	TYPE	NPT SIZE (inches)	AVAILABLE SHEATH DIAMETERS (inches)
10A	303 SS	1/8	1/8, 3/16
10B	303 SS	1/4	1/4, 3/8
10C	303 SS	1/2	1/4, 3/8
12A	316 SS	1/8	1/8, 3/16, 1/4
12B	316 SS	1/4	1/8, 3/16, 1/4, 3/8
12C	316 SS	1/2	1/8, 1/4, 3/8
11A	Brass	1/8	1/8, 3/16, 1/4
11B	Brass	1/4	1/8, 3/16, 1/4, 3/8
11C	Brass	1/2	1/4, 3/8
19C	Spring-loaded SS well fitting	1/2	3/16, 1/4

Teflon® gland standard 204 ºC [400 ºF] max.

3-3 Fixed Bushings

CODE *316 SS*	MOUNTING THREAD NPT (inches)	AVAILABLE SHEATH DIAMETERS (inches)
8A _ _[1]	1/8	1/8, 3/16, 1/4
8B _ _[1]	1/4	1/8, 3/16, 1/4, 3/8
8C _ _[1]	1/2	1/8, 3/16, 1/4, 3/8
8D _ _[1]	3/4	1/8, 3/16, 1/4, 3/8

[1] When ordering fixed bushings, specify order code above plus inserting length "U", as measured from hot tip to bottom of threaded bushing. EXAMPLE: order code 8A06 is 1/8" NPT, 316 SS bushing located 6" from hot tip.

4-0 Head Mounting Fittings

CODE	DESCRIPTION
9HNB	1/4" x 1/4" stainless steel hex nipple
8HPB	1/4" stainless steel hex bushing (no process threads)
8CFB	1/4" NPT 316 stainless steel compression fitting (no process threads)
22CFB	1/4" NPT brass compression fitting (no process threads)

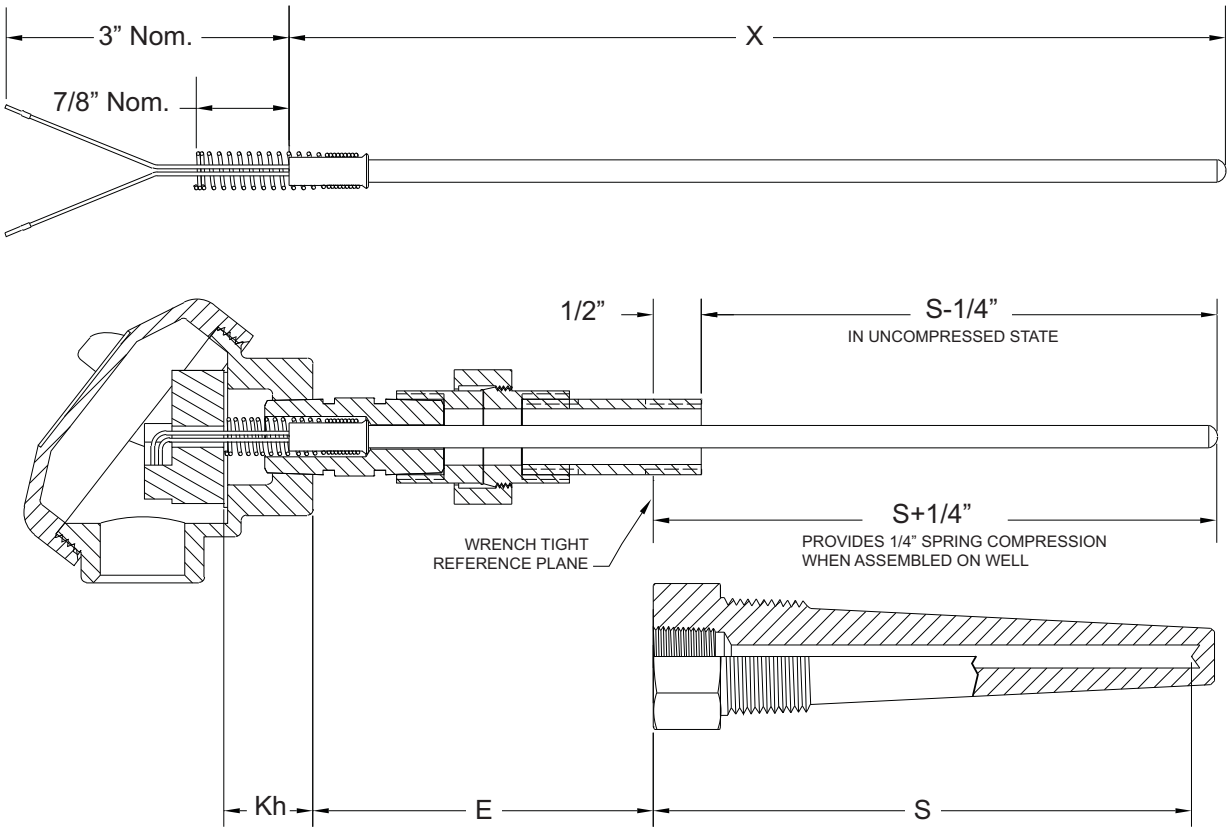
4-1 Miniature Head Terminations

CODE	DESCRIPTION
17	Miniature plastic head (3/8" NPT conduit opening)
25	Miniature nickel-plated head

Pyromation, Inc.

"X" Dimension Formula for Replacement Sensors

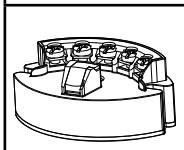
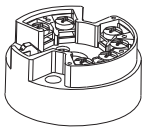
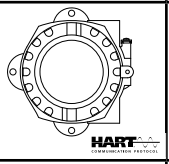
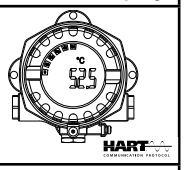
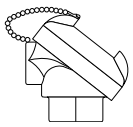
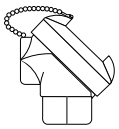
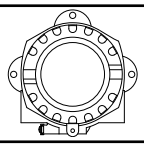
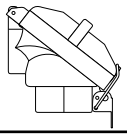
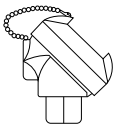
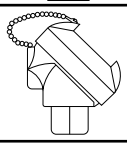
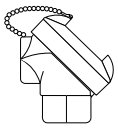
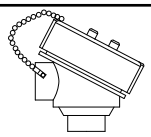
OPTION	FORMULA
SL	X = "S" Well length + "E" Extension length + "Kh" Head length - 3/8 inch
SC	X = "S" Well length + "E" Extension length



Pyromation Head Order Code	Kh Dimension in inches	Formula for SL option	Formula for SC option
31	1.00	X = S + E + 5/8"	X = S + E
34	1.00	X = S + E + 5/8"	X = S + E
49	1.00	X = S + E + 5/8"	X = S + E
53	1.00	X = S + E + 5/8 "	X = S + E
62	1.25	X = S + E + 7/8"	X = S + E
63	1.00	X = S + E + 5/8"	X = S + E
71	1.00	X = S + E + 5/8"	X = S + E
72	1.125	X = S + E + 3/4"	X = S + E
74	1.625	X = S + E + 1 1/4"	X = S + E
81	1.00	X = S + E + 5/8"	X = S + E
82	1.00	X = S + E + 5/8"	X = S + E
91	1.00	X = S + E + 5/8"	X = S + E
92	1.00	X = S + E + 5/8"	X = S + E

Complete Transmitter Specifications are located in Transmitter Section.

Complete Connection Head Specifications are located in the Accessories Section.

			Temperature Transmitters				
			T-440	**T-441**	**T-442**	**T-642**	**T-642 w/Display**
							
			Input: Pt100 RTD Only	Input: Thermocouple, RTD, Other	Input: Thermocouple, RTD, Other	Input: Thermocouple, RTD, Other	Input: Thermocouple, RTD, Other
			Programmable Head Mounted Transmitter, (4 to 20) mA analog output	Programmable Head Mounted Transmitter, Isolated, (4 to 20) mA analog output	Programmable Head Mounted Transmitter, Isolated, HART®, protocol, (4 to 20) mA analog output	Programmable Field Transmitter, Dual Input, Isolated, HART®, protocol, (4 to 20) mA analog output	Programmable Field Transmitter, Dual Input, Isolated, HART®, protocol, (4 to 20) mA analog output with Digital display
Connection Heads							
31		Aluminum Screw Cover Head	X	X	X		
34		Cast Iron Screw Cover Head	X				
35		Aluminum Field Transmitter Housing				X	X
49		Flip Top Aluminum Head	X	X	X		
53		Grey Delrin® Screw Cover Head	X				
62		DIN Form B White Polypropylene Screw Cover Head		X	X		
63		White Polypropylene Screw Cover Head	X				
91		316L Stainless Steel Screw Cover Head	X				
92		DIN form B 316 Stainless Steel Screw Cover Head		X	X		

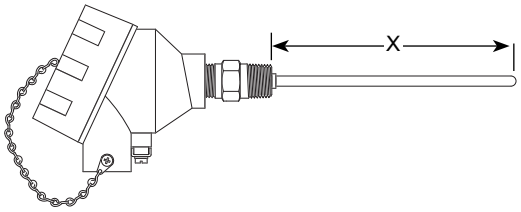
Configuration Code XP01

Hazardous Location Explosion Proof Approved Fixed Element RTD Assemblies - Model 70-22

Explosion Proof Fixed Element RTD's are for use in U.S. and Canadian hazardous areas. They are designed to extinguish flames inside the device eliminating the potential for ignition of flammable mixtures in the surrounding atmosphere. FM and CSA approved assemblies, dependent on connection head type, meet XP Class I, Division 1, Group A, B, C and D; DIP Class II, Division I, Groups E, F, G, and Class III, Division 1. They may be installed directly in the process without being inserted into a thermowell. The assemblies feature 316 stainless steel sheaths in various diameter sizes. They are available with or without process mountings and with aluminum or stainless steel explosion proof connection heads.

CSA file #217989

FM APPROVED



ORDER CODES

Example Order Number:

1-0		2-0	2-1	2-2		3-0		4-0		5-0	5-1	5-2	
XP	-	R1T185L	48	3	-	012	-	00	-	8HN	74,	T-	Select Type and Range from back of Section

1-0 Agency Approval

CODE	DESCRIPTION
XP	FM/CSA explosion proof approved assembly

2-0 100 Ω Platinum RTD Elements α = 0.003 85 ºC^{-1}

CODE		INITIAL ELEMENT ACCURACY 0 ºC
LOW RANGE WIRE WOUND (-200 to 204) ºC		
SINGLE	***DUPLEX***	
R1T185L	R1T285L	± 0.1%
R5T185L	R5T285L	± 0.01%
LOW RANGE THIN FILM (-40 to 204) ºC		
RBF185L	RBF285L	± 0.12%
RAF185L	RAF285L	± 0.06%
HIGH RANGE WIRE WOUND (-200 to 600) ºC		
R1T185H	R1T285H	± 0.1%

2-1 Sheath Diameters 316 SS

CODE	DIAMETERS (inches)
28[1]	1/8
38	3/16
48	1/4
68	3/8
[1] Not available in duplex	

2-2 Element Connection

CODE	DESCRIPTION
2	2 wire element
3	3 wire element
4[1]	4 wire element
[1] Not available in duplex or with 440 Series Transmitter	

5-1 Head Terminations

CODE	DESCRIPTION
71	Cast iron/aluminum explosion proof head Group C
72	DIN form B aluminum explosion proof head Group B
74	DIN form B aluminum explosion proof head Group A
75T-642B	(4 to 20) mA HART® Field Transmitter with aluminum explosion proof housing, Group A
81	316L stainless steel explosion proof head Group C
82	DIN form B 316 stainless steel explosion proof head Group B
5-2 Options	
SB	1/2" NPT conduit reducer bushing
I	Stainless steel tag
T-440[1]	(4 to 20) mA Head-mounted transmitter
T-441[2]	(4 to 20) mA Isolated Head-mounted transmitter
T-442[2]	(4 to 20) mA Hart® Isolated Head-mounted transmitter
See transmitter ordering information in back of section.	
[1] Only available with option 71 or 81 [2] Not available with option 71 or 81	

5-0 Head Mounting Fittings

CODE	DESCRIPTION
6HN	1/2" x 1/2" NPT steel hex nipple 1" "E" length
8HN	1/2" x 1/2" NPT stainless steel hex nipple 1" "E" length
9HP	1/2" NPT stainless steel bushing (no process threads)
8RNDC	3/4" x 1/2" NPT stainless steel hex nipple

4-0 Sheath Mounting Fittings

CODE	DESCRIPTION
00	No Fitting

3-0 "X" Dimensions

Insert three digit sheath length ("X" Dimension) in inches.

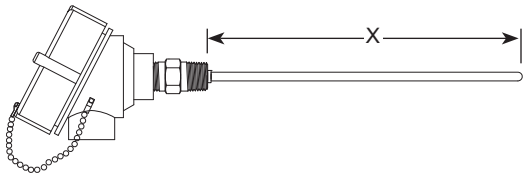
Configuration Code XP02

Hazardous Location Explosion Proof Approved Fixed Element Thermocouple Assemblies - Model 70-82

Explosion Proof Fixed Element Thermocouples are for use in U.S. and Canadian hazardous areas. They are designed to extinguish flames inside the device eliminating the potential for ignition of flammable mixtures in the surrounding atmosphere. FM and CSA approved assemblies, dependant on connection head type, meet XP Class I, Division 1, Group A, B, C and D; DIP Class II, Division I, Groups E, F, G and Class III, Division 1. They may be installed directly in the process without being inserted into a thermowell. The assemblies feature 316 stainless steel sheaths in various diameter sizes and ungrounded isolated junctions. They are available with or without process mountings and with aluminum or stainless steel explosion proof connection heads.

CSA file #217989

FM APPROVED



ORDER CODES

Example Order Number:

1-0		2-0	2-1	2-2	2-3		3-0		4-0		5-0	5-1	5-2	
XP	-	K	4	8	U	-	012	-	00	-	8HN	72,	T-	Select Type and Range from back of Section

1-0 Agency Approval

CODE	DESCRIPTION
XP	FM/CSA explosion proof approved assembly

2-0 Thermocouple Types

CODE	CODE
SINGLE	DUPLEX
E	EE
J	JJ
K	KK
T	TT

2-1 Sheath Diameters

CODE	DIAMETER (inches)
2	1/8
38	3/16
4	1/4
6	3/8

2-2 Sheath Materials

CODE	MATERIAL	STANDARD AVAILABLE TYPES
3	Inconel 600	K
4	310 SS	K
5	446 SS	K
8	316 SS	E, J, K, T

2-3 Measuring Junction

CODE	DESCRIPTION
U	Ungrounded

3-0 "X" Dimensions

Insert three digit sheath length ("X" Dimension) in inches.

4-0 Sheath Mounting Fittings

CODE	DESCRIPTION
00	No Fitting

5-0 Head Mounting Fittings

CODE	DESCRIPTION
6HN	1/2" x 1/2" NPT steel hex nipple
8HN	1/2" x 1/2" NPT stainless steel hex nipple
9HP	1/2" NPT stainless steel brushing (no process threads)
8RNDC	3/4" x 1/2" NPT stainless steel hex nipple

5-1 Head Terminations

CODE	DESCRIPTION
71	Cast Iron/aluminum explosion proof head Group C
72	DIN form B aluminum explosion proof head Group B
74	DIN form B aluminum explosion proof head Group A
75T-642B	(4 to 20) mA HART® Field Transmitter with aluminum explosion proof housing, Group A
81	316L stainless steel exploxion proof head Group C
82	DIN form B 316 stainless steel explosion proof head Group B
5-2	**Options**
SB	1/2" NPT conduit reducer bushing
I	Stainless steel tag
T-441[1]	(4 to 20) mA isolated head-mounted transmitter
T-442[1]	(4 to 20) mA Hart® isolated head-mounted transmitter
See transmitter ordering information in back of section.	
[1] Not available with option 71 or 81	

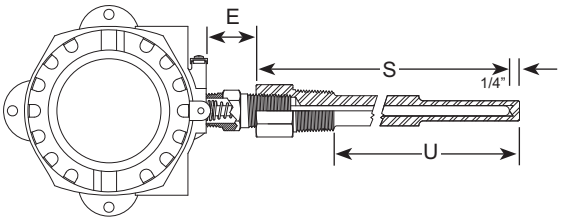
Configuration Code XP03

Hazardous Location Explosion Proof Approved RTD Assemblies with Thermowells - Model 70-20

Explosion Proof RTD Assemblies with Thermowells are for use in U.S. and Canadian hazardous areas. They are designed to extinguish flames inside the device eliminating the potential for ignition of flammable mixtures in the surrounding atmosphere. FM and CSA approved assemblies, dependant on connection head type, meet XP Class I, Division 1, Group A, B, C, and D; DIP Class II, Division I, Groups E, F, G and Class III, Division 1. The required thermowell is available in standard, heavy-duty, and flanged constructions. The assemblies feature 316 stainless steel sheaths. They are available with aluminum or stainless steel explosion proof connection heads.

CSA file #217989

FM APPROVED



ORDER CODES

Example Order Number:

1-0		2-0	2-1	2-2		3-0		4-0		5-0	5-1	5-2
XP	-	R1T185L	48	3	-	Select Thermowell Part # from Thermowell Section	-	SC	-	8HN	75T-642B,	I

Select Type and Range from back of Section

1-0 Agency Approval

CODE	DESCRIPTION
XP	FM/CSA explosion proof approved assembly

2-0 100 Ω Platinum RTD Elements

$\alpha = 0.003\ 85\ ^{\circ}C^{-1}$

CODE		INITIAL ELEMENT ACCURACY 0 ºC
LOW RANGE WIRE WOUND (-200 to 204) ºC		
SINGLE	***DUPLEX***	
R1T185L	R1T285L	± 0.1%
R5T185L	R5T285L	± 0.01%
LOW RANGE THIN FILM (-40 to 204) ºC		
RBF185L	RBF285L	± 0.12%
RAF185L	RAF285L	± 0.06%
HIGH RANGE WIRE WOUND (-200 to 600) ºC		
R1T185H	R1T285H	± 0.1%

2-1 Sheath Diameters 316 S.S.

CODE	DIAMETERS (inches)
48	1/4

2-2 Element Connection

CODE	DESCRIPTION
2	2 wire
3	3 wire
4[1]	4 wire
[1] Not available in duplex or with 440 Series Transmitter	

3-0 Thermowell

Select thermowell part number from Thermowell Section.

4-0 Element Options

CODE	DESCRIPTION
SL[1]	Spring loaded element
SC	Self-contained spring loaded element
[1] Not available with option 75T-642B	

5-1 Head Terminations

CODE	DESCRIPTION
71	Cast iron/aluminum explosion proof head Group C
72	DIN form B aluminum explosion proof head Group B
74	DIN form B aluminum explosion proof head Group A
75T-642B	(4 to 20) mA HART® Field Transmitter with aluminum explosion proof housing, Group A
81	316L stainless steel exploxion proof head Group C
82	DIN form B 316 stainless steel explosion proof head Group B
5-2 Options	
SB	1/2" NPT conduit reducer bushing
I	Stainless steel tag
T-440[1]	(4 to 20) mA Head-mounted transmitter
T-441[2]	(4 to 20) mA Isolated Head-mounted transmitter
T-442[2]	(4 to 20) mA Hart® Isolated Head-mounted transmitter
See transmitter ordering information in back of section.	
[1] Only available with option 71 or 81 [2] Not available with option 71 or 81	

5-0 Head Mounting Fittings

CODE	DESCRIPTION	CODE	DESCRIPTION
STEEL FITTINGS		*316SS FITTINGS*	
6HN	1/2" x 1/2" NPT hex nipple 1" length	8HN	1/2" x 1/2" NPT hex nipple 1" length
6PN_	1/2" NPT pipe nipple (specify "E" length in inches)	8PN	1/2" NPT pipe nipple (specify "E" length in inches)
6XU_[1]	1/2" NPT union/nipple (specify "E" length in inches)	8XU_[1]	1/2" NPT union/nipple (specify "E" length in inches)
[1] 3 1/2" Minimum length required. Maximum allowable "E" length is 9"			

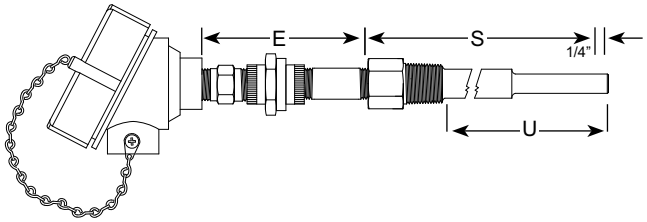
Configuration Code XP04

Hazardous Location Explosion Proof Approved Thermocouple Assemblies with Thermowells - Model 70-80

Explosion Proof Thermocouple Assemblies with Thermowells are for use in U.S. and Canadian hazardous areas. They are designed to extinguish flames inside the device eliminating the potential for ignition of flammable mixtures in the surrounding atmosphere. FM and CSA approved assemblies, dependant on connection head type, meet XP Class I, Division 1, Group A, B, C, and D; DIP Class II, Division I, Groups E, F, G and Class III, Division 1. The required thermowell is available in standard, heavy-duty, and flanged constructions. The assemblies feature 316 stainless steel sheaths and ungrounded isolated junctions. They are available with aluminum or stainless steel explosion proof connection heads.

CSA file #217989

FM APPROVED



ORDER CODES

Example Order Number:

1-0		2-1	2-2	2-3		3-0		4-0		5-0	5-1	5-2	
XP	-	J	48	U	-	Select Thermowell Part # from Thermowell Section	-	SL	-	8XU4	72,	I	Select Type and Range from back of Section

1-0 Agency Approval

CODE	DESCRIPTION
XP	FM/CSA explosion proof approved assembly

2-1 Thermocouple Types

CODE	CODE
SINGLE	DUPLEX
E	EE
J	JJ
K	KK
T	TT

2-2 Sheath Diameters 316 SS

CODE	DIAMETER (inches)
48	1/4

2-3 Measuring Junction

CODE	DESCRIPTION
U	Ungrounded

3-0 Thermowell

Select thermowell from Thermowell Section.

4-0 Element Options

SL[1]	Spring-loaded element
SC	Self-contained spring loaded element
[1] Not available with option 75T-642B	

5-1 Head Terminations

CODE	DESCRIPTION
71	Cast Iron/aluminum explosion proof head Group C
72	DIN form B aluminum explosion proof head Group B
74	DIN form B aluminum explosion proof head Group A
75T-642B	(4 to 20) mA HART® Field Transmitter with aluminum explosion proof housing, Group A
81	316L stainless steel explosion proof head Group C
82	DIN form B 316 stainless steel explosion proof head Group B
5-2 Options	
SB	1/2" NPT conduit reducer bushing
I	Stainless steel tag
T-441[1]	(4 to 20) mA isolated head-mounted transmitter
T-442[1]	(4 to 20) mA Hart® isolated head-mounted transmitter
See transmitter ordering information in back of section.	
[1] Not available with option 71 or 81	

5-0 Head Mounting Fittings

CODE	DESCRIPTION	CODE	DESCRIPTION
STEEL FITTINGS		*316SS FITTINGS*	
6HN	1/2" x 1/2" NPT hex nipple 1" length	8HN	1/2" x 1/2" NPT hex nipple 1" length
6PN_	1/2" NPT pipe nipple (specify "E" length in inches)	8PN	1/2" NPT pipe nipple (specify "E" length in inches)
6XU_[1]	1/2" NPT union/nipple (specify "E" length in inches)	8XU_[1]	1/2" NPT union/nipple (specify "E" length in inches)
[1] 3 1/2" minimum length required. Maximum allowable "E" length is 9"			

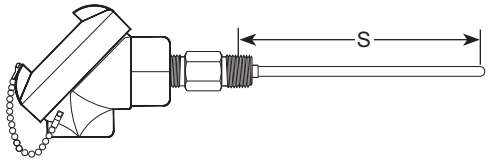
Configuration Code XP05

Hazardous Location Explosion Proof Approved Spring-Loaded RTD Assemblies - Model 70-21

Explosion Proof Spring-Loaded RTD's are for use in U.S. and Canadian hazardous areas. They are designed to extinguish flames inside the device eliminating the potential for ignition of flammable mixtures in the surrounding atmosphere. FM and CSA approved assemblies, dependant on connection head type, meet XP Class I, Division 1, Group B, C and D; DIP Class II, Division I, Groups E, F, G and Class III, Division 1. Pyromation provides sensors for installation into your existing thermowell or provides the required thermowell as part of the assembly. Refer to the Thermowell Section of this catalog for product selection. The assemblies feature 316 stainless steel sheaths. They are available with aluminum or stainless steel explosion proof connection heads. **Note:** The "S" dimension will measure 1/4" longer than specified when the spring is in the relaxed postition. The "S" dimension is calculated when the sensor is compressed or in the installed position. This design allows 1/4" spring compression to ensure positive contact with the bottom of the thermowell.

CSA file #217989

FM APPROVED



ORDER CODES

Example Order Number:

1-0		2-0	2-1	2-2		3-0		4-0		5-0	5-1	5-2	
XP	-	R1T185L	48	3	-	006	-	FP	-	8HN	81,	T-	Select Type and Range from back of Section

1-0 Agency Approval

CODE	DESCRIPTION
XP	FM/CSA explosion proof approved assembly

2-0 100 Ω Platinum RTD Elements

α = 0.003 85 ºC^{-1}

CODE		INITIAL ELEMENT ACCURACY 0 ºC
LOW RANGE WIRE WOUND (-200 to 204) ºC		
SINGLE	***DUPLEX***	
R1T185L	R1T285L	± 0.1%
R5T185L	R5T285L	± 0.01%
LOW RANGE THIN FILM (-40 to 204) ºC		
RBF185L	RBF285L	± 0.12%
RAF185L	RAF285L	± 0.06%
HIGH RANGE WIRE WOUND (-200 to 600) ºC		
R1T185H	R1T285H	± 0.1%

2-1 Sheath Diameters 316 SS

CODE	DIAMETERS (inches)
48	1/4

2-2 Element Connection

CODE	DESCRIPTION
2	2 wire
3	3 wire
4[1]	4 wire
[1] Not available in duplex or with 440 Series Transmitter	

5-1 Head Terminations

CODE	DESCRIPTION
71	Cast iron/aluminum explosion proof head Group C
72	DIN form B aluminum explosion proof head Group B
75T-642D	(4 to 20) mA HART® Field Transmitter with aluminum explosion proof housing, Group B
81	316L stainless steel explosion proof head Group C
82	DIN form B 316 stainless steel explosion proof head Group B
5-2 Options	
SB	1/2" NPT conduit reducer bushing
I	Stainless steel tag
T-440[1]	(4 to 20) mA Head-mounted transmitter
T-441[2]	(4 to 20) mA Isolated Head-mounted transmitter
T-442[2]	(4 to 20) mA Hart® Isolated Head-mounted transmitter
See transmitter ordering information in back of section.	
[1] Only available with option 71 or 81 [2] Not available with option 71 or 81	

5-0 Head Mounting Fittings

CODE	DESCRIPTION
316 STAINLESS STEEL FITTINGS	
8HN	1/2" NPT flame path fitting (1-1/2" "E" length)
8PU4[1]	1/2" NPT union/nipple with flame path fitting (specify "E" length in inches, maximum allowable 9")
[1] For longer lengths replace "4" with length in inches.	

4-0 Element Options

FP	Spring-loaded element with flame path

3-0 "S" Dimensions

Insert three digit sheath length ("S" Dimension) in inches

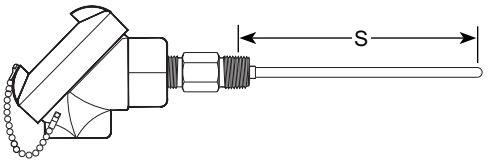
Configuration Code XP06

Hazardous Location Explosion Proof Approved Spring-Loaded Thermocouple Assemblies - Model 70-81

Explosion Proof Spring-Loaded Thermocouples are for use in U.S. and Canadian hazardous areas. They are designed to extinguish flames inside the device eliminating the potential for ignition of flammable mixtures in the surrounding atmosphere. FM and CSA approved assemblies, dependant on connection head type, meet XP Class I, Division 1, Group B, C and D; DIP Class II, Division I, Groups E, F, G and Class III, Division 1. Pyromation provides sensors for installation into your existing thermowell or provides the required thermowell as part of the assembly. Refer to the Thermowell Section of this catalog for product selection. The assemblies feature 316 stainless steel sheaths and ungrounded isolated junctions. They are available with aluminum or stainless steel explosion proof connection heads. **Note:** The "S" dimension will measure 1/4" longer than specified when the spring is in the relaxed postition. The "S" dimension is calculated when the sensor is compressed or in the installed position. This design allows 1/4" spring compression to ensure positive contact with the bottom of the thermowell.

CSA file #217989

FM APPROVED



ORDER CODES

Example Order Number:

1-0		2-1	2-2	2-3		3-0		4-0		5-0	5-1	5-2	
XP	-	J	48	U	-	012	-	FP	-	8HN	71,	T-	Select Type and Range from back of Section

1-0 Agency Approval

CODE	DESCRIPTION
XP	FM/CSA explosion proof approved assembly

2-1 Thermocouple Types

CODE	CODE
SINGLE	DUPLEX
E	EE
J	JJ
K	KK
T	TT

2-2 Sheath Diameters 316 SS

CODE	DIAMETER (inches)
48	1/4

2-3 Measuring Junction

CODE	DESCRIPTION
U	Ungrounded

3-0 "S" Dimensions

Insert three digit sheath length ("S" Dimension) in inches

4-0 Element Options

FP	Spring-loaded element with flame path

5-0 Head Mounting Fittings

CODE	DESCRIPTION
316 STAINLESS STEEL FITTINGS	
8HN	1/2" NPT flame path fitting (1-1/2" "E" length)
8PU4[1]	1/2" NPT union/nipple with flame path fitting (specify "E" length in inches, maximum allowable 9")
[1] For longer lengths replace "4" with length in inches.	

5-1 Head Terminations

CODE	DESCRIPTION
71	Cast Iron/aluminum explosion proof head Group C
72	DIN form B aluminum explosion proof head Group B
75T-642D	(4 to 20) mA HART® Field Transmitter with aluminum explosion proof housing, Group B
81	316L stainless steel explosion proof head Group C
82	DIN form B 316 stainless steel explosion proof head Group B
5-2 Options	
SB	1/2" NPT conduit reducer bushing
I	Stainless steel tag
T-441[1]	(4 to 20) mA isolated head-mounted transmitter
T-442[1]	(4 to 20) mA Hart® isolated head-mounted transmitter
See transmitter ordering information in back of section.	
[1] Not available with option 71 or 81	

Temperature Transmitters for Hazardous Location Explosion Proof Sensor Assemblies

ORDER CODES

Example Order Number:

1-0		1-1		1-2	1-3	1-4		1-5		1-6
75T-642B	-	D	-	3	85	U	-	S(0-200)		C

1-0 Transmitter Type

CODE	DESCRIPTION
440[1]	(4 to 20) mA programmable Head mounted RTD Transmitter
441	(4 to 20) mA programmable Head mounted universal Transmitter
442	(4 to 20) mA HART® programmable Head mounted universal Transmitter
75T-642B	(4 to 20) mA HART® Field Transmitter with explosion proof aluminum housing FM/CSA Class I, Div I, Groups A,B,C,D; Class II, Groups E,F,G: Class III
75T-642D	(4 to 20) mA HART® Field Transmitter with explosion proof aluminum housing FM/CSA Class I, Div I, Groups B,C,D; Class II, Groups E,F,G: Class III
[1] Only available with 2 or 3 wire input connection and Pt100 sensor type	

1-1 Options (For 642 Series only)

CODE	DESCRIPTION
T	Solid cover
D	Glass cover with digital display
Leave blank if using 440, 441, or 442	

1-2 Input Type

CODE	DESCRIPTION
00[1]	Unconfigured
1	Thermocouple (TC)
2	RTD (2-wire)
3	RTD (3-wire)
4	RTD (4-wire)
[1] Default setting supplied as Pt100 (0-100) °C	

1-3 Sensor Type

CODE	DESCRIPTION
J	Type J thermocouple
K	Type K thermocouple
T	Type T thermocouple
N	Type N thermocouple
E	Type E thermocouple
85	100 ohm platinum (α = 0.003 85 ºC)

1-4 Failure Mode

CODE	DESCRIPTION
U	Upscale Burnout ≥ 20.5 mA
D	Downscale Burnout ≤ 3.8 mA

1-5 Range

CODE	DESCRIPTION
S	(lower limit – upper limit)

1-6 Unit of Measure

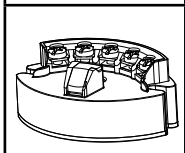
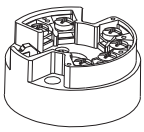
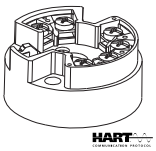
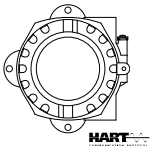
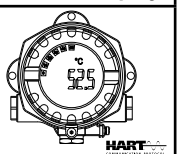
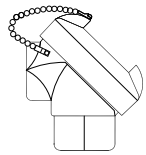
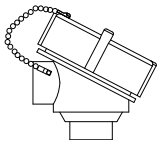
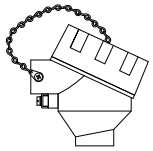
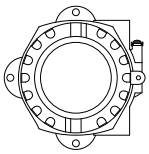
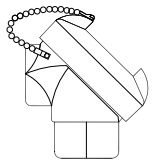
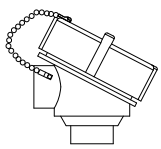
CODE	DESCRIPTION
C	Celsius
F	Fahrenheit

For complete transmitter specifications see Transmitter Section.

Connection Head and Transmitter Selection Guide

Complete Transmitter Specifications are located in Transmitter Section.

Complete Connection Head Specifications are located in the Accessories Section.

Connection Heads			Temperature Transmitters				
			T-440	T-441	T-442	T-642	T-642 w/display
							
			Input: Pt100 RTD Only	Input: Thermocouple, RTD, Other	Input: Thermocouple, RTD, Other	Input: Thermocouple, RTD, Other	Input: Thermocouple, RTD, Other
			Programmable Head Mounted Transmitter, (4 to 20) mA analog output	Programmable Head Mounted Transmitter, Isolated, (4 to 20) mA analog output	Programmable Head Mounted Transmitter, Isolated, HART®, protocol, (4 to 20) mA analog output	Programmable Field Transmitter, Dual Input, Isolated, HART®, protocol, (4 to 20) mA analog output	Programmable Field Transmitter, Dual Input, Isolated, HART®, protocol, (4 to 20) mA analog output with Digital display
71		Cast Iron/ Aluminum Explosion Proof Head Group C	X				
72		DIN form B Aluminum Explosion Proof Head Group B		X	X		
74		DIN form B Aluminum Explosion Proof Head Group A		X	X		
75		DIN form B Aluminum Explosion Proof Field Transmitter Housing Group A				X	X
81		316L Stainless Steel Explosion Proof Head Group C	X				
82		DIN form B 316 Stainless Steel Head Group B		X	X		

Overview of NEC® Hazardous Location Classifications and Methods of Protection

Classes	Groups	Divisions	
		1	2
Class I	**Examples**		
Location in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.	Group A: Acetylene Group B: Hydrogen Group C: Ethylene Group D: Propane, Fuels, Solvents	Locations where hazardous material exists under normal operating conditions or through breakdown or repair.	Locations where hazardous materials are expected to be confined within closed containers of closed systems but may become present through a leak or process failure.
Class II	**Examples**		
Locations that are hazardous because of the presence of combustible dust.	E: Metal Dusts F: Carbon Dust G: Combustible Dust, flour, grain, wood, plastic, chemicals	Combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitable mixtures or through breakdown or repair.	Combustible dust may be in the air in sufficient quantities to produce an explosion due to abnormal operations or failure of electrical equipment.
Class III			
Locations that are hazardous because of the presence of easily ignitable fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures.	There are no defined Groups. Examples are Textiles, woodworking, Paper fibers.	Easily ignitable fibers or materials producing combustible flyings are handled, manufactured, or used.	Easily ignitable fibers are stored or handled other than in the process of manufacture.

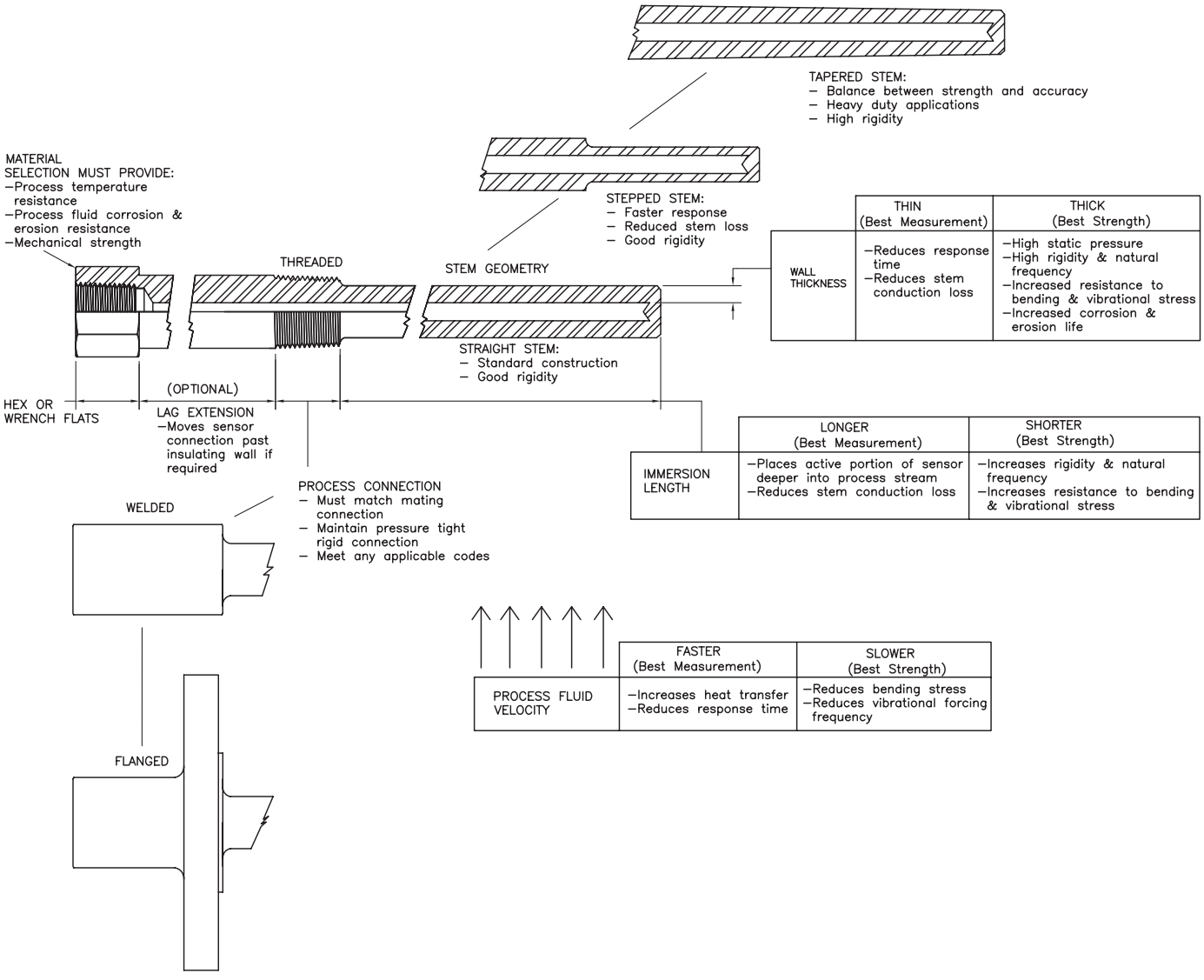
Methods of Protection			
Explosionproof (XP) **Class I, Division 1, 2**	**Dust-Ignitionproof (DIP)** **Class II, Division 1, 2**	**Intrinsically Safe (IS)** **Class I, Division 1, 2** **Class II, Division 1, 2** **Class III, Division 1, 2**	**Nonincendive (NI)** **Class I, Division 2** **Class II, Division 2** **Class III, Division 1, 2**
Apparatus enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby.	Equipment enclosed in a manner that excludes dust and does not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure.	Equipment not capable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific flammable or combustible atmospheric mixture in its most easily ignitable concentration.	Equipment having electrical circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas-air, vapor-air, or dust-air mixture due to arcing or thermal means.

This material is for reference only. Refer to *The NEC® 2005 Handbook, NFPA 70: National Electrical Code® International Electrical Code® Series* (Quincy, MA, 2005) for authoritative and complete documentation.

Thermowell Design and Selection Criteria

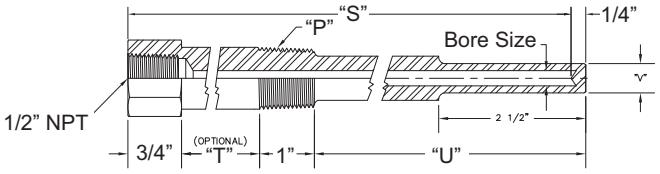
A thermowell is a pressure-tight receptacle that protects and extends the life of a temperature sensor in processing applications where the sensor is not mechanically or chemically compatible with the process environment. Installed directly into the piping systems, thermowells facilitate sensor replacement in high pressure pipelines and eliminate the need to interrupt the process flow or drain the process system for sensor maintenance functions. The use of standardized thermowells permits simple relocation of sensors throughout a plant.

Strength versus accurate and fast temperature measurement is a balancing act. The factors which tend to produce high strength also tend to reduce the temperature sensor's accuracy and speed of response. A properly selected thermowell will balance these opposing factors to produce a design capable of functioning satisfactorily in the intended application. The listed factors are a general guide and are not all inclusive. Refer to ASME Performance Test code 19.3 for a more authoritative dissertation on proper thermowell selection.

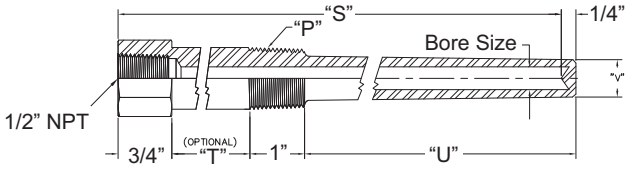


The drilled thermowells listed below are those most commonly found in process applications. Other types and styles are listed later in this section. The thermowells listed below are available as separate component wells and can be ordered by the code numbers listed below. They can also be ordered as a part of a complete sensor assembly. Consult factory for wells with different mounting threads, lengths, and materials.

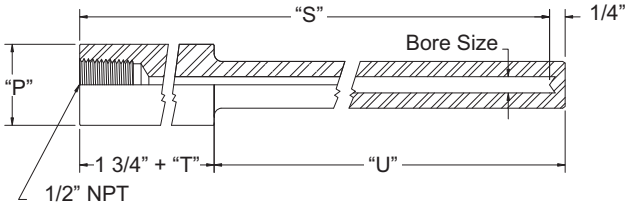
STANDARD DUTY WELLS



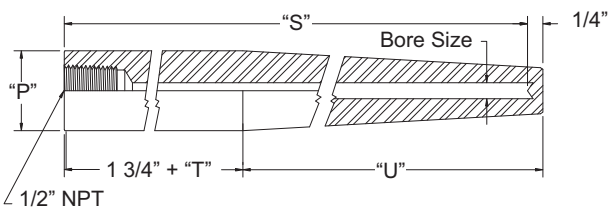
HEAVY DUTY WELLS



STRAIGHT SHANK SOCKET WELD



WELD-IN WELLS



ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6
S	4	D	06	08	T2	S

1-0 Well Type

CODE	DESCRIPTION
S	Standard duty threaded (NPT)
H	Heavy duty threaded (NPT)
SW	Straight shank socket weld
WI	Weld-in

1-1 Bore Size

CODE	DESCRIPTION
4	0.260 Dia. Bore

1-2 Pipe Size "P"

CODE	DESCRIPTION
C	1/2" Pipe[1]
D	3/4" Pipe
E	1" Pipe
[1] Only available with well type S or H	

1-3 Length Dimensions (inches)

CODE	"S" DIMENSIONS	"U" DIMENSIONS	
		NO LAG	*WITH STANDARD LAG*
04	4	2(1/2)	N/A
06	6	4(1/2)	2(1/2)
09	9	7(1/2)	4(1/2)
12	12	10(1/2)	7(1/2)
15	15	13(1/2)	10(1/2)
18	18	16(1/2)	13(1/2)
24	24	22(1/2)	19(1/2)

1-4 Material

CODE	DESCRIPTION
8	316 stainless steel
9	304 stainless steel

1-5 Optional "T" Lag Dimension

CODE	DESCRIPTION
Leave blank if No Lag is required	
T2	2" Lag standard on 6" well
T3	3" Lag standard on 9, 12, 15, 18, 24" wells
T__	Special Lag specify "T" dimension in inches

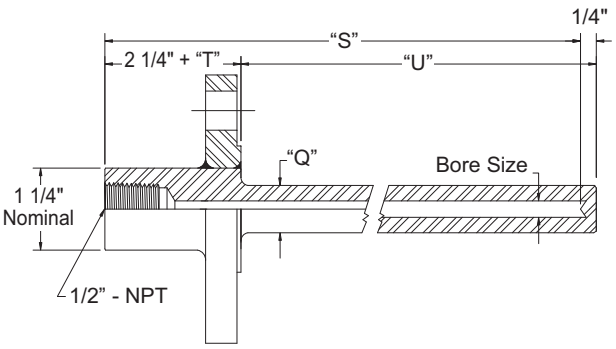
1-6 Well Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Customer specified part number marked on the thermowell - (10 digit maximum)

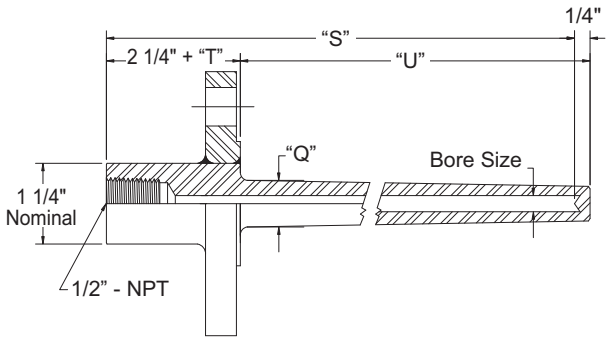
The flanged thermowells described on this page are those commonly found in most process applications. These wells are supplied as standard or heavy duty with raised-faced flanges. Other types and styles are listed later in this section. Consult factory for wells with different flange sides, lengths, and materials.

FLANGED THERMOWELLS

STANDARD DUTY



HEAVY DUTY



ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8
SF	**4**	**15**	**R**	**3**	**12**	**08**	**T2**	**C8**

1-0 Well Type

CODE	DESCRIPTION
SF	Standard flanged
HF	Heavy Duty flanged

1-1 Bore Size

CODE	DESCRIPTION
4	0.260 Bore

1-2 Flange Size

CODE	DESCRIPTION
10	1”
15	1 1/2”
20	2”

1-3 Flange Type

CODE	DESCRIPTION
R	Raised face

1-4 Pressure Rating

CODE	DESCRIPTION
1	150 class
3	300 class

1-8 Well Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Customer specified part number marked on thermowell (10 digit maximum)

1-7 Optional “T” Lag Dimension

CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify “T” dimension in inches

1-6 Well Material

CODE	DESCRIPTION
08	316 Stainless steel
09	304 Stainless steel

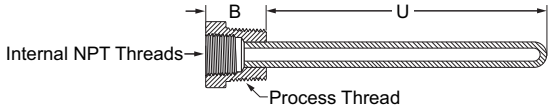
1-5 Well Length (inches)

CODE	DESCRIPTION	
	“S” DIMENSION	“U” DIMENSION
06	6	4
09	9	7
12	12	10
15	15	13
18	18	16
24	24	22

ORDER CODES

BUILT-UP PROTECTION WELLS

Built-Up Protection Wells are small diameter general purpose wells for use in low temperature, low pressure, and low fluid velocity applications. **Built-Up Protection Wells** are constructed using tubing and welding or brazing bushings onto the tubing. **Built-Up Protection Wells** of all stainless steel construction have welded-on bushings. **Built-Up Protection Wells** with brass bushings are brazed-on bushings.



1 2 3

Example Order Number: **26 - 48 - 06 - 803**

1 Well Size and Material

CODE	TUBE (inches) OD ID	MATERIAL
48	0.250 x 0.193	316 SS
58	0.313 x 0.255	316 SS
88	0.500 x 0.260	316 SS
Z	Special (Consult factory)	

2 Well 'U' Dimensions

Insert (2) digit 'U' length in inches. EXAMPLES: 06 = 6" U Dim. 02 (1/2) = 2(1/2") U Dim.

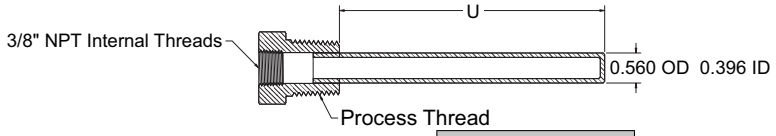
3 Mounting Bushing Material - Dimensions

CODE		BUSHING THREADS (inches)		BUSHING 'B' DIM. (inches)
BRASS	*316 SS*	*EXT.*	*INT.*	
2201[1]	801[1]	1/4	1/8	3/4
2202	802	3/8	1/8	3/4
2203	803	3/8	1/4	3/4
2204	804	1/2	1/8	15/16
2205	805	1/2	1/4	15/16
2206	806	1/2	3/8	15/16
2207	807	1/2	1/2	1 1/2
2208	808	3/4	1/8	1
2209	809	3/4	1/4	1
2210	810	3/4	3/8	1
2211	811	3/4	1/2	1
[1] Not available with 1/2" OD wells				

ORDER CODES

THERMAL ELEMENT WELLS

The **Thermal Element Wells** listed below are for use with Partlow's filled system thermometer bulbs. **Thermal Element Wells** are available in 3/4" NPT and 1" NPT external mounting threads. All **Thermal Element Wells** have 3/8" NPT internal threads, and all wells are constructed with 304 SS.



Example Order Number: **26 - W225-3/4"**

304 SS Thermal Element Protection Wells

CODE				'U' DIMENSIONS (inches)
3/4" NPT PROCESS THREAD (inches)	*1" NPT PROCESS THREAD (inches)*	ELEMENT RANGE		
		OLD	*NEW*	
W 112 - 3/4	W 112 - 1	112	091 or 117	29 13/16
W 217 - 3/4	W 217 - 1	217	094 or 119	15 11/16
W 225 - 3/4	W 225 - 1	225	101 or 121	16 1/16
W 335 - 3/4	W 335 - 1	335	104 or 237	13 3/8
W 445 - 3/4	W 445 - 1	445	106 or 123	10 1/4
W 555 - 3/4	W 555 - 1	555	108 or 125	8 7/16
W 665 - 3/4	W 665 - 1	665	109 or 126	7 5/16
W 780 - 3/4	W 780 - 1	780	111 or 128	6 1/16
W 910 - 3/4	W 910 - 1	910	113 or 130	5 3/16
W1011 - 3/4	W1011 - 1	1011	115	4 7/8

Code	Description	UNS Number	Trade Names
03	Alloy 600	N06600	Inconel®
04	310 SS	S31000	
05	446 SS	S44600	
06	C1018	G10180	
07	Alloy 601	N06601	Inconel®
08	316 SS/316 L	S31603	
09	304 SS/304 L	S30403	
22	Brass*		
27	Alloy 400	N04400	Monel®
28	Alloy B	N10001	Hastelloy®
29	Alloy C-276	N10276	Hastelloy®
31	Nickel 200	N02200	
35	321 SS	S32100	
36	347 SS	S34700	
37	Alloy 800	N08800	Incoloy®
38	Alloy 20	N08020	Carpenter®
41	HR-160	N12160	Haynes®
50	Zirconium	R60702	
51	Alloy X		Hastelloy®
56	Teflon		Teflon®
59	F22	K21590	
60	F11	K11572	
61	A105	K03504	
91	F91	K91560	
*Materials available in various alloys - Consult factory.			

Thermowell Options and Specifications

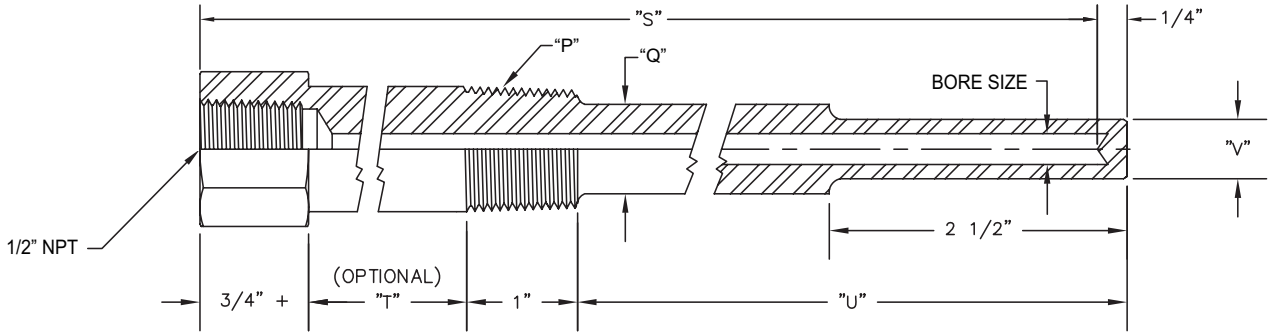
The following options are available on Pyromation thermowells. Please contact our sales department for information and current pricing.

Documentation/Testing	
Certificate of Compliance	C of C
Hydrostatic Test (Internal)	ASTM E1003 Compliant
Liquid Dye Penetrant Test	ASTM E1220 Compliant
Material Test Reports	MTR
NACE Hardness Test	Thermowell must be made of a NACE recognized material.
Positive Material Identification	X-Ray Fluorescence Spectrometry
Surface Roughness Test	ASME B46.1
Wake Frequency Calculation	ASME PTC 19.3
Weld X-Ray Inspection	Call for Pricing
Services	
Expedited Delivery	Call for Pricing
Oxygen cleaning	ASTM G93 Compliant (when specified)
Stamping	10 Characters Maximum
Full Penetration Weld	Performed by welders certified to ASME Section IX, Boiler and Pressure Vessel Code
Component/Coatings	
Abrasive Coatings	Call for Pricing
Plug and Chain - Brass	Call for Pricing
Plug and Chain - Stainless Steel	Call for Pricing
Ring-Joint Flange	Call for Pricing
Tantalum Jacket	Call for Pricing
Teflon® Coatings (FEP)	Call for Pricing
Industry Specifications	
Canadian Registration Numbers[1]	CSA B51 Boiler, Pressure Vessel and Pressure Piping Code
Flanged Thermowells	ASME B16.5 prior to fabrication
Heat Treating	NACE Certification available for applicable materials.(Barstock thermowells meet this specifiction. Flanged thermowells can be heat treated to comply.) Stress relief, annealing, and custom heat treating available upon request.
Material	ASTM Compliance and other applicable National Standards
Pipe Threads	ASME B1.20.1
Sanitary Thermowells	3A Sanitary Council Standard. Authorization Number: 487 32 µin R_a Food Grade Surface Finish
Manufacturing Tolerances and Maximums	
“S” Length Maximum	32” maximum for standard drilled thermowells. 61” maximum for full penetrating butt weld, two piece construction thermowells. Over 61” consult factory. 12” maximum “S” length for plastic thermowells
Bore “Bottom” Shape	“W” (nominal)
Bore Concentricity	± 10% of minimum wall thickness
Bore Depth	±0.020” (through 32.00”)
Bore Diameter	+0.005” / -0.003” (bore sizes 0.125” through 0.406” I.D.)
Insertion Length	Lengths up to 22.50” ± 0.0625”. Lengths up to 22.50” through 48” ±0.125”. Lengths over 48” through ±0.25”.
Marking	Standard marking includes material grade and material traceability codes
Stem Outside Diameter	±0.010”
Tapered Allowance	Maximum tapered length is 16.00”. “U” dimensions greater than 16.00” in length are manufactured with a straight OD beginning below the process connection radius and following through with only the last 16.00” of “U” dimension tapered to minor OD.
Internal Threads	1/2”-14 - NPT per ANSI B1.20.1 (1 to 3 turns deep per UL 866 and CSA C22.2 No. 30-M1986)
Tip Thickness	0.25” ± 0.0625”

[1] Available as an option. Must be specified.

Standard Duty Threaded Thermowells

Standard Duty Threaded Thermowells are available in a variety of materials, process connection sizes, lengths, and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. The stepped construction is used in standard duty application and increases the speed of response while maintaining mechanical strength. They are designed with standard 0.260" bore diameters to accommodate sensing elements with a 0.252" maximum diameter. These wells are available as a separate component or as part of a complete sensor assembly.



+ = Wells are made from round bar with milled wrench hex. 1 1/4" NPT and 1 1/2" NPT wells are supplied as round bar with milled wrench flats.

("U" length for non-lagging wells) = "S" -1 1/2"
("U" length for lagging wells) = "S" -1 1/2" -"T"
(To solve for "T"), "T" = "S" -"U" -1 1/2" (When "U" and "S" are specified)

Thermowell Dimensions

"P"	"Q"	"V"
1/2" NPT	5/8" Dia.	1/2" Dia.
3/4" NPT	3/4" Dia.	1/2" Dia.
1" NPT	7/8" Dia.	1/2" Dia.
1 1/4" NPT	1 1/4" Dia.	7/8" Dia.
1 1/2" NPT	1 1/2" Dia.	7/8" Dia.

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6
S	4	D	06	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
S	Standard duty threaded

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore

1-2 Pipe Size "P"

CODE	DESCRIPTION
C	1/2" NPT
D	3/4" NPT
E	1" NPT
F	1 1/4" NPT
G	1 1/2" NPT

1-6 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Well stamped with customer specified part number

1-5 Optional "T" Lag Dimension

CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-4 Material

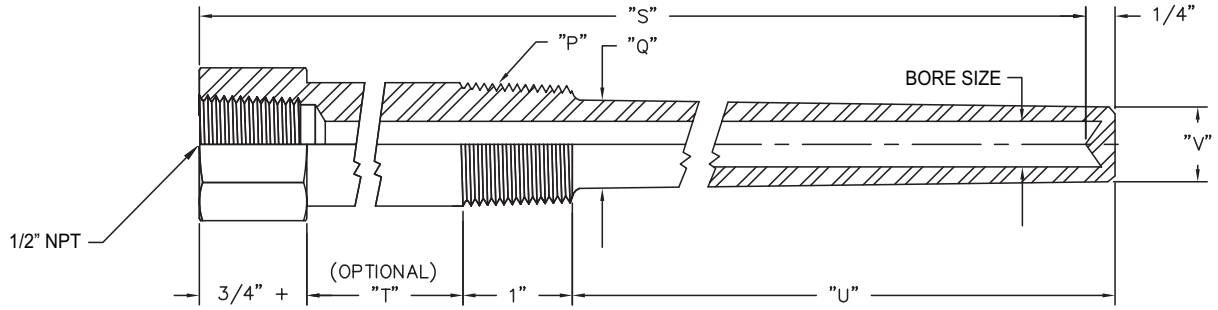
CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

1-3 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

Heavy Duty Threaded Thermowells

Heavy Duty Threaded Thermowells are available in a variety of materials, process connection sizes, lengths and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. They are designed with standard 0.260" or 0.385" bore diameters to accommodate sensing elements with either a 0.252" or 0.377" maximum diameters. The tapered design is suited for heavy duty applications where greater rigidity is required for increased pressure and flow due to process conditions. These wells are available as a separate component or as part of a complete sensor assembly.



+ = Wells are made from round bar with milled wrench hex. 1 1/4" NPT and 1 1/2" NPT wells are supplied as round bar with milled wrench flats.

("U" length for non-lagging wells) = "S" -1 1/2"
("U" length for lagging wells) = "S" -1 1/2" -"T"
(To solve for "T"), "T" = "S" -"U" -1 1/2" (When "U" and "S" are specified)
Maximum tapered length is 16"

Thermowell Dimensions

"P"	"Q"	"V" (0.260")	"V" (0.385")
1/2" NPT	5/8" Dia.	5/8" Dia.	N/A
3/4" NPT	7/8" Dia.	5/8" Dia.	49/64" Dia.
1" NPT	1 1/16" Dia.	5/8" Dia.	49/64" Dia.
1 1/4" NPT	1 3/8" Dia.	7/8" Dia.	7/8" Dia.
1 1/2" NPT	1 5/8" Dia.	7/8" Dia.	7/8" Dia.

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6
H	4	D	06	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
H	Heavy duty threaded

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore
6	0.385" Dia. bore

1-2 Pipe Size "P"

CODE	DESCRIPTION
C	1/2" NPT
D	3/4" NPT
E	1" NPT
F	1 1/4" NPT
G	1 1/2" NPT

1-3 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-4 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

1-5 Optional "T" Lag Dimension

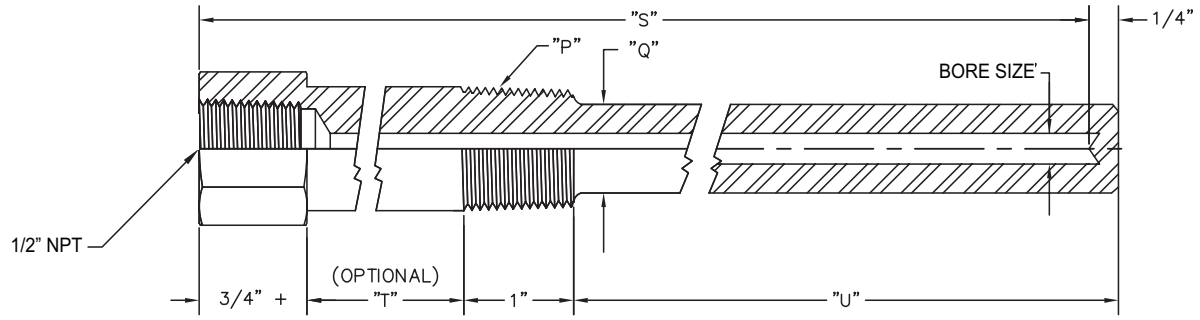
CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-6 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Well stamped with customer specified part number

Straight Shank Threaded Thermowells

Straight Shank Threaded Thermowells are available in a variety of materials, process connection sizes, lengths, and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. They are designed with standard 0.260" or 0.385" bore diameters to accommodate sensing elements with either a 0.252" or 0.377" maximum diameters. These wells are available as a separate component or as part of a complete sensor assembly.



+ = Wells are made from round bar with milled wrench hex. 1 1/4" NPT and 1 1/2" NPT wells are supplied as round bar with milled wrench flats.

("U" length for non-lagging wells) = "S" -1 1/2"
("U" length for lagging wells) = "S" -1 1/2" -"T"
(To solve for "T"), "T" = "S" -"U" -1 1/2" (When "U" and "S" are specified)

Thermowell Dimensions

"P"	"Q"
1/2" NPT	5/8" Dia.
3/4" NPT	3/4" Dia.
1" NPT	7/8" Dia.
1 1/4" NPT	1 1/4" Dia.
1 1/2" NPT	1 1/2" Dia.

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6
ST	4	D	09	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
ST	Straight shank threaded

1-1 Bore Size

CODE	DESCRIPTION
4	0.260 Dia. bore
6	0.385" Dia. bore

1-2 Pipe Size "P"

CODE	DESCRIPTION
C	1/2" NPT
D	3/4" NPT
E	1" NPT
F	1 1/4" NPT
G	1 1/2" NPT

1-3 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-4 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

1-5 Optional "T" Lag Dimension

CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

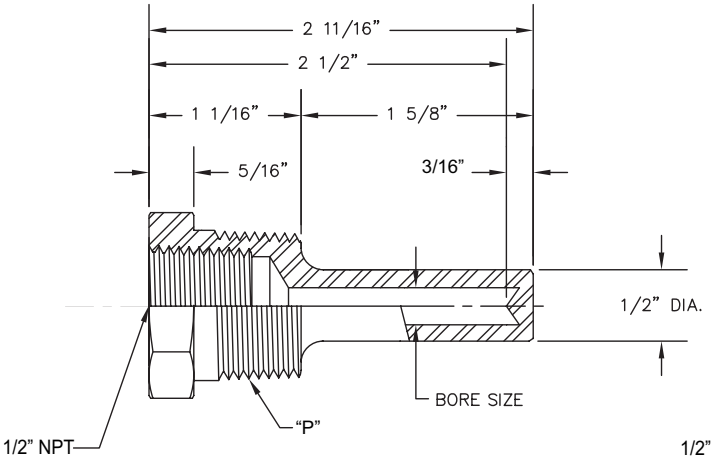
1-6 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Well stamped with customer specified part number

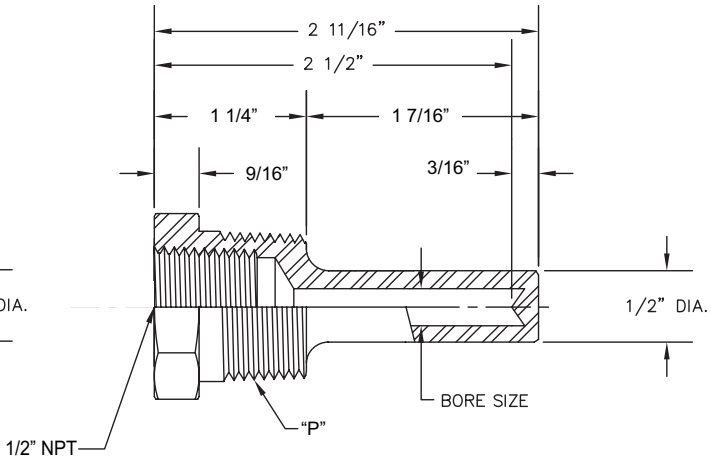
Limited Space Thermowells

Limited Space Thermowells are available in a variety of materials and process connection sizes. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. They are intended for use in piping systems where space is limited. They are designed with standard 0.260" bore diameter to accommodate sensing elements with a 0.252" maximum diameter. These wells are available as a separate component or as part of a complete sensor assembly.

3/4" and 1" NPT



1/2" NPT



ORDER CODES

Example Order Number:

1-0	1-1	1-2		1-3	1-4
LS	**4**	**D**	**2.5**	**08**	**C8**

1-0 Well Type

CODE	DESCRIPTION
LS	Limited space threaded

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore

1-2 Pipe Size "P"

CODE	DESCRIPTION
C	1/2" NPT
D	3/4" NPT
E	1" NPT

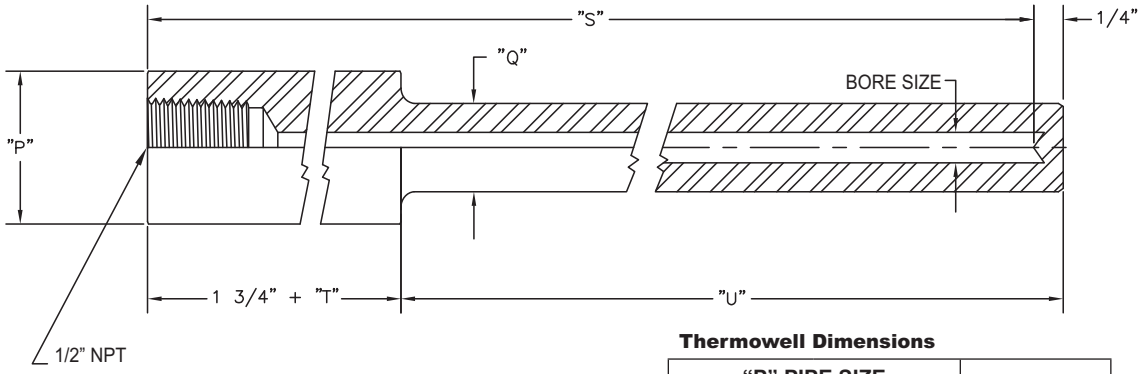
1-4 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Well stamped with customer specified part number

1-3 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

Straight Shank Socket Weld Thermowells are available in a variety of materials, process connection sizes, lengths, and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. The Straight Shank Socket Weld is designed to be used with a 3000 class weld-o-let which allows the thermowell to be welded permanently into the process. They are designed with standard 0.260" or 0.385" bore diameters to accommodate sensing elements with either a 0.252" or 0.377" maximum diameters. These wells are available as a separate component or as part of a complete sensor assembly.



("U" length for non-lagging wells) = "S" -1 1/2"
("U" length for lagging wells) = "S" -1 1/2" -"T"
(To solve for "T"), "T" = "S" -"U" -1 1/2" (When "U" and "S" are specified)

Thermowell Dimensions

"P" PIPE SIZE		Q
NOM.	DIA.	
3/4"	1.050"	3/4" Dia.
1"	1.315"	1" Dia.
1 1/4"	1.660"	1 1/4" Dia.
1 1/2"	1.900"	1 1/2" Dia.

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6
SW	4	D	09	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
SW	Straight shank socket weld

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore
6	0.385" Dia. bore

1-2 Pipe Size "P"

CODE	DESCRIPTION
D	3/4" NPS
E	1" NPS
F	1 1/4" NPS
G	1 1/2" NPS

1-3 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-4 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

1-5 Optional "T" Lag Dimension

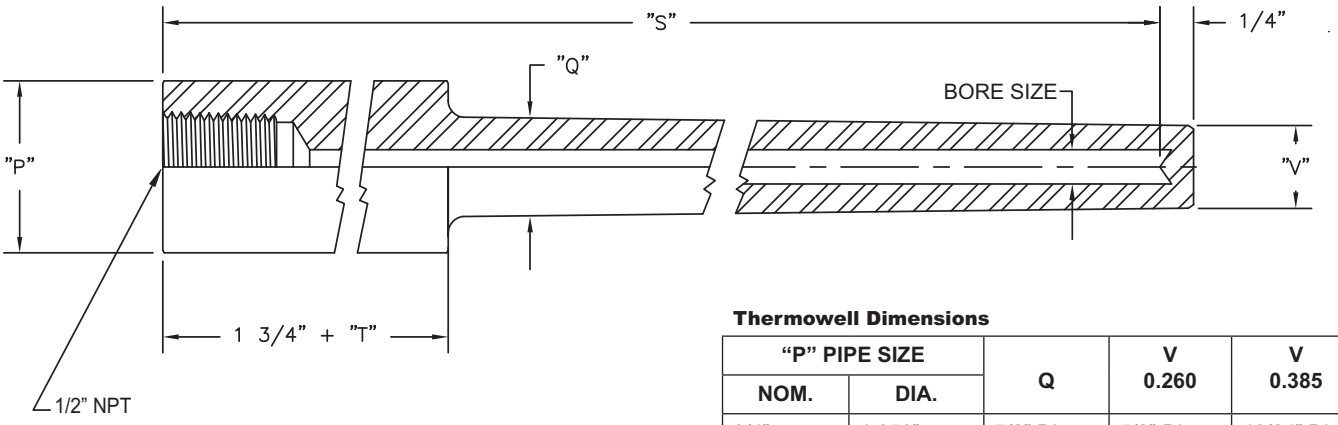
CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-6 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Well stamped with customer specified part number

Heavy Duty Socket Weld Thermowells

Heavy Duty Socket Weld Thermowells are available in a variety of materials, process connection sizes, lengths and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, and pressure and corrosion resistance requirements. The Heavy Duty Socket Weld is designed to be used with a 3000 class weld-o-let which allows the thermowell to be welded permanently into the process. They are designed with standard 0.260" and 0.385" bore diameters to accommodate sensing elements with a 0.252" or 0.377 maximum diameters. The tapered design is suited for heavy duty applications where greater rigidity is required due to process conditions. These wells are available as a separate component or as part of a complete sensor assembly.



("U" length for non-lagging wells) = "S" -1 1/2"
("U" length for lagging wells) = "S" -1 1/2" -"T"
(To solve for "T"), "T" = "S" -"U" -1 1/2" (When "U" and "S" are specified)

Thermowell Dimensions

"P" PIPE SIZE		Q	V 0.260	V 0.385
NOM.	DIA.			
3/4"	1.050"	7/8" Dia.	5/8" Dia.	49/64" Dia.
1"	1.315"	1" Dia.	5/8" Dia.	49/64" Dia.
1 1/4"	1.660"	1 1/4" Dia.	7/8" Dia.	7/8" Dia.
1 1/2"	1.900"	1 1/2" Dia.	7/8" Dia.	7/8" Dia.

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6
HW	4	D	09	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
HW	Heavy duty socket weld

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore
6	0.385" Dia. bore

1-2 Pipe Size "P"

CODE	DESCRIPTION
D	3/4" NPS
E	1" NPS
F	1 1/4" NPS
G	1 1/2" NPS

1-3 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-4 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

1-5 Optional "T" Lag Dimension

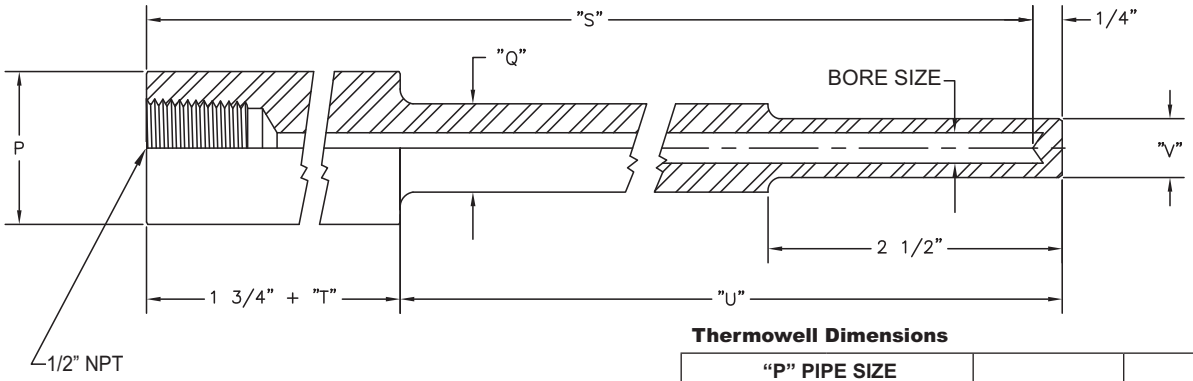
CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-6 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Well stamped with customer specified part number

Reduced Tip Socket Weld Thermowells

Reduced Tip Socket Weld Thermowells are available in a variety of materials, process connection sizes, lengths, and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. The Reduced Tip Socket Weld is designed to be used with a class 3000 weld-o-let which allows the thermowell to be welded permanently into the process. The stepped construction is used in standard duty applications and increases the speed of response while maintaining mechanical strength. They are designed with standard 0.260" bore diameters to accommodate sensing elements with a 0.252" maximum diameter. These wells are available as a separate component or as part of a complete sensor assembly.



("U" length for non-lagging wells) = "S" -1 1/2"
("U" length for lagging wells) = "S" -1 1/2" -"T"
(To solve for "T"), "T" = "S" -"U" -1 1/2" (When "U" and "S" are specified)

Thermowell Dimensions

"P" PIPE SIZE		Q	V
NOM.	DIA.		
3/4"	1.050"	3/4" Dia.	1/2" Dia.
1"	1.315"	7/8" Dia.	1/2" Dia.
1 1/4"	1.660"	1 1/4" Dia.	7/8" Dia.
1 1/2"	1.900"	1 1/2" Dia.	7/8" Dia.

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6
RW	4	D	09	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
RW	Reduced tip socket weld

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore

1-2 Pipe Size "P"

CODE	DESCRIPTION
D	3/4" NPS
E	1" NPS
F	1 1/4" NPS
G	1 1/2" NPS

1-3 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-4 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

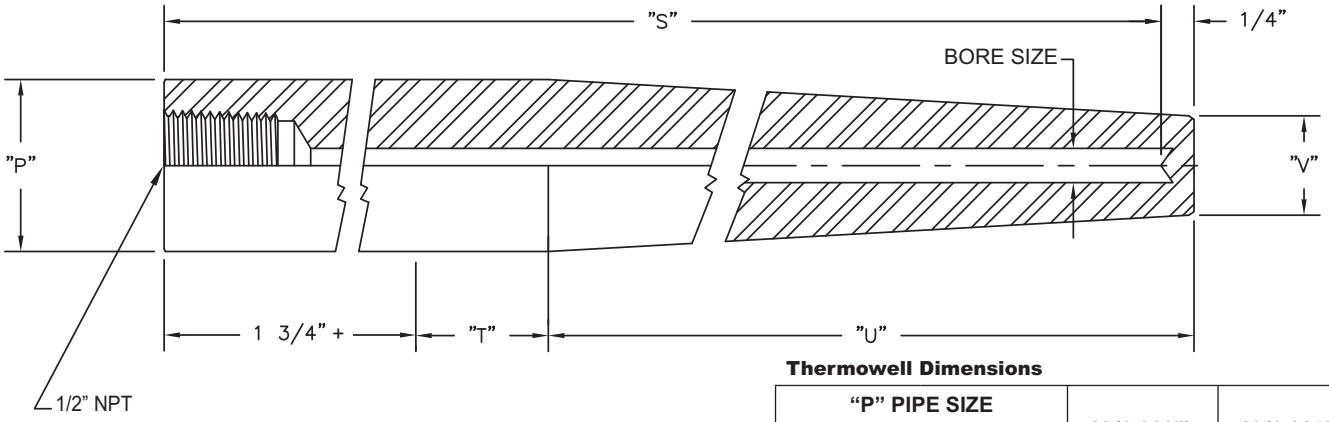
1-5 Optional "T" Lag Dimension

CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-6 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Well stamped with customer specified part number

Weld-In Thermowells are available in a variety of materials, process connection sizes, lengths and with optional lagging extensions. Thermowell specifications should be based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. Weld-In thermowells are welded directly into the process apparatus. They are designed with standard 0.260" or 0.385" bore diameters to accommodate sensing elements with a 0.252" or 0.377 maximum diameters. The tapered design is suited for heavy duty applications where greater rigidity is required due to process conditions. These wells are available as a separate component or as part of a complete sensor assembly.



("U" length for non-lagging wells) = "S" -1 1/2"
("U" length for lagging wells) = "S" -1 1/2" -"T"
(To solve for "T"), "T" = "S" -"U" -1 1/2" (When "U" and "S" are specified)

Thermowell Dimensions

"P" PIPE SIZE		V (0.260")	V (0.385")
NOM.	DIA.		
3/4"	1.050"	5/8" Dia.	49/64" Dia.
1"	1.315"	5/8" Dia.	49/64" Dia.
1 1/4"	1.660"	7/8" Dia.	7/8" Dia.
1 1/2"	1.900"	7/8" Dia.	7/8" Dia.

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6
WI	4	D	09	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
WI	Weld-In

1-1 Bore Size

CODE	DESCRIPTION
4	0.260 Dia. bore
6	0.385 Dia. bore

1-2 Pipe Size "P"

CODE	DESCRIPTION
D	3/4" NPS
E	1" NPS
F	1 1/4" NPS
G	1 1/2" NPS

1-3 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-4 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

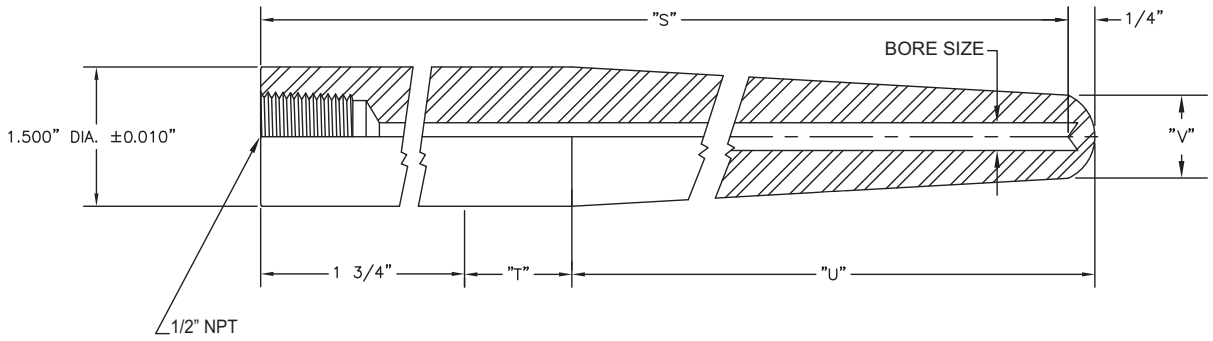
1-5 'T' Lag Dimension

CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-6 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Well stamped with customer specified part number

Sanitary Weld-In Thermowells are offered in 304 and 316 stainless steel. They are available in a variety of lengths, process connection sizes, and with optional lagging extensions. The thermowell is to be welded into a tank or vat with a full crevice free fillet-weld to prevent corrosion, bacteria growth, and product contamination. Thermowells are supplied with a surface finish that meets or exceeds 32µin R_a. Surface finishes of 15µin R_a or better are available upon request. They are designed with standard 0.260" and 0.385" bore diameters to accommodate sensing elements with a 0.252" or 0.377 maximum diameters. These wells are available as a separate component or as part of a complete sensor assembly.



Authorized 74-

("U" length for non-lagging wells) = "S" -1 1/2"
("U" length for lagging wells) = "S" -1 1/2" -"T"
(To solve for "T"), "T" = "S" -"U" -1 1/2" (When "U" and "S" are specified)

Thermowell Dimensions

BORE SIZE	"V"
0.260" Dia.	5/8" Dia.
0.385" Dia.	49/64" Dia.

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6
WS	4	09	08	T2	C8S	

1-0 Well Type

CODE	DESCRIPTION
WS	Sanitary weld-in

1-1 Bore Size

CODE	DESCRIPTION
4	0.260 Dia. bore
6	0.385 Dia. bore

1-2 "S" Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-5 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Well stamped with customer specified part number

1-4 Optional "T" Lag Dimension

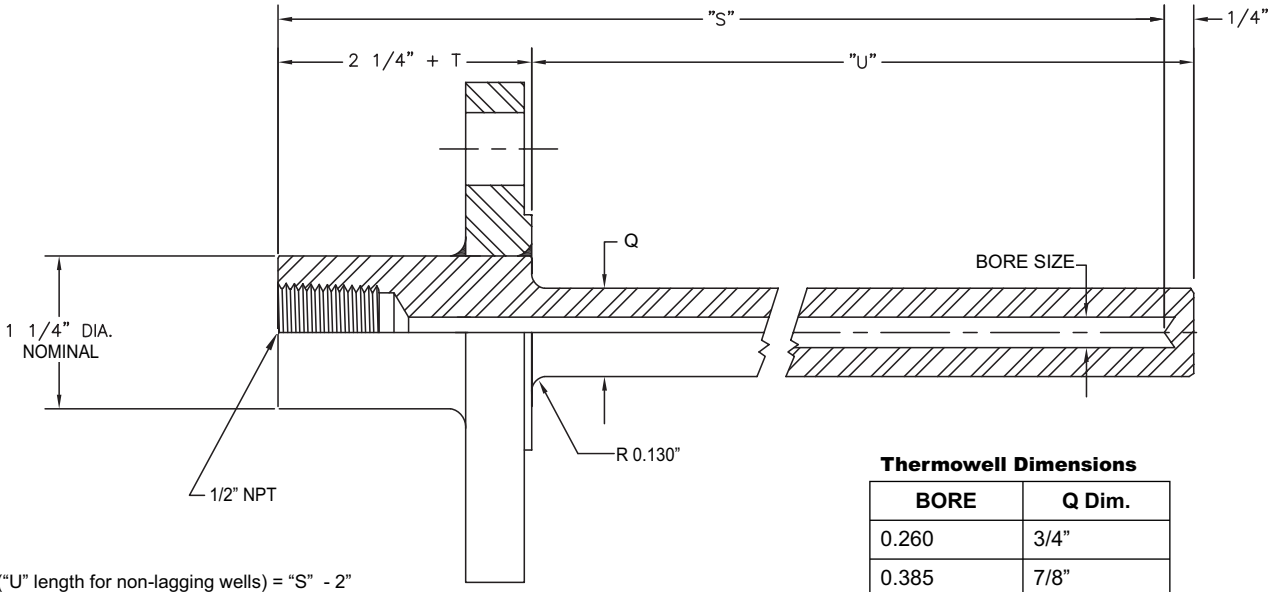
CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-3 Material

CODE	DESCRIPTION
08	316 stainless steel
09	304 stainless steel

Standard Flanged Thermowells

Standard Flanged Thermowells are available in a variety of materials, flange types, flange sizes, and pressure ratings. They are available in various lengths and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. The standard flanged thermowell is supplied with a straight shank and are designed with a 0.260" or 0.385" bore diameters to accommodate sensing elements with a 0.252" or 0.377 maximum diameters. These wells are available as a separate component or as part of a complete sensor assembly.



Thermowell Dimensions

BORE	Q Dim.
0.260	3/4"
0.385	7/8"

("U" length for non-lagging wells) = "S" - 2"
("U" length for lagging wells) = "S" - 2" - "T"
(To solve for "T"), "T" = "S" - "U" - 2" (When "U" and "S" are specified)

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8
SF	4	15	R	1	09	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
SF	Standard flanged

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore
6	0.385" Dia. bore

1-2 Flange Size

CODE	DESCRIPTION
10	1" (DN 25)
13	1 1/4" (DN 32)
15	1 1/2" (DN 40)
20	2" (DN 50)
30	3" (DN 80)

1-3 Flange Type

CODE	DESCRIPTION
F	Flat face
J	Ring joint
R	Raised face

1-4 Pressure Rating

CODE	DESCRIPTION
1	150 Class
3	300 Class
6	600 Class
9	900 Class
15	1500 Class

1-5 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-6 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

1-7 Optional "T" Lag Dimension

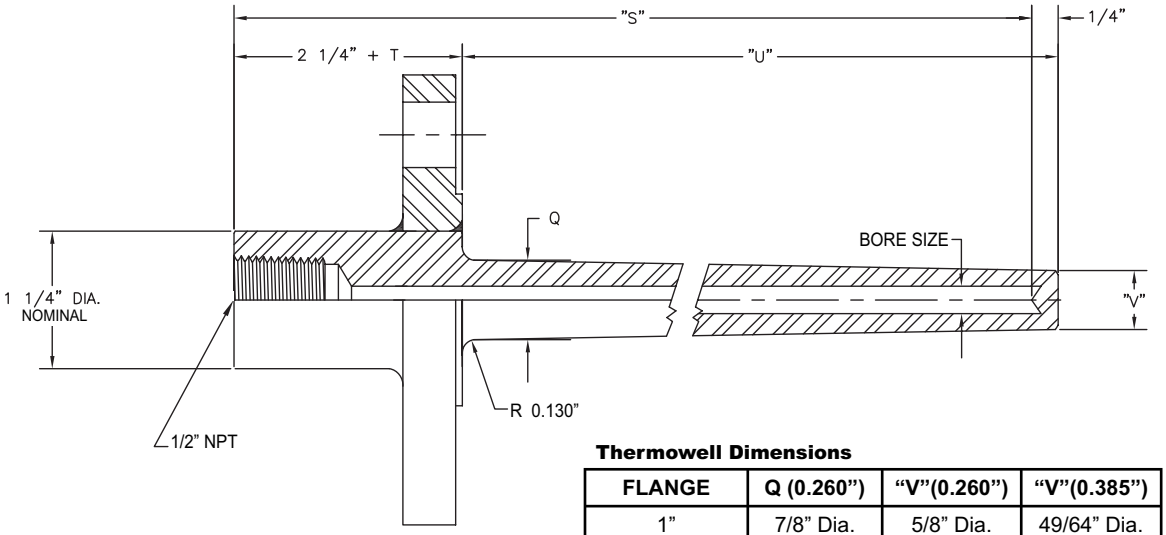
CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches using two digits plus any fractional length

1-8 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
F	Full penetration weld
S	Well stamped with customer specified part number

Heavy Duty Flanged Thermowells

Heavy Duty Flanged Thermowells are available in a variety of materials, flange types, flange sizes, and pressure ratings. They are available in various lengths and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. The heavy duty flanged thermowell is supplied with a 0.260" or 0.385" bore diameters to accommodate sensing elements with a 0.252" or 0.377 maximum diameters. The tapered design is suited for heavy duty applications where greater rigidity is required for increased pressure and flow due to process conditions. These wells are available as a separate component or as part of a complete sensor assembly.



Thermowell Dimensions

FLANGE	Q (0.260")	"V"(0.260")	"V"(0.385")
1"	7/8" Dia.	5/8" Dia.	49/64" Dia.
1 1/4" thru 3"	1 1/16" Dia.	5/8" Dia.	49/64" Dia.

Maximum tapered length is 16"
("U" length for non-lagging wells) = "S" - 2"
("U" length for lagging wells) = "S" - 2" - "T"
(To solve for "T"), "T" = "S" - "U" - 2" (When "U" and "S" are specified)

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8
HF	4	15	R	1	09	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
HF	Heavy duty flanged

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore
6	0.385" Dia. bore

1-2 Flange Size

CODE	DESCRIPTION
10	1" (DN 25)
13	1 1/4" (DN 32)
15	1 1/2" (DN 40)
20	2" (DN 50)
30	3" (DN 80)

1-3 Flange Type

CODE	DESCRIPTION
F	Flat face
J	Ring joint
R	Raised face

1-4 Pressure Rating

CODE	DESCRIPTION
1	150 Class
3	300 Class
6	600 Class
9	900 Class
15	1500 Class

1-5 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-6 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

1-7 Optional "T" Lag Dimension

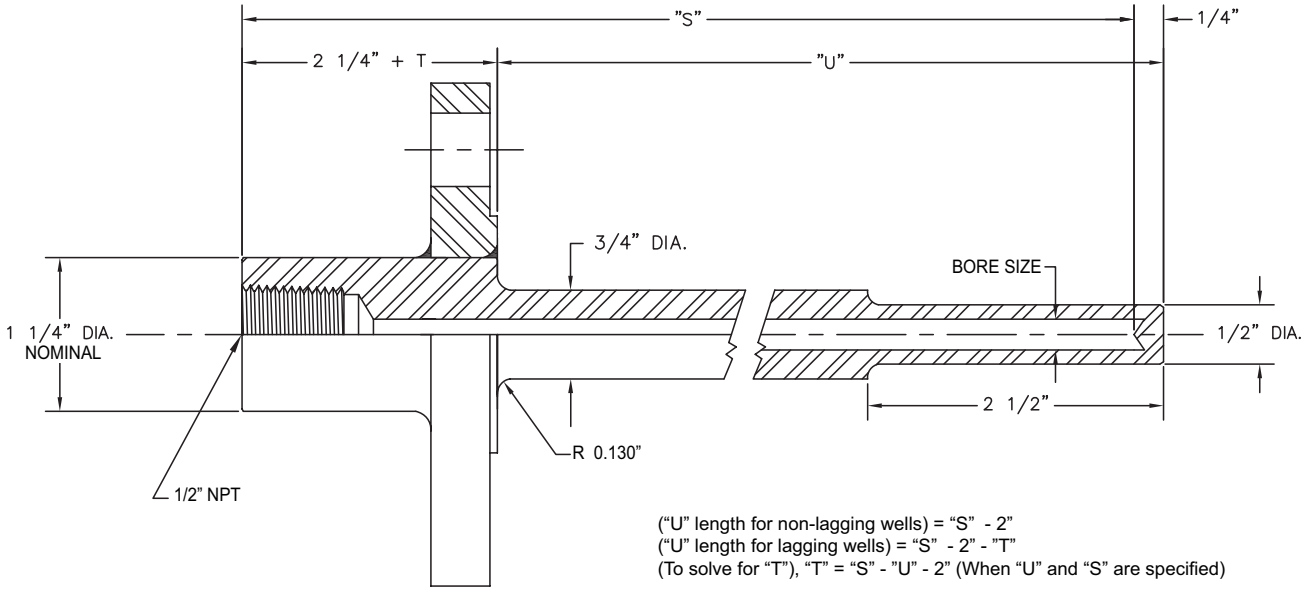
CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-8 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
F	Full penetration weld
S	Well stamped with customer specified part number

Reduced Tip Flanged Thermowells

Reduced Tip Flanged Thermowells are available in a variety of materials, flange types, flange sizes, and pressure ratings. They are available in various lengths and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. The stepped construction is normally used in standard duty applications and increases the speed of response while maintaining mechanical strength. They are designed with standard 0.260" bore diameters to accommodate sensing elements with a 0.252" maximum diameter. These wells are available as a separate component or as part of a complete sensor assembly.



("U" length for non-lagging wells) = "S" - 2"
("U" length for lagging wells) = "S" - 2" - "T"
(To solve for "T"), "T" = "S" - "U" - 2" (When "U" and "S" are specified)

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8
RF	4	15	R	1	09	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
RF	Reduced tip flanged

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore

1-2 Flange Size

CODE	DESCRIPTION
10	1" (DN 25)
13	1 1/4" (DN 32)
15	1 1/2" (DN 40)
20	2" (DN 50)
30	3" (DN 80)

1-3 Flange Type

CODE	DESCRIPTION
F	Flat face
J	Ring joint
R	Raised face

1-4 Pressure Rating

CODE	DESCRIPTION
1	150 Class
3	300 Class
6	600 Class
9	900 Class
15	1500 Class

1-5 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-6 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

1-7 Optional "T" Lag Dimension

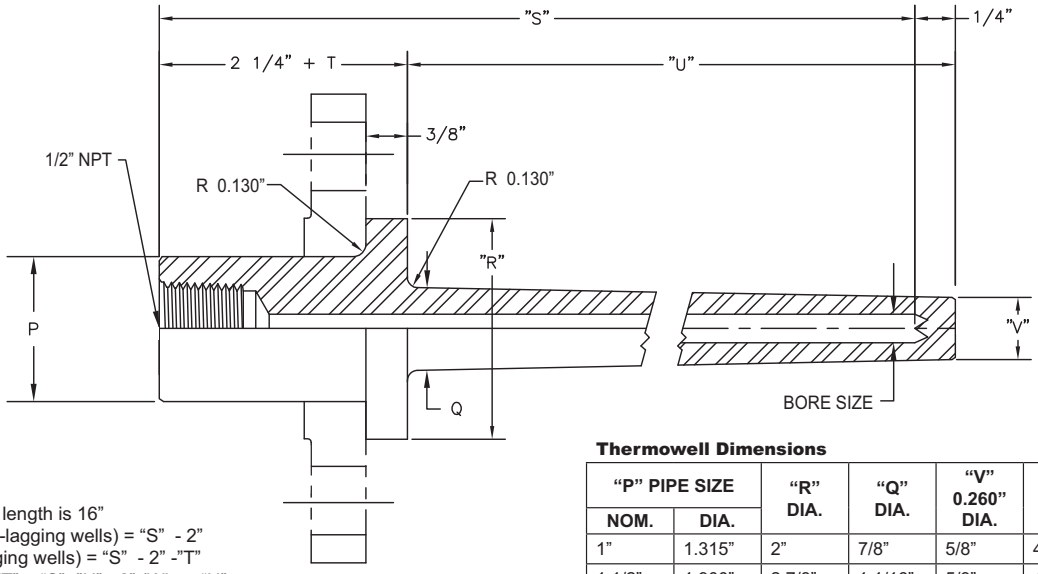
CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-8 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
F	Full penetration weld
S	Well stamped with customer specified part number

Heavy Duty Van Stone Thermowells

Heavy Duty Van Stone Thermowells are available in a variety of materials, flange sizes, and pressure ratings. They are available in various lengths and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. The heavy duty Van Stone thermowell is supplied with a 0.260" and 0.385" bore diameters to accommodate sensing elements with a 0.252" or 0.377 maximum diameters. Van Stone thermowells are connected using a separate and reusable backing flange eliminating the need for expensive flange materials. The tapered design is suited for heavy duty applications where greater rigidity is required due to increased pressure and flow due to process conditions. These wells are available as a separate component or as part of a complete sensor assembly.



Maximum tapered length is 16"
("U" length for non-lagging wells) = "S" - 2"
("U" length for lagging wells) = "S" - 2" -"T"
(To solve for "T"), "T" = "S" -"U" - 2" (When "U" and "S" are specified)

Thermowell Dimensions

"P" PIPE SIZE		"R" DIA.	"Q" DIA.	"V" 0.260" DIA.	"V" 0.385" DIA.
NOM.	DIA.				
1"	1.315"	2"	7/8"	5/8"	49/64"
1 1/2"	1.900"	2 7/8"	1 1/16"	5/8"	49/64"

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8
HF	4	15	V	1	09	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
HF	Heavy Duty Van Stone

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore
6	0.385" Dia. bore

1-2 Flange Size

CODE	DESCRIPTION
10	1" (DN 25)
15	1 1/2" (DN 40)

1-3 Flange Type

CODE	DESCRIPTION
V	Van Stone (lap joint)

1-4 Pressure Rating

CODE	DESCRIPTION
0	No backing flange
1	150 Class
3	300 Class
6	600 Class
9	900 Class
15	1500 Class
Carbon steel lap joint flange standard	

1-5 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-6 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

1-7 'T' Lag Dimension

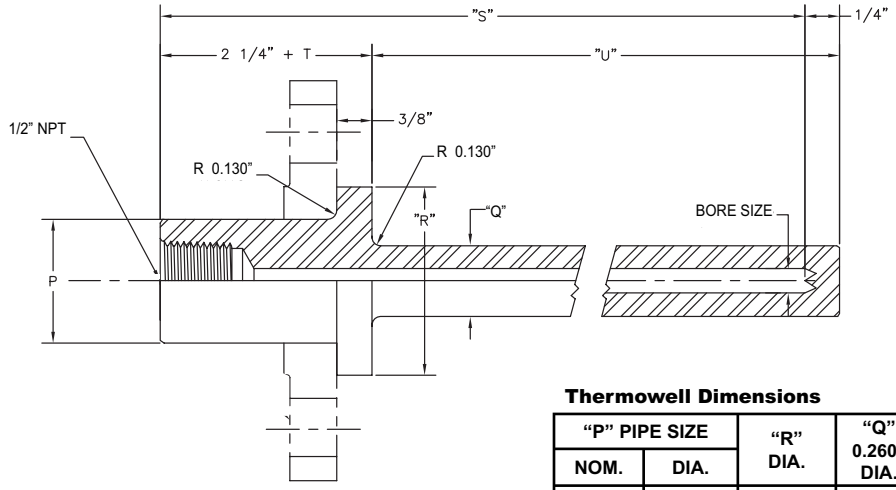
CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches using two digits plus any fractional length

1-8 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
F	Full penetration weld
S	Well stamped with customer specified part number

Straight Van Stone Thermowells

Straight Van Stone Thermowells are available in a variety of materials, flange sizes, and pressure ratings. They are available in various lengths and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. The Straight Van Stone thermowell is supplied with a 0.260" and 0.385" bore diameters to accommodate sensing elements with a 0.252" or 0.377 maximum diameters. Van Stone thermowells are connected using a separate and reusable backing flange eliminating the need for expensive flange materials. These wells are available as a separate component or as part of a complete sensor assembly.



("U" length for non-lagging wells) = "S" - 2"
("U" length for lagging wells) = "S" - 2" - "T"
(To solve for "T"), "T" = "S" - "U" - 2"
(When "U" and "S" are specified)

Thermowell Dimensions

"P" PIPE SIZE		"R" DIA.	"Q" 0.260" DIA.	"Q" 0.385" DIA.
NOM.	DIA.			
1"	1.315"	2"	3/4"	7/8"
1 1/2"	1.900"	2 7/8"	3/4"	7/8"

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8
SF	4	15	V	1	09	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
SF	Straight Van Stone

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore
6	0.385" Dia. bore

1-2 Flange Size

CODE	DESCRIPTION
10	1" (DN25)
15	1 1/2" (DN40)

1-3 Flange Type

CODE	DESCRIPTION
V	Van Stone (lap joint)

1-4 Pressure Rating

CODE	DESCRIPTION
0	No backing flange
1	150 Class
3	300 Class
6	600 Class
9	900 Class
15	1500 Class
Carbon steel lap joint flange standard	

1-5 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-6 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

1-7 Optional "T" Lag Dimension

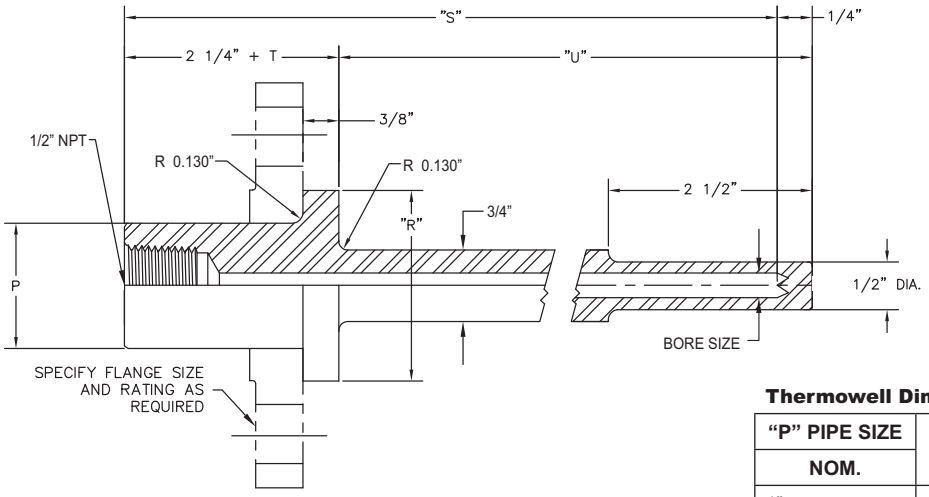
CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-8 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Well stamped with customer specified part number

Reduced Tip Van Stone Thermowells

Reduced Tip Van Stone Thermowells are available in a variety of materials, flange sizes, and pressure ratings. They are offered in various lengths and with optional lagging extensions. Thermowell specifications should be determined based on process conditions which include strength, temperature, pressure and corrosion resistance requirements. The Reduced Tip Van Stone thermowell is supplied with a 0.260" bore diameter to accommodate sensing elements with a 0.252" maximum diameter. The stepped construction is normally used in standard duty applications and increases the speed of response while maintaining mechanical strength. Van Stone thermowells are connected using a separate and reusable backing flange eliminating the need for expensive flange materials. These wells are available as a separate component or as part of a complete sensor assembly.



("U" length for non-lagging wells) = "S" - 2"
("U" length for lagging wells) = "S" - 2" -"T"
(To solve for "T"), "T" = "S" -"U" - 2" (When "U" and "S" are specified)

Thermowell Dimensions

"P" PIPE SIZE NOM.	"P" DIA.	"R" DIA.
1"	1.315"	2"
1 1/2"	1.900"	2 7/8"

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8
RF	4	15	V	1	09	08	T2	C8S

1-0 Well Type

CODE	DESCRIPTION
RF	Reduced Tip Van Stone

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore

1-2 Flange Size

CODE	DESCRIPTION
10	1" (DN25)
15	1 1/2" (DN40)

1-3 Flange Type

CODE	DESCRIPTION
V	Van Stone (lap joint)

1-4 Pressure Rating

CODE	DESCRIPTION
0	No backing flange
1	150 Class
3	300 Class
6	600 Class
9	900 Class
15	1500 Class
Carbon steel backing flange standard	

1-5 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-6 Material

CODE	DESCRIPTION
XX	Specify two digit material code as stated in the Thermowell Material Table located earlier in section

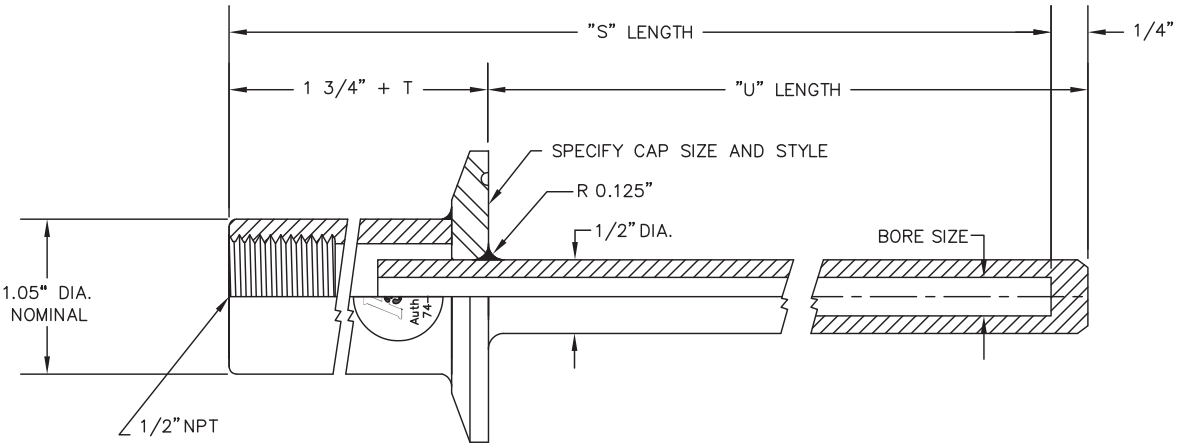
1-7 Optional "T" Lag Dimension

CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-8 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
C22	Brass well cap and chain
S	Well stamped with customer specified part number

Sanitary Connected Thermowells are offered in 304 and 316 stainless steel. The DW series is a welded construction, and they are available in a variety of lengths, cap styles, cap sizes, and with optional lagging extensions. Thermowells are supplied with a surface finish that meets or exceeds 32µin R_a. Surface finishes of 15µin R_a or better are available upon request. They are designed with standard 0.260" bore diameters to accommodate sensing elements with a 0.252" maximum diameter. These wells are available as a separate component or as part of a complete sensor assembly.



3 Authorized 74-

("U" length for non-lagging wells) = "S" - 1 1/2"
("U" length for lagging wells) = "S" - 2" - "T"
(To solve for "T"), "T" = "S" - "U" - 2" (When "U" and "S" are specified)

ORDER CODES

Example Order Number:

1-0	1-1	1-2	1-3	1-4	1-5	1-6
DW	**4**	**25**	**09**	**08**	**T2**	**C8S**

1-0 Well Type

CODE	DESCRIPTION
DW	Sanitary well

1-1 Bore Size

CODE	DESCRIPTION
4	0.260" Dia. bore

1-2 Cap Size & Style

CODE	DESCRIPTION
15	1", 1 1/2" Triclamp® 16 AMP
25	2" Triclamp® 16 AMP
35	2 1/2" Triclamp® 16 AMP
45	3" Triclamp® 16 AMP
Other styles - sizes available. Consult factory.	

1-3 S Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits plus fractional length

1-4 Material

CODE	DESCRIPTION
08	316 stainless steel
09	304 stainless steel

1-5 Optional "T" Lag Dimension

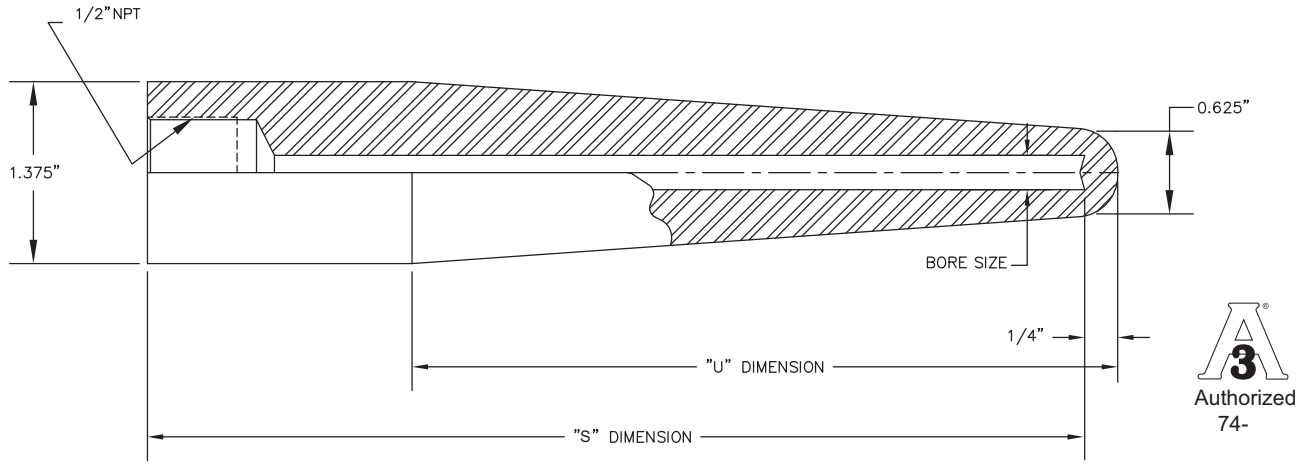
CODE	DESCRIPTION
Leave blank if no lag is required	
T__	Specify "T" dimension in inches

1-6 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
S	Well stamped with customer specified part number

W81 Series Sanitary Weld-In Thermowells

Sanitary Weld-In Thermowells are offered in 304 and 316 stainless steel. The thermowell is to be welded into a tank or vat with a full crevice free fillet-weld to prevent corrosion, bacteria growth, and product contamination. Thermowells are supplied with a surface finish that meets or exceeds 32µin R_a. Surface finishes of 15µin R_a or better are available upon request. They are designed with standard 0.260" bore diameter to accommodate sensing elements with a 0.252" maximum diameter. These wells are available as a separate component or as part of a complete sensor assembly.



ORDER CODES

Example Order Number:

1-0		1-1	1-2	1-3
W81	-	1	9	S

1-0 Well Type

CODE	DESCRIPTION
W81	Sanitary weld-in

1-3 Options

CODE	DESCRIPTION
C8	316 stainless steel well cap and chain
S	Well stamped with customer specified part number

1-1 Length

CODE	"S" LENGTH	"U" LENGTH
1	8 1/2"	3 1/4"
2	10 1/8"	3 1/4"
3	11 7/8"	5"
4	13 1/8"	3 3/4"

1-2 Material

CODE	DESCRIPTION
8	316 stainless steel
9	304 stainless steel

Wake Frequency Calculation Request

Please complete the following information when requesting a wake frequency calculation.

Company Name

Company Name:	Contact Name:
Phone Number:	Fax Number:
E-Mail Address:	
Request Date (MM/DD/YY):	Calculation Required By Date:

Well Geometry and Material

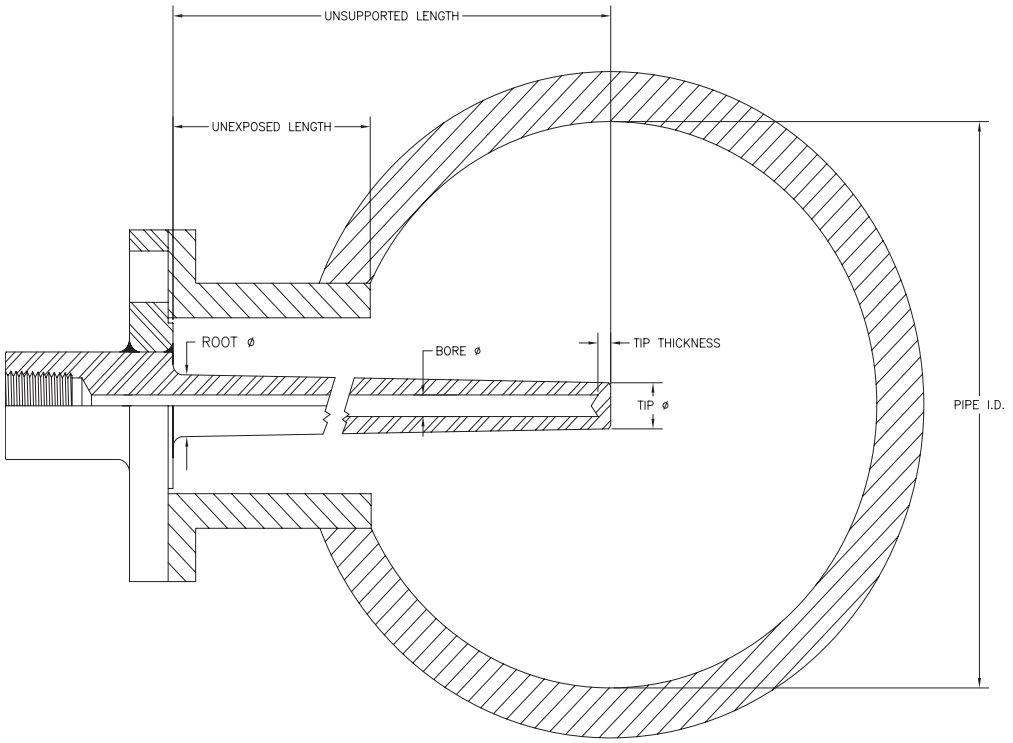
(all of the following are represented by the Pyromation Part Number)	
Unsupported Length (in), (mm):	Root Diameter (in), (mm):
Tip Diameter (in), (mm):	Bore Diameter (in), (mm):
Tip Thickness (in), (mm) {3/16” minimum}:	Material Type:

Process Medium

Process Fluid (water, steam natural gas, crude oil, etc.):
Fluid State (Gas or Liquid):
Maximum Fluid Temperature (°F) (°C):
Maximum Fluid Pressure (psig), (kPa):
Maximum Fluid Velocity (ft/s), (m/s) / or Maximum fluid mass flow rate (lbm/s), (kg/s)/ or Maximum fluid volumetric flow rate (ft^3/s), (m^3/s):

Pipe Size and Mounting

I.D. of pipe in which thermowell is mounted (in), (mm) / or pipe size and schedule:
Length of thermowell’s unsupported length not exposed to fluid flow (in), (mm), {if applicable}:



Typical Wake Frequency Calculation Report

Date:	7/18/2006
Customer Name:	Example, Inc.
Sales Order No.:	S.O. 123456
Pyromation P/N:	H4E0908
Tag No:	TW-ABC

INPUTS

Thermowell Material:

Grade: 300 Series Austenitic Stainless Steel

	English		Metric	
Modulus of Elasticity @ Design Temp.:	25,894,562	(psi)	178543.01	(Mpa)
Density @ Design Temp.:	0.287	(Lb/in^3)	7940	(Kg/m^3)
Coeff. Of Thermal Expansion @ Design Temp.:	1.010E-05	(/°F)	1.818E-05	(/°C)

Thermowell Dimensions @ Room Temp.:

Root Dia.:	1.063	(in)	27.00	(mm)
Tip Dia.:	0.625	(in)	15.88	(mm)
Bore Dia.:	0.260	(in)	6.60	(mm)
Tip Thickness:	0.250	(in)	6.35	(mm)
Unsupported Length:	7.500	(in)	190.50	(mm)

Fluid Properties:

Velocity:	48.0	(Ft/s)	14.63	(m/s)
Design Temperature:	500	(°F)	260.0	(°C)

OUTPUTS

Thermowell Natural Frequency:	417	(Hz)	417	(Hz)
Vortex Shedding Frequency:	202	(Hz)	202	(Hz)
Frequency Ratio:	**0.48**	**PASS**	**0.48**	**PASS**
Max. Fluid Velocity:	79.3	(Ft/s)	24.18	(m/s)
Maximum Length:	9.663	(in)	245.44	(mm)
Magnification Factor:	1.31		1.31	

SUMMARY

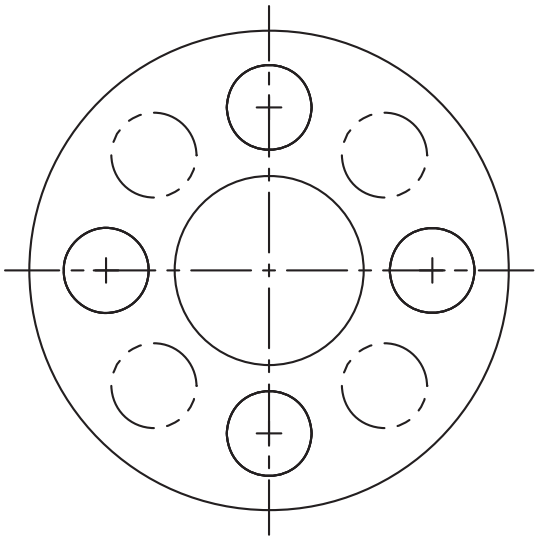
The thermowell design has passed the wake frequency calculations derived from those used in ASME PTC 19.3-1974 (1986)

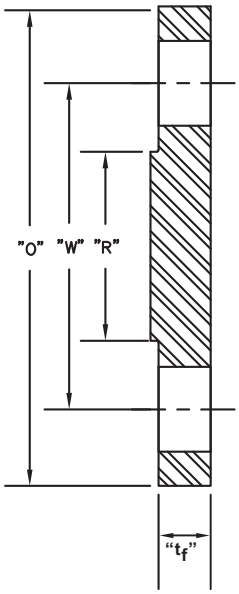
Note: This is a typical Wake Frequency Report and is subject to change based on process parameters customer specifications and code changes.

ANSI Flanged Thermowell Data Sheet

Flanges comply with ASME B16.5 and are welded in accordance to the Boiler Code by ASME Section IX certified welders using ASME Section II Compliant materials. Gaskets are not supplied with flanged thermowells and assemblies.

Nominal Pipe Size (inches)	Nominal Diameter DN	Flange Class	"O" Outside Diameter of Flange	"R" Outside Diameter Raised Face Large Male and Large Tongue	"W" Diameter of Bolt Circle	Number of Bolts	"t_f" Thickness of Flange Min.
1/2	15	150	3.50	1.38	2.38	4	0.38
3/4	20	150	3.88	1.69	2.75	4	0.44
1	25	150	4.25	2.00	3.12	4	0.50
1 1/4	32	150	4.62	2.50	3.50	4	0.56
1 1/2	40	150	5.00	2.88	3.88	4	0.62
2	50	150	6.00	3.62	4.75	4	0.69
2 1/2	65	150	7.00	4.12	5.50	4	0.81
3	80	150	7.50	5.00	6.00	4	0.88
3 1/2	90	150	8.50	5.50	7.00	8	0.88
4	100	150	9.00	6.19	7.50	8	0.88
1/2	15	300	3.75	1.38	2.62	4	0.50
3/4	20	300	4.62	1.69	3.25	4	0.56
1	25	300	4.88	2.00	3.50	4	0.62
1 1/4	32	300	5.25	2.50	3.88	4	0.69
1 1/2	40	300	6.12	2.88	4.50	4	0.75
2	50	300	6.50	3.62	5.00	8	0.81
2 1/2	65	300	7.50	4.12	5.88	8	0.94
3	80	300	8.25	5.00	6.62	8	1.06
3 1/2	90	300	9.00	5.50	7.25	8	1.12
4	100	300	10.00	6.19	7.88	8	1.19
1/2	15	600	3.75	1.38	2.62	4	0.56
3/4	20	600	4.62	1.69	3.25	4	0.62
1	25	600	4.88	2.00	3.50	4	0.69
1 1/4	32	600	5.25	2.50	3.88	4	0.81
1 1/2	40	600	6.12	2.88	4.50	4	0.88
2	50	600	6.50	3.62	5.00	8	1.00
2 1/2	65	600	7.50	4.12	5.88	8	1.12
3	80	600	8.25	5.00	6.62	8	1.25
3.50	90	600	9.00	5.50	7.25	8	1.38
4.00	100	600	10.75	6.19	8.50	8	1.50





(1) HEIGHT OF RAISED FLANGE
0.06" FOR 150 & 300 CLASS
0.25" FOR ALL OTHER CLASSES

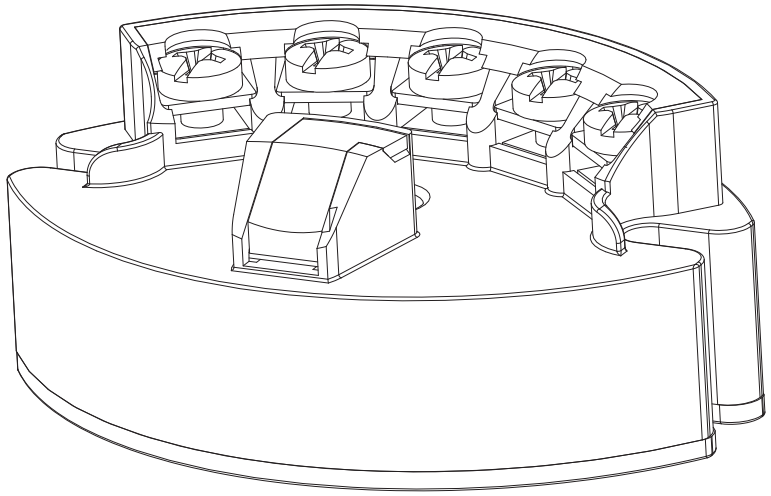
FOR ALL OTHER DIMENSIONS REFER TO ASME/ANSI B16.5

Configuration Code TM01
Series 440 Programmable
RTD Temperature Transmitter

The Series 440 programmable RTD temperature transmitter is a two-wire transmitter with an analog output. It has measurement input for Pt100 resistance thermometers (RTD) in 2 or 3 wire connection. Setting up of the transmitter is done using the 440-CABLE. These small units can be mounted in Pyromation heads or they can be used for surface mounting by using a 35 mm DIN rail mounting clip.

TEMPERATURE HEAD TRANSMITTER

Universal head transmitter for Pt100 resistance thermometers (RTD) settable using a PC, for installation in a sensor head.



Patent #D350, 596

Application Areas

- PC programmable temperature head transmitter for converting Pt100 input signal into an scaleable (4 to 20) mA analog output signal
- Platinum Resistance thermometer (RTD)
- Online configuration using PC with SETUP connector.

Features and Benefits

- Universally PC programmable for Pt100 signals
- 2 wire technology, (4 to 20) mA analog output
- High accuracy in total ambient temperature range
- Fault signal on sensor break or short circuit
- RFI/EMI Protected, CE marked
- c UL us UL Recognized Component
- FM CSA General Purpose and non-incendive for use in hazardous locations
- Online configuration during measurement using SETUP connector
- Output simulation

ORDER CODES

Unconfigured Order Number: **440-00[1]**

Configured Order Number: **4 4 0 - 3 85 U - S (50-300) F**

(1 2 3 - 4 5)

1

CODE	DESCRIPTION
2	RTD (2-wire)
3	RTD (3-wire)

2

CODE	DESCRIPTION
85	100 ohm platinum (α = 0.003 85 $^{\circ}C^{-1}$)

[1] Default setting for unconfigured transmitter is Pt100 (0 -100)°C

3

CODE	DESCRIPTION
U	Upscale Burnout ≥ 21.0 mA
D	Downscale Burnout ≤ 3.6 mA

4

RANGE
S (lower limit – upper limit)

5

CODE	DESCRIPTION
C	Celsius
F	Fahrenheit

Accessories

CODE	DESCRIPTION
440-CABLE	Communication Cable and Software (RS232)
440-CABLE-USB	Communication Cable and Software (USB)
440-DIN35	35 mm DIN rail mounting clip

Series 440 Programmable RTD Temperature Transmitter Specifications

Resistance Thermometer Input (RTD)

TYPE	MEASUREMENT RANGE	MINIMUM RANGE
Pt100 (α = 0.003 85 $^{o}C^{-1}$)	(-200 to 650) °C [-328 to 1202] °F	10 ˚C [18 ˚F]
Connection Type	2 or 3 wire connection cable resistance compensation possible in the 2 wire system (0 to 20) Ω	
Sensor cable resistance	maximum 11 Ω per cable	
Sensor current	≤ 0.6 mA	

Output (Analog)

Output signal	(4 to 20) mA or (20 to 4) mA
Transmission as	Temperature linear
Maximum load	($V_{power\ supply}$ - 10 V) / 0.023 A (current output)
Digital filter 1st degree	(0 to 8) s
Induced current required	≤ 3.5 mA
Current limit	≤ 23 mA
Switch on delay	4 s (during power 1_a = 3.8 mA)
Electronic response time	1 s

Failure Mode

Undershooting measurement range	Decrease to 3.8 mA
Exceeding measurement range	Increase to 20.5 mA
Sensor breakage/short circuit	≤ 3.6 mA or ≥ 21.0 mA

Electronic Connection

Power supply	U_b = (10 to 30) V dc, polarity protected
Allowable ripple	U_{ss} ≤ 5 V at U_b ≥ 13 V, f_{max} = 1 kHz

Resistance Thermometer Accuracy (RTD)

TYPE	MEASUREMENT ACCURACY
Pt100	0.2 °C or 0.08% [1]
Reference conditions	Calibration temperature (23 ± 5) °C [73 ± 9] °F

General Accuracy

Influence of power supply	± 0.01%/V deviation from 24 V [2]
Load influence	± 0.02%/100 Ω [2]
Temperature drift	T_d = ± (15 ppm/°C × (range end value + 200) + 50 ppm/°C × measurement range) × $\Delta\vartheta$ $\Delta\vartheta$ = deviation of the ambient temperature according to the reference condition
Long term stability	≤ 0.1 °C/year [3] or ≤ 0.05%/year [1][3]

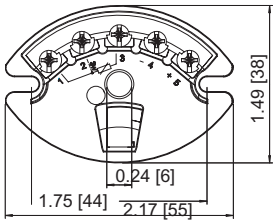
[1] % is related to the adjusted measurement range (the value to be applied is the greater)
[2] All data is related to a measurement end value of 20 mA
[3] Under reference conditions

Series 440 Programmable RTD Temperature Transmitter Specifications

Environmental Conditions

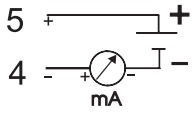
Ambient temperature	(-40 to 85) °C [-40 to 185] °F
Storage temperature	(-40 to 100) °C [-40 to 212] °F
Climatic class	EN 60 654-1, Class C
Condensation	Permitted
Shock resistance	4 g / (2 to 150) Hz according to IEC 60 068-2-6
EMC immunity	Interference immunity and interference emission according to EN 61 326-1 (1EC 1326)

Mechanical Construction

Dimensions	 Dimensions in inches [mm] 
Weight	Approximately 44 g
Materials	Housing: Polycarbonate • Potting: Polyurethane
Terminals	15 AWG (maximum)

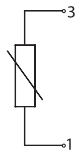
Terminal Connections

Power supply and current output

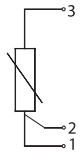


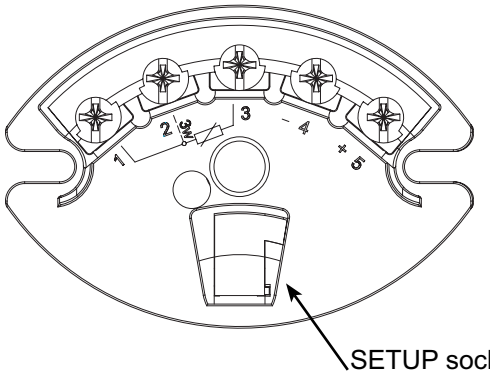
(10 to 30) V dc
(4 to 20) mA

2-Wire



3-Wire





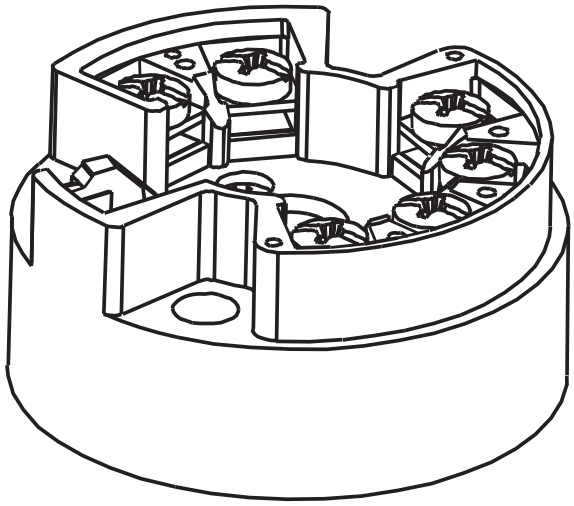
Approvals

CE marked	Unit complies with the legal requirements set forth by the EU regulations.
c UL us	UL Recognized Component
FM CSA	General Purpose and non-incendive for use in hazardous locations Class I, Division 2 Groups A, B, C and D

The Series 441 programmable temperature transmitter is a two-wire transmitter with an analog output. It has measurement input for resistance thermometers (RTD) in 2, 3 or 4 wire connection, thermocouples, resistance and voltage. Setting up of the transmitter is done using the 440-CABLE. These small units can be mounted in Pyromation DIN (Form B) heads or they can be used for surface mounting by using a 35 mm DIN rail mounting clip.

TEMPERATURE HEAD TRANSMITTER

Universal head transmitter for resistance thermometers (RTD), thermocouples, resistance and voltage transmitters, settable using a PC, for installation in a sensor head (Form B)



Application Areas

- PC programmable temperature head transmitter for converting various input signals into an scalable (4 to 20) mA analog output signal
- Input:
  Resistance thermometer (RTD)
  Thermocouple (TC)
  Resistance (Ω)
  Voltage (mV)
- Online configuration using PC with SETUP connector

Features and Benefits

- Universally PC programmable for various signals
- Galvanic isolation
- 2 wire technology, (4 to 20) mA analog output
- High accuracy in total ambient temperature range
- Fault signal on sensor break or short circuit
- RFI/EMI Protected, CE marked
- c UL us UL Recognized Component
- CSA Intrinsically safe and non-incendive for hazardous locations
- FM Intrinsically safe and non-incendive for hazardous locations
- Online configuration during measurement using SETUP connector
- Output simulation

ORDER CODES

Unconfigured Order Number: **441-00[1]**

Configured Order Number: **4 4 1 - 1 J U - S (50-300) F**

1 2 3 4 5

1

CODE	DESCRIPTION
1	Thermocouple (TC)
2	RTD (2-wire)
3	RTD (3-wire)
4	RTD (4-wire)

2

CODE	DESCRIPTION
J	Type J thermocouple
K	Type K thermocouple
T	Type T thermocouple
N	Type N thermocouple
E	Type E thermocouple
R	Type R thermocouple
S	Type S thermocouple
B	Type B thermocouple
85	100 ohm platinum (α = 0.003 85 $^{\circ}C^{-1}$)
55	500 ohm platinum (α = 0.003 85 $^{\circ}C^{-1}$)
95	1000 ohm platinum (α = 0.003 85 $^{\circ}C^{-1}$)
MV	Millivolts
W	Resistance

[1] Default setting for unconfigured transmitter is Pt100 (0 - 100) °C

3

CODE	DESCRIPTION
U	Upscale Burnout ≥ 21.0 mA
D	Downscale Burnout ≤ 3.5 mA

4

RANGE
S (lower limit – upper limit)

5

CODE	DESCRIPTION
C	Celsius
F	Fahrenheit

Accessories

CODE	DESCRIPTION
440-CABLE	Communication Cable and Software (RS232)
440-CABLE-USB	Communication Cable and Software (USB)
441-DIN35	35 mm DIN rail mounting clip

INPUT

Resistance Thermometer (RTD)

TYPE	MEASUREMENT RANGE		MINIMUM RANGE
Pt100 (α = 0.003 85 $^{o}C^{-1}$) Pt500 Pt1000	(-200 to 850) °C (-200 to 250) °C (-200 to 250) °C	[-328 to 1562] °F [-328 to 482] °F [-328 to 482] °F	10° C [18 °F] 10° C [18 °F] 10° C [18 °F]
Ni100 (α = 0.006 18 $^{o}C^{-1}$) Ni500 Ni1000	(-60 to 180) °C (-60 to 150) °C (-60 to 150) °C	[-76 to 356] °F [-76 to 302] °F [-76 to 302] °F	10° C [18 °F] 10° C [18 °F] 10° C [18 °F]
Connection Type	2, 3 or 4 wire connection cable resistance compensation possible in the 2 wire system (0 to 20) Ω		
Sensor Cable Resistance	maximum 11 Ω per cable		
Sensor current	≤ 0.6 mA		

Resistance (Ω)

TYPE	MEASUREMENT RANGE	MINIMUM RANGE
Resistance (Ω)	(10 to 400) Ω (10 to 2000) Ω	10 Ω 100 Ω

Thermocouples (TC)

TYPE	MEASUREMENT RANGE		MINIMUM RANGE
B (PtRh30-PtRh6)	(0 to 1820) °C	[32 to 3308] °F	500 °C [900 °F]
C (W5Re-W26Re)	(0 to 2320) °C	[32 to 4208] °F	500 °C [900 °F]
D (W3Re-W25Re) [3]	(0 to 2495) °C	[32 to 4523] °F	500 °C [900 °F]
E (NiCr-CuNi)	(-200 to 915) °C	[-328 to 1679] °F	50 °C [90 °F]
J (Fe-CuNi)	(-200 to 1200) °C	[-328 to 2192] °F	50 °C [90 °F]
K (NiCr-Ni)	(-200 to 1372) °C	[-328 to 2501] °F	50 °C [90 °F]
L (Fe-CuNi) [2]	(-200 to 900) °C	[-328 to 1652] °F	50 °C [90 °F]
N (NiCrSi-NiSi)	(-270 to 1300) °C	[-454 to 2372] °F	50 °C [90 °F]
R (PtRh13-Pt)	(0 to 1768) °C	[32 to 3214] °F	500 °C [900 °F]
S (PtRh10-Pt)	(0 to 1768) °C	[32 to 3214] °F	500 °C [900 °F]
T (Cu-CuNi)	(-200 to 400) °C	[-328 to 752] °F	50 °C [90 °F]
U (Cu-CuNi) [2]	(-200 to 600) °C	[-328 to 1112] °F	50 °C [90 °F]
MoRe5-MoRe41 [1]	(0 to 2000) °C	[32 to 3632] °F	500 °C [900 °F]
Cold junction	internal (Pt100) or external (0 to 80) °C [32 to 176] °F		
Cold junction accuracy	± 1 °C		

Voltage (mV)

TYPE	MEASUREMENT RANGE	MINIMUM RANGE
Millivolt (mV)	(-10 to 100) mV	5 mV

[1] no reference
[2] according to DIN 43710
[3] according to ASTM E988

OUTPUT

Output (Analog)

Output signal	(4 to 20) mA or (20 to 4) mA
Transmission as	Temperature linear, resistance linear, voltage linear
Maximum load	($V_{power\ supply}$ - 8 V) / 0.025 A (current output)
Digital filter 1st degree	(0 to 8) s
Induced current required	≤ 3.5 mA
Current limit	≤ 25 mA
Switch on delay	4 s (during power up I_a = 3.8 mA)
Electronic response time	1 s

Failure Mode

Undershooting measurement range	Decrease to 3.8 mA
Exceeding measurement range	Increase to 20.5 mA
Sensor breakage/short circuit [1]	≤ 3.5 mA or ≥ 21.0 mA

Electrical Connection

Power supply	U_b = (8 to 30) V dc, polarity protected
Galvanic isolation (In/out)	$\hat{U}$ = 3.75 kV ac
Allowable ripple	U_{ss} ≤ 5 V at U_b ≥ 13 V, f_{max} = 1 kHz

ACCURACY

Reference conditions	Calibration temperature (23 ± 5) °C [73 ± 9] °F

Resistance Thermometer (RTD)

TYPE	MEASUREMENT ACCURACY
Pt100, Ni100 Pt500, Ni500 Pt1000, Ni1000	0.2 °C or 0.08% [2] 0.5 °C or 0.20% [2] 0.3 °C or 0.12% [2]

Resistance (Ω)

TYPE	MEASUREMENT ACCURACY	MEASUREMENT RANGE
Resistance	± 0.1 Ω or 0.08% [2]	(10 to 400) Ω
	± 1.5 Ω or 0.12% [2]	(10 to 2000) Ω

[1] Not for thermocouple
[2] % is related to the adjusted measurement range (the value to be applied is the greater)

ACCURACY (continued)

Thermocouple (TC)

TYPE	MEASUREMENT ACCURACY
K, J, T, E, L, U N, C, D S, B, R MoRe5-MoRe41	0.5 °C or 0.08% [1] 1.0 °C or 0.08% [1] 2.0 °C or 0.08% [1]
Influence of the internal reference junction	Pt100 ± (0.30 + 0.005 |t|) °C |t| = value of temperature without regard to sign °C

Voltage (mV)

TYPE	MEASUREMENT ACCURACY	MEASUREMENT RANGE
Millivolt (mV)	± 20 µV or 0.08% [1]	(-10 to 100) mV

General

Influence of power supply	± 0.01%/V deviation from 24 V [2]
Load influence	± 0.02%/100 Ω [2]
Temperature drift	Resistive thermometer (RTD): T_d = ± (15 ppm/°C × range end value + 50 ppm/°C × measurement range) × $\Delta\vartheta$ Resistive thermometer Pt100: T_d = ± (15 ppm/°C × (range end value + 200) + 50 ppm/°C × measurement range) × $\Delta\vartheta$ Thermocouple (TC): T_d = ± (50 ppm/°C × range end value + 50 ppm/°C × measurement range) × $\Delta\vartheta$ $\Delta\vartheta$ = Deviation of the ambient temperature according to the reference condition
Long term stability	≤ 0.1 °C/year [3] or ≤ 0.05%/year [1][3]

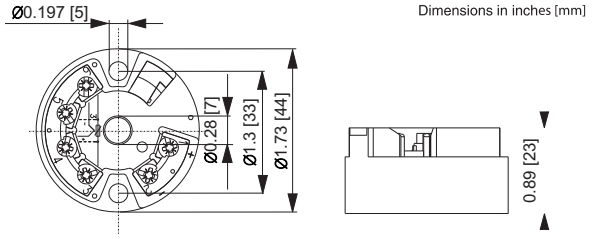
INSTALLATION CONDITIONS

Ambient Conditons

Ambient temperature	(-40 to 85) °C [-40 to 185] °F
Storage temperature	(-40 to 100) °C [-40 to 212] °F
Climatic class	To EN 60 654-1, Class C
Moisture condensation	Allowable
Vibration protection	4 g / (2 to 150) Hz according to IEC 60 068-2-6
EMC immunity	Interference immunity and interference emission as per EN 61 326-1 (IEC 1326)

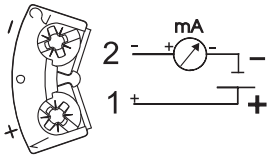
[1] % is related to the adjusted measurement range (the value to be applied is the greater)
[2] All data is related to a measurement end value of 20 mA
[3] Under reference conditions

MECHANICAL CONSTRUCTION

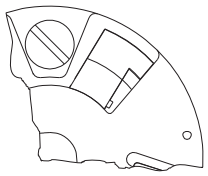
Dimensions	
Weight	approximately 40 g
Materials	Housing: Polycarbonate • Potting: Polyurethane
Terminals	15 AWG (maximum)

Terminal Connections

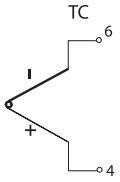
Power supply and current output



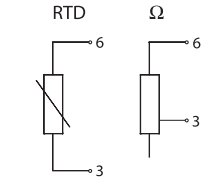
SETUP socket



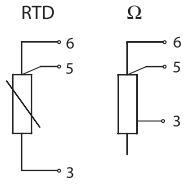
Sensor Connection



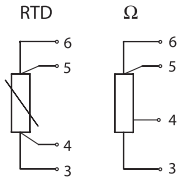
2-Wire



3-Wire



4-Wire



Remote Operation

Configuration set	Configuration kit 440-CABLE
Configuration	Using PC program TransComm
Interface	PC interface connection cable TTL -/- RS 232 with plug
Configurable parameters	Sensor type and connection type, engineering units (°C/°F), measurement range, internal/external cold junction compensation, cable resistance compensation on 2 wire connection, fault conditioning, output signal (4 to 20) mA or (20 to 4) mA, digital filter (damping), offset, measurement point identification (8 characters), output simulation

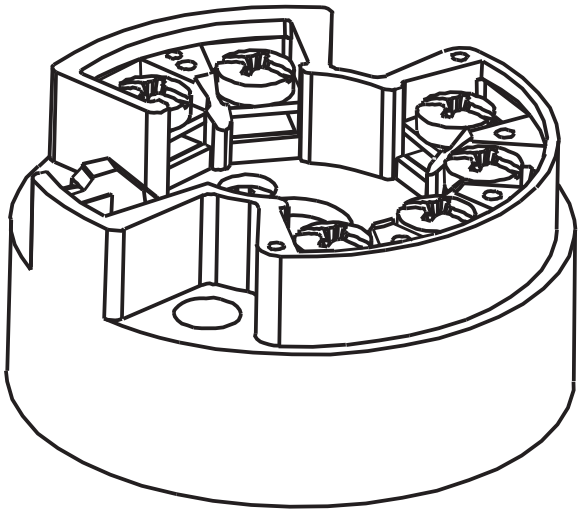
Approvals

CE marked	Unit complies with the legal requirements set forth by the EU regulations.
c UL us	UL Recognized Component
CSA	Intrinsically safe and non-incendive for hazardous locations Class I, Division 1 and 2, Groups A, B, C and D
FM APPROVED	Intrinsically safe and non-incendive for hazardous locations Class I, Division 1 and 2, Groups A, B, C and D

The Series 442 programmable HART® temperature transmitter is a two-wire transmitter with an analog output. It has measurement input for resistance thermometers (RTD) in 2, 3 or 4 wire connection, thermocouples, resistance and voltage. Setting up of the transmitter is done using the 442-MODEM or HART® hand-operating module (275 or 375). These small units can be mounted in Pyromation DIN (Form B) heads or they can be used for surface mounting by using a 35 mm DIN rail mounting clip.

TEMPERATURE HEAD TRANSMITTER

Intrinsically safe universal head transmitter for resistance thermometers (RTD), thermocouples, resistance and voltage transmitters, settable using HART® protocol, for installation in a sensor head (Form B).



HART COMMUNICATION PROTOCOL

Application Areas

- Temperature head transmitter with HART® protocol for converting various input signals into an scalable (4 to 20) mA analog output signal
- Input:
  Resistance thermometer (RTD)
  Thermocouple (TC)
  Resistance (Ω)
  Voltage (mV)
- HART® protocol for front end unit or panel unit operation using the hand-operating module (275 or 375) or PC.

Features and Benefits

- Universal settings with HART® protocol for various signals.
- Galvanic isolation
- 2 wire technology, (4 to 20) mA analog output
- High accuracy in total ambient temperature range
- Fault signal on sensor break or short circuit
- RFI/EMI Protected, CE marked
- c UL us UL Recognized Component
- CSA Intrinsically safe and non-incendive for hazardous locations
- FM Intrinsically safe and non-incendive for hazardous locations
- Output simulation

ORDER CODES

Unconfigured Order Number: **442-00[1]**

Configured Order Number: **4 4 2 - 1 J U - S (50-300) F**

1 2 3 4 5

1

CODE	DESCRIPTION
1	Thermocouple (TC)
2	RTD (2-wire)
3	RTD (3-wire)
4	RTD (4-wire)

2

CODE	DESCRIPTION
J	Type J thermocouple
K	Type K thermocouple
T	Type T thermocouple
N	Type N thermocouple
E	Type E thermocouple
R	Type R thermocouple
S	Type S thermocouple
B	Type B thermocouple
85	100 ohm platinum (α = 0.003 85 $^{\circ}C^{-1}$)
55	500 ohm platinum (α = 0.003 85 $^{\circ}C^{-1}$)
95	1000 ohm platinum (α = 0.003 85 $^{\circ}C^{-1}$)
MV	Millivolts
W	Resistance

[1] Default setting for unconfigured transmitters is Pt100 (0 - 100) °C

3

CODE	DESCRIPTION
U	Upscale Burnout ≥ 21.0 mA
D	Downscale Burnout ≤ 3.6 mA

4

RANGE
S (lower limit – upper limit)

5

CODE	DESCRIPTION
C	Celsius
F	Fahrenheit

Accessories

CODE	DESCRIPTION
442-MODEM	HART® Communication Modem and Software (RS232)
442-MODEM-USB	HART® Communication Modem and Software (USB)
441-DIN35	35 mm DIN rail mounting clip

INPUT

Resistance Thermometer (RTD)

TYPE	MEASUREMENT RANGE		MINIMUM RANGE
Pt100 (α = 0.003 85 $^{o}C^{-1}$)	(-200 to 850) °C	[-328 to 1562] °F	10° C [18 °F]
Pt500	(-200 to 250) °C	[-328 to 482] °F	10° C [18 °F]
Pt1000	(-200 to 250) °C	[-328 to 482] °F	10° C [18 °F]
Ni100 (α = 0.006 18 $^{o}C^{-1}$)	(-60 to 250) °C	[-76 to 356] °F	10° C [18 °F]
Ni500	(-60 to 150) °C	[-76 to 302] °F	10° C [18 °F]
Ni1000	(-60 to 150) °C	[-76 to 302] °F	10° C [18 °F]
Connection Type	2, 3 or 4 wire connection cable resistance compensation possible in the 2 wire system (0 to 30) Ω		
Sensor Cable Resistance	maximum 11 Ω per cable		
Sensor current	≤ 0.2 mA		

Resistance (Ω)

TYPE	MEASUREMENT RANGE	MINIMUM RANGE
Resistance (Ω)	(10 to 400) Ω	10 Ω
	(10 to 2000) Ω	100 Ω

Thermocouples (TC)

TYPE	MEASUREMENT RANGE		MINIMUM RANGE
B (PtRh30-PtRh6)	(0 to 1820) °C	[32 to 3308] °F	500 °C [900 °F]
C (W5Re-W26Re)	(0 to 2320) °C	[32 to 4208] °F	500 °C [900 °F]
D (W3Re-W25Re) [3]	(0 to 2495) °C	[32 to 4523] °F	500 °C [900 °F]
E (NiCr-CuNi)	(-270 to 1000) °C	[-454 to 1832] °F	50 °C [90 °F]
J (Fe-CuNi)	(-210 to 1200) °C	[-346 to 2192] °F	50 °C [90 °F]
K (NiCr-Ni)	(-270 to 1372) °C	[-454 to 2501] °F	50 °C [90 °F]
L (Fe-CuNi) [2]	(-200 to 900) °C	[-328 to 1652] °F	50 °C [90 °F]
N (NiCrSi-NiSi)	(-270 to 1300) °C	[-454 to 2372] °F	50 °C [90 °F]
R (PtRh13-Pt)	(-50 to 1768) °C	[-58 to 3214] °F	500 °C [900 °F]
S (PtRh10-Pt)	(-50 to 1768) °C	[-58 to 3214] °F	500 °C [900 °F]
T (Cu-CuNi)	(-270 to 400) °C	[-454 to 752] °F	50 °C [90 °F]
U (Cu-CuNi) [2]	(-200 to 600) °C	[-328 to 1112] °F	50 °C [90 °F]
MoRe5-MoRe41 [1]	(0 to 2000) °C	[32 to 3632] °F	500 °C [900 °F]
Cold junction	internal (Pt100) or external (0 to 80) °C [32 to 176] °F		
Cold junction accuracy	± 1 °C		

Voltage (mV)

TYPE	MEASUREMENT RANGE	MINIMUM RANGE
Millivolt (mV)	(-10 to 75) mV	5 mV

[1] no reference
[2] according to DIN 43710
[3] according to ASTM E988

Series 442 Programmable HART® Temperature Transmitter Specifications

OUTPUT

Output (Analog)

Output signal	(4 to 20) mA or (20 to 4) mA
Transmission as	Temperature linear, resistance linear, voltage linear
Maximum load	($V_{power\ supply}$ - 10V) / 0.022 A current output)
Digital filter 1st degree	(0 to 60) s
Induced current required	≤ 3.5 mA
Current limit	≤ 25 mA
Switch on delay	4 s (during power up I_a = 3.8 mA)
Electronic response time	1 s

Failure Mode

Undershooting measurement range	Decrease to 3.8 mA
Exceeding measurement range	Increase to 20.5 mA
Sensor breakage/short circuit [1]	≤ 3.6 mA or ≥ 21.0 mA

Electrical Connection

Power supply	U_b = (11.5 to 30) V dc, polarity protected
Galvanic isolation (In/out)	$\hat{U}$ = 2 kV ac
Allowable ripple	U_{ss} ≤ 3 V at U_b ≥ 13 V, f_{max} = 1 kHz

ACCURACY

Reference conditions	Calibration temperature (23 ± 5) °C [73 ± 9] °F

Resistance Thermometer (RTD)

TYPE	MEASUREMENT ACCURACY
Pt100, Ni100 Pt500, Ni500 Pt1000, Ni1000	0.2 °C or 0.08% [2] 0.5 °C or 0.20% [2] 0.3 °C or 0.12% [2]

Resistance (Ω)

TYPE	MEASUREMENT ACCURACY	MEASUREMENT RANGE
Resistance	± 0.1 Ω or 0.08% [2]	(10 to 400) Ω
	± 1.5 Ω or 0.12% [2]	(10 to 2000) Ω

[1] Not for thermocouple
[2] % is related to the adjusted measurement range (the value to be applied is the greater)

ACCURACY (CONT)

Thermocouple (TC)

TYPE	MEASUREMENT ACCURACY [1]
K, J, T, E, L, U N, C, D S, B, R MoRe5-MoRe41	0.5 °C or 0.08% 1.0 °C or 0.08% 2.0 °C or 0.08%
Influence of the internal reference junction	Pt100 ± (0.30 + 0.005 |t|) °C |t| = value of temperature without regard to sign °C

Voltage (mV)

TYPE	MEASUREMENT ACCURACY	MEASUREMENT RANGE
Millivolt (mV)	± 20 µV or 0.08% [1]	(-10 to 100) mV

General

Influence of power supply	± 0.01%/V deviation from 24 V [2]
Load influence	± 0.02%/100 Ω [2]
Temperature drift	Resistive thermometer (RTD): T_d = ± (15 ppm/°C × range end value + 50 ppm/°C measurement range) × $\Delta\vartheta$ Resistive thermometer Pt100: T_d = ± (15 ppm/°C × (range end value + 200) + 50 ppm/°C × measurement range) × $\Delta\vartheta$ Thermocouple (TC): T_d = ± (50 ppm/°C × range end value + 50 ppm/°C measurement range) × $\Delta\vartheta$ $\Delta\vartheta$ = Deviation of the ambient temperature according to the reference condition
Long term stability	≤ 0.1 °C/year [3] or ≤ 0.05%/year [1][3]

INSTALLATION CONDITIONS

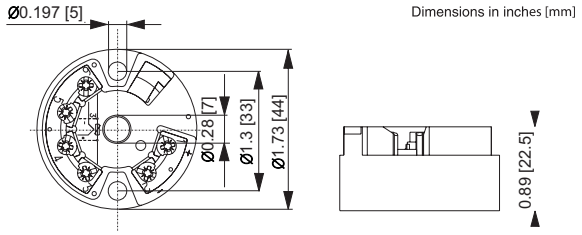
Ambient Conditions

Ambient temperature	(-40 to 85) °C [-40 to 185] °F
Storage temperature	(-40 to 100) °C [-40 to 212] °F
Climatic class	To EN 60 654-1, Class C
Moisture condensation	Allowable
Vibration protection	4 g / (2 to 150) Hz according to IEC 60 068-2-6
EMC immunity	Interference immunity and interference emission as per EN 61 326-1 (IEC 1326)

[1] % is related to the adjusted measurement range (the value to be applied is the greater)
[2] All data is related to a measurement end value of 20 mA
[3] Under reference conditions

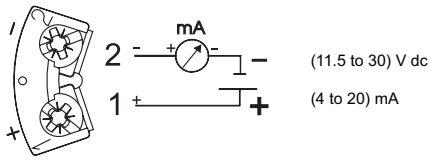
Series 442 Programmable HART® Temperature Transmitter Specifications

MECHANICAL CONSTRUCTION

Dimensions	
Weight	approximately 40 g
Materials	Housing: Polycarbonate • Potting: Polyurethane
Terminals	15 AWG (maximum)

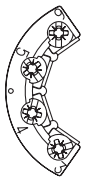
Terminal Connections

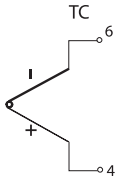
Power supply and current output



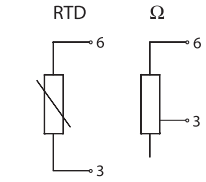
HART® Communication on (4 to 20) mA

Sensor Connection

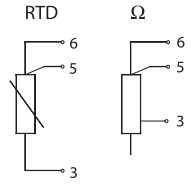




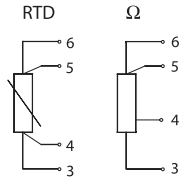
2-Wire



3-Wire



4-Wire



Remote Operation

Configuration set	Configuration kit 442-MODEM
Configuration	Using PC program TransComm
Interface	PC interface connection cable TTL -/- RS 232 with plug
Configurable parameters	Sensor type and connection type, engineering units (°C/°F), measurement range, internal/external cold junction compensation, cable resistance compensation on 2 wire connection, fault conditioning, output signal (4 to 20) mA or (20 to 4) mA, digital filter (damping), offset, measurement point identification (8 characters), output simulation

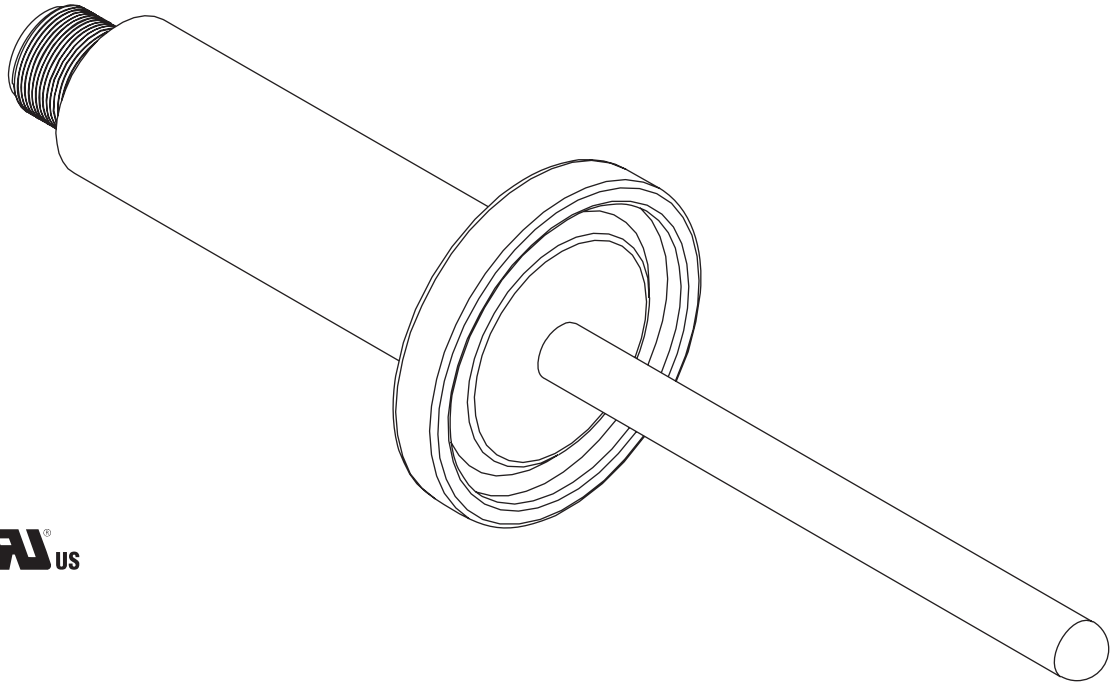
Approvals

CE marked	Unit complies with the legal requirements set forth by the EU regulations.
c UL us	UL Recognized Component
CSA	Intrinsically safe and non-incendive for hazardous locations Class I, Division 1 and 2, Groups A, B, C and D
FM APPROVED	Intrinsically safe and non-incendive for hazardous locations Class I, Division 1 and 2, Groups A, B, C and D

Series 450 Programmable Integral Temperature Transmitter

The Series 450 Programmable Integral Temperature Transmitter is ideal for monitoring temperature in highly moist or corrosive environments and in small areas such as pipes and tanks. The unit consists of a 4-wire Pt100 RTD sensor, built-in (4 to 20) mA transmitter, and process connection. The integral design eliminates all external screw connections simplifying the electrical installation process and solving the problems caused by moisture, loose connections, and corrosion. A "quick disconnect" M12 plug adapter connects the transmitter to a PC for ease of calibration, re-programming, and wiring accuracy.

SERIES 450 PROGRAMMABLE INTEGRAL TEMPERATURE TRANSMITTER



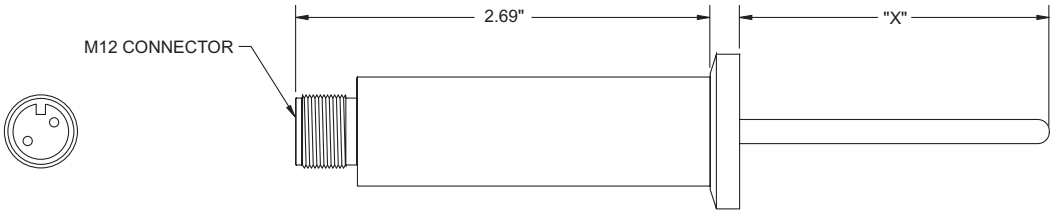
Application Areas

- PC programmable temperature transmitter for converting Pt100 input signal into a scaleable (4 to 20) mA analog output signal
- Platinum Resistance Thermometer (RTD)
- Ideal for use in applications where sanitary wash-down procedures are required
- Compact design is well suited for use in small areas such as tanks and pipes
- Used for measuring temperatures from (-51 to 160) °C [-60 to 320] °F

Features and Benefits

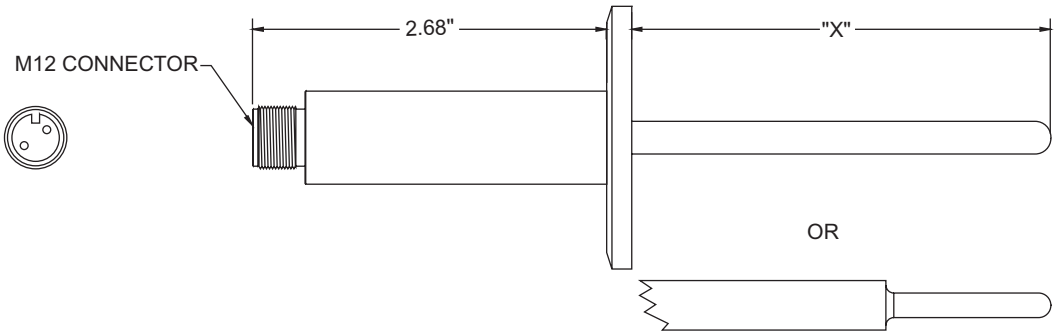
- PC programmable transmitter with (4 to 20) mA output
- Reliable measurements despite fluctuations in ambient temperature
- Available in threaded and Clean-In-Place connections
- RFI/EMI Protected, CE marked
- c UL us UL Recognized Component

MINIATURE CIP RTD ASSEMBLY



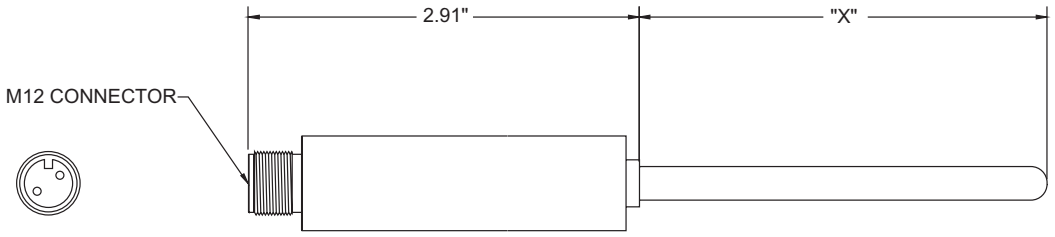
See Food & Dairy Section For Ordering Information

CIP RTD ASSEMBLY



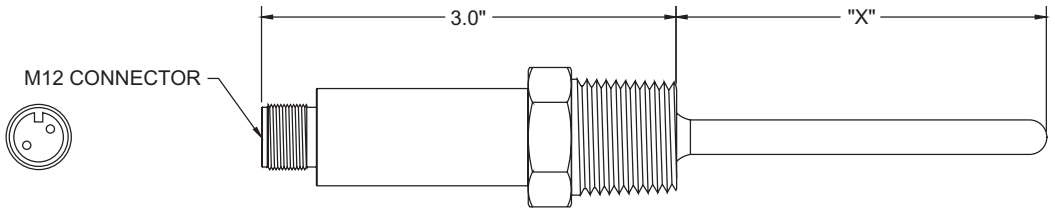
See Food & Dairy Section For Ordering Information

RTD ASSEMBLY WITH NO PROCESS FITTING



See RTD Section For Ordering Information

RTD ASSEMBLY WITH THREADED CONNECTION



See RTD Section For Ordering Information

Resistance Thermometer Input (RTD)

TYPE	MEASUREMENT RANGE	MINIMUM RANGE
Pt100 (α = 0.003 85)	(-51 to 160) °C [-60 to 320] °F	10 ˚C [18 ˚F]
Connection Type	4 wire connection (standard)	
Sensor current	≤ 0.6 mA	

Output (Analog)

Output signal	(4 to 20) mA or (20 to 4) mA
Transmission as	Temperature linear
Maximum load	($V_{power\ supply}$ - 10 V) / 0.023 A (current output)
Induced current required	≤ 3.5 mA
Current limit	≤ 23 mA
Switch on delay	2 s
Electronic response time	1 s

Failure Mode

Undershooting measurement range	Decreases to 3.8 mA
Exceeding measurement range	Increases to 20.5 mA
Sensor breakage/short circuit	≤ 3.6 mA or ≥ 21.0 mA

Accuracy

Electronics measurement error	0.1 °C or 0.08% [1]
Reference conditions	Calibration temperature (23 ± 5) °C [73 ± 9] °F
Sensor measurement error	Class A ± (0.15 + 0.002 |t|) °C Class B ± (0.30 + 0.005 |t|) °C Band 1 ± (0.26 + 0.0042 |t|) °C Band 3 ± (0.08 + 0.0017 |t|) °C Band 5 ± (0.03 + 0.0017 |t|) °C |t| = value of temperature without regard to sign, °C
Influence of power supply	± 0.01%/V deviation from 24 V [2]
Load influence	± 0.02%/100 Ω [2]
Temperature drift	T_d= ± (15 ppm/°C × (full scale value + 200) + 50 ppm/°C of set measuring range) × $\Delta\vartheta$ $\Delta\vartheta$ = deviation of ambient temperature from the reference operation condition
Electronics long term stability	≤ 0.1 °C/year [3] or ≤ 0.05%/year [1][3]

[1] % is related to the adjusted measurement range (the value to be applied is the greater)
[2] All data is related to a measurement and value of 20 mA
[3] Under reference conditions

Series 450 Programmable Integral Temperature Transmitter Specifications

Electrical Connection

Electrical connection	 Electrical connection of the compact thermometer (view from above) - M12 plug, 4-pin Pin 1: Power supply (10 to 35) V dc; Current output (4 to 20) mA Pin 2: PC configuration cable connection Pin 3: Power supply 0 V dc; current output (4 to 20) mA Pin 4: PC configuration cable connection
Power supply	U_b = (10 to 35) V dc, polarity protected
Allowable ripple	$U_{ss} \leq 3V$ at $U_b \geq 13V$, f_{max} = 1 kHz

Environmental Conditions

Ambient Temperature	(-40 to 85) ˚C [-40 to 185] ˚F
Storage Temperature	(-40 to 100) ˚C [-40 to 212] ˚F
Climatic Class	EN 60 654-1, class C
Condensation	Permitted
Ingress protection	IP 67
Shock resistance	4g / (2 to 150) Hz as per IEC 60 068-2-6
EMC immunity	Interference immunity and interference emission as per EN 61 326-1 (IEC 1326)

Process

Process temperature limit	**MAXIMUM AMBIENT**	**MAXIMUM PROCESS**
	to 25 °C [77 °F]	160 °C [320 °F]
	to 40 °C [104 °F]	135 °C [275 °F]
	to 60 °C [140 °F]	120 °C [248 °F]
	to 85 °C [185 °F]	100 °C [212 °F]

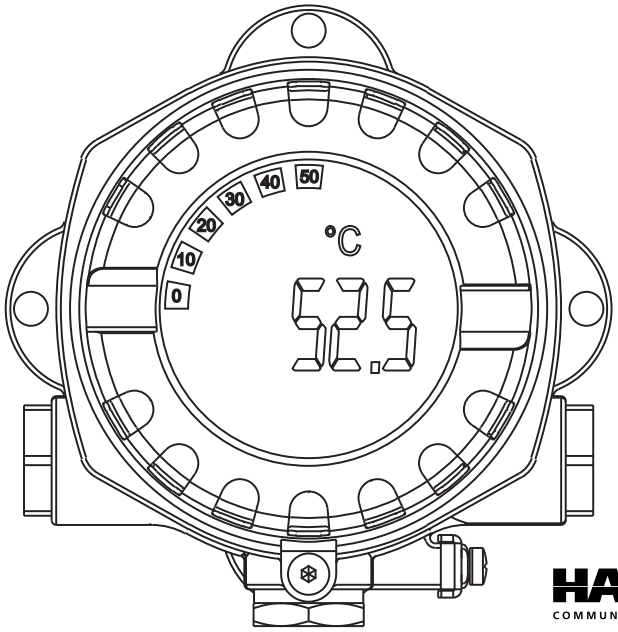
Approvals

CE marked	Unit complies with the legal requirements set forth by the EU regulations.
c UL us	UL Recognized Component
3A AUTHORIZED 74-	3A Sanitary Council Standard 74- (CIP sensors only)

The Series 642 programmable HART® field temperature transmitter is a two wire transmitter with analog output. It includes input for RTD's and resistance in 2-wire, 3-wire, and 4-wire connections, thermocouple, and voltage signals. The transmitter can be supplied with or without a digital display, in either a general purpose aluminum housing, or explosion proof aluminum housing. The Series 642 can be programmed with a PC or a HART® protocol handheld terminal. When supplied with a digital display the LC screen shows the current measured value and as a bar graph with limit value violation indicator.

PROGRAMMABLE FIELD TEMPERATURE TRANSMITTER

Programmable temperature transmitter for resistance thermometers, (RTD) thermocouples, resistance inputs and voltage inputs, adjustable via HART® protocol.



HART COMMUNICATION PROTOCOL

Application Areas

- Temperature field transmitter with HART® protocol for converting various input signals to an analog, scaleable (4 to 20) mA output signal
- Input:
  Resistance thermometer (RTD)
  Thermocouples (TC)
  Resistance input (Ohm)
  Voltage input (mV)
- HART® protocol for operating the device on site using a handheld communicator 275, 375, or remotely via the PC

Features and Benefits

- Universally programmable with HART® protocol for various input signals
- Illuminated display, rotatable
- Operation, visualization and maintenance with PC, e.g. using TransComm Light operating software
- Two-wire technology, analog output (4 to 20) mA
- Undervoltage detection
- Highly accurate in entire operating temperature range
- Approvals:
  FM and CSA (IS, NI, XP and DIP)
- Galvanic isolation
- Output simulation
- Min./max. process values recorded
- Customized measuring range setup or expanded SETUP, see questionnaire

FM APPROVED CE marked

ORDER CODES

Example Order Number:

1-0		1-1		1-2	1-3	1-4		1-5	1-6
642A	-	D	-	3	85	U	-	S(0-200)	C

1-0 Transmitter Type

CODE	DESCRIPTION
642A	(4 to 20) mA HART® Field Transmitter with general purpose aluminum housing
642C	(4 to 20) mA HART® Field Transmitter with explosion proof aluminum housing FM/CSA / XP Class I / Div 1/ Groups A,B,C,D / DIP Class II / Div 1 / Groups E,F,G / Class III / NI Class I / Div 2 / Groups A,B,C,D
642F	(4 to 20) mA HART® Field Transmitter with general purpose aluminum housing FM/CSA IS Class I / Div 1 / Groups A,B,C,D / NI Class I / Div 2 / Groups A,B,C,D

1-1 Options

CODE	DESCRIPTION
T	Solid cover
D	Glass cover with digital display

1-2 Input Type

CODE	DESCRIPTION
00	Unconfigured[1]
1	Thermocouple (TC) or milivolt
2	RTD (2-wire) or resistance
3	RTD (3-wire) or resistance
4	RTD (4-wire) or resistance

[1] Default setting for unconfigured transmitter is Pt100 (0 - 100) °C

Accessories

CODE	DESCRIPTION
442-MODEM	HART® Communication Modem and Software (RS232)
442-MODEM-USB	HART® Communication Modem and Software (USB)
642-BRACKET	Pipe mounting bracket for use on pipes with a diameter between 1.5” to 3.3”

1-3 Sensor Type

CODE	DESCRIPTION
J	Type J thermocouple
K	Type K thermocouple
T	Type T thermocouple
N	Type N thermocouple
E	Type E thermocouple
R	Type R thermocouple
S	Type S thermocouple
B	Type B thermocouple
85	100 ohm platinum (α = 0.003 85 ºC)
55	500 ohm platinum (α = 0.003 85 ºC)
95	1000 ohm platinum (α = 0.003 85 ºC)
MV	Millivolts
W	Resistance
Other types available. Consult factory.	

1-4 Failure Mode

CODE	DESCRIPTION
U	Upscale Burnout ≥ 23 mA
D	Downscale Burnout ≤ 3 mA

1-5 Range

CODE	DESCRIPTION
S	(lower limit – upper limit)
Z	Special Configuration (See configuration sheet for customer specific set-up)

1-6 Unit of Measure

CODE	DESCRIPTION
C	Celsius
F	Fahrenheit
K	Kelvin

INPUT

Resistance Thermometer (RTD)

TYPE	STANDARDS	MEASUREMENT RANGE		MINIMUM RANGE
Pt100 (α = 0.003 85 °C^{-1}) Pt200 Pt500 Pt1000	ASTM E1137 IEC 60 751	(-200 to 850) °C (-200 to 850) °C (-200 to 250) °C (-200 to 250) °C	[-328 to 1562] °F [-328 to 1562] °F [-328 to 482] °F [-328 to 482] °F	10 °C [18 °F] 10 °C [18 °F] 10 °C [18 °F] 10 °C [18 °F]
Pt100 (α = 0.003 916)	JIS C1604	(-200 to 649) °C	[-328 to 1200] °F	10 °C [18 °F]
Pt100 (α = 0.003 923)	SAMA	(-100 to 700) °C	[-148 to 1292] °F	10 °C [18 °F]
Ni100 (α = 0.006 180) Ni1000 (α = 0.006 180)	DIN 43 760	(-60 to 250) °C (-60 to 150) °C	[-76 to 482] °F [-76 to 302] °F	10 °C [18 °F] 10 °C [18 °F]
Ni120 (α = 0.006 720) Cu10 (α = 0.004 274)	Edison Curve	(-70 to 270) °C (-100 to 260) °C	[-94 to 518] °F [-148 to 500] °F	10 °C [18 °F] 10 °C [18 °F]
Pt50 (α = 0.003 911) Pt100 (α = 0.003 911) Cu50 (α = 0.004 278) Cu100 (α = 0.004 278)	GOST	(-200 to 1100) °C (-200 to 850) °C (-200 to 200) °C (-200 to 200) °C	[-328 to 2012] °F [-328 to 1562] °F [-328 to 392] °F [-328 to 392] °F	10 °C [18 °F] 10 °C [18 °F] 10 °C [18 °F] 10 °C [18 °F]
Polynomial RTD Pt100 (Callendar - van Dusen)		(-200 to 850) °C (-200 to 850) °C	[-328 to 1562] °F [-328 to 1562] °F	10 °C [18 °F] 10 °C [18 °F]
Connection Type		2, 3 or 4 wire connection cable resistance compensation possible in the 2 wire system (0 to 30) Ω		
Sensor Cable Resistance		3 wire and 4 wire connection, sensor wire resistance to maximum 50 Ω per wire		
Sensor current		≤ 0.3 mA		

Resistance (Ω)

TYPE	MEASUREMENT RANGE	MINIMUM RANGE
Resistance (Ω)	(10 to 400) Ω (10 to 2000) Ω	10 Ω 100 Ω

Thermocouples (TC) (ASTM E230)

TYPE	MEASUREMENT RANGE		MINIMUM RANGE
B (PtRh30-PtRh6)	(0 to 1820) °C	[32 to 3308] °F	500 °C [900 °F]
C (W5Re-W26Re)	(0 to 2320) °C	[32 to 4208] °F	500 °C [900 °F]
D (W3Re-W25Re) [1]	(0 to 2495) °C	[32 to 4523] °F	500 °C [900 °F]
E (NiCr-CuNi)	(-270 to 1000) °C	[-454 to 1832] °F	50 °C [90 °F]
J (Fe-CuNi)	(-210 to 1200) °C	[-346 to 2192] °F	50 °C [90 °F]
K (NiCr-Ni)	(-270 to 1372) °C	[-454 to 2501] °F	50 °C [90 °F]
L (Fe-CuNi) [2]	(-200 to 900) °C	[-328 to 1652] °F	50 °C [90 °F]
N (NiCrSi-NiSi)	(-270 to 1300) °C	[-454 to 2372] °F	50 °C [90 °F]
R (PtRh13-Pt)	(-50 to 1768) °C	[-58 to 3214] °F	500 °C [900 °F]
S (PtRh10-Pt)	(-50 to 1768) °C	[-58 to 3214] °F	500 °C [900 °F]
T (Cu-CuNi)	(-270 to 400) °C	[-454 to 752] °F	50 °C [90 °F]
U (Cu-CuNi) [2]	(-200 to 600) °C	[-328 to 1112] °F	50 °C [90 °F]
Cold junction	internal (Pt100) or external (0 to 80) °C [32 to 176] °F		
Cold junction accuracy	± 1 °C		
Max. sensor resistance	10 kΩ		

Voltage (mV)

TYPE	MEASUREMENT RANGE	MINIMUM RANGE
Millivolt (mV)	(-20 to 100) mV	5 mV

[1] no reference
[2] according to DIN 43 710

Series 642 Programmable HART® Field Temperature Transmitter Specifications

OUTPUT

Output (Analog)

Output signal	Analog (4 to 20) mA or (20 to 4) mA
Transmission as	Temperature linear, resistance linear, voltage linear
Maximum load	($V_{power\ supply}$ - 11V) / 0.022 A (current output)
Digital filter 1st degree	(0 to 60) s
Induced current required	≤ 3.5 mA
Current limit	≤ 23 mA
Switch on delay	4 s (during switch-on operation I_a = 4 mA)
Response time	1 s

Failure Mode

Undershooting measurement range	Decrease to 3.8 mA
Exceeding measurement range	Increase to 20.5 mA
Sensor breakage/short circuit	≤ 3.6 mA or ≥ 21.0 mA (configurable 21.6 mA to 23 mA)

Electrical Connection

Power supply	U_b = 11 to 40 V (8 to 40 without display), reverse polarity protected
Cable entry	Three 1/2” NPT openings
Allowable ripple	U_{ss} ≤ 3 V at U_b ≥ 13.5 V, f_{max} = 1 kHz

ACCURACY

Reference conditions	Calibration temperature (23 ± 5) °C [73.4 ± 9] °F

Resistance Thermometer (RTD)

TYPE	MEASUREMENT ACCURACY - DIGITAL	MEASUREMENT ACCURACY - D/A[1]
Cu100, Pt100, Ni100, Ni120	0.2 °C [0.36 °F]	0.02%
Pt500	0.6 °C [1.08 °F]	0.02%
Cu50, Pt50, Pt1000, Ni1000	0.4 °C [0.72 °F]	0.02%
Cu10, Pt200	2 °C [3.6 °F]	0.02%

Thermocouple (TC)

TYPE	MEASUREMENT ACCURACY - DIGITAL	MEASUREMENT ACCURACY - D/A[1]
K, J, T, E, L, U	Typical 0.5 °C [0.9 °F]	0.02%
N, C, D	Typical 1 °C [0.18 °F]	0.02%
S, B, R	Typical 2 °C [3.6 °F]	0.02%

Resistance (Ω)

TYPE	MEASUREMENT ACCURACY - DIGITAL	MEASUREMENT ACCURACY - D/A[1]	MEASUREMENT RANGE
Resistance	± 0.08 Ω	0.02%	(10 to 400) Ω
	± 1.6 Ω	0.02%	(10 to 2000) Ω

Voltage (mV)

TYPE	MEASUREMENT ACCURACY - DIGITAL	MEASUREMENT ACCURACY - D/A[1]	MEASUREMENT RANGE
Voltage	± 20 µV	0.02%	(20 to 100) mV

[1] % relates to the set span. Accuracy = digital + D/A accuracy

ACCURACY (CONT)

Physical input range of the sensors

TYPE	MEASUREMENT ACCURACY[1]
(10 to 400) Ω	Cu10, Cu50, Cu100, polynomial RTD, Pt50, Pt100, Ni100, Ni120
(10 to 2000) Ω	Pt200, Pt500, Pt1000, Ni1000
(-20 to 100) mV	Thermocouple type: C, D, E, J, K, L, N
(-5 to 30) mV	Thermocouple type: B, R, S, T, U

[1] % is related to the adjusted measurement range (the value to be applied is the greater)

General

Repeatability	0.03% of the physical input range (15 Bit) Resolution A/D conversion: 18 Bit
Load influence	≤ ± 0.005%/V deviation from 24 V, related to the full scale value
Long term stability	≤ 0.1 °C [0.18 °F] / year or ≤ 0.05%/year Date under reference conditions. % relates to the set span. The larger value applies.

Temperature Drift

Total temperature drift = input temperature drift + output temperature drift	Effect on the accuracy when ambient temperature changes by 1 °C [1.8 °F]	
	Input (10 to 400) Ω	0.002% of measured value
	Input (10 to 2000) Ω	0.002% of measured value
	Input (-20 to 100) mV	typ. 0.002% of measured value (maximum value = 1.5 x typ.)
	Input (5 to 30) mV	typ. 0.002% of measured value (maximum value = 1.5 x typ.)
	Output (4 to 20) mA	typ. 0.002% of measured value (maximum value = 1.5 x typ.)

INSTALLATION CONDITIONS

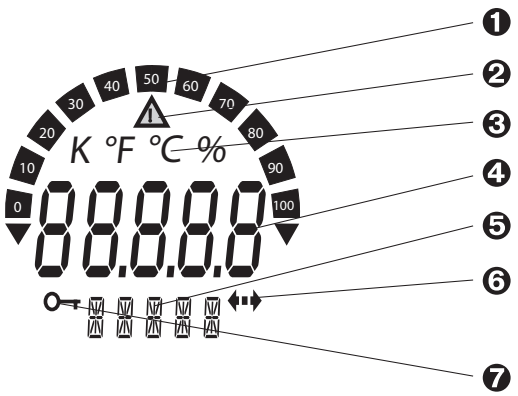
Ambient Conditions

Ambient temperature	Without display: (-40 to 85) °C [-40 to 185] °F With display: (-40 to 70) °C [-40 to 158] °F NOTE: The display can react slowly for temperature < -20 °C [< -4 °F]
Storage temperature	Without display: (-40 to 100) °C [-40 to 212] °F With display: (-40 to 85) °C [-40 to 185] °F
Allowable Altitude	6500 ft above sea level
Climatic class	As per EN 60 654-1, Class C
Moisture condensation	Allowable
Shock and vibration protection	3 g / (2 to 150) Hz according to IEC 60 068-2-6
EMC immunity	Interference immunity and interference emission as per EN 61 326-1 (IEC 1326) (0.08 to 2) GHz 10 V/m; (1.4 to 2) GHz 30 V/m to EN 61 000-4-3
Protection	IP67, NEMA 4X, Class 1, Division 1, Group A, B, C; Class II Division I, Groups E, F, G and Class III, Division I (when specified)

Series 642 Programmable HART® Field Temperature Transmitter Specifications

INTERFACE

Display Elements



LC display of the field transmitter (illuminated, can be rotated in 90° increments)

Item 1: Bar graph display in 10% increments with indicators for overranging / underranging
Item 2: 'Caution' display
Item 3: Unit display K, °F, or °C or %
Item 4: Measured value display (digit height 20.5 mm / 0.81 ")
Item 5: Status and information display
Item 6: 'Communication' display
Item 7: 'Programming disabled' display

Operating Elements

No operating elements are present directly on the display. The device parameters of the field transmitter are configured using the 275 or 375 handheld communicator or a PC with HART® Modem and operating software TransComm Light.

Remote Operation

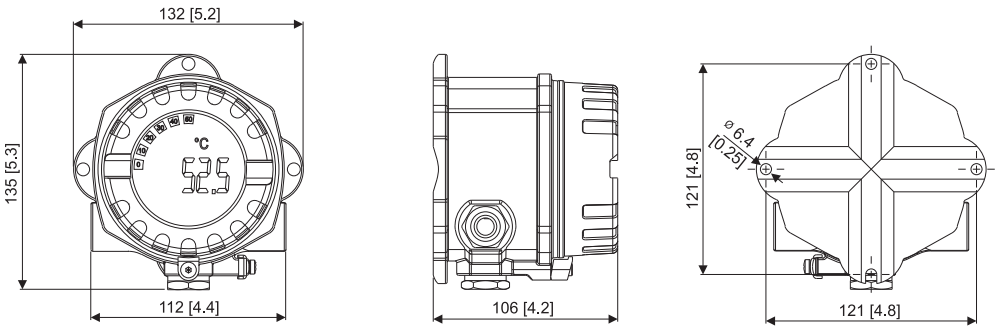
Interface	HART® communication via transmitter power supply
Configurable device parameters	Sensor type and connection type, engineering units (°C/°F), measurement ranges, internal/external cold junction compensation of wire resistance with 2-wire connection, failure mode, output signal (4 to 20) mA (20 to 4) mA, digital filter (damping), offset, TAG+descriptor (8+16 characters), output simulation, customized linearization, recording of min./max process value, analog output: Option: customized linearization

STANDARDS

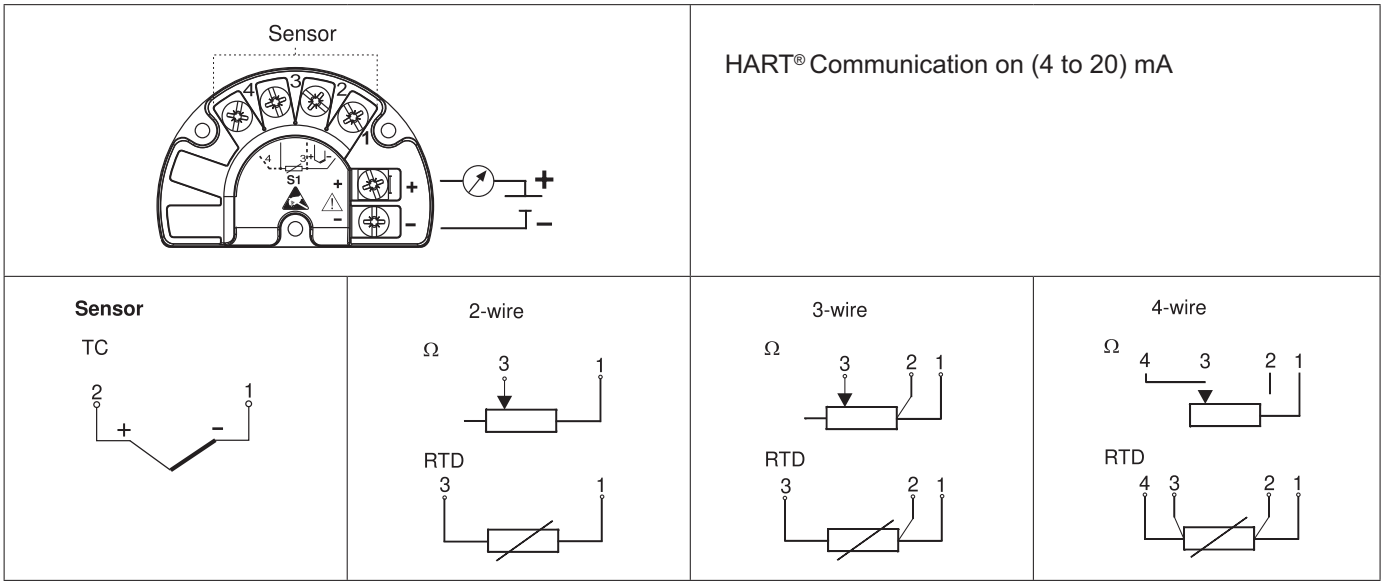
Approvals

CE marked	Unit complies with the legal requirements set forth by the EU regulations.
CSA	Intrinsically safe and non-incendive or explosion proof for hazardous locations Class I, Division 1 and 2, Groups A, B, C and D
FM APPROVED	Intrinsically safe and non-incendive or explosion proof for hazardous locations Class I, Division 1 and 2, Groups A, B, C and D
Other standards and guidelines	IEC 60 529: Degrees of protection through housing (IP code) IEC 61 010: Protection measures for electrical equipment for measurement, control, regulation and laboratory procedures IEC1326: Electromagnetic compatibility (EMC requirements)

MECHANICAL CONSTRUCTION

Dimensions	 Display rotatable in 90° increments *Dimensions in mm [inches]*
Weight	approximately 1.6 kg [3.53 lb]
Materials	Housing: die-cast aluminum with powder coating
Terminals	Cables / wires up to max. 2.5 mm² (AWG 13)

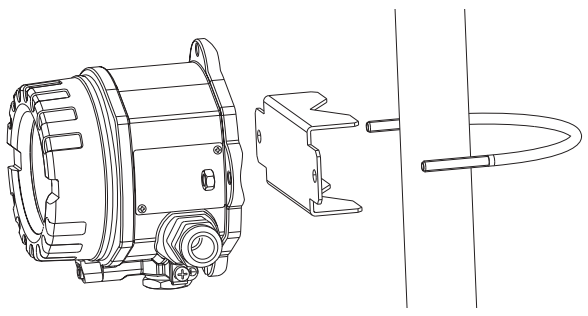
Terminal Connections



Optional Mounting Bracket

Part Number: 642-BRACKET

Designed for use on pipes with a diameter between 1.5” to 3.3”.
The additonal mounting plate must be used for pipes with a diameter of 1.5” to 2.2”. No plate is required for pipes with a diameter of 2.2” to 3.3”.
Assembly includes bracket, screws, and mounting plate.



Configuration sheet for Series 642 temperature transmitter
For customer specific setup

Sensor

TC ( ) B ( ) C ( ) D ( ) E ( ) J
( ) K ( ) L ( ) N ( ) R ( ) S
( ) T ( ) U

RTD ( ) Pt100 ( ) Pt500 ( ) Pt1000
( ) Ni100 ( ) Ni500 ( ) Ni1000

( ) mV ( ) (10 to 400) Ohm ( ) (10 to 2000) Ohm

( ) 2-wire ( ) 3-wire ( ) 4-wire

Unit ( ) °C ( ) °F ( ) K ( ) mV ( ) Ohm

Range Lower limit [ ][ ][ ][ ][ ].[ ]

Upper limit [ ][ ][ ][ ][ ].[ ]

Note:
Must meet minimum
space requirements

Expanded setup

Reference junction/TC only ( ) internal ( ) external [ ][ ][ ] (0 to 80) ºC (32 to 17) ºF

Compensation wire resistance S1 [ ][ ] (0 to 30) Ohm

Failure mode ( ) ≤ 3.6 mA ( ) ≥ 21.0 mA

Output ( ) (4 to 20) mA ( ) (20 to 4) mA

Filter [ ][ ] (0 to 60) s

Offset S1 [ ][ ].[ ] (-10 to 10) ºC [-18 to 18] ºF

Line voltage filter ( ) 50 Hz ( ) 60 Hz

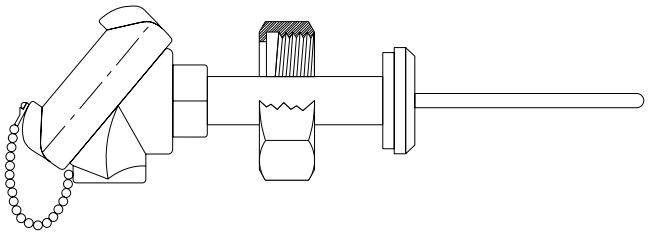
TAG [ ][ ][ ][ ][ ][ ][ ][ ]

DESCRIPTION
16 characters max. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

CIP Sanitary Fitting Reference Data Sheet

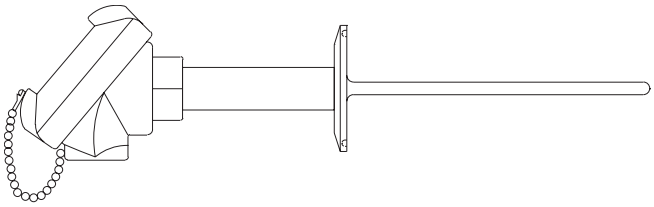
The CIP (clean in place) sanitary connections illustrated on this page are the most commonly used fittings in food, dairy, beverage, pharmaceutical, and chemical processes where contamination and cleanliness is of concern. Fittings other than those illustrated are available upon request. The illustrations are provided for reference purposes to aid in the selection of the correct fitting style for new or replacement sensor assemblies. Most CIP sensor assemblies manufactured by Pyromation are constructed in accordance to the **3-A Sanitary Council Standard 74-** for instrument fittings and connections.

BEVEL SEAT FITTING[1]



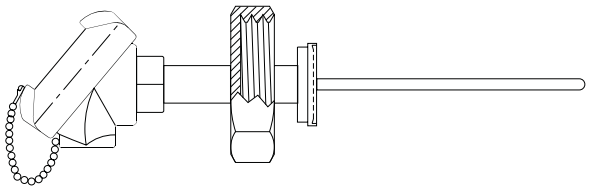
Cap Style 16A - Order Code 1 without Nut
Cap Style 16A - Order Code 2 with 13-H Nut

TRI-CLAMP® FITTING



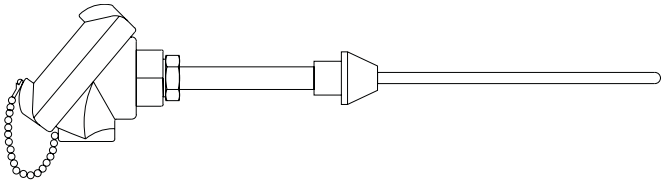
Cap Style 16AMP - Order Code 5

PV GASKET TYPE



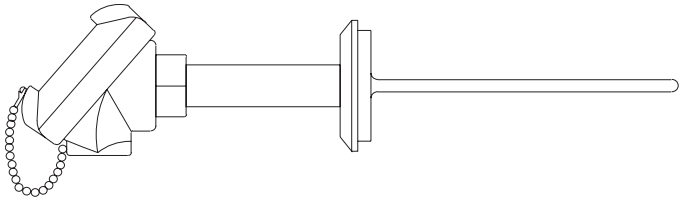
Cap Style 16APV - Order Code 3 without Nut
Cap Style 16APV - Order Code 4 with 13-H Nut

3A4 ADAPTOR [1]



Cap Style 3A4 Adaptor - Order Code 6

"I" CLAMP FITTING[2]



Cap Style 16AI-14I - Order Code 7

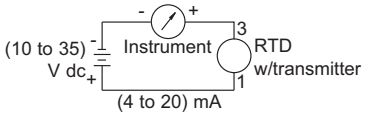
See back section for cap dimension.

[1] Must be manually cleaned.
[2] Not 3 A authorized.

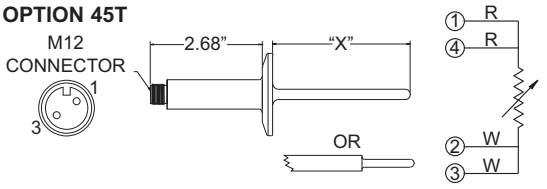
Configuration Code FD01

Water-Tight CIP RTD Assembly With Optional Series 450 Integral Transmitter

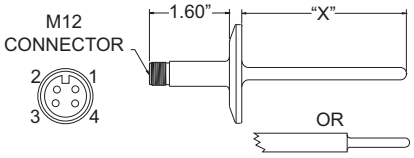
The Water-Tight CIP RTD Assembly houses an optional integral Series 450 Temperature Transmitter (no connection head is required) that is ideal for monitoring temperature in small areas such as tanks and pipes. The water-tight construction meets the NEMA 6P requirements. Assemblies are supplied with a surface finish that meets or exceeds 32µin R_a. Surface finishes of 15µin R_a or better are available upon request. Standard units include a M12 process connection housing. The transmitter is a 2-wire unit with an analog output and 2 second response time. It has measurement input for Pt100 resistance thermometers (RTD) in 4 wire connections. Transmitters can be ranged from (-51 to 160) ºC [-60 to 320] ºF with a 10 ºC [18 ºF] minimum span requirement. **Ambient temperature limits for the M12 connector is (-40 to 85) °C.**



OPTION 45T



OPTION 45



ORDER CODES

Example Order Number:

1		2		3		4		5		6		7	8
R5T185L484	-	**04**	-	**CIP**	-	**2-5**	-	**45,**	**T**	-	**450**	-	**U**	-	**S (0-200)**	**F**

1 Standard Tip

Pt100 (α = 0.003 85 ºC^{-1}) **RTD Assemblies**

CODE	INITIAL ELEMENT ACCURACY @ 0 ºC (percentage)	NOMINAL SHEATH DIAMETER OD (inches)
RAF185L484	± 0.06	1/4
R1T185L484	± 0.1	1/4
R5T185L484	± 0.01	1/4

1-1 Reduced Tip

Pt100 (α = 0.003 85 ºC^{-1}) **RTD Reduced Tip Assemblies**

CODE	INITIAL ELEMENT ACCURACY @ 0 ˚C (percentage)	NOMINAL SHEATH DIAMETER OD (inches)	TIP OUTER DIA. (inches)
RAF185L88R484	± 0.06	1/2	1/4
RAF185L68R384	± 0.06	3/8	3/16
R1T185L88R484	± 0.1	1/2	1/4
R1T185L68R384	± 0.1	3/8	3/16
R5T185L88R484	± 0.01	1/2	1/4
R5T185L68R384	± 0.01	3/8	3/16

2 Immersion Length "X"

Specify "X" length in inches using 2 digits, plus any fractional length
Examples: 04 = 4", 04(1/2) = 4.5"

For field wireable and molded extensions see RTD Section.

[1] See Instrument Section for total sensor and transmitter output accuracy.

3 Sanitary Cap Size and Style

CODE	DESCRIPTION
1-5	1" & 1 1/2" 16 AMP cap - Tri-Clamp®
2-5	2" 16 AMP cap - Tri-Clamp®
3-5	2 1/2" 16 AMP cap - Tri-Clamp®
4-5	3" 16 AMP cap - Tri-Clamp®
Other cap styles available - consult factory	

4 Termination

CODE	DESCRIPTION
45	M12 Water-tight connector
Optional Transmitter	
T[1]	(4 to 20)mA Temperature Transmitter (requires table 5 selection)

5 Transmitter

CODE	DESCRIPTION
450-00	Programmable Transmitter Unconfigured
450	Programmable Transmitter Configured

6 Fault Signal

CODE	DESCRIPTION
U	Upscale Burnout
D	Downscale Burnout

7 Range

S (lower limit - upper limit)

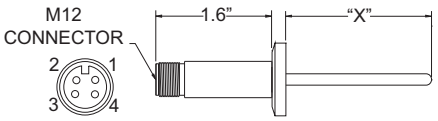
8 Units

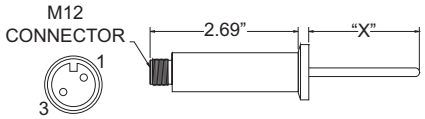
CODE	DESCRIPTION
C	Celsius
F	Fahrenheit

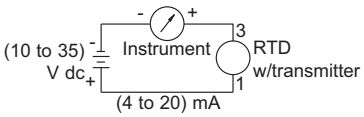
Configuration Code FD01

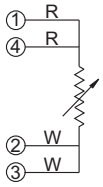
Water-Tight Miniature CIP RTD Assembly With Optional Series 450 Integral Transmitter

The Water-Tight Miniature CIP RTD Assembly houses an optional Series 450 Temperature Transmitter (no connection head is required) that is ideal for monitoring temperature in small areas such as tanks and pipes. The water-tight construction meets NEMA 6P requirements. These assemblies include a 316SS clean-in-place connection. Assemblies are supplied with a surface finish that meets or exceeds 15µin R_a. Standard units include a M12 process connection housing. The transmitter is a 2-wire unit with an analog output and a response time of two seconds that is ideal for pharmaceutical applications. It has measurement input for Pt100 resistance thermometers (RTD) in 4 wire connections. Transmitters can be ranged from (-51 to 160) ºC [60 to 320] ºF minimum span requirement. **Ambient temperature limits for the M12 connector is (-40 to 85) °C.**









ORDER CODES

Example Order Number:

1		2		3		4		5		6		7	8
R5T185L(156)84	-	**04**	-	**CIP**	-	**075-5**	-	**45,**	**T**	-	**450**	-	**U**	-	**S (0-200)**	**F**

1 Pt100 (α = 0.003 85 ºC^{-1}) RTD Assemblies

CODE	INITIAL ELEMENT ACCURACY @ 0 ºC (percentage)	NOMINAL SHEATH DIAMETER OD (inches)
RAF185L(156)84	± 0.06	5/32
R1T185L(156)84	± 0.1	5/32
R3T185L(156)84	± 0.03	5/32
R5T185L(156)84	± 0.01	5/32

2 Immersion Length "X"

Specify "X" length in inches using 2 digits,
plus any fractional length desired
Examples: 04 = 4", 04(1/2) = 4.5"

3 Sanitary Cap Size and Style

CODE	DESCRIPTION
075-5	1/2" & 3/4" 16 AMP cap - Tri-Clamp®

For field wireable and molded extensions see RTD Section.

[1] See Instrument Section for total sensor and transmitter output accuracy.

4 Termination

CODE	DESCRIPTION
45	M12 Water-tight connector
Optional Transmitter	
T[1]	(4 to 20)mA Temperature Transmitter (requires table 5 selection)

5 Transmitter

CODE	DESCRIPTION
450-00	Programmable Transmitter Unconfigured
450	Programmable Transmitter Configured

6 Fault Signal

CODE	DESCRIPTION
U	Upscale Burnout
D	Downscale Burnout

7 Range

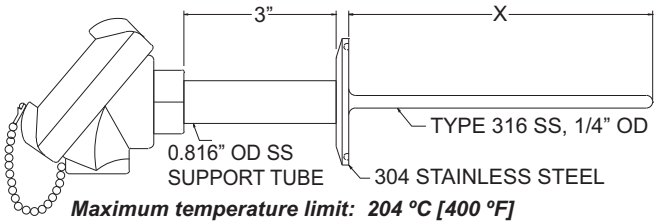
RANGE
S (lower limit - upper limit)

8 Units

CODE	DESCRIPTION
C	Celsius
F	Fahrenheit

General purpose CIP sanitary connected RTD temperature sensors are used in food, dairy, beverage, pharmaceutical, and chemical processing applications where sensor corrosion and product contamination are critical factors. The sanitary caps listed are those most commonly used in such processes. Sanitary caps are welded to the sheath and to a heavier support tube, all of stainless steel, and then ground and polished to a finish that exceeds No. 4 minimum finish required by the **3-A Sanitary Standard 74 -** . Assemblies are supplied with a surface finish that meets or exceeds 32µin R_a. Surface finishes of 15µin R_a or better are available upon request. The process contact surfaces are free of pits, crevices, and pockets thus preventing corrosion and bacteria growth. The three wire constructed sensor assembly consists of a high-accuracy platinum element sealed inside a 316 stainless steel sheath and is provided with a FDA compliant white thermoplastic gasketed connecting head. The complete assembly provides excellent washdown protection. It is recommended that once customer connections are made, the connecting terminals be further protected by applying a coating of moisture-proof sealant over the connections.

AUTHORIZED
74-



Maximum temperature limit: 204 ºC [400 ºF]

ORDER CODES

Example Order Number:

1-1		1-2		2		3		4
R5T185L483	-	04	-	CIP	-	2	-	5	-	63, T

1-1 Pt100 (α = 0.003 85 ºC^{-1}) RTD Assemblies

CODE	INITIAL ELEMENT ACCURACY @ 0 ºC (percentage)
SINGLE	
RAF185L483	± 0.06
R1T185L483	± 0.1
R3T185L483	± 0.03
R5T185L483	± 0.01
DUPLEX	
RAF285L483	± 0.06
R1T285L483	± 0.1
R3T285L483	± 0.03
R5T285L483	± 0.01
Thermocouple Assemblies	
For CIP thermocouple assemblies use T/C types J, K, T, or E and options G for grounded junction or U for ungrounded junction as per example. EXAMPLE: TP48G-04 - CIP - 2 - 5 - 63	

1-2 Immersion Length “X”

Specify "X" length in inches using 2 digits, plus any fractional length desired
Examples: 04 = 4", 05(1/2) = 5.5”

2 Sanitary Cap Size

CODE	TUBE OD (inches)	CODE	TUBE OD (inches)
1	1(1/2)	4	3
2	2	5	Other (specify)
3	2 (1/2)	6	3A4 adapter only

4 Terminations

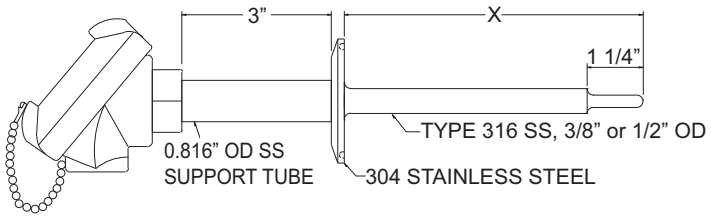
CODE	DESCRIPTION
91	316L stainless steel head
63	White polypropylene head
62	White polypropylene head, DIN form B
31,W	Aluminum screw cover head with white expoxy coating
22 (06)	6” individual Teflon® leads with terminal pins
02	1/2” OD, 2 1/4” long extension leadwire transition (requires table 5 & 6 selections from RTD section)
Head Options	
T	Head mounted transmitter (see instrument section)
I	Stainless steel tags
HS	Wire seal security screws
CT	Ceramic Terminal Block

3 Sanitary Cap Style

CODE	DESCRIPTION
1	16A cap - Bevel Seat [1]
2	16A cap - Bevel Seat with13-H Nut [1]
5	16 AMP cap - Tri-Clamp®
6	3A4 adaptor [1]
7	16AI-14I cap [2]
8	Other (describe)
[1] Must be manually cleaned	[2] Not 3A authorized

General purpose reduced tip CIP sanitary connected RTD temperature sensors are used in food, dairy, beverage, pharmaceutical, and chemical processing applications where sensor corrosion and product contamination are critical factors. The reduced tip construction provides strength along the major sheath length, and faster temperature response times at the reduced tip. The reduced tip sizes listed below are the most common constructions. For other configurations please consult the factory. The sanitary caps listed are those most commonly used in such processes. The sanitary caps are welded to the sheath and to a heavier support tube, all of stainless steel, and then ground and polished to a finish that exceeds No. 4 minimum finish required by the **3-A Sanitary Standard 74-** . Assemblies are supplied with a surface finish that meets or exceeds 32µin R_a. Surface finishes of 15µin R_a or better are available upon request. The process contact surfaces are free of pits, crevices, and pockets thus preventing corrosion and bacteria growth. The three wire constructed sensor assembly consists of a high-accuracy platinum element sealed inside a 316 stainless steel sheath and is provided with a FDA compliant white thermoplastic gasketed connecting head. The complete assembly provides excellent washdown protection. It is recommended that once customer connections are made, the connecting terminals be further protected by applying a coating of moisture-proof sealant over the connections. Sealant products are listed later in this section.

AUTHORIZED
74-



Maximum temperature limit: 204 °C [400 °F]

ORDER CODES

Example Order Number: **R5T185L68R383 - 04 - CIP - 2 - 5 - 63, I**

(1-1 = R5T185L68R383; 1-2 = 04; 2 = CIP; 3 = 2; 4 = 5; 63, I)

1-1 Pt100 (α = 0.003 85 °C^{-1}) RTD Assemblies

CODE		INITIAL ELEMENT ACCURACY @ 0 °C (percentage)	NORMAL SHEATH DIA. OD (inches)	TIP DIAMETER OD (inches)
SINGLE	*DUPLEX*			
RAF185L88R483	RAF285L88R483	± 0.06	1/2	1/4
RAF185L68R383	RAF285L68R383	± 0.06	3/8	3/16
R1T185L88R483	R1T285L88R483	± 0.1	1/2	1/4
R1T185L68R383	R1T285L68R383	± 0.1	3/8	3/16
R3T185L88R483	R3T285L88R483	± 0.03	1/2	1/4
R3T185L68R383	R3T285L68R383	± 0.03	3/8	3/16
R5T185L88R483	R5T285L88R483	± 0.01	1/2	1/4
R5T185L68R383	R5T285L68R383	± 0.01	3/8	3/16
Thermocouple Assemblies				
For CIP thermocouple assemblies use T/C types J, K, T, or E and options G for grounded junction or U for ungrounded junction as per example. EXAMPLE: TP68R38G-04 - CIP - 2 - 5 - 63				

1-2 Immersion Length "X"

Specify "X" length in inches using 2 digits, plus any fractional length desired. Examples: 04 = 4", 05(1/2) = 5.5"

2 Sanitary Cap Size

CODE	TUBE OD (inches)	CODE	TUBE OD (inches)
1	1(1/2)	4	3
2	2	5	Other (specify)
3	2 (1/2)	6	3A4 adapter only

4 Terminations

CODE	DESCRIPTION
91	316L stainless steel head
63	White polypropylene head
62	White polypropylene head DIN, form B
31,W	Aluminum screw cover head with white epoxy coating
22 (06)	6" individual Teflon® leads with terminal pins
02	1/2" OD, 2 1/4" long extension leadwire transition (requires table 5 & 6 selections from RTD section)
Head Options	
T	Head-mounted transmitter (see instrument section)
I	Stainless steel tags
HS	Wire seal security screws
CT	Ceramic terminal block

3 Sanitary Cap Style

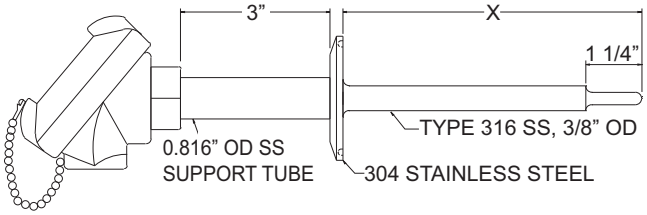
CODE	DESCRIPTION
1	16A cap - Bevel Seat [1]
2	16A cap - Bevel Seat with13-H Nut [1]
5	16 AMP cap - Tri-Clamp®
6	3A4 adaptor [1]
7	16AI-14I cap [2]
8	Other (describe)
[1] Must be manually cleaned [2] Not 3-A authorized	

Configuration Code FD02

Fast Temperature Response RTD's With CIP Fittings

The sensors listed below are sanitary connected RTD temperature sensor assemblies designed to meet the stringent requirements of HTST pasteurization systems. HTST requirements are described in the Grade "A" Milk Pasteurization Ordinance-2001 Revision. The sensors listed on this page have response times below four seconds and come standard in accuracies at 100 ºC [212 ºF] ± 0.5 ºC. The below listed assemblies are available in a variety of sanitary connections. All wetted parts are ground and polished to a finish that exceeds the No. 4 minimum finish required by the 3A Sanitary Standards for Sensors and Sensor Fittings and Connections used on Milk and Milk Product Equipment Standard **74-** . Assemblies are supplied with a surface finish that meets or exceeds 32µin R_a. Surface finishes of 15µin R_a or better are available upon request. The three-wire constructed sensor assembly consists of a high accuracy platinum element sealed inside a 316 stainless steel sheath and a white FDA compliant polypropylene connecting head. The complete assembly provides excellent wash down protection. It is recommended that once customer connections are made, the connecting terminals be further protected by applying a coating of moisture-proof sealant over the connections.

AUTHORIZED
74-



Maximum temperature limit: 204 °C [400 °F]
Pasteurization Test Response Time: 2 to 3 seconds typical

ORDER CODES

Example Order Number:

1-1		1-2			2		3		4
R5T185L68R383	-	**04**	-	**HTST**	**2**	-	**5**	-	**63**

1-1 Pt100 (α = 0.003 85 ºC^{-1}) RTD Assemblies

CODE		INITIAL ELEMENT ACCURACY @ 0 °C (percentage)
SINGLE	*DUPLEX*	
R3T185L68R383	R3T285L68R383	± 0.03
R5T185L68R383	R5T285L68R383	± 0.01

1-2 Immersion Length "X"

Specify "X" length in inches using 2 digits, plus any fractional length desired.
Examples: 04 = 4", 05(1/2) = 5.5"

2 Sanitary Cap Size

CODE	TUBE OD (inches)	CODE	TUBE OD (inches)
1	1(1/2)	4	3
2	2	5	Other (specify)
3	2 (1/2)	6	3A4 adapter only

3 Sanitary Cap Size

CODE	DESCRIPTION
1	16A cap - Bevel Seat [1]
2	16A cap - Bevel Seat with13-H Nut [1]
5	16 AMP cap - Tri-Clamp®
6	3A4 adaptor [1]
7	16AI-14I cap [2]
8	Other (describe)

[1] Must be manually cleaned [2] Not 3-A authorized

4 Terminations

CODE	DESCRIPTION
91	316L stainless steel head
63	White polypropylene head
62	White polypropylene head DIN, form B
31,W	Aluminum screw cover head with white epoxy coating
22 (06)	6" individual Telflon® leads with terminal pins
02	1/2" OD, 2 1/4" long extension leadwire transition (requires table 5 & 6 selections from RTD section)
	Head Options
T	Head-mounted transmitter (see instrument section)
I	Stainless steel tags
HS	Wire seal security screws
CT	Ceramic terminal block

The RTD sensors listed below are constructed with the CIP sanitary connected cap thermowell, which is then mounted into the process with a clamp and mating sanitary cap. A 3-wire spring loaded RTD element and sheath is then screwed into the back of the thermowell. This construction method allows for easy removal of both the well and/or the sensor assembly. The well and sanitary cap in contact with the process are all ground and polished to a finish that exceeds the **3-A Sanitary Standard 74-** . Thermowells are supplied with a surface finish that meets or exceeds 32µin R_a. Surface finishes of 15µin R_a or better are available upon request. The complete assembly provides excellent washdown protection.

AUTHORIZED
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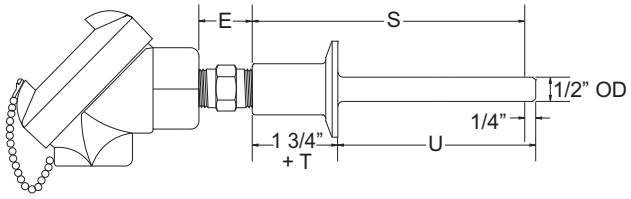


ORDER CODES

Example Order Number: **R5T185L483 - DW4 25 06 09 - SL - 8HN 63**

(1 | 2 | 2-1 | 2-2 | 2-3 | 3 | 4 | 5)

1 Pt100 (α = 0.003 85 °C^{-1}) RTD Assemblies

CODE	INITIAL ELEMENT ACCURACY @ 0 °C (percentage)
SINGLE	
R1T185L483	± 0.1
R3T185L483	± 0.03
R5T185L483	± 0.01
RAF185L483	± 0.06
DUPLEX	
R1T285L483	± 0.1
R3T285L483	± 0.03
R5T285L483	± 0.01
RAF285L483	± 0.06

2 Well Type

CODE	DESCRIPTION
DW4	0.260" bore sanitary well

2.1 Cap Size Style

CODE	DESCRIPTION
15	1", 1 1/2" Triclamp® 16 AMP
25	2" Triclamp® 16 AMP
35	2 1/2" Triclamp® 16 AMP
45	3" Triclamp® 16 AMP
Other styles - sizes available. Consult factory.	

2.2 "S" Length

CODE	DESCRIPTION
XX	Specify length in inches using two digits.

2.3 Well Material

CODE	DESCRIPTION
09	304SS
08	316SS

3 Element Style

CODE	DESCRIPTION
SL	Spring-loaded element

4 Head Mounting Fittings

CODE	DESCRIPTION
8HN	316SS hex fitting
8PN(E)	316SS pipe nipple specify E length

5 Terminations

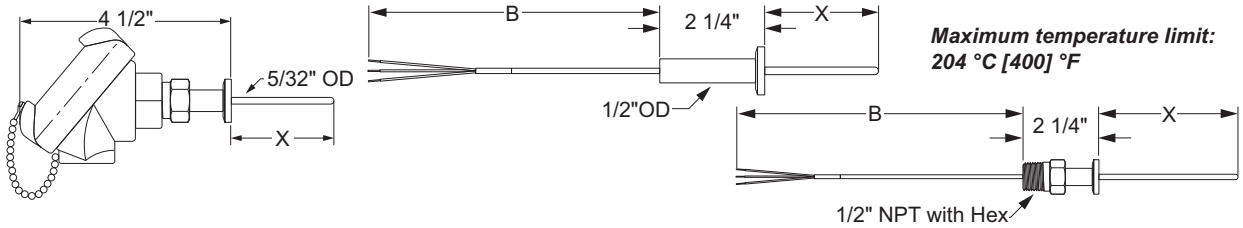
CODE	DESCRIPTION
91	316L stainless steel head
63	White polypropylene head
62	White polypropylene head DIN form B
31,W	Aluminum screw cover head with white epoxy coating
Head Options	
CT	Ceramic terminal block
T	Head-mounted transmitter (see instrument section)
I	Stainless steel tags (specify tag #)

Configuration Code FD04

Miniature Sanitary CIP RTD Sensors

Miniature CIP sanitary RTD temperature sensors are provided with 16AMP sanitary caps to fit 1/2" and 3/4" tube size sanitary fittings. They are used in pharmaceutical, chemical, biotech, R & D laboratory, and food process applications. The sanitary caps are welded to the sheath and to a heavier support tube, all of 316 stainless steel, and then ground and polished to a finish that exceeds the No. 4 minimum finish required by the **3-A Sanitary Standard 74-** . Assemblies are supplied with a surface finish that meets or exceeds 15µin R_a. The process contact surfaces are free of pits, crevices, and pockets thus preventing corrosion and bacteria growth. All leads are Teflon® insulated to further provide moisture and chemical resistance. The listed sheath lengths provide assurance that the sensing element is properly placed in the flowing medium when used with typical sanitary tees and tube fittings, and the small sheath diameter provides fast temperature response times.

3-A® AUTHORIZED 74-



ORDER CODES

Example Order Number: **R1T185L(156)83 - 02 - CIP - 075-5 - 02 - T3T120 - 3**

(1) (2) (3) (4) (5) (6)

1 Pt100 (α = 0.003 85 °C^{-1}) RTD Assemblies

CODE	INITIAL ELEMENT ACCURACY @ 0 °C (percentage)
R1T185L(156)83	± 0.1
R3T185L(156)83	± 0.03
R5T185L(156)83	± 0.01
RAF185L(156)83	± 0.06

2 Immersion Length "X"

Specify "X" length in inches using 2 digits, plus any fractional length desired
Examples: 02 = 2", 02(1/2) = 2.5"

3 16 AMP Sanitary Cap Size

CODE	DESCRIPTION
075-5	1/2", 3/4" 16AMP Cap Tri-Clamp®

4 Terminations

CODE	DESCRIPTION
91	316L stainless steel head
63	White polypropylene head
62	White polypropylene head, DIN form B
31,W	Aluminum screw cover head with white epoxy coating
02	1/2" OD, 2 1/4" long extension leadwire transition (requires table 5 and 6 selection)
8HP	1/2" NPT 316 SS hex fitting for conduit box or head mounting (use w/lead options from Tbl. 5 and 6)
Head Options	
T	Head-Mounted Transmitter (see Instrument Section)

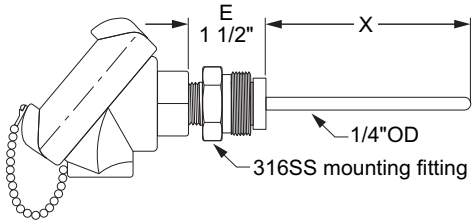
5 Extension Leadwire

CODE[1]	DESCRIPTION	TEMP RATING
T3	Teflon® Insulation - Stranded Conductor	204 °C [400 °F]
T3T	Teflon® Insulation - Stranded Conductor -Flexible Armour - Teflon Coated	204 °C [400 °F]
M3	Teflon® Insulation - Stranded Conductor - Stainless Steel Overbraid - Teflon® Insulation	204 °C [400 °F]
[1] Insert 3 digit "B" dimension in inches.		

6 Lead Terminations

CODE	DESCRIPTION
0	Leads not stripped
2	2" split leads 1/4" stripped
3	2" split leads w/spade lugs
4	Standard plug
6	Miniature plug
Options	
CG	1/2" NPT weatherproof nylon cord grip on Teflon® covered flex. armor
HS	Head supplied with wire seal security screws
I	Stainless steel tags
MC	Mating Connector
CT	Ceramic terminal block

Thermometer replacement RTD temperature sensor assemblies are used when converting instrumentation from older direct reading thermometers to electronic instruments requiring RTD inputs. These RTD assemblies replace the filled system capillary actuating bulbs and will fit into the old existing bulb wells as listed below. These 3-wire constructed sensor assemblies consist of a high-accuracy platinum element sealed inside a spring-loaded 316 stainless steel sheath and is supplied with a FDA compliant white thermoplastic gasketed head. Each sensor is supplied with a free rotating stainless steel mounting fitting with the appropriate threading for the wells listed below.



Maximum temperature limit: 204 °C [400 °F]

ORDER CODES

Example Order Number: **R5T185L483 - 09(1/2) - TR - 63, I**

1 Pt100 (α = 0.003 85 ºC^{-1})
RTD Assemblies

CODE		INITIAL ELEMENT ACCURACY @ 0 °C (percentage)
SINGLE	***DUPLEX***	
R1T185L483	R1T285L483	± 0.1
R3T185L483	R3T285L483	± 0.03
R5T185L483	R5T285L483	± 0.01
RAF185L483	RAF285L483	± 0.06
Thermocouple Assemblies		
For thermocouple assemblies use T/C types J, K, T, or E and options G for grounded junction or U for ungrounded junction as per example. EX.: TP48G - 09 (1/2) - TR - 63.		

2 Immersion Length "X"

Specify "X" length in inches using 2 digits, plus any fractional length desired. Examples: 04 = 4", 05(1/2) = 5.5

3 Terminations

CODE	DESCRIPTION
91	316L stainless steel head
63	White polypropylene head
62	White polypropylene head, DIN Form B
31,W	Aluminum screw cover head with white epoxy coating
Head Options	
T	Head-mounted transmitter (see instrument section)
I	Stainless steel tags
HS	Head supplied w/wire seal security screw
CT	Ceramic terminal block

Immersion Length "X"

"X" IMMERSION LENGTH[1] (inches)	LENGTH AND MOUNTING FITTING TO FIT BELOW LISTED WELL PART NUMBER		MOUNTING FITTING THREAD
	TAYLOR	ANDERSON	
9 (1/2)	26P397	41247	1 (1/4)"-18 UNEF
12 (1/2)	26P398	41279	1 (1/4)"-18 UNEF
11 (1/2)	SK10274	41280	1 (1/4)"-18 UNEF
[1] "X" dimension is with spring in its fully expanded position. Spring will retract 1/2" minimum to 3/4" maximum.			

Sensor Accessories

CODE	DESCRIPTION
440017	1/2 oz. silicone rubber head sealant (RTV)
440040	10cc tube heat transfer compound 149 ºC [300 ºF] max.

Weld - in RTD temperature sensor assemblies listed below are commonly used in the food, dairy, beverage, pharmaceutical, and chemical processing industries. The complete assemblies are provided with a 3-wire platinum RTD element sealed inside a 1/4" OD, spring loaded, stainless steel sheath, and with a heavy wall sanitary protection well. Thermowells are supplied with a surface finish that meets or exceeds 32µin R_a. Surface finishes of 15µin R_a or better are available upon request. The well is to be welded into a tank or vat with a full crevice free fillet-weld to prevent corrosion, bacteria growth, and product contamination. Assemblies are provided with a FDA compliant white thermoplastic gasketed connecting head. The complete assembly provides excellent washdown protection.

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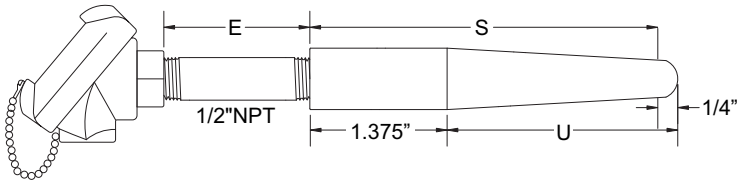


Maximum Temperature Limit: 204 ºC [400 ºF]

ORDER CODES

Example Order Number: **R1T185L483 - W81-18 - SL - 8PN4 - 63**

(1 = R1T185L483, 2 = W81-18, 3 = SL, 4 = 8PN4, 5 = 63)

1 Pt100 (α = 0.003 85 ºC^{-1}) RTD Assemblies

CODE	INITIAL ELEMENT ACCURACY @ 0 °C (percentage)	NORMAL SHEATH DIAMETER OD (inches)
SINGLE		
R1T185L483	± 0.1	1/4
R3T185L483	± 0.03	1/4
R5T185L483	± 0.01	1/4
RAF185L483	± 0.06	1/4
DUPLEX		
R1T285L483	± 0.1	1/4
R3T285L483	± 0.03	1/4
R5T285L483	± 0.01	1/4
RAF285L483	± 0.06	1/4

2 Weld - In Wells

CODE	WELL DIMENSIONS (inches)	
316SS	**S**	**U**
W81-18	8 (1/2)	3 (1/4)
W81-28	10 (1/8)	3 (1/4)
W81-38	11 (7/8)	5
W81-48	13 (1/8)	3 (3/4)

3 Element Style

CODE	DESCRIPTION
SL	Spring-loaded element

4 Head Extensions

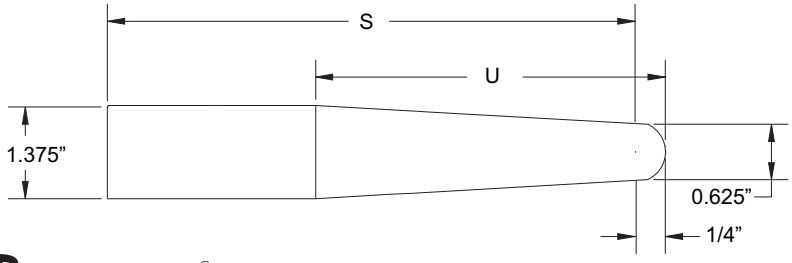
CODE	DESCRIPTION
8HN	316SS 1/2" NPT hex fitting
8PN(E)	316SS pipe nipple (specify length in inches)

5 Terminations

CODE	DESCRIPTION
91	316L stainless steel head
63	White polypropylene head
62	White polypropylene head, DIN Form B
31,W	Aluminum screw cover head with white epoxy coating
Head Options	
T	Head-mounted transmitter (see Instrument Section)
I	Stainless steel tag
CT	Ceramic terminal block

Example Order Number: **W81-18**

PART NUMBER	S LENGTH (inches)	U LENGTH (inches)
W81-18	8 (1/2)	3 (1/4)
W81-28	10 (1/8)	3 (1/4)
W81-38	11 (7/8)	5
W81-48	13 (1/8)	3 (3/4)



Pyromation insertion probes with formed pistol grip handles, are used to measure internal temperature of meat, fish, poultry, and other food products, both fresh and slightly frozen varieties. Other uses include penetration of soft process materials such as rubber and plastic compounds. The materials of construction are all FDA compliant for use in sanitary applications. The sheath tips are made of full hard drawn 304SS hypodermic tubing with a sharp needle point insertion tip. Handles are constructed of formed stainless steel tubing and are available in three size and strength configurations to match the process duty requirements, and all leads are epoxy sealed.

FIGURE 1

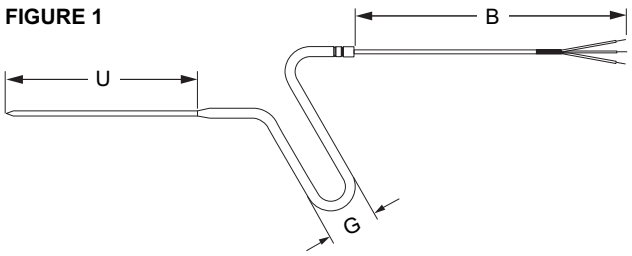
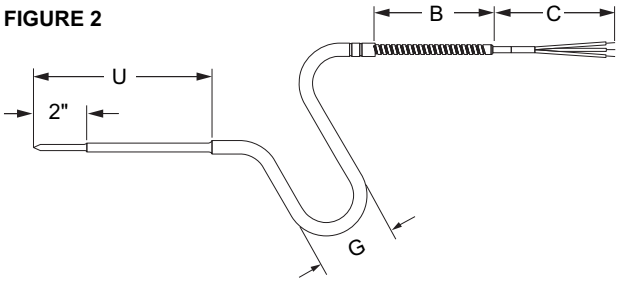


FIGURE 2



ORDER CODES

	1		2		3		4
Example Thermocouple Order Number:	**JPGM2G**	-	**06**	-	**M3036**	-	**4**
Example RTD Order Number:	**RBF185PGM3**	-	**06**	-	**M3120**	-	**2**

1 Penetration Thermocouple

CODE	TIP DIA. (inches)	GRIP 'G' DIM (inches)	GRIP DIA. (inches)
LIGHT DUTY HANDLE			
JPGL2G	0.134" OD	1 1/4	1/4
MEDIUM DUTY HANDLE			
JPGM2G	0.134	2 3/8	5/16
JPGM3G	0.180	2 3/8	5/16
HEAVY DUTY HANDLE			
JPGH3G	0.180	2 3/8	3/8
DUPLEX			
JJPGH3G	0.180	2 3/8	3/8
To specify other calibrations change first digit to K or T. To specify ungrounded junction change last digit from G to U.			

2 Immersion "U" Length

DESCRIPTION
Specify "U" dimension in inches. Using 2 digits, plus any fractional lengths. Examples: 02 = 2", 02(1/2) = 2.5". 12" maximum insertion length.

4 Terminations

CODE	DESCRIPTION
2	2" split leads 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
6	Minature plug
Options	
RB	Rubber boot (2 pin plugs only)
MC	Mating connector
CG	Cord grip (1/2" NPT PVC)

1 Penetration Style 3 Wire RTD's Pt100 (α = 0.003 85 ºC^{-1})

CODE	INITIAL ELEMENT ACCURACY @ 0 ºC (percentage)	TIP DIA. (inches)	GRIP 'G' DIM (inches)	GRIP DIA. (inches)
LIGHT DUTY HANDLE				
RBF185PGL2	± 0.12	0.134	1 1/4	1/4
MEDIUM DUTY HANDLE				
RBF185PGM2	± 0.12	0.134	2 3/8	5/16
RBF185PGM3	± 0.12	0.180	2 3/8	5/16
HEAVY DUTY HANDLE				
RBF185PGH3	± 0.12	0.180	2 3/8	3/8
DUPLEX				
RBF285PGH3	± 0.12	0.180	2 3/8	3/8
Consult factory for other accuracies and types.				

3 Extension Leadwire

CODE[1]	DESCRIPTION	TEMP RATING
T3	Teflon® Insulation - Stranded Conductor	204 °C [400 °F]
T3A	Teflon® Insulation - Stranded Conductor -Flexible Armour	204 °C [400 °F]
T3T	Teflon® Insulation - Stranded Conductor -Flexible Armour - Teflon Coated	204 °C [400 °F]
T3P	Teflon® Insulation - Stranded Conductor -Flexible Armour - PVC Coated	105 °C [221 °F]
M3[2]	Teflon® Insulation - Stranded Conductor -Stainless Steel Overbraid - Teflon® Insulation	204 °C [400 °F]
S3[3]	Teflon® Insulation - Stranded Conductor	204 °C [400 °F]
[1] Insert 3 digit "B" dimension in inches. [2] Not available with Type K. [3] Only available in single 3 wire RTD.		

Insertion RTD probes are used to monitor internal temperatures of meat, fish, poultry, dough, and other food products, both fresh and slightly frozen varieties. Other uses include penetration of soft process materials such as rubber and plastic compounds. The materials of construction are all FDA compliant for use in sanitary applications. The sheaths are made of full hard drawn 304SS, hypodermic tubing with a sharp needle point insertion tip. Several varieties of handles, leadwire, and termination configurations are available. All assemblies are three wire construction and use a 100 ohm platinum element with a ± 0.12% accuracy at 0 °C.

FIGURE #1 Transition Fitting Without Handle

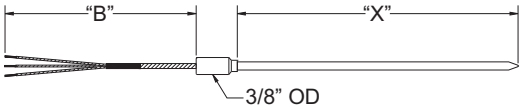
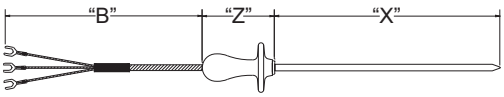


FIGURE #2 PBT Plastic Handle



Maximum temperature on Valox® handle is 275 °F

FIGURE #3 Sabre Handle

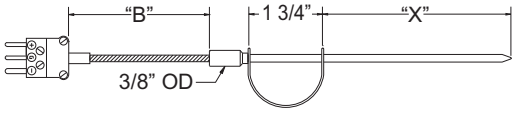
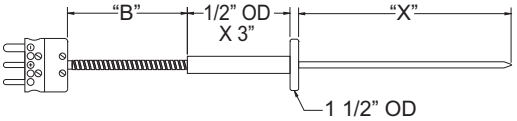


FIGURE #4 Heavy Duty Handle



ORDER CODES

Example Order Number:

1		2		3		4
RBF185MH2	-	**06**	-	**T3120**	-	**4**

1 Pt100 (α = 0.003 85 °C^{-1}) 3 Wire RTD Assemblies

CODE		NOM. SHEATH DIAMETER (inches)
SINGLE	***DUPLEX***	
FIGURE 1 LESS HANDLE		
RBF185LH2		0.134
RBF185LH3	RBF285LH3	0.180
FIGURE 2 MOLDED HANDLE		
RBF185MH2		0.134
RBF185MH3	RBF285MH3	0.180
FIGURE 3 SABRE HANDLE		
RBF185SH2		0.134
RBF185SH3	RBF285SH3	0.180
FIGURE 4 HEAVY DUTY HANDLE		
RBF185HD2		0.134
RBF185HD3	RBF285HD3	0.180

2 Sheath 'X' Dimension

Specify "X" length in inches using 2 digits plus any fractional length. Examples: 02 = 2", 02(1/2)" = 2.5"
12" max. standard construction length.

4 Terminations

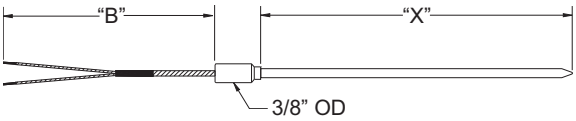
CODE	DESCRIPTION
2	2" split leads 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
6	Miniature plug

3 Extension Leadwire

CODE[1]	DESCRIPTION	TEMP RATING
T3	Teflon® Insulation - Stranded Conductor	204 °C [400 °F]
T3A	Teflon® Insulation - Stranded Conductor -Flexible Armour	204 °C [400 °F]
T3T	Teflon® Insulation - Stranded Conductor -Flexible Armour - Teflon Coated	204 °C [400 °F]
T3P	Teflon® Insulation - Stranded Conductor -Flexible Armour - PVC Coated	105 °C [221 °F]
M3	Teflon® Insulation - Stranded Conductor -Stainless Steel Overbraid - Teflon® Insulation	204 °C [400 °F]
S3	Teflon® Insulation - Stranded Conductor	204 °C [400 °F]
[1] Insert 3 digit "B" dimension in inches.		

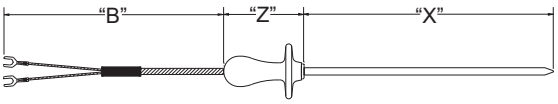
Insertion thermocouple probes are used to monitor internal temperatures of meat, fish, poultry, dough, and other food products, both fresh and slightly frozen varieties. Other uses include penetration of soft process materials such as rubber and plastic compounds. The materials of construction are all FDA compliant for use in sanitary applications. The sheaths are made of full hard drawn 304SS hypodermic tubing with a sharp needle point insertion tip. Several varieties of handles, leadwire, and termination configurations are available. Probes are supplied with grounded hot junctions unless otherwise specified*.

FIGURE #1 TRANSITION FITTING WITHOUT HANDLE



Maximum temperature on Valox® handle is 135 ºC [275 ºF]

FIGURE #2 MOLDED PBT PLASTIC HANDLE



Maximum temperature limit 204 °C [400 °F]

FIGURE #3 SABRE HANDLE

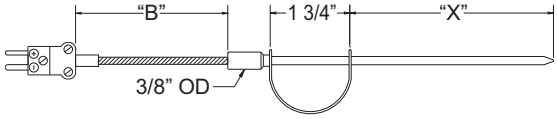
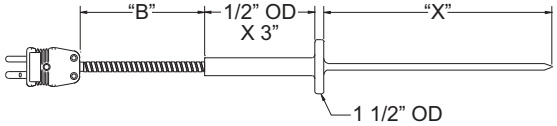


FIGURE #4 HEAVY DUTY HANDLE



ORDER CODES

Example Order Number: 1 **JMH2G** - 2 **06** - 3 **T3120** - 4 **4**

1 Thermocouple Type

CODE		NOM. SHEATH DIAMETER (inches)	
SINGLE	***DUPLEX***		
FIGURE 1 LESS HANDLE			
JLH2G		J	0.134
JLH3G	JJLH3G	J	0.180
FIGURE 2 MOLDED HANDLE			
JMH2G		J	0.134
JMH3G	JJMH3G	J	0.180
FIGURE 3 SABRE HANDLE			
JSH2G		J	0.134
JSH3G	JJSH3G	J	0.180
FIGURE 4 HEAVY DUTY HANDLE			
JHD2G		J	0.134
JHD3G	JJHD3G	J	0.180
To specify other calibrations change first digit to K or T. To specify ungrounded junctions change last digit from G to U.			

4 Terminations

CODE	DESCRIPTION
2	2" split leads 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
6	Miniature plug

3 Extension Leadwire

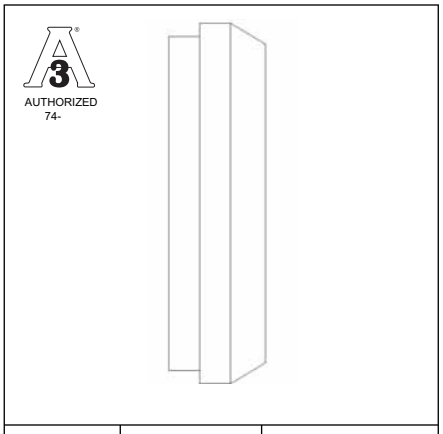
CODE[1]	DESCRIPTION	TEMP RATING
T3	Teflon® Insulation - Stranded Conductor	204 °C [400 °F]
T3A	Teflon® Insulation - Stranded Conductor -Flexible Armor	204 °C [400 °F]
T3T	Teflon® Insulation - Stranded Conductor -Flexible Armor - Teflon Coated	204 °C [400 °F]
T3P	Teflon® Insulation - Stranded Conductor -Flexible Armor - PVC Coated	105 °C [221 °F]
M3	Teflon® Insulation - Stranded Conductor -Stainless Steel Overbraid -Teflon® Insulation	204 °C [400 °F]
[1] Insert 3 digit "B" dimension in inches. [2] Not available with Type K.		

2 Sheath "X" Dimension

Specify "X" length in inches using 2 digits.
12" max. standard construction length.

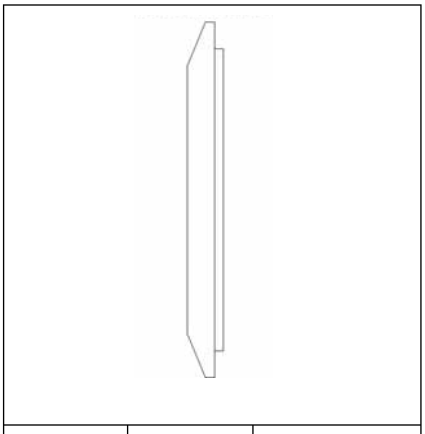
CIP Sanitary End Cap Dimensions

16A Bevel Seat*



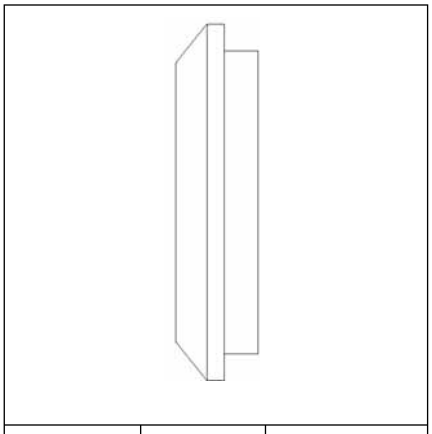
TUBE SIZE	O.D. (inches)	THICKNESS (inches)
1	1.31	0.46
1 1/2	1.84	0.56
2	2.37	0.62
2 1/2	2.90	0.66
3	3.43	0.71
4	4.50	0.81
Must be manually cleaned		

16AH H-Line



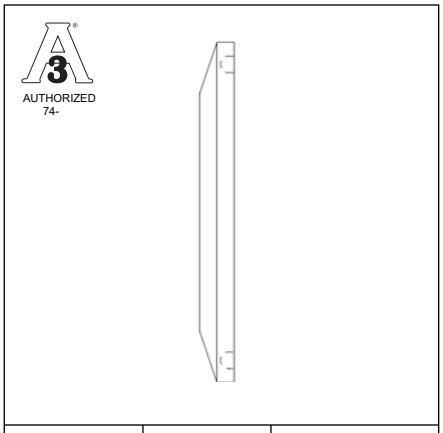
TUBE SIZE	O.D. (inches)	THICKNESS (inches)
1 1/2	2.00	0.250
2	2.50	0.250
2 1/2	3.03	0.250
3	3.56	0.250
4	4.68	0.250

16AI - 14I



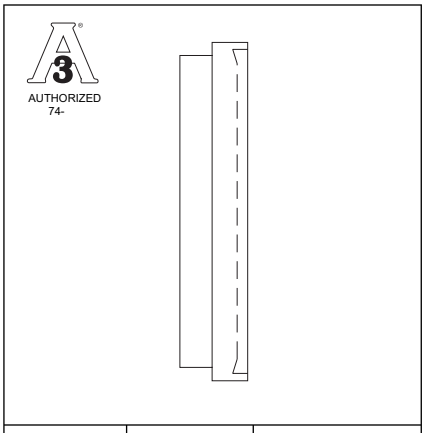
TUBE SIZE	O.D. (inches)	THICKNESS (inches)
1 or 1 1/2	2.00	0.50
2	2.65	0.56
2 1/2	3.12	0.56
3	3.87	0.75
4	4.87	0.75

16AMP



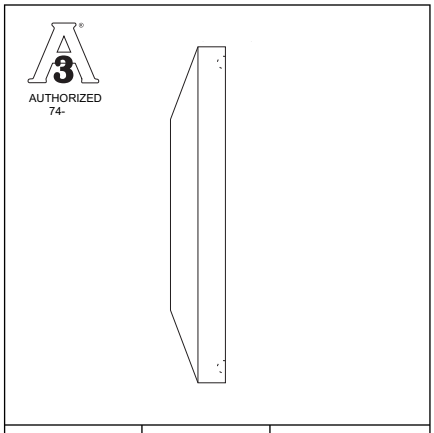
TUBE SIZE	O.D. (inches)	THICKNESS (inches)
1/2 or 3/4	1.00	0.25
1 or 1 1/2	1.98	0.25
2	2.51	0.25
2 1/2	3.03	0.25
3	3.57	0.25
4	4.68	0.31

16APV



TUBE SIZE	O.D. (inches)	THICKNESS (inches)
1	1.38	0.29
1 1/2	1.88	0.42
2	2.38	0.46
2 1/2	2.88	0.47
3	3.38	0.50
4	4.38	0.53

16AQ - 14Q

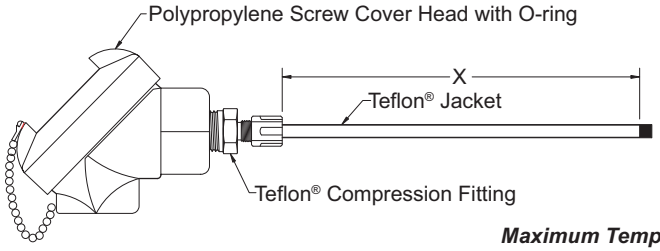


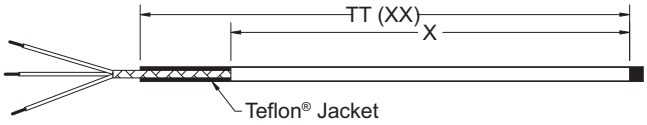
TUBE SIZE	O.D. (inches)	THICKNESS (inches)
1 or 1 1/2	1.98	0.31
2	2.64	0.43
2 1/2	3.30	9.50
3	3.87	0.50
4	4.87	0.62

Special Purpose

Configuration Code SP01
Teflon Coated Thermocouple Assemblies
Configuration Code SP02
Teflon Coated RTD Assemblies

The assemblies listed below are designed for a broad range of applications that require resistance to corrosion and chemical attack. They provide very good temperature measurement and service life in plating, pickeling, and acid bath applications. The stainless steel sheath is coated with FEP Teflon® and includes a fused Teflon® tip for excellent corrosion resistance.





Maximum Temperature Rating 400 °F

ORDER CODES

Example Order Number:

1		2		3		4		5		6
JP38UT	-	012	-	00	-	TT(36)	-	T3072	-	4

1 Thermocouple Types

CODE	T/C TYPE	SHEATH OD (inches)
JP38UT	J	3/16
JP48UT	J	1/4
KP38UT	K	3/16
KP48UT	K	1/4
TP38UT	T	3/16
TP48UT	T	1/4
For grounded hot junctions substitute the letter 'G' in place of the 'U' above.		

1-2 100 OHM Platinum RTD

α = 0.003 85 °C^{-1}
Initial Element Accuracy @ 0 °C ± 0.12%

CODE	LEADS	SHEATH OD (inches)
RBF185L383T	3	3/16
RBF185L483T	3	1/4

2 'X' Dimension

Insert 3 Digit Sheath Length (X dimension) in Inches.

3 Sheath Mountings

CODE	DESCRIPTION
00	No fitting

Re-Adjustable Compression Fittings

CODE	DESCRIPTION	NPT SIZE (inches)	AVAILABLE SHEATH DIAMETERS (inches)
10A	303 stainless steel	1/8	3/16
10B	303 stainless steel	1/4	1/4
10C	303 stainless steel	1/2	1/4
56B	Teflon®	1/4	1/4
56C	Teflon®	1/2	1/4

6 Leadwire Terminations

CODE	DESCRIPTION
0	No termination
2	2" split leads, 1/4" stripped
3	2" split leads with spade lugs
4	Standard plug
6	Miniature plug
Options	
MC	Mating connector
RB	Rubber boot

5 Extension Leadwire

CODE	DESCRIPTION
T1	Teflon® insulation - solid conductor (available in thermocouples only)
T3	Teflon® insulation - stranded conductor

4 Head Terminations

CODE	DESCRIPTION
8HN63	White polypropylene head with 1/2"NPT stainless steel hex mounting fitting
9HP63	White polypropylene head with 1/2"NPT bushing holding head to sheath
56CF63	White polypropylene head with Teflon® compression fitting holding head to sheath

4-1 Sheath Terminations

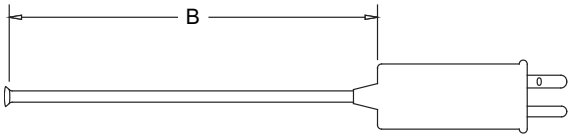
CODE	DESCRIPTION
4	Standard plug
5	Standard jack
Options	
MC	Mating connector
RB	Rubber boot

4-2 Leadwire Transitions

CODE	DESCRIPTION
TT	Teflon® coating both sheath and leads (specify total length of Teflon® coating) Example: TT(36)
15	Extension leadwire transition with relief spring
16	Extension leadwire transition with heat shrink tubing

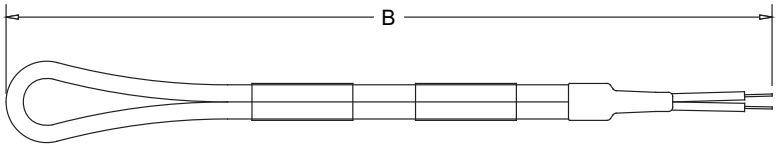
The thermocouples listed below are designed for a broad range use in applications that require resistance to corrosion and chemical attack. They provide very good temperature measurement and service life in plating, pickling, and acid bath application. The Teflon® and Tygon® assemblies provide excellent resistance to strong acids, alkalines, and saline solutions. Teflon® is a FDA compliant material, while the Tygon® should not be used with foods, beverages, or drugs. Tygon® provides very poor resistance to organic solvents and should not be used in a solvent application.

TYG TYGON ASSEMBLY



TEF TEFLON ASSEMBLY

FEP TEFLON ASSEMBLY



ORDER CODES

Example Order Number:

1-1	1-2		2		3	
J4	**TEF**	**-**	**072**	**-**	**4,**	**RB**

1-1 Thermocouple Type

CODE	DESCRIPTION
J4	Type J
K4	Type K
T4	Type T

2 Length

3 Digit “B” Length in Inches.

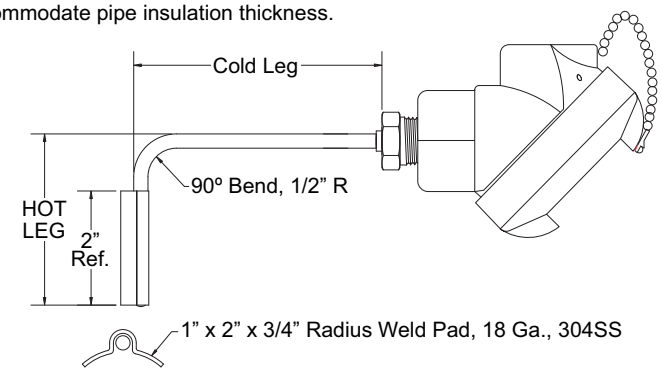
3 Terminations

CODE	DESCRIPTION
2	2” split leads, 1/4” stripped
3	2” split leads with spade lugs
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
Options	
MC	Mating connector
CG	Cord grip (1/2” NPT PVC)
RB	Rubber boot
SP	Solid pin plug

1-2 Outer Tubing

CODE	DESCRIPTION	TEMPERATURE RATING
TEF	Teflon®	204 ºC [400 ºF]
TYG	TR-3400 Tygon®	74 ºC [165 ºF]
FEP	Teflon®	260 ºC [500 ºF]

Heat tracing temperature sensors are for use in systems that measure the surface temperature of process pipe that is carrying products whose temperatures must be controlled to prevent freeze-up or to maintain a viscosity level so that the inner medium will flow. These sensors are offered with either Thermocouple or RTD sensing elements inside 316SS sheaths, and with radiused stainless steel mounting pads. Cold legs are available in customer-specified lengths to accommodate pipe insulation thickness.



ORDER CODES

Example Order Number:

1-1	1-2		3		4		5	5-1
RBF185L483	-	HT	-	0304	-	18RD	-	31,	I

1-1 Thermocouple Styles

CODE	T/C TYPE	HOT JUNCTION STYLE	SHEATH INSULATION
JP48G	J	Grounded	Fiberglass
KP48G	K	Grounded	Fiberglass
TP48G	T	Grounded	Fiberglass
EP48G	E	Grounded	Fiberglass
For ungrounded hot junctions substitute the letter "U" in place of the "G" above.			

1-2 100 Ohm Platinum 3 Wire RTD Styles

α = 0.003 85 ºC^{-1}

CODE	INITIAL ELEMENT ACCURACY @ 0 ºC (percentage)	MAX. TEMP RATING	INSULATION TYPE
RBF185L483	± 0.12	204 ºC [400 °F]	Teflon®
RBF185M483	± 0.12	482 ºC [900 °F]	Fiberglass
R1T185H483	± 0.1	593 ºC [1100 °F]	MgO

3 Sheath Lengths

CODE	HOT LEG (inches)	COLD LEG (inches)
0304	3	4
0306	3	6
0308	3	8
Consult factory for other hot leg lengths or cold leg lengths.		

4 Radius Mounting Pads

1" W x 2 1/4" L x 18 Ga. 304 SS

CODE	RADIUS (inches)	NPT PIPE SIZE (inches)
18RD	3/4	1 1/2
Mounting pad is flexible enough to be formed around pipe sizes from 1" to 12" NPT pipe.		

5 Standard Head Terminations

CODE	DESCRIPTION
31	Aluminum screw cover head
34	Cast iron screw cover head
49	Flip top aluminum head
53	Grey Delrin® screw cover head
62	White DIN form B polypropylene head
63	White polypropylene head
71	Cast iron/aluminum explosion proof head Group C
72	DIN form B aluminum explosion proof head Group B
81	316 LSS explosion proof head Group C
82	DIN form B 316SS explosion proof head Group B
91	316 LSS head
92	DIN form B 316SS head

5-1 Standard Head Options

CODE	DESCRIPTION
BX	Box connector
CG	Nylon cord grip
CT	Ceramic terminal block
GS	Ground screw
I	Stainless steel tag
NB	1/2" NPT nylon conduit reducer bushing
SB	1/2" NPT conduit reducer bushing
T-440[1]	4-20 mA head mounted RTD transmitter (see instrument section)
T-441[2]	4-20 mA isolated head mounted transmitter (see instrument section)
T-442[2]	4-20 mA Hart® isolated head mounted transmitter (see instrument section)
[1] Not available with option 62, 72, 82, 92 [2] Available with option 31, 62, 72, 82, 92 only	

The hardened tip aggregate temperature sensor assemblies illustrated in Figures 1, 2, and 3 below are typically used to measure the temperature of severely abrasive materials found in asphalt aggregate mixers and in other granular material mixing and drying processes. Three styles of hardened tip constructions are offered to resist destructive abrasion and wear. Figure 4 illustrates an open end tube style thermocouple assembly used to measure the temperature of hot sand and other similar free flowing materials on conveyors, or at drop chutes, where abrasion is not as severe, but where product temperature response time is important.

FIG. 1 FLAME SPRAYED TUNGSTEN CARBIDE TIP

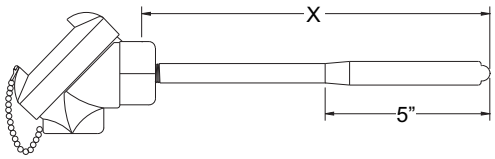


FIG. 2 RUGGEDIZED BULLET NOSED HARDENED TOOL STEEL WITH CARBIDE TIP

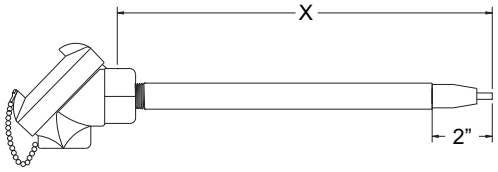


FIG. 3 SMALL DIAMETER HEAVY WALL TUBE WITH CARBIDE TIP

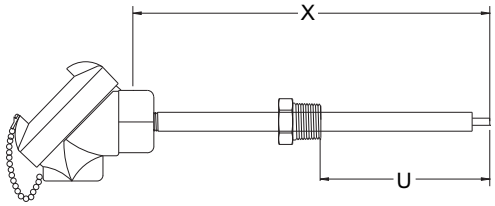
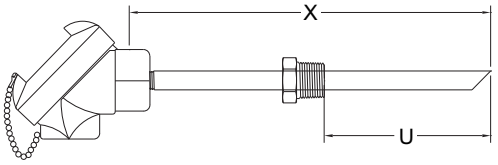


FIG. 4 BEVELED TIP OPEN END TIP



ORDER CODES

Example Order Number: 1 **J29GA1** - 2 **18** - 3 **6D12** - 4 **31**

1 Thermocouple Styles

CODE	T/C TYPE	NOM.TUBE DIA. (inches)	MEASURING TIP CONSTRUCTION	FIG. NO.
J29GA1	J	0.540	Flame sprayed tungsten carbide	1
J29GA2	J	0.840	Tool steel with carbide tip	2
J29GA3	J	0.540	Carbide tip	3
J14CS	J	0.540	Open end tube	4
For ungrounded junctions, change ‘G’ in above order code to ‘U’. Consult factory for availability of other thermocouple types and duplex elements.				

2 Length ‘X’

CODE	LENGTH (inches)	CODE	LENGTH (inches)
12	12	20	20
14	14	24	24
18	18	Specify other lengths	

4 Head Terminations

CODE	DESCRIPTION
22[1]	3” individual leads with terminal pins
31	Aluminum screw cover head
34	Cast iron screw cover head
49	Flip-top aluminum head
91	316L stainless steel screw cover head
[1] Not available with J14CS Series	

3 Options

CODE	DESCRIPTION
6C(U)	1/2” NPT steel bushing (for use with figures 1, 3, and 4 only)
6D(U)	3/4” NPT welded steel bushing
6E(U)	1” NPT welded steel bushing
H	Adjustable steel mounting flange
Substitute length in inches from hot tip to bottom of bushing for ‘U’ above	

The below illustrated thermocouples are most commonly used in the mixing of rubber compounds and other abrasive substances. All standard thermocouples are individually tested to meet or surpass the Industry Time Response Test Standard. Thermocouple sensors are supplied with grounded hot junctions as standard. Thermocouples may be ordered with a choice of either a hard-chrome plated tip, or with a XH-5 coated tip that provides greater abrasion and wear resistance.

FIGURE 1

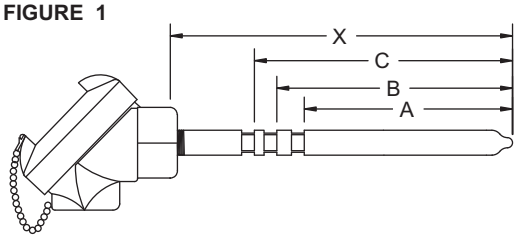


FIGURE 2

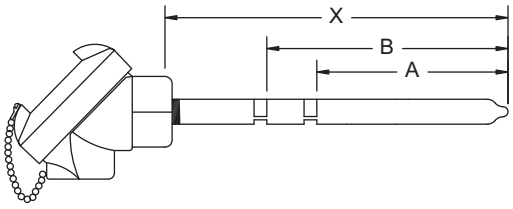


FIGURE 3

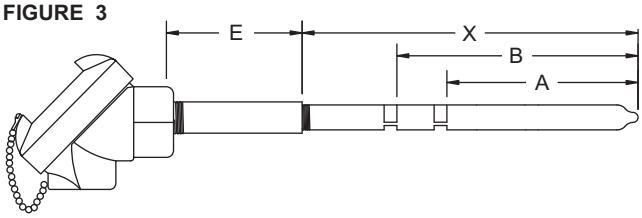
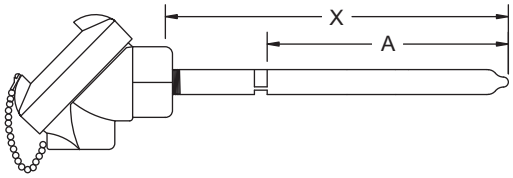


FIGURE 4



All mill slots are 5/16" wide. Abrasion resistant tips are 0.625" OD x 2 1/2" long.

ORDER CODES

Example Order Number: **J050G - CM - 10 - 31** (1 - 2 - 3)

1 Measuring Element

CODE		ELEMENT TYPE
SINGLE	*DUPLEX*	
J050G	JJ050G	Type J thermocouple
To order type K thermocouple replace 'J' in the above order code with desired (K).		

3 Termination Options

CODE	ELEMENT TYPE
31	Aluminum screw cover head
49	Aluminum flip-top head
[1]K1_ _ _	Kapton® - solid conductor
[1] Specify lead length in inches using 3 digits.	

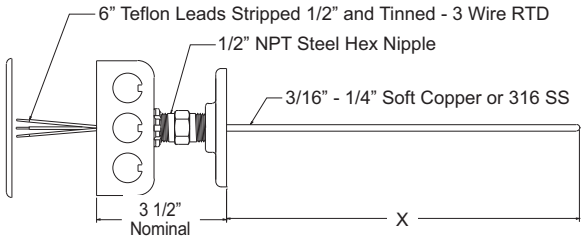
2 Mounting Configuration

CODE		MOUNTING NOTCH CONFIGURATION	TYPICAL APPLICATION BY MIXER MODELS	FIG. NO.
HARD CHROME PLATED TIP	XH-5 COATED TIP			
10	12	3 notch (square)	11D, F80, 9D, 3D	1
20	22	2 notch (triangular)	F270, F620	2
20E	22E	2 notch (triangular) w/ nipple extension	F370, F620	3
40	42	1 notch (triangular)	F270	4
90	92	2 notch (triangular)		2
Applications are typical but may vary by machine.				

Critical Sensor Dimensions

MOUNTING CONFIG. CODE	FIG. NO.	DIMENSIONS (inches)				
		A	B	C	X	E
10 or 12	1	9 1/16	9 13/16	10 5/16	13	
20 or 22	2	13 31/32	15 31/32		18	
20E or 22E	3	13 31/32	15 31/32		17 5/8	5
40 or 42	4	10 7/32			12	
90 or 92	2	13 15/32	15 15/32		18	
All notches are 5/16" wide (nominal)						

The averaging RTD sensors listed below measure the temperature over the entire sheath length to provide an average temperature measurement of the cross sectional area of air ducts, room gradient temperatures, and other low temperature averaging applications. The sensing element has a resistance output that conforms to a 100 Ω platinum element with a 0.003 85 $ºC^{-1}$ temperature coefficient within a measurement range of (0 to 100) ºC [32 to 212] ºF. The RTD sensors are available in copper or 316 stainless steel sheath materials and can be supplied in various lengths up to 828 inches. All RTD sensors 48 inches and longer will be shipped in a coiled configuration. The sensors on this page can be provided with a (4 to 20) mA Transmitter integrally mounted inside the available enclosures.



Maximum temperature rating 200 ºF

ORDER CODES

Example Order Number:

1	2		3		4	5	
2290L	**4(23)3**	**-**	**120**	**-**	**8HN**	**47,**	**HT**

1 RTD Averaging Sensor

CODE	DESCRIPTION
2290L	3 wire continuous averaging RTD sensor

2 Sheath Material and Diameter

CODE	DESCRIPTION	
	DIAMETER (inches)	MATERIAL
3(23)3	3/16	Copper
4(23)3	1/4	Copper
383	3/16	316 SS
483	1/4	316 SS

3 Length

AVAIL. LENGTHS (inches)	DIAMETER OD (inches)	BENDABILITY
12	3/16, 1/4	Rigid
24	3/16, 1/4	Rigid
36	3/16, 1/4	Rigid
37 to 324	3/16, 1/4	Bendable
325 to 828	1/4	Bendable
Specify length in inches using 3 digits.		

Initial averaging RTD accuracy calculation: ± [1.3 + 0.005 |t|] ºC
|t| = Value of temperature without regard to sign, ºC

TEMPERATURE	ºC	ºF	TEMPERATURE	ºC	ºF
0 ºC [32 ºF]	1.3	2.3	60 ºC [140 ºF]	1.6	2.9
20 ºC [68 ºF]	1.4	2.5	80 ºC [176 ºF]	1.7	3.1
40 ºC [104 ºF]	1.5	2.7	100 ºC [212 ºF]	1.8	3.2

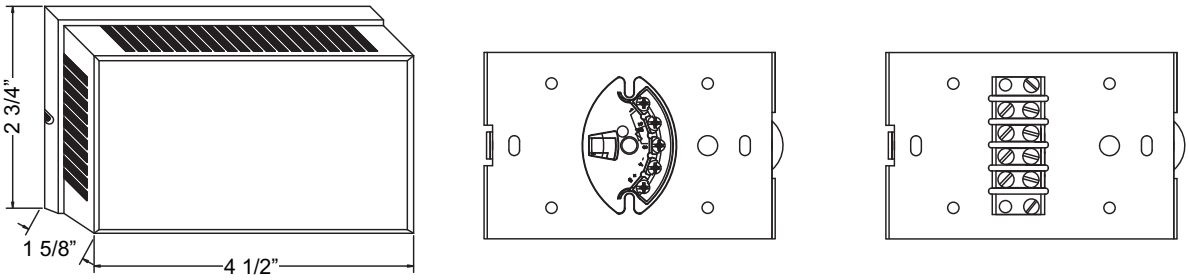
4 Head Mounting Fittings

CODE	DESCRIPTION
8HN	1/2" x 1/2" NPT stainless steel hex nipple
6HN	1/2" x 1/2" NPT steel hex nipple

5 Terminations

CODE	DESCRIPTION
22(06)	6" individual Teflon® leads with terminal pins
31	Aluminum screw cover head
49	Flip top aluminum head
47	2" x 4" electrical handibox
Options	
HT	Floor flange threaded on hex
T-440	4-20 mA head mounted transmitter (see instrument section)

The Pyromation thermostat temperature sensors are provided with the sensor, or the sensor and a (4 to 20) mA temperature transmitter, mounted on a subplate within a standard size thermostat housing. The thermostat housing measures 2 3/4"h x 4 1/2"w x 1 5/8"d and can be mounted either horizontally or vertically on a 2" x 4" electrical handibox. The cover is vented on two sides to provide for airflow over the sensing element, regardless of mounting position. The standard temperature sensing elements are available as a Teflon® insulated thermocouple or a three wire RTD. Matching transmitters are available for all configurations and output ranges.



ORDER CODES

Example Order Number: **2215-RBF185L3 - T**

Thermostat Housings

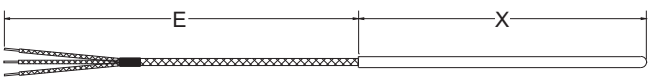
CODE	DESCRIPTION
2215 - RBF185L3	Thermostat housing with integral 100 Ω platinum RTD 0.003 85 0 $°C^{-1}$ temperature coefficient
2215 - (J, K, T, E)	Thermostat housing with integral thermocouple element
2415	Thermostat housing with base plate and 4 position terminal strip - no sensing element

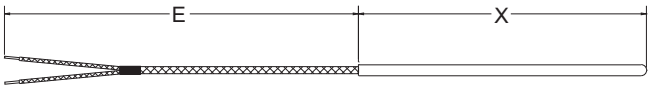
Option

CODE	DESCRIPTION
T-440	4-20 mA RTD transmitter mounted in housing with sensor (see instrument section)
T-441	4-20 mA isolated transmitter mounted in housing with sensor (see instrument section)

Configuration Code SP08
Variable Length RTD Elements

The sensing elements listed on this page can be cut to any desired length over 3 inches long by using an ordinary tubing cutter. All sheaths are provided in 316 stainless steel.





ORDER CODES

Example Order Number: **R1T185L48 | 3 - 12 - VCL - T3012 - 2**

(1 = R1T185L48 | 1-2 = 3 | 2 = 12 | 3 = VCL - T3012 - 2)

1 3 Wire RTD Assemblies Pt100 α = 0.003 85 ºC^{-1}

CODE		INITIAL ELEMENT ACCURACY @ 0 ºC (percentage)	SHEATH DIAMETER OD (inches)
SINGLE	*DUPLEX*		
RBF185L483	RBF285L483	± 0.12	1/4
R1T185L483	R1T285L483	± 0.1	1/4
RBF185L683	RBF285L683	± 0.12	3/8
R1T185L683	R1T285L683	± 0.1	3/8
Consult factory for other RTD elements.			

3 RTD Extension Leadwire

CODE[1]	DESCRIPTION	TEMP. RATING
T3J _ _ _	Teflon® insulation - individual leads stranded conductor (12" limit)	204 ºC [400 °F]
T3 _ _ _	Teflon® insulation - stranded conductor	204 ºC [400 °F]
Leads supplied stripped and tinned 1/2" [1] Insert wire code number and 3 digit 'E' length code in inches		

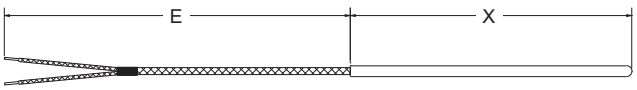
2 Sheath X Length

Specify 'X' Length in Inches Using (3) Digits

Configuration Code SP10
Variable Length Thermocouple Elements

ORDER CODES

Maximum T/C Temperature Limits:
Fiberglass insulated lead style: 482 °C [900 °F]
Teflon® insulated lead style: 204 °C [400 °F]



Example Order Number: **JP48 G - 06 - VCL - T1012 - 2**

(1-1 = JP48 | 1-2 = G | 2 = 06 - VCL | 3 = T1012 - 2)

1-1 Thermocouple Assemblies

CODE		T/C TYPE	SHEATH DIAMETER OD (inches)
SINGLE	*DUPLEX*		
JP48	JJP48	J	1/4
KP48	KKP48	K	1/4
TP48	TTP48	T	1/4
EP48	EEP48	E	1/4
JP68	JJP68	J	3/8
KP68	KKP68	K	3/8
TP68	TTP68	T	3/8
EP68	EEP68	E	3/8

1-2 Hot Junction

CODE	DESCRIPTION
G	Grounded
U	Ungrounded

3 Thermocouple Extension Leadwire

CODE[1]	DESCRIPTION	INSUL. TEMP. LIMIT
F1 _ _ _	Fiberglass insulation - solid conductor	482 ºC [900 °F]
T1 _ _ _	Teflon® insulation - solid conductor	204 ºC [400 °F]
Leads supplied split 2", 1/4" stripped [1] Insert wire code number and 3 digit "E" length code in inches		

2 Sheath X Length

Specify 'X' Length in Inches Using (2) Digits

ANSI LIMITS of ERROR

Unless otherwise specified, all thermocouple wire and extension wire is supplied to meet either Standard or Special Limits of Error per ASTM/ ANSI E - 230.

The Standard and Special Limits of Error for thermocouple and extension wires are given in the accompanying tables.

Where Limits of Error are given in percent, the percentage applies to the temperature being measured.

Limits of Error for Thermocouples and Thermocouple Wire
Reference Junction 0 °C [32 °F]

T/C TYPE	TEMPERATURE RANGE	LIMITS OF ERROR	
		STANDARD	SPECIAL
T	(0 to 133) °C [32 to 270] °F (133 to 350) °C [270 to 662] °F	± 1 °C [2 °F] ± 0.75%	± 0.5 °C [1 °F] ± 0.4%
J	(0 to 293) °C [32 to 559] °F (293 to 750) °C [559 to 1382] °F	± 2.2 °C [4 °F] ± 0.75%	± 1.1 °C [2 °F] ± 0.4%
E	(0 to 340) °C [32 to 644] °F (340 to 900) °C [644 to 1652] °F	± 1.7 °C [3 °F] ± 0.5%	± 1 °C [2 °F] ± 0.4%
K	(0 to 293) °C [32 to 559] °F (293 to 1250) °C [559 to 2282] °F	± 2.2 °C [4 °F] ± 0.75%	± 1.1 °C [2 °F] ± 0.4%
N	(0 to 293) °C [32 to 559] °F (0 to 1250) °C [559 to 2282] °F	± 2.2 °C [4 °F] ± 0.75%	± 1.1 °C [2 °F] ± 0.4%
R, S	(0 to 600) °C [32 to 1112] °F (600 to 1450) °C [1112 to 2642] °F	± 1.5 °C [3 °F] ± 0.25%	± 0.6 °C [1 °F] ± 0.1%
B	(870 to 1700) °C [1598 to 3092] °F	± 0.5%	
T[1]	(-200 to -66) °C [-328 to -87] °F (-66 to 0) °C [-87 to + 32] °F	± 1 °C [2 °F] ± 1.5%	
E[1]	(-200 to -100) °C [-328 to -148] °F (-100 to 0) °C [- 148 to 32] °F	± 1.1 °C [3 °F] ± 1%	
K[1]	(-200 to -110) °C [-328 to -166] °F (-110 to 0) °C [-166 to 32] °F	± 2.2 °C [4 °F] ± 2%	

[1] Thermocouples and thermocouple materials are normally supplied to meet the limits of error specified in the table for temperatures above 0 °C [32 °F]. The same materials, however, may not fall within the sub-zero limits of error given in the second section of the table. If materials are required to meet the sub-zero limits, the purchase order must so state. Selection of materials usually will be required. Little information is available to justify establishing special limits of error for sub-zero temperatures. Limited experience suggest the following limits for types E and T thermocouples:

Type E	(-200 to 0) °C [-328 to 32] °F
Type T	(-200 to 0) °C [-328 to 32] °F

These limits are given only as a guide for information purposes. Due to the characteristics of the materials, sub-zero limits of error for type J thermocouples and special sub-zero limits for type K thermocouples are not listed.

Limits of Error for Thermocouple Extension Wire
Reference Junction 0 °C [32 °F]

EXT. WIRE TYPE	TEMPERATURE RANGE	LIMITS OF ERROR	
		STANDARD	SPECIAL
KX	(0 to 200) °C [32 to 392] °F	± 2.2 °C [4 °F]	
JX	(0 to 200) °C [32 to 392] °F	± 2.2 °C [4 °F]	± 1.1 °C [2 °F]
EX	(0 to 200) °C [32 to 392] °F	± 1.7 °C [3 °F]	
TX	(0 to 100) °C [32 to 212] °F	± 1.0 °C [2 °F]	± 0.5 °C [1 °F]
NX	(0 to 200) °C [32 to 392] °F	± 2.2 °C [4 °F]	

Limits of Error for Thermocouple Compensating Extension Wire Reference Junction 0 °C [32 °F]

T/C TYPE	COMPENSATION WIRE TYPE	TEMPERATURE RANGE	LIMITS OF ERROR[1]
R, S	SX§	(0 to 200) °C [32 to 392] °F	± 5 °C [9 °F]
B	BX#	(0 to 100) °C [32 to 212] °F	0 °C [0 °F] -3.7 °C [- 6 °F]

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

WIRE TYPE	MEASURING JUNCTION TEMPERATURE
SX	Greater than 870 °C [1598] °F
BX	Greater than 1000 °C [1832] °F

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

Copper versus copper compensating extension wire, usable to 100 °C [212 °F] with maximum errors as indicated, but with no significant error 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[1].

Calibrating, Checking, and Tagging

Pyromation thermocouple wire and extension wire is available calibrated, "checked and tagged" when so specified, at an extra charge. Wires of this classification are within the Standard Limits of Error but, most important, their specific departure at temperatures specified is known and can be taken into account. Each thermocouple, coil, reel, or spool of wire is checked and tagged to show the departure from the curve. Single conductors will be calibrated to show their emf values versus pure platinum, with a 0 °C [32 °F] reference junction unless otherwise specified. Thermocouples and wire sample sent to the factory for evaluation must be at least 36" long.

Temperature range for all checking and selecting is from 0 °C [32 °F] to 1371 °C [2500 °F], depending on type and gauge of wire. Sub-zero checking to -79 °C [-110 °F] and high temperature rising from 1371 °F [2500 °F] to 1649 °C [3000 °F] is available. Calibration can also be accomplished at standard check points such as boiling points of helium, oxygen, and nitrogen.

SHIPPING

Each coil or spool is marked with its exact length, however Pyromation reserves the right to ship plus or minus 10% of the total amount of either standard or special wire ordered.

ASTM/ANSI LETTER DESIGNATIONS

Thermocouple and extension wires are now generally ordered and specified by ASTM/ANSI designations for calibration. Popular generic and trade name examples are Chromel/Alumel-ASTM/ANSI Type K; Iron/Constantan-ASTM/ANSI Type J; Copper/Constantan-ASTM/ANSI Type T; Chromel/Constantan-ASTM/ANSI Type E; Nicrosil/Nisil-ASTM/ANSI Type N; Platinum/Platinum 10% Rhodium-ASTM/ANSI Type S; Platinum/Platinum 13% Rhodium-ASTM/ANSI Type R; and Platinum 6% Rhodium/Platinum 30% Rhodium-ASTM/ANSI Type B. Positive and negative legs are identified by the appropriate letter suffixes P and N, respectively. Those not familiar with this system will find this table helpful.

ANSI Letter Designations	Generic or Trade Names
JP	Iron
JN, EN, or TN	Constantan, Cupron®, Advance
TP	Copper
KP or EP	Chromel®, Tophel®, T1
NP	Nicrosil
KN	Alumel®, Nial®, T2
NN	Nisil
RP	Platinum 13% Rhodium
SP	Platinum 10% Rhodium
RN or SN	Pure Platinum
BN	Platinum 6% Rhodium
BP	Platinum 30% Rhodium

COLOR CODING

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

ASTM/ANSI TYPE		MAGNETIC		ASTM/ANSI COLOR CODE		
T/C	Sgl.	Yes	No	Sgl.	Overall Extension Wire	Overall T/C Wire
T	TP TN		X X	Blue Red	Blue	Brown
J	JP JN	X	 X	White Red	Black	Brown
E	EP EN		X X	Purple Red	Purple	Brown
K	KP KN	X	X	Yellow Red	Yellow	Brown
N	NP NN		X X	Orange Red	Orange	Brown
R, S	RP, SP RN, SN		X X	Black Red	Green	
B	BP BN		X X	Grey Red	Grey	

SOLID and STRANDED CONDUCTORS

Thermocouple wire and extension wire are usually solid conductors. When greater flexibility is required, either are available in stranded construction. The accompanying table gives the stranding combinations used in Pyromation wire. However, other stranding combinations may be ordered to suit requirements.

STRANDING COMBINATIONS

CONDUCTOR		STRANDING	
GAUGE	I.S.I. 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

STOCK INSULATED WIRE

'Stocked' insulated thermocouple and extension wire, as indicated in the catalog pages, is available in the following "standard packaging": 50 ft. coils - 100 ft. coils - 250 ft. spools - 500 ft. spools - 1,000 ft. spools. Coils or spools of less than 1,000 ft. packaged in non-standard lengths, are available at an additional charge and may result in a delay in shipment. Spools or reels of over 1,000 ft. can be supplied at no extra charge, but may also result in a delay in shipment.

NON-STOCK INSULATED WIRE

'Non-stocked' insulated thermocouple and extension wire in 1,000 ft. spools and over is available at no additional charge. Coils or spools of less than 1,000 ft. are available at an additional charge. Minimum order is 100 ft.

HOW TO READ PYROMATION CATALOG NUMBERS

EXAMPLE ORDER NUMBER:

K 20 - 1 - S - 305

- **K** — ASTM/ANSI Thermocouple Type
- **20** — Wire Gauge
- **1** — Conductor Type
- **S** — Opt. Overbraid Selections
- **305** — Wire Insulation (Pages W4, W5, W9)

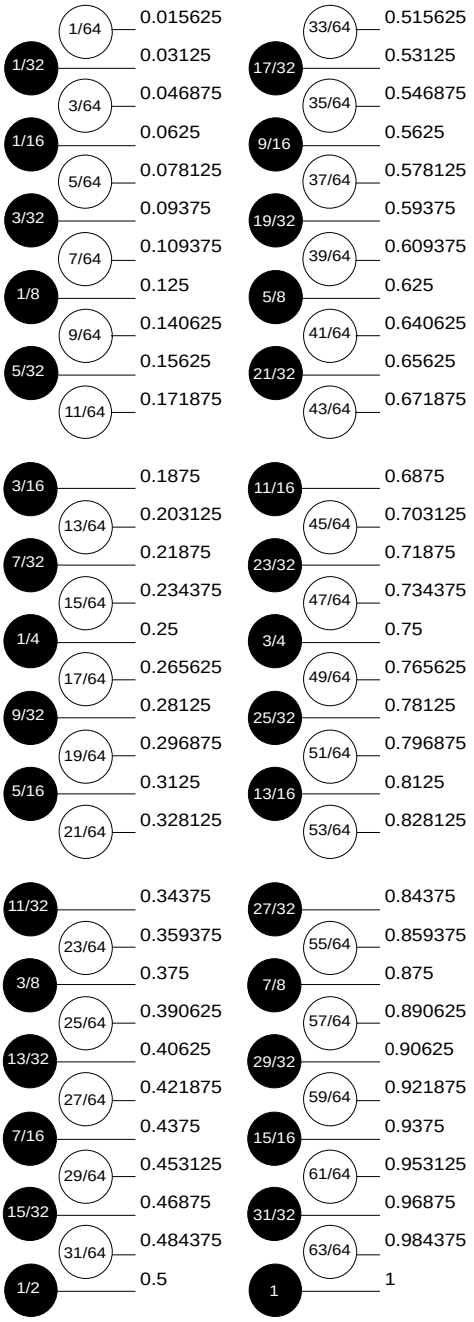
Conductor Type

CODE	DESCRIPTION			
T/C Grades	Solid	Stranded	Std. Limits	Special
1	X		X	
2	X			X
3		X	X	
4		X		X
Ext. Grades	Solid	Stranded	Std. Limits	Special
5	X		X	
6	X			X
7		X	X	
8		X		X

Opt. Overbraid Selections

CODE	DESCRIPTION
S	SS Wire Braid
C	Tinned Copper Wire Braid
F	Flat SS Ribbon Wrap
W	Flat SS Spiral Wrap
G	Half Oval Galvanized Steel Spiral Wrap
N	Inconel 600 Wire Braid

Standard Wire Gauge Conversions



INCHES in DECIMALS of a FOOT

1/16 - 0.0052	1 - 0.0833
3/32 - 0.0078	2 - 0.1667
1/8 - 0.0104	3 - 0.2500
3/16 - 0.0156	4 - 0.3333
1/4 - 0.0208	5 - 0.4167
5/16 - 0.0260	6 - 0.5000
3/8 - 0.0313	7 - 0.5833
1/2 - 0.0417	8 - 0.6667
5/8 - 0.0521	9 - 0.7500
3/4 - 0.0625	10 - 0.8333
7/8 - 0.0729	11 - 0.9167

Standard Wire Gauges in Approximate Decimals of an Inch and mm.

WIRE GAUGE	AMERICAN or BROWN AND SHARP DIAMETER (inches)	DIAMETER MILLIMETERS	BIRMINGHAM or STUBS	US STANDARD
1	0.2893	7.348	0.300	0.281
2	0.2576	6.544	0.284	0.266
3	0.2294	5.827	0.259	0.250
4	0.2043	5.189	0.238	0.234
5	0.1819	4.621	0.220	0.219
6	0.1620	4.115	0.203	0.203
7	0.1443	3.665	0.180	0.188
8	0.1285	3.264	0.165	0.172
9	0.1144	2.906	0.148	0.156
10	0.1019	2.588	0.134	0.141
11	0.0907	2.304	0.120	0.125
12	0.0808	2.053	0.109	0.109
13	0.0720	1.829	0.095	0.0938
14	0.0641	1.628	0.083	0.0781
15	0.0571	1.450	0.072	0.0703
16	0.0508	1.291	0.065	0.0625
17	0.0453	1.150	0.058	0.0563
18	0.0403	1.024	0.049	0.0500
19	0.0359	0.9116	0.042	0.0438
20	0.0320	0.8118	0.035	0.0375
21	0.0285	0.7230	0.032	0.0344
22	0.0253	0.6438	0.028	0.0313
23	0.0226	0.5733	0.025	0.0281
24	0.0201	0.5106	0.022	0.0250
25	0.0179	0.4547	0.020	0.0219
26	0.0159	0.4049	0.018	0.0188
27	0.0142	0.3606	0.016	0.0172
28	0.0126	0.3211	0.014	0.0156
29	0.0113	0.2859	0.013	0.0141
30	0.0100	0.2546	0.012	0.0125
31	0.0089	0.2268	0.010	0.0109
32	0.0080	0.2019	0.009	0.0102
33	0.00708	0.178	0.008	0.0094
34	0.00630	0.152	0.007	0.0086
35	0.00561	0.138	0.005	0.0078
36	0.00500	0.127	0.004	0.0070
37	0.00445	0.1131		0.0066
38	0.00397	0.1007		0.0063
39	0.00353	0.08969		
40	0.00314	0.07987		

CONDUIT SIZE (I.P.S.)	Approximate No. of Insulated Double Conductor Lengths of Extension					
	Wire - Size Conductor					
	NO. 14	NO. 14[1]	NO. 16	NO. 16[2]	NO. 20	NO. 24
1/2"	1	2	2	1	7	9
3/4"	3	7	4	2	16	21
1"	5	10	6	4	24	29
1 1/4"	7	14	10	5	35	44
1 1/2"	13	23	13	7	48	69
2"	18	48	20	11	73	95

[1] Single Conductor Insulated
[2] Three Conductor Insulated

STANDARD INSULATED BASE METAL THERMOCOUPLE WIRE

The following four pages give the details of the standard insulated thermocouple wires generally available for stock delivery. All of these wires are selected and matched to meet the Standards Limits of Error of ASTM/ANSI E230 given on page 1 of this catalog section. If the closer accuracy of the Special Limits of Error wire is desired, then special limit wires can be selected and matched. To order, change the fourth figure of the catalog number to the next higher "even" digit (example: K20-1-305 becomes K20-2-305). With the aid of the wire temperature limit tables from page 1 and the tabulated wire insulation data below, thermocouple wire can be selected to meet most industrial process requirements. When conditions call for other than the listed standard wires, special wires and insulations can be made to fulfill application requirements in minimum amounts of 2,000 feet. Complete process requirements and specifications should accompany quotation requests.

Thermocouple Wire Types, Construction and Characteristics

Standard Fiberglass Insulations

SINGLE CONDUCTOR			DUPLEX CONDUCTOR		TEMP RATING[1]		PHYSICAL PROPERTIES			
Type	Insulation (Inches)	Impregnation	Insulation (Inches)	Impregnation	Continuous	ASTM/ANSI Sgl. Reading	Color Coded	Abrasion Resistance	Moisture Resistance	Notes
302	Double Glass Braid 0.12 Wall	Modified Resin	Glass Braid 0.006	Modified Resin	482 °C [900 °F]	538 °C [1000 °F]	Yes	Good	Good	Impregnation retained to 204 °C [400 °F]
304	Glass Braid 0.006	Modified Resin	Glass Braid 0.006	Modified Resin	482 °C [900 °F]	538 °C [1000 °F]	Yes	Fair	Good	Impregnation retained to 204 °C [400 °F]
305	Double Glass Wrap 0.005	High Temp. Varnish	Glass Braid 0.006	Modified Resin	482 °C [900 °F]	538 °C [1000 °F]	Yes	Fair	Good	Impregnation retained to 204 °C [400 °F]
306	Glass Braid 0.006	None	Glass Braid 0.006	None	482 °C [900 °F]	538 °C [1000 °F]	No	Fair	Fair	Heat treated
307	Teflon® TFE Tape (not fused) 0.004 TFE Coated Glass, 0.006	None	Teflon® Coated Glass Braid	None	482 °C [900 °F]	538 °C [1000 °F]	Yes	Good	Excellent	Teflon® good to 316 °C [600 °F]
313	Glass Braid 0.008	Modified Resin	Glass Braid 0.006	Modified Resin	482 °C [900 °F]	538 °C [1000 °F]	Yes	Good	Good	Impregnation retained to 204 °C [400 °F]
315	Glass Braid 0.008	Modified Resin	None Twisted	None	482 °C [900 °F]	538 °C [1000 °F]	Yes	Good	Good	Impregnation retained to 204 °C [400 °F]
317	Heavy Glass Braid	High Temp. Varnish	None Twisted	None	482 °C [900 °F]	538 °C [1000 °F]	Yes	Good	Good	Impregnation retained to 204 °C [400 °F]

High Temperature Fiberglass Insulations

SINGLE CONDUCTOR			DUPLEX CONDUCTOR		TEMP RATING*		PHYSICAL PROPERTIES			
Type	Insulation (Inches)	Impregnation	Insulation (Inches)	Impregnation	Continuous	ASTM/ANSI Sgl. Reading	Color Coded	Abrasion Resistance	Moisture Resistance	Notes
309	Hi-Temp. Glass Braid 0.012	None	Hi-Temp. Glass Braid 0.012	Modified Resin	704 °C [1300 °F]	871 °C [1600 °F]	[2]	Good	Fair	Impregnation retained to 204 °C [400 °F]
311	Hi-Temp. Glass Braid 0.012	None	Hi-Temp. Glass Braid 0.012	Light Lacquer	704 °C [1300 °F]	871 °C [1600 °F]	No	Fair	Fair	Coating retained to 149 °C [300 °F]
314	Hi-Temp. Glass Braid 0.008	High Temp. Varnish	None Twisted	None	704 °C [1300 °F]	871 °C [1600 °F]	Yes	Good	Good	Impregnation retained to 204 °C [400 °F]
321	High Temp. Glass Braid	High Temp. Varnish	High Temp. Glass Braid	High Temp. Varnish	704 °C [1300 °F]	871 °C [1600 °F]	Yes	Good	Good	Impregnation retained to 204 °C [400 °F]

[1] Thermocouple extension grade wire is only calibrated up to 204 °C [400 °F]
[2] Both Legs Have Tracer

Vitreous Silica Insulation

SINGLE CONDUCTOR			DUPLEX CONDUCTOR		TEMP RATING		PHYSICAL PROPERTIES			
Type	**Insulation (Inches)**	**Impregnation**	**Insulation (Inches)**	**Impregnation**	**Continuous**	**ANSI Sg. Reading**	**Color Code**	**Abrasion Resistance**	**Moisture Resistance**	**Notes**
301	Vitreous Silica Fiber 0.015	None	Vitreous Silica Fiber 0.020	None	871 °C [1600 °F]	1093 °C [2000 °F]	No	Fair	Fair	

Ceramic Fiber Insulation

SINGLE CONDUCTOR			DUPLEX CONDUCTOR		TEMP RATING[1]		PHYSICAL PROPERTIES			
Type	**Insulation (Inches)**	**Impregnation**	**Insulation (Inches)**	**Impregnation**	**Continuous**	**ANSI Sg. Reading**	**Color Code**	**Abrasion Resistance**	**Moisture Resistance**	**Notes**
350	Ceramic Fiber Braid 0.018	None	Ceramic Fiber Braid 0.018	None	1204 °C [2200 °F]	1430 °C [2600 °F]	No	Good	Fair	

Polyvinyl Insulation

SINGLE CONDUCTOR			DUPLEX CONDUCTOR		TEMP RATING		PHYSICAL PROPERTIES			
Type	**Insulation (Inches)**	**Impregnation**	**Insulation**	**Impregnation**	**Continuous**	**ANSI Sg. Reading**	**Color Code**	**Abrasion Resistance**	**Moisture Resistance**	**Notes**
505	Polyvinyl Extr. 0.012-0.014		Singles Fused-Ripcord		(-29 to 105) °C [-20 to 221] °F		Yes	Good	Excellent	

Teflon® Insulations

SINGLE CONDUCTOR			DUPLEX CONDUCTOR		TEMP RATING		PHYSICAL PROPERTIES			
Type	**Insulation (Inches)**	**Impregnation**	**Insulation (Inches)**	**Impregnation**	**Continuous**	**ANSI Sg. Reading**	**Color Code**	**Abrasion Resistance**	**Moisture Resistance**	**Notes**
506	Teflon® FEP Extr. 0.005	None	Teflon® FEP Extr. 0.005	None	204 °C [400 °F]	260 °C [500 °F]	Yes	Good	Excellent	
507	Teflon® FEP Extr. 0.008	None	Teflon® FEP Extr. 0.010	None	204 °C [400 °F]	260 °C [500 °F]	Yes	Good	Excellent	
508	Teflon® TFE Tape fused 0.005	None	Teflon® TFE Tape fused 0.0075	None	260 °C [500 °F]	316 °C [600 °F]	Yes	Very Good	Excellent	
509	Teflon® FEP Extr. 0.009	None	Teflon® FEP Extr. 0.010 Twisted	None	204 °C [400 °F]	260 °C [500 °F]	Yes	Good	Excellent	Aluminum/Mylar® shield w/ #20 drain wire
516	Extruded PFA	None	Extruded PFA	None	260 °C [500 °F]	316 °C [600 °F]	Yes	Good	Excellent	
517	Extruded PFA	None	Twisted; Extr. PFA Overall	None	260 °C [500 °F]	316 °C [600 °F]	Yes	Good	Excellent	Aluminum/Mylar® shield w/drain wire
595	Teflon® FEP Extruded	None	Teflon® (FEP) Extruded	None	204 °C [400 °F]	260 °C [500 °F]	Yes	Good	Excellent	Stainless steel overbraid inner

Kapton® Insulations

SINGLE CONDUCTOR			DUPLEX CONDUCTOR		TEMP RATING		PHYSICAL PROPERTIES			
Type	**Insulation (Inches)**	**Impregnation**	**Insulation (Inches)**	**Impregnation**	**Continuous**	**ANSI Sg. Reading**	**Color Code**	**Abrasion Resistance**	**Moisture Resistance**	**Notes**
511	Fused Kapton® Tape 0.004		None Twisted		316 °C [600 °F]	427 °C [800 °F]	[2] [2]	Excellent	Excellent	FEP binder melts @ 260 °C [500 °F]
512	Fused Kapton® Tape 0.004		Fused Kapton® 0.004		316 °C [600 °F]	427 °C [800 °F]	[2]	Excellent	Excellent	FEP binder melts @ 260 °C [500 °F]
513	Fused Kapton® Tape,0.006 Polyimide Enamel		Fused Kapton® 0.004		316 °C [600 °F]	427 °C [800 °F]	Yes singles only	Excellent	Excellent	FEP binder melts @ 260 °C [500 °F]

Tefzel® Insulation

SINGLE CONDUCTOR			DUPLEX CONDUCTOR		TEMP RATING		PHYSICAL PROPERTIES			
Type	**Insulation (Inches)**	**Impregnation**	**Insulation (Inches)**	**Impregnation**	**Continuous**	**ANSI Sg. Reading**	**Color Code**	**Abrasion Resistance**	**Moisture Resistance**	**Notes**
514	Tefzel® Extr. 0.008 (ETFE)		Tefzel® Extr. 0.010 (ETFE)		150 °C [302 °F]	200 °C [392 °F]	Yes	Good	Excellent	

[1] These wires have no impregnation on insulation
[2] Both Legs Have Tracer

Standard length spools are in 50/ft. increments. Non-standard lengths are available at an extra charge.

Duplex - ASTM/ANSI Type J
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, White: Over-all Brown, with Tracer where possible.

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
J18 - 3 - 313	18	Strd.	Glass braid	Glass braid		Std.	0.090 x 0.150	18
J20 - 1 - 304	20	Solid	Glass braid	Glass braid		Std.	0.059 x 0.097	8
J20 - 1 - S - 304	20	Solid	Glass braid	Glass braid	Stainless overbraid	Std.	0.080 x 0.119	17
J20 - 2 - 304	20	Solid	Glass braid	Glass braid		Spl.	0.059 x 0.097	8
J20 - 1 - 305	20	Solid	Glass wrap	Glass braid		Std.	0.054 x 0.095	8
J20 - 1 - 307	20	Solid	Teflon® (TFE) tape. Teflon® (TFE) impregnated glass braid.	Teflon® (TFE) impregnated glass braid.		Std.	0.075 x 0.118	11
J20 - 1 - 314	20	Solid	High temp. glass braid	None - twisted		Std.	0.120	8
J20 - 2 - 321	20	Solid	High temp. glass braid	High temp. glass braid		Spl.	0.085 x 0.140	15
J20 - 1 - 507	20	Solid	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Std.	0.072 x 0.124	11
J20 - 1 - 508	20	Solid	Fused Teflon® (TFE) tape	Fused Teflon® (TFE) tape		Std.	0.059 x 0.100	10
J20 - 2 - 513	20	Solid	Fused Kapton® tape	Fused Kapton® tape		Spl.	0.065 x 0.100	11
J20 - 3 - 302	20	Strd.	Double glass braid	Glass braid		Std.	0.068 x 0.120	9
J20 - 3 - S - 302	20	Strd.	Double glass braid	Glass braid	Stainless overbraid	Std.	0.093 x 0.140	16
J20 - 3 - 304	20	Strd.	Glass braid	Glass braid		Std.	0.072 x 0.132	9
J20 - 3 - 507	20	Strd.	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Std.	0.077 x 0.128	12
J20 - 3 - S - 507	20	Strd.	Teflon® (FEP) extruded	Teflon® (FEP) extruded	Stainless overbraid	Std.	0.092 x 0.144	15
J20 - 3 - 512	20	Strd.	Kapton®	Kapton®		Std.	0.055 x 0.1020	11
J24 - 1 - 304	24	Solid	Glass braid	Glass braid		Std.	0.047 x 0.081	4
J24 - 1 - 305	24	Solid	Glass wrap	Glass braid		Std.	0.045 x 0.077	4
J24 - 1 - S - 305	24	Solid	Glass wrap	Glass braid	Stainless overbraid	Std.	0.067 x 0.095	9
J24 - 1 - 508	24	Solid	Fused Teflon® (TFE) tape	Fused Teflon® (TFE) tape		Std.	0.047 x 0.078	5
J24 - 2 - 513	24	Solid	Fused Kapton® tape	Fused Kapton® tape		Spl.	0.060 x 0.085	6
J24 - 3 - 304	24	Strd.	Glass braid	Glass braid		Std.	0.043 x 0.082	8
J24 - 3 - S - 305	24	Strd.	Glass wrap	Glass braid	Stainless overbraid	Std.	0.074 x 0.104	11
J24 - 3 - 507	24	Strd.	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Std.	0.065 x 0.110	8
J24 - 3 - 595	24	Strd.	FEP Teflon®	FEP Teflon®/Stainless OB	FEP Teflon®	Std.	0.145	17
J28 - 1 - 305	28	Solid	Glass wrap	Glass braid		Std.	0.036 x 0.057	3
J30 - 1 - 304	30	Solid	Glass braid	Glass braid		Std.	0.037 x 0.059	3
J30 - 1 - 305	30	Solid	Glass wrap	Glass braid		Std.	0.043 x 0.067	3
J30 - 2 - 506	30	Solid	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Spl.	0.030 x 0.050	4

Type J Thermocouple and Extension Wire Conductor Specifications

WIRE GAUGE	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
14	0.0641		0.086	
16	0.0508	0.0600	0.137	0.125
18		0.0490		0.185
20	0.0320	0.0390	0.357	0.343
24	0.0201	0.0250	0.877	0.842
28	0.0126		2.216	
30	0.0100		3.520	

Standard length spools are in 50/ft. increments. Non-standard lengths are available at an extra charge.

Duplex - ASTM/ANSI Type K
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Yellow: Over-all Brown, with Tracer where possible.

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
K14 - 1 - 309	14	Solid	High temp. glass braid	High temp. glass braid		Std.	0.125 x 0.195	39
K20 - 2 - 301	20	Solid	Vitreous silica fiber braid	Vitreous silica fiber braid		Spl.	0.100 x 0.155	16
K20 - 1 - 304	20	Solid	Glass braid	Glass braid		Std.	0.059 x 0.097	8
K20 - 1 - S - 304	20	Solid	Glass braid	Glass braid	Stainless overbraid	Std.	0.080 x 0.119	17
K20 - 1 - 305	20	Solid	Glass wrap	Glass braid		Std.	0.054 x 0.095	8
K20 - 2 - 321	20	Solid	High temp. glass braid	High temp. glass braid		Spl.	0.085 x 0.140	15
K20 - 2 - S - 321	20	Solid	High temp. glass braid	High temp. glass braid	Stainless overbraid	Spl.	0.101 x 0.161	15
K20 - 2 - 350	20	Solid	Ceramic fiber braid	Ceramic fiber braid		Spl.	0.096 x 0.175	16
K20 - 2 - N - 350	20	Solid	Ceramic fiber braid	Ceramic fiber braid	Inconel® overbraid	Spl.	0.126 x 0.166	23
K20 - 1 - 507	20	Solid	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Std.	0.072 x 0.124	11
K20 - 1 - 508	20	Solid	Fused teflon (TFE) tape	Fused Teflon® (TFE) tape		Std.	0.059 x 0.100	10
K20 - 2 - 509	20	Solid	Twisted alum. Mylar®	Twisted alum. Mylar®	Teflon® (FEP)	Spl.	0.132	16
K20 - 2 - 513	20	Solid	Fused Kapton® tape	Fused Kapton® tape		Spl.	0.065 x 0.100	11
K20 - 3 - 302	20	Strd.	Double glass braid	Glass braid		Std.	0.093 x 0.140	9
K20 - 3 - S - 302	20	Strd.	Double glass braid	Glass braid	Stainless overbraid	Std.	0.093 x 0.140	16
K20 - 3 - 304	20	Strd.	Glass braid	Glass braid		Std.	0.077 x 0.113	10
K20 - 3 - 507	20	Strd.	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Std.	0.077 x 0.128	12
K20 - 3 - S - 507	20	Strd.	Teflon® (FEP) extruded	Teflon® (FEP) extruded	Stainless overbraid	Std.	0.110 x 0.130	13
K24 - 1 - 304	24	Solid	Glass braid	Glass braid		Std.	0.047 x 0.081	4
K24 - 1 - 305	24	Solid	Glass wrap	Glass braid		Std.	0.045 x 0.077	4
K24 - 1 - S - 305	24	Solid	Glass wrap	Glass braid	Stainless overbraid	Std.	0.067 x 0.095	13
K24 - 1 - 508	24	Solid	Fused Teflon® (TFE) tape	Fused Teflon® (TFE) tape		Std.	0.047 x 0.078	5
K24 - 3 - S - 305	24	Strd.	Glass braid	Glass braid	Stainless overbraid	Std.	0.070 x 0.100	9

Type K Thermocouple and Extension Wire Conductor Specifications

AWG.	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
14	0.0641	0.0760	0.147	0.134
16	0.0508	0.0600	0.233	0.213
20	0.0320	0.0390	0.590	0.538
24	0.0201	0.0250	1.490	1.435
28	0.0126		3.770	
30	0.0100		5.980	
36	0.0050		24.080	

Standard length spools are in 50/ft. increments. Non-standard lengths are available at an extra charge.

Duplex - ANSI Type T
ASTM/ANSI Color Code: Negative Wire, Blue: Positive Wire, Blue: Over-all Brown, with Tracer where possible.

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
T20 - 1 - 507	20	Solid	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Std.	0.072 x 0.124	11
T20 - 3 - 507	20	Strd.	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Std.	0.080 x 0.137	12
T24 - 1 - 304	24	Solid	Glass braid	Glass braid		Std.	0.047 x 0.081	4
T24 - 1 - 505	24	Solid	Polyvinyl	None (ripcord constr.)		Std.	0.048 x 0.086	3
T24 - 2 - 508	24	Solid	Fused Teflon® (TFE) tape	Fused Teflon® (TFE) tape		Spl.	0.047 x 0.078	5
T24 - 3 - 508	24	Strd.	Fused Teflon® (TFE) tape	Fused Teflon® (TFE) tape		Std.	0.047 x 0.086	7
T24 - 3 - 595	24	Strd.	FEP Teflon®	FEP Teflon®/stainless OB	Teflon® (FEP)	Std.	0.145	17

Duplex - ANSI Type E
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Purple: Over-all Brown, with Tracer where possible.

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
E20 - 1 - 304	20	Solid	Glass braid	Glass braid		Std.	0.059 x 0.097	8

Type T Thermocouple and Extension Wire Conductor Specifications

WIRE GAUGE	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
16	0.0508		0.118	
20	0.0320	0.0390	0.298	0.272
24	0.0201	0.0250	0.272	
30	0.0100		3.520	
36	0.0050		12.174	

Type E Thermocouple and Extension Wire Conductor Specifications

WIRE GAUGE	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
16		0.0600		0.254
20	0.0320		0.704	

Type N Thermocouple and Extension Wire Conductor Specifications

WIRE GAUGE	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
20	0.0320		0.352	
24	0.0201		1.980	

STANDARD INSULATED THERMOCOUPLE EXTENSION WIRE

On this and the following page are the details of the standard insulated thermocouple extension wires generally available for base and noble metal thermocouple installations. By using the tabulated wire insulation data below, one can select a wire suitable for most process applications. When process conditions require the use of a special construction wire, please provide complete process requirements and specifications with your request for quotation. Minimums of 2,000 feet are generally required for special constructions.

Extension Wire Types, Construction and Characteristics

ServTex® Insulations

SINGLE CONDUCTOR			DUPLEX CONDUCTOR		TEMP RATING[1]		PHYSICAL PROPERTIES			
Type	Insulation	Impregnation	Insulation	Impregnation	Continuous	ANSI Sgl. Reading	Color Coded	Abrasion Resistance	Moisture Resistance	Notes
155	Heavy fiberglass braid single insulation	Moisture Resistant Impregnation	ServTex® Braid	Ceramic-like Impregnation	288 ºC [550 ºF]	343 ºC [650 ºF]	Yes	Good	Fair	Impregnation retained to 200 ºC [400 ºF]
157	Teflon® TFE Tape (not fused). Heavy fiberglass braid single insulation	Modified Resin	ServTex® Braid	Moisture Resistant Compound	288 ºC [550 ºF]	343 ºC [650 ºF]	Yes	Good	Fair	Impregnation retained to 204 ºC [400 ºF]: Teflon® good to 260 ºC [500 ºF]

Fiberglass Insulation

303	Enamel/Glass Braid 0.006"	Modified Resin	Glass Braid 0.006"	Modified Resin	482 ºC [900 ºF]	538 ºC [1000 ºF]	Yes	Good	Fair	Impregnation retained to 204 ºC [400 ºF]

Polyvinyl Insulations

SINGLE CONDUCTOR			DUPLEX CONDUCTOR		TEMP RATING[1]		PHYSICAL PROPERTIES			
Type	Insulation	Impregnation	Insulation	Impregnation	Continuous	ANSI Sg. Reading	Color Code	Abrasion Resistance	Moisture Resistance	Notes
502	Polyvinyl Extr. 0.012" to #20; #16 to 0.018"		Polyvinyl Extr., 0.016"		(-29 to 105) ºC [-20 to +221] ºF		Yes	Good	Excellent	
503	Polyvinyl Extr. 0.015"		Twisted w/Cotton Filler; PVC 0.030"		(-29 to 105) ºC [-20 to +221] ºF		Yes	Good	Excellent	Stranded conductors only
510	Polyvinyl Extr. 0.015"		Polyvinyl 0.020" Twisted		(-29 to 105) ºC [-20 to +221] ºF		Yes	Good	Excellent	Alum./Mylar® shield for computer application #16 uses #18 drain wire; #20 uses #20 drain wire

Tefzel® Insulations

514	Tefzel® Extr., 0.008" (ETFE)		Tefzel® 0.0010" (ETFE)		150 ºC [302 ºF]	200 ºC [392 ºF]	Yes	Excellent	Excellent	
515	Tefzel® Extr., 0.008" (ETFE)		Twisted		150 ºC [302 ºF]	200 ºC [392 ºF]	Yes	Excellent	Excellent	Alum./Mylar® shield w/20 AWG drain wire

[1] Thermocouple extension grade wire is only calibrated up to 204 ºC [400 ºF]

Stock Thermocouple Extension Wire

Standard length spools are in 50/ft. increments. Non-standard lengths are available at an extra charge.

Duplex - ASTM/ANSI Type JX
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, White: Over-all Black.

CODE	AWG. GAUGE	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
J16 - 5 - 157	16	Solid	TFE tape/heavy glass braid	ServTex® braid		Std.	0.170 x 0.220	32
J16 - 5 - 502	16	Solid	Polyvinyl	Polyvinyl		Std.	0.111 x 0.188	27
J16 - 5 - 510	16	Solid	Polyvinyl	Twisted alum. Mylar®	PVC	Std.	0.206	28
J18 - 7 - 503	18	Strd.	Polyvinyl	Twisted cotton filler	PVC	Spl.	0.254	35
J20 - 5 - 502	20	Solid	Polyvinyl	Polyvinyl		Std.	0.095 x 0.158	14
J20 - 5 - 510	20	Solid	Polyvinyl	Twisted alum. Mylar®	PVC	Std.	0.170	20
J20 - 7 - 502	20	Strd.	Polyvinyl	Polyvinyl		Std.	0.108 x 0.185	14
J20 - 7 - 510	20	Strd.	Polyvinyl	Twisted alum. Mylar®	PVC	Std.	0.176	24

Duplex - ASTM/ANSI Type KX
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Yellow: Over-all Yellow.

K16 - 5 - 157	16	Solid	Teflon® TFE heavy glass braid	ServTex® braid		Std.	0.170 x 0.220	33
K16 - 5 - 303	16	Solid	Enamel glass braid	Glass braid		Std.	0.100 x 0.160	23
K16 - 5 - 502	16	Solid	Polyvinyl	Polyvinyl		Std.	0.111 x 0.188	27
K16 - 5 - 510	16	Solid	Polyvinyl	Twisted alum. Mylar®	PVC	Std.	0.206	28
K20 - 5 - 502	20	Solid	Polyvinyl	Polyvinyl		Std.	0.095 x 0.158	14
K20 - 5 - 510	20	Solid	Polyvinyl	Twisted alum. Mylar®	PVC	Std.	0.170	20
K20 - 7 - 502	20	Strd.	Polyvinyl	Polyvinyl		Std.	0.108 x 0.185	14
K20 - 7 - 503	20	Strd.	Polyvinyl	Twisted cotton filler	PVC	Std.	0.225	35
K20 - 7 - 510	20	Strd.	Polyvinyl	Twisted alum. Mylar®	PVC	Std.	0.198	20

Duplex - ASTM/ANSI Type TX
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Blue: Over-all Blue.

T20 - 5 - 502	20	Solid	Polyvinyl	Polyvinyl		Std.	0.095 x .158	15
T20 - 5 - 510	20	Solid	Polyvinyl	Twisted alum. Mylar®	PVC	Std.	0.170	20

Type J Thermocouple and Extension Wire Conductor Specifications

WIRE GAUGE	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
14	0.0641		0.086	
16	0.0508	0.0600	0.137	0.125
18		0.0490		0.185
20	0.0320	0.0390	0.357	0.343
24	0.0201	0.0250	0.877	0.842
28	0.0126		2.216	
30	0.0100		3.520	

Type T Thermocouple and Extension Wire Conductor Specifications

WIRE GAUGE	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
16	0.0508		0.118	
20	0.0320	0.0390	0.298	0.272
24	0.0201		0.272	
30	0.0100		3.025	
36	0.0050		12.174	

Type K Thermocouple and Extension Wire Conductor Specifications

WIRE GAUGE	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
14	0.0641	0.0760	0.147	0.134
16	0.0508	0.0600	0.233	0.213
20	0.0320	0.0390	0.590	0.538
24	0.0201	0.0250	1.490	1.435
28	0.0126		3.770	
30	0.0100		5.980	
36	0.0050		24.080	

Standard length spools are in 50/ft. increments. Non-standard lengths are available at an extra charge.

Duplex - ASTM/ANSI Type NX
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Orange: Over-all Orange.

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
N20 - 5 - 502	20	Solid	Polyvinyl	Polyvinyl		Std.	0.111 x 0.188	15

Duplex - ASTM/ANSI Type SX and RX
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Black: Over-all Green; Compensating Extension Wires for Type R, S Thermocouples

S16 - 5 - 157	16	Solid	TFE tape/heavy glass braid	ServTex® braid		Std.	0.170 x 0.220	30
S20 - 5 - 304	20	Solid	Glass braid	Glass braid		Std.	0.056 x 0.096	8
S20 - 5 - 502	20	Solid	Polyvinyl	Polyvinyl		Std.	0.095 x 0.158	13
S20 - 5 - 507	20	Solid	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Std.	0.070 x 0.120	13
S20 - 5 - 510	20	Solid	Polyvinyl	Twisted alum. Mylar®	PVC	Std.	0.170	20

Duplex - ASTM/ANSI Type BX
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Grey: Over-all Grey; Compensating Extension Wires for ANSI Type B Thermocouples

B20 - 5 - 304	20	Solid	Glass braid	Glass braid		Std.	0.056 x 0.096	8

Type N Thermocouple and Extension Wire Conductor Specifications

WIRE GAUGE	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
20	0.0320		0.352	
24	0.0201		1.980	

Type S Thermocouple and Extension Wire Conductor Specifications

WIRE GAUGE	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
16	0.0508	0.0600	0.016	0.014
20	0.0320		0.040	
24	0.0201		0.087	

Type B Thermocouple and Extension Wire Conductor Specifications

WIRE GAUGE	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
20	0.0320		0.069	

Type C Thermocouple and Extension Wire Conductor Specifications

WIRE GAUGE	CONDUCTOR DIAMETER		OHMS PER DOUBLE FOOT	
	SOLID (inches)	STRANDED (inches)	SOLID (ohms)	STRANDED (ohms)
24	0.0201		0.940	

Special Construction RTD Wire and Cable

Pyromation offers several special construction thermocouple wire and RTD cables for process applications. Those listed below, because of their specialized construction, have been used in many unusual applications to solve problems where standard "off-the-shelf" wire and cable would not suffice. The listed wire and cable is normally carried in stock. Other non-standard wire and cable is available on special order. Please contact us with your specifications for a quotation. Minimum order quantities may apply on special construction items.

Special Construction RTD Cables

CODE	CONSTRUCTION STYLE	GAUGE AND TYPE	[1] Ohms	INSULATIONS			TEMP. RATING	COLOR CODE	OUTER JACKET	NOMINAL SIZE (inches)
				EACH COND.	INNER JACKET	OUTER JACKET				
RT24-3-595	Triplex	24 - stranded (silver plated copper)	0.066	TFE Teflon®	FEP Teflon® & stainless steel overbraid	FEP Teflon®	204 ºC [400 °F]	Red, red, white	White	0.160 OD
RT24-3-527	Triplex	24 - stranded (silver plated copper)	0.066	TFE Teflon®	None	FEP Teflon®	204 ºC [400 °F]	Red, red, white	White	0.110 OD
RT28-6-527	Six conductor	28 - stranded (silver plated copper)	0.175	TFE Teflon®	None	FEP Teflon®	204 ºC [400 °F]	Red, red, wht., blk., blk., grn.	White	0.132 OD
RT24-2-S-330	Duplex	24 - stranded (nickel plated copper)	0.060	Glass braid	Glass braid	Stainless steel overbraid	482 ºC [900 °F]	Red, white	-	0.110 OD
RT24-3-S-330	Triplex	24 - stranded (nickel plated copper)	0.090	Glass braid	Glass braid	Stainless steel overbraid	482 ºC [900 °F]	Red, red, wht.	-	0.120 OD
RT24-3-330	Triplex	24 - stranded (nickel plated copper)	0.090	Glass braid	None	Glass braid	482 ºC [900 °F]	Red, red, wht.	White	0.072 OD
RT22-3-502	Triplex	22 - stranded tinned copper	0.044	PVC	None	PVC	105 ºC [221 °F]	Red, red, wht.	White	0.160 OD
RT22-4-502	Four conductor	22 - stranded tinned copper	0.059	PVC	None	PVC	105 ºC [221 °F]	Red, red white, white	White	0.175 OD
RT24-3-509	Triplex	24 - stranded tinned copper	0.066	FEP Teflon®	Aluminum Mylar® shield with drain wire	FEP Teflon®	204 ºC [400 °F]	Red, red, white	White	0.150 OD
RT24-4-509	Four conductor	24 - stranded tinned copper	0.066	FEP Teflon®	Aluminum Mylar® shield with drain wire	FEP Teflon®	204 ºC [400 °F]	Red, red, white, white	White	0.150 OD

[1] Ohms per double or triple foot @ 20 ºC [68 ºF]

Multipair Thermocouple Extension Wire

Cables made up of multipairs of thermocouple extension wire have gained wide acceptance as a cost effective means of running thermocouple extension wire from the process area to central control locations. Installation cost reductions are achieved by running one or more cables containing many pairs of wires rather than individual pairs in separate conduits. Pyromation offers two standard constructions of multipair cable as listed below, however special made-to-order cables are available. Contact us with your complete specifications for a quotation. Minimum order quantities will apply on special cables.

900 SERIES STANDARD MULTIPAIR THERMOCOUPLE EXTENSION CABLE SPECIFICATIONS

Single Conductor Insulation: Extruded PVC (pairs twisted)

Shield: Spiral wrapped aluminized polyester tape over all pairs w/copper drain wire

Overall Insulation: Extruded PVC jacket with a jacket splitting ripcord

Communication Wire: Insulated copper wire

Color Coding: ASTM/ANSI standard color codes

Numbering: Each pair

Temperature Rating: [-20° to 221] °F (-29° to 105) °C

Physical Properties: Abrasion resistance: good
Moisture resistance:excellent
Chemical resistance: good

ASTM/ANSI Type JX Pairs

ASTM/ANSI Color Code: Negitive Wire, Red; Positive Wire, White; Over-all Black

CODE	NUMBER OF PAIRS	B & S GAUGE	APPROX. OD (inches)	APPROX. SHIP WT. PER 1000 FT. (pounds)
J20-5-904	4 - Twisted	20	0.350	83
J20-5-908	8 - Twisted	20	0.420	131
J20-5-912	12 - Twisted	20	0.495	198
J20-5-924	24 - Twisted	20	0.665	338

ASTM/ANSI Type KX Pairs

ASTM/ANSI Color Code: Negative Wire, Red; Positive Wire, Yellow; Over-all Yellow

CODE	NUMBER OF PAIRS	B & S GAUGE	APPROX. OD (inches)	APPROX. SHIP WT. PER 1000 FT. (pounds)
K20-5-904	4 - Twisted	20	0.350	83
K20-5-908	8 - Twisted	20	0.420	131
K20-5-912	12 - Twisted	20	0.495	198
K20-5-924	24 - Twisted	20	0.665	338

1000 SERIES STANDARD MULTIPAIR THERMOCOUPLE EXTENSION CABLE SPECIFICATIONS

Single Conductor Insulation: Extruded PVC (pairs twisted)

Shield: Spiral wrapped aluminized polyester tape over each pair w/copper drain wire

Overall Insulation: Extruded PVC jacket with a jacket splitting ripcord

Communication Wire: Insulated copper wire

Color Coding: ASTM/ANSI standard color codes

Numbering: Each pair

Temperature Rating: [-20° to 221] °F (-29° to 105) °C

Physical Properties: Abrasion resistance: good
Moisture resistance:excellent
Chemical resistance: good

ASTM/ANSI Type JX Pairs

ASTM/ANSI Color Code: Negative Wire, Red; Positive Wire, White; Over-all Black

CODE	NUMBER OF PAIRS	B & S GAUGE	APPROX. OD (inches)	APPROX. SHIP WT. PER 1000 FT. (pounds)
J20-5-1004	4 - Twisted	20	0.395	94
J20-5-1008	8 - Twisted	20	0.455	142
J20-5-1012	12 - Twisted	20	0.550	220
J20-5-1024	24 - Twisted	20	0.842	428

ASTM/ANSI Type KX Pairs

ASTM/ANSI Color Code: Negative Wire, Red; Positive Wire, Yellow; Over-all Yellow

CODE	NUMBER OF PAIRS	B & S GAUGE	APPROX. OD (inches)	APPROX. SHIP WT. PER 1000 FT. (pounds)
K20-5-1004	4 - Twisted	20	0.395	94
K20-5-1008	8 - Twisted	20	0.455	142
K20-5-1012	12 - Twisted	20	0.550	220
K20-5-1024	24 - Twisted	20	0.842	428

Non-Stock Thermocouple Wire

The thermocouple wire, below, is not stocked at the factory but may be available on a special order basis. Minimum order quantities may apply.

Duplex - ASTM/ANSI Type J
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, White: Over-all Brown, with Tracer where possible.
Non Stock Wire

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
J14-1-309	14	Solid	High temp. glass braid	High temp. glass braid		Std.	0.125 x 0.195	36
J20-1-509	20	Solid	Teflon® (FEP) extruded	Twisted Alum. Mylar®	Teflon® (FEP)	Std.	0.059 x 0.100	10
J20-1-511	20	Solid	Fused Kapton® tape	Twisted		Std.	0.087	10
J20-1-516	20	Solid	Extruded PFA	Extruded PFA		Std.	0.070 x 0.120	11
J20-1-517	20	Solid	Extruded PFA	Extruded PFA		Std.	0.131	16
J20-2-305	20	Solid	Glass braid	Glass Braid		Spl.	0.054 x 0.095	8
J24-3-508	24	Strd.	Fused Teflon® (TFE) tape	Fused Teflon® (TFE) tape		Std.	0.047 x 0.086	7
J24-1-511	24	Solid	Fused Kapton® tape	Twisted		Std.	0.063	5
J30-2-513	30	Solid	Fused Kapton® tape	Fused Kapton® tape		Spl.	0.048 x 0.058	4

Duplex - ASTM/ANSI Type K
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Yellow: Over-all Brown, with Tracer where possible.
Non Stock Wire

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
K20-1-311	20	Solid	High temp. glass braid	High temp. glass braid		Std.	0.100 x 0.150	16
K20-1-314	20	Solid	High temp. glass braid	None - twisted		Std.	0.120	8
K20-1-509	20	Solid	Teflon® (FEP) extruded	Twisted alum. Mylar®	Teflon® (FEP)	Std.	0.132	16
K20-1-516	20	Solid	Extruded PFA	Extruded PFA		Std.	0.070 x 0.120	11
K20-1-517	20	Solid	Extruded PFA	Extruded PFA		Std.	0.131	16
K20-2-355	20	Solid	Ceramic fiber braid	Ceramic fiber braid		Spl.	0.090 x 0.135	14
K20-2-511	20	Solid	Fused Kapton® tape	Fused Kapton® tape		Spl.	0.087	10
K24-2-513	24	Solid	Fused Kapton® tape	Fused Kapton® tape		Spl.	0.060 x 0.085	6
K24-3-508	24	Strd.	Fused Teflon® (TFE) tape	Fused Teflon® (TFE) tape		Std.	0.047 x 0.085	6
K28-1-304	28	Solid	Glass braid	Glass braid		Std.	0.039 x 0.064	3
K28-1-305	28	Solid	Glass wrap	Glass braid		Std.	0.036 x 0.057	3
K30-1-305	30	Solid	Glass wrap	Glass braid		Std.	0.043 x 0.067	2
K30-2-506	30	Solid	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Spl.	0.030 x 0.050	4
K30-2-513	30	Solid	Fused Kapton® tape	Fused Kapton® tape		Spl.	0.048 x 0.058	4
K36-2-506	36	Solid	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Spl.	0.029 x 0.042	2

The thermocouple wire, below, is not stocked at the factory but may be available on a special order basis. Minimum order quantities may apply.

Duplex - ASTM/ANSI Type T
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Blue: Over-all Brown, with Tracer where possible.
Non Stock Wire

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
T20-1-S-304	20	Solid	Glass braid	Glass braid	Stainless overbraid	Std.	0.080 x 0.097	17
T20-1-305	20	Solid	Glass braid	Glass braid		Std.	0.054 x 0.095	8
T20-1-508	20	Solid	Fused Teflon® (TFE) tape	Fused Teflon® (TFE) tape		Std.	0.059 x 0.100	10
T20-1-509	20	Solid	Teflon® (FEP) extruded	Twisted alum. Mylar®	Teflon® (FEP)	Std.	0.132	16
T20-1-516	20	Solid	Extruded PFA	Extruded PFA		Std.	0.070 x 0.120	11
T20-1-517	20	Solid	Extruded PFA	Extruded PFA		Std.	0.070 x 0.120	16
T20-2-513	20	Solid	Fused Kapton® tape	Fused Kapton® tape		Spl.	0.065 x 0.100	11
T20-3-512	20	Strd.	Kapton®	Kapton®		Std.	0.055 x 0.102	11
T24-1-S-304	24	Solid	Glass braid	Glass braid	Stainless overbraid	Std.	0.067 x 0.095	13
T24-1-305	24	Solid	Glass wrap	Glass braid		Std.	0.045 x 0.077	4
T24-2-513	24	Solid	Fused Kapton® tape	Fused Kapton® tape		Spl.	0.060 x 0.085	5
T30-1-305	30	Solid	Glass wrap	Glass braid		Std.	0.043 x 0.067	2
T30-2-506	30	Solid	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Spl.	0.030 x 0.050	4
T30-2-513	30	Solid	Fused Kapton® tape	Fused Kapton® tape		Spl.	0.048 x 0.058	4
T36-2-506	36	Solid	Teflon® (FEP) extruded	Teflon® (FEP) extruded		Spl.	0.029 x 0.042	2

Duplex - ASTM/ANSI Type E
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Purple: Over-all Brown, with Tracer where possible.
Non Stock Wire

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
E20-1-508	20	Solid	Fused Teflon® (TFE) tape	Fused Teflon® (TFE) tape		Std.	0.059 x 0.100	10
E20-1-516	20	Solid	Extruded PFA	Extruded PFA		Std.	0.070 x 0.120	11
E20-1-517	20	Solid	Extruded PFA	Extruded PFA		Std.	0.070 x 0.120	16

Duplex - ASTM/ANSI Type N
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Orange: Over-all Brown, with Tracer where possible.
Non Stock Wire

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
N20-1-304	20	Solid	Glass braid	Glass braid		Std.	0.059 x 0.097	8
N20-2-301	20	Solid	Vitreous silica fiber braid	Vitreous silica fiber braid		Spl.	0.100 x 0.155	16
N24-1-304	24	Solid	Glass braid	Glass braid		Std.	0.047 x 0.081	4
N20-1-S-304	20	Solid	Glass braid/Teflon® (TFE) impregnated	Glass braid/Teflon® (TFE) impregnated	Stainless overbraid	Std.	0.075 x 0.117	11
N20-1-S-307	20	Solid	Impregnated glass braid	Glass braid	Stainless overbraid	Std.	0.095 x 0.138	13

Non-Stock Thermocouple Extension Wire

The thermocouple extension wire, below, is not stocked at the factory but may be available on a special order basis. Minimum order quantities may apply.

Duplex - ASTM/ANSI Type J
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, White: Over-all Black
Non Stock Extension Wire

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
J14-6-502	14	Solid	Polyvinyl	Polyvinyl		Spl.	0.130 x 0.226	37
J16-5-303	16	Solid	Enamel glass braid	Glass braid		Std.	0.100 x 0.160	18
J16-7-155	16	Strd.	ServTex	ServTex braid		Std.	0.188 x 0.260	31
J16-7-515	16	Strd.	Tefzel®	Twisted alum. Mylar®		Std.	0.185	29
J20-5-514	20	Solid	Tefzel®	Tefzel®	Tefzel®	Std.	0.080 x 0.130	10

Duplex - ASTM/ANSI Type KX
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Yellow: Over-all Yellow
Non Stock Extension Wire

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
K14-5-502	14	Solid	Polyvinyl	Polyvinyl		Std.	0.130 x 0.226	38
K16-7-515	16	Strd.	Tefzel®	Twisted alum. Mylar®	Tefzel®	Std.	0.185	30
K20-5-514	20	Solid	Tefzel®	Tefzel®		Std.	0.080 x 0.130	10

Duplex - ASTM/ANSI Type TX
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Blue: Over-all Blue
Non Stock Extension Wire

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
T16-5-502	14	Solid	Polyvinyl	Polyvinyl		Std.	0.111 x 0.188	38
T20-7-502	16	Strd.	Polyvinyl	Polyvinyl		Std.	0.108 x 0.185	30

Duplex - ASTM/ANSI Type EX
ASTM/ANSI Color Code: Negitive Wire, Red: Positive Wire, Purple: Over-all Purple
Non Stock Extension Wire

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
E16-7-515	16	Strd.	Tefzel®	Twisted alum. Mylar®	Tefzel®	Std.	0.185	30
E20-5-502	20	Solid	Polyvinyl	Polyvinyl		Std.	0.095 x 0.158	15

Duplex - ASTM/ANSI Type NX
ASTM/ANSI Color Code: Negitive Wire, Red: Positive Wire, Orange: Over-all Orange
Non Stock Extension Wire

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
N20-5-510	20	Solid	Polyvinyl	Twisted alum. Mylar®	PVC	Std.	0.170	20

Duplex - ASTM/ANSI Type SX and RX
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Black: Over-all Green; Compensating Extension Wire for ANSI Types R, S Thermocouples
Non Stock Extension Wire

CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
S24-5-304	24	Solid	Glass Braid	Glass Braid		Std.	0.045 x 0.077	4

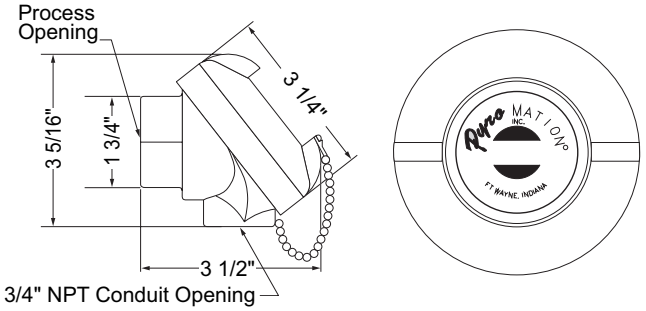
Tungsten/Tungsten Rhenium Type C
ASTM/ANSI Color Code: Negative Wire, Red: Positive Wire, Orange: Over-all Orange
Non Stock Extension Wire

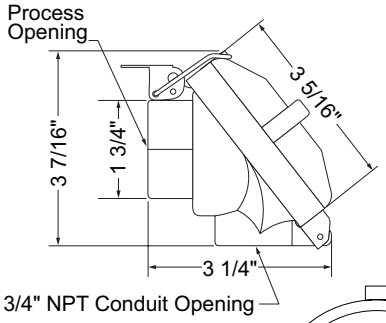
CODE	AWG.	CONDUCTOR	INSULATIONS			LIMITS OF ERROR	NOMINAL SIZE (inches)	WEIGHT per 1000 FT. (pounds)
			EACH CONDUCTOR	OUTER JACKET	OVER-ALL			
C24-5-304	24	Solid	Glass Braid	Glass Braid		Std.	0.045 x0.072	7

Accessories

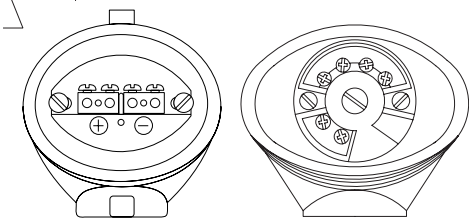
Die Cast Aluminum Connection Heads

The thermocouple and RTD connection heads listed below meet NEMA 4 requirements for indoor or outdoor non-hazardous use to provide protection against dust, rain, splashing and hose directed water. The 300 series heads include a compressed graphite material gasket that provides high chemical stability, good creep resistance, excellent wet/steam sealing characteristics and have an 825 °F maximum temperature rating. The 500 series flip top aluminum head utilizes an EPDM O-ring seal with a maximum temperature rating of 400 °F. These heads accept the Pyromation 340 series terminal blocks, transmitter and DIN standard blocks and transmitters.





Now accepts DIN blocks and transmitters



Die Cast Aluminum

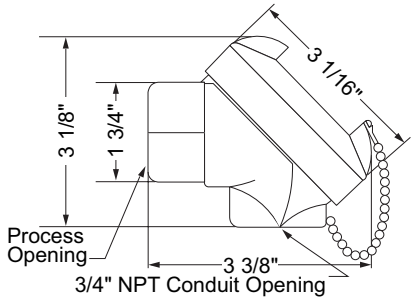
PROCESS OPENING SIZE (inches)	CODE	Order Code for Complete Head and Block Assembles					
	HEAD & CAP WITHOUT BLOCK	***SINGLE***	***DUPLEX***	***TRIPLEX***			
				2-Term	**3-Term**	**4-Term**	**6-Term**
1/8 NPT	301	311	321	331-2	331-3	331-4	331-6
1/4 NPT	302	312	322	332-2	332-3	332-4	332-6
3/8 NPT	303	313	323	333-2	333-3	333-4	333-6
1/2 NPT	304	314	324	334-2	334-3	334-4	334-6
3/4 NPT	305	315	325	335-2	335-3	335-4	335-6
1 NPT	306[1]	316	326	336-2	336-3	336-4	336-6
[1] Not available with DIN mounting holes							

Die Cast Aluminum Flip Top

PROCESS OPENING SIZE (inches)	CODE	Order Code for Complete Head and Block Assembles					
	HEAD & CAP WITHOUT BLOCK	***SINGLE***	***DUPLEX***	***TRIPLEX***			
				2-Term	**3-Term**	**4-Term**	**6-Term**
1/2 NPT	504	514	524	534-2	534-3	534-4	534-6
3/4 NPT	505	515	525	535-2	535-3	535-4	535-6
Other process openings available with minimum purchase							

CAST IRON and STAINLESS STEEL CONNECTION HEADS

The thermocouple and RTD connection heads listed below meet NEMA 4 requirements for indoor or outdoor non-hazardous use to provide protection against dust, rain, splashing and hose directed water. The cast iron heads are coated with a black paint. The paint provides good corrosion and chemical resistance, however, it does not provide UV protection for outdoor applications. The 316L stainless steel head offers excellent corrosion resistance and chemical resistance and is suitable for outdoor applications and meets NEMA 4X requirements. These heads will accept any of the Pyromation 340 series terminal blocks and series 440 RTD transmitter. These heads will not accept the DIN standard blocks or transmitters.



316L Stainless Steel

PROCESS OPENING SIZE (inches)	CODE	Order Code for Complete Head and Block Assembles					
	HEAD & CAP WITHOUT BLOCK	***SINGLE***	***DUPLEX***	***TRIPLEX***			
				2-Term	**3-Term**	**4-Term**	**6-Term**
1/2 NPT	904	914	924	934-2	934-3	934-4	934-6
3/4 NPT	905	915	925	935-2	935-3	935-4	935-6

Cast Iron

PROCESS OPENING SIZE (inches)	CODE	Order Code for Complete Head and Block Assembles					
	HEAD & CAP WITHOUT BLOCK	***SINGLE***	***DUPLEX***	***TRIPLEX***			
				2-Term	**3-Term**	**4-Term**	**6-Term**
1/2 NPT	307	317	327	337-2	337-3	337-4	337-6
3/4 NPT	308	318	328	338-2	338-3	338-4	338-6
1 NPT	309	319	329	339-2	339-3	339-4	339-6

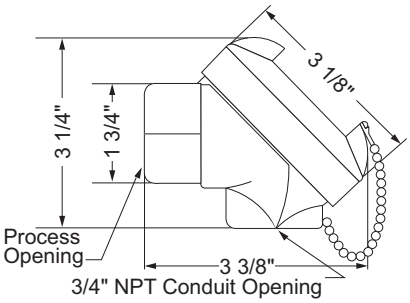
Head Options

CODE	DESCRIPTION
B	Head with internal ground screw
W[1]	Protective epoxy coating (2 mil. thickness - white only)
R	Ethylene propylene rubber gasket with adhesive
Add Suffix Above to Part Number. Example: #334-4B	
[1] Only Available with 304 series head	

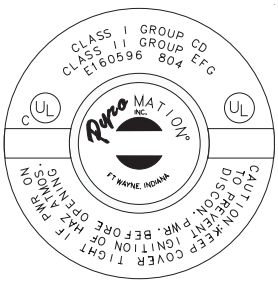
Accessories

Hazardous Location UL® Listed Connection Heads

The series 800 thermocouple and RTD connection heads listed below are UL listed and they meet the requirements listed under UL886 and CSA C22.2 for Class I Groups C, D, Division 1 and 2; Class II Groups E, F, G; Class III for use in hazardous locations as described by the National Electrical Code. Series 804 and 805 heads are supplied with a bright finish 316L stainless steel body and cap, and they provide excellent chemical and corrosion resistance and meets NEMA 4X requirements. Series 807 and 808 heads are provided with a zinc-plated cast iron body and polished aluminum cap and they provide some degree of corrosion resistance. All heads are supplied with an internal ground screw, a 825°F temperature rated gasket, and they will accept any of the series 340 terminal blocks listed below and Pyromation's standard series 440 RTD transmitters.



UL® LISTED,FILE E160596



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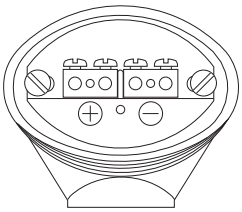


316L Stainless Steel

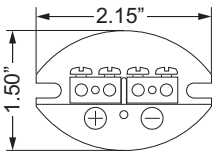
PROCESSING OPENING SIZE (inches)	CODE	Order Code for Complete Head and Block Assemblies					
	HEAD & CAP WITHOUT BLOCK	***SINGLE***	***DUPLEX***	***TRIPLEX***			
				2-Term	**3-Term**	**4-Term**	**6-Term**
1/2 NPT	804	814	824	834-2	834-3	834-4	834-6
3/4 NPT	805	815	825	835-2	835-3	835-4	835-6
Cast Iron / Aluminum							
1/2 NPT	807	817	827	837-2	837-3	837-4	837-6
3/4 NPT	808	818	828	838-2	838-3	838-4	838-6

Head Options

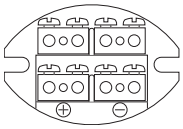
CODE	DESCRIPTION
W[1]	Protective epoxy coating (2 mil. thickness - white only)
R	Ethylene propylene rubber gasket w/adhesive
Specify	Private logo nameplate (consult factory for details)
[1] Only available with 807 series head	

CERAMIC TERMINAL BLOCKS

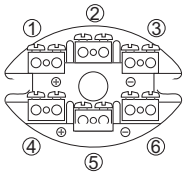
The terminal blocks, listed below, fit all Pyromation series 300, 400, 800, and 900 connecting heads. The terminal blocks are provided with a steatite ceramic base, brass terminal pieces, and stainless steel screws. These terminal blocks are not rated for high voltage use, but can be used in temperature sensor or low voltage Class 2 circuits. Series 341 and 342 terminal blocks accept up to an #8 gauge wire, and the series 343 accepts up to a #10 gauge wire.



5/8" THICK SINGLE BLOCK #341



15/16" THICK DUPLEX BLOCK #342



7/8" THICK TRIPLEX BLOCK #343

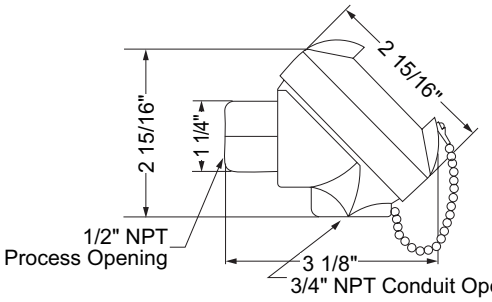
TERMINAL BLOCK CODE	TERMINAL POSITION AS SUPPLIED
343-2	①–③
343-3	②–④–⑥
343-4	①–③–④–⑥
343-6	All Positions

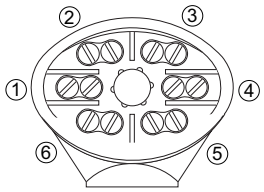
Replacement Component Parts

CODE	DESCRIPTION	CODE	DESCRIPTION
341	Single terminal block	343-3	Triplex terminal block with 3 brass terminals
342	Duplex terminal block	343-4	Triplex terminal block with 4 brass terminals
343-2	Triplex terminal block with 2 brass terminals	343-6	Triplex terminal block with 6 brass terminals

Thermoplastic Screw Cover Connection Heads

The thermoplastic connection heads shown on this page are molded from white polypropylene and grey Delrin®. They meet NEMA 4 requirements for indoor or outdoor non-hazardous use to provide protection against dust, rain, splash water, and hose directed water. The heads are provided with an O-ring, stainless steel chains and pins, and all heads have a 1/2" NPT process opening and a 3/4" NPT conduit opening. Both heads will also accept the below listed series 340 ceramic terminal blocks and Pyromation's series 440 RTD temperature transmitters.





CONNECTING HEAD CODE	TERMINAL POSITIONS AS SUPPLIED
480-390	①–④ Screw Insert Only
482-392	①–④
483-393	①–③–④
486-396	All Positions

Unpigmented White Polypropylene

The molded, unpigmented, white polypropylene head is FDA compliant for use in sanitary applications, and has a continuous temperature use rating of 198 °F. The polypropylene head provides excellent resistance to acids, alkalines, and most process chemicals and meets NEMA 4X requirements. It also provides good strength, is scratch resistant, and has excellent resistance to environmental stress cracking.

CODE	TERMINAL DESCRIPTION	MAX. WIRE GA. SIZE
480	No terminals-supplied w/transmitter mtg. inserts	N/A
482	Head supplied w/ 2 self-contained terminals	18
483	Head supplied w/ 3 self-contained terminals	18
486	Head supplied w/ 6 self-contained terminals	18

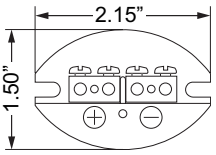
Grey Pigmented Delrin®

The grey pigmented head is molded of Delrin® 500HP, and although this material is attacked by strong acids, it provides good resistance to most weak acid solutions, alkalines, salt water, and provides good weathering resistance to sunlight and meets NEMA 4X requirements. This grey pigmented head is not FDA compliant, but it does have a relatively high continuous temperature use rating of 275 °F.

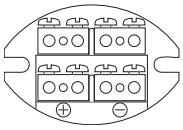
CODE	TERMINAL DESCRIPTION	MAX. WIRE GA. SIZE
390	No terminals-supplied w/transmitter mtg. inserts	N/A
392	Head supplied w/ 2 self-contained terminals	18
393	Head supplied w/ 3 self-contained terminals	18
396	Head supplied w/ 6 self-contained terminals	18

CERAMIC TERMINAL BLOCKS

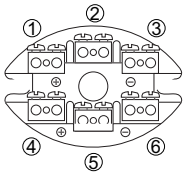
The terminal blocks, listed below, fit all Pyromation series 300, 400, 500, 800, and 900 connecting heads. The terminal blocks are provided with a stearite ceramic base, brass terminal pieces, and stainless steel screws. These terminal blocks are not rated for high voltage use, but can be used in temperature sensor or low voltage Class 2 circuits. Series 341 and 342 terminal blocks accept up to an #8 gauge wire and the series 343 accepts up to a #10 gauge wire.



5/8" THICK SINGLE BLOCK #341



15/16" THICK DUPLEX BLOCK #342



7/8" THICK TRIPLEX BLOCK #343

TERMINAL BLOCK CODE	TERMINAL POSITION AS SUPPLIED
343-2	①–③
343-3	②–④–⑥
343-4	①–③–④–⑥
343-6	All Positions

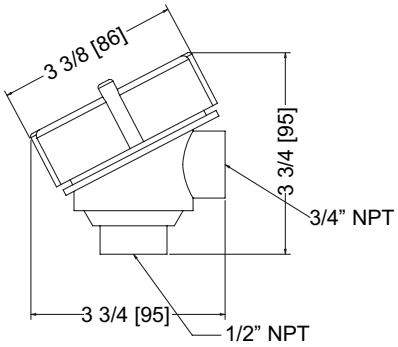
Spring-Loading Sheath Spring

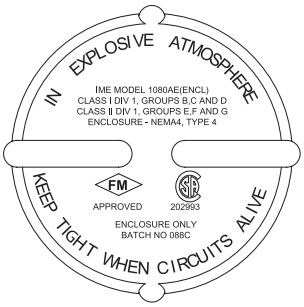
Replacement Component Parts

CODE	DESCRIPTION	CODE	DESCRIPTION
341	Single terminal block	349-3	O-ring
342	Duplex terminal block	353	Plate for spring-loading and transmitter mounting
343-2	Triplex terminal block with 2 brass terminals	382	1/8" OD spring-loading sheath spring
343-3	Triplex terminal block with 3 brass terminals	383	3/16" OD spring-loading sheath spring
343-4	Triplex terminal block with 4 brass terminals	384	1/4" OD spring-loading sheath spring
343-6	Triplex terminal block with 6 brass terminals	386	3/8" OD spring-loading sheath spring

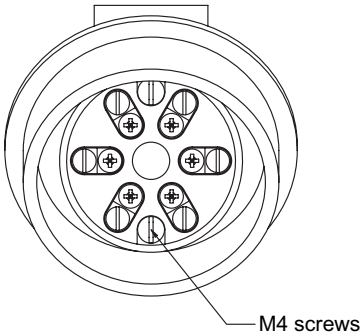
HAZARDOUS LOCATION

The Series 210804 and 210807 connection heads are FM and CSA listed and meet the requirements for Class I Groups B, C, and D; Class II Groups E, F, and G. These connection heads accommodate terminal blocks or head-mounted transmitters 42 mm and 50 mm in diameter.





Dimensions in inches [mm]



DIN Style 316 Stainless Steel Screw Cover Connection Head

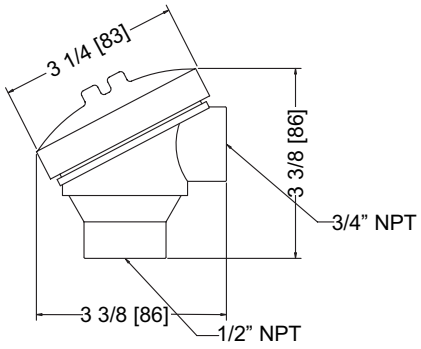
CODE	DESCRIPTION
210804	1/2" NPT Process x 3/4" NPT Conduit

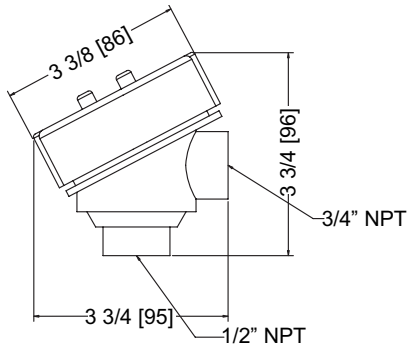
DIN Style Die Cast Aluminum Screw Cover Connection Head

CODE	DESCRIPTION
210807	1/2" NPT Process x 3/4" NPT Conduit

NON-HAZARDOUS LOCATION

The Series 210904 316 stainless steel, 210480 white polypropylene, connection heads are suitable for indoor or outdoor non-hazardous applications. They provide protection against dust, rain, splashing, hose directed water, and provide excellent corrosion and chemical resistance. These connection heads accommodate terminal blocks or head-mounted transmitters 42 mm and 50 mm in diameter.





DIN Style White Polypropylene Screw Cover Connection Head

CODE	DESCRIPTION
210480	1/2" NPT Process x 3/4" NPT Conduit

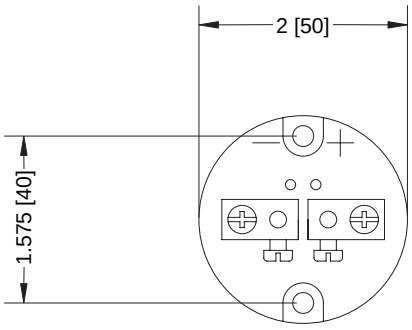
DIN Style 316 Stainless Steel Screw Cover Connection Head

CODE	DESCRIPTION
210904	1/2" NPT Process x 3/4" NPT Conduit

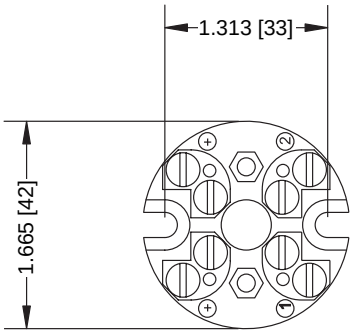
DIN Style Ceramic Terminal Blocks

The DIN Style terminal blocks are 42 mm and 50 mm in diameter and are designed to fit all Pyromation Series 210 connection heads. The terminal blocks are supplied with a ceramic base. They can be provided in 2, 3, 4, or 6 terminal configurations.

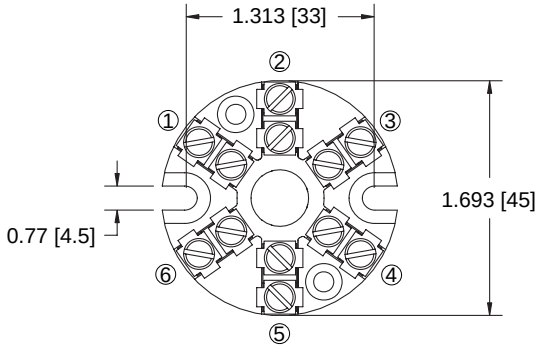
Dimensions In Inches [mm]



210412



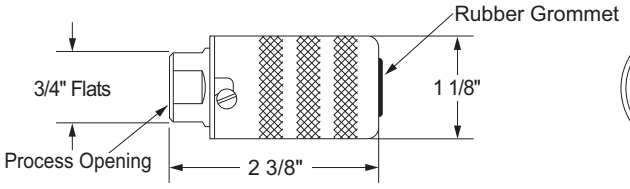
210304

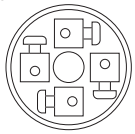


210332 thru 210336

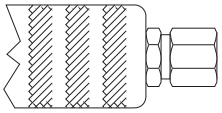
CODE	DESCRIPTION	TERMINAL POSITIONS
210412	2 Pole Terminal Block (8, 11, 14 AWG)	N/A
210304	4 Pole Terminal Block	N/A
210332	2 Pole Terminal Block	①–③
210333	3 Pole Terminal Block	①–③–⑤
210334	4 Pole Terminal Block	①–③–④–⑥
210336	6 Pole Terminal Block	All Positions

The thermocouple and RTD connection heads listed below are for use in indoor or outdoor non-hazardous locations. They provide some degree of protection from dust, rain, and splashing water. They are supplied with an "O" ring moisture seal, and when used with optional cap compression fitting and PVC or Teflon® coated flexible armor, they provide excellent moisture resistance. A neoprene grommet, around the cap leadwire exit, is provided as standard. The nickel plating provides good corrosion resistance.





OPTIONAL COMPRESSION FITTING



Complete Head Assemblies

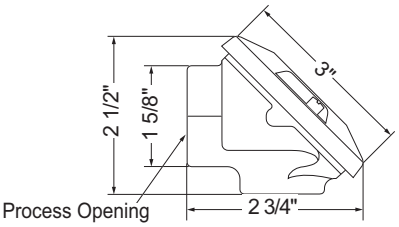
CODE	NO. OF TERMINALS	PROCESS OPENING (inches)	SUPPLIED CAP STYLE	CODE	NO. OF TERMINALS	PROCESS OPENING (inches)	SUPPLIED CAP STYLE
362A	2	1/8 NPT	w / grommet	362B	2	1/4 NPT	w / grommet
363A	3	1/8 NPT	w / grommet	363B	3	1/4 NPT	w / grommet
364A	4	1/8 NPT	w / grommet	364B	4	1/4 NPT	w / grommet
372A	2	1/8 NPT	w / comp. ftg.	372B	2	1/4 NPT	w / comp. ftg.
373A	3	1/8 NPT	w / comp. ftg.	373B	3	1/4 NPT	w / comp. ftg.
374A	4	1/8 NPT	w / comp. ftg.	374B	4	1/4 NPT	w / comp. ftg.

Component Parts

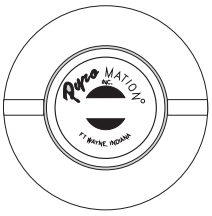
CODE	DESCRIPTION
360	Cap with grommet
361	Cap with fitting
365	Grommet
367	O - ring
The optional nickel plated brass cap compression fitting will accept PVC or Teflon® coated flexible armor or 5/16" OD tubing.	

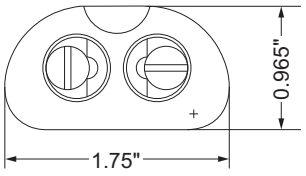
ALUMINUM GENERAL PURPOSE HEADS

The thermocouple and RTD connection heads listed below meets the NEMA 2 requirements for indoor non-hazardous use to provide a degree of protection against limited amounts of falling water and dirt. This aluminum general purpose head also provides some corrosion resistance. The gasketed cover is attached to the body by two screws, and can be removed from the body by a twist and lift motion after the screws are loosened. The head gasket is a compressed graphite material. This head can be provided with a private label.

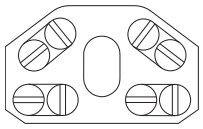


1/2" NPT CONDUIT OPENING





13/16" THICK SINGLE BLOCK #141



5/8" THICK DUPLEX BLOCK #142

Aluminum General Purpose

PROCESS OPENING SIZE (inches)	CODE		
	HEAD AND CAP WITHOUT BLOCK	*HEAD AND BLOCK COMPLETE ASSEMBLIES*	
		SINGLE	***DUPLEX***
1/8 NPT	101	111	121
1/4 NPT	102	112	122
3/8 NPT	103	113	123
1/2 NPT	104	114	124
3/4 NPT	105	115	125
1 NPT	106	116	126

Component Parts

CODE	DESCRIPTION
141	Single terminal block
142	Duplex terminal block
146	Cap and gasket[1]
Specify Logo #	Private logo nameplates Consult factory for details
[1] Gasket Material is Phelps 7075 (Trade Name)	

FIG. 1

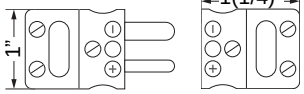


FIG. 2

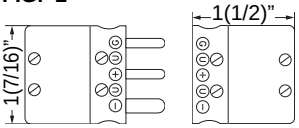


FIG. 3

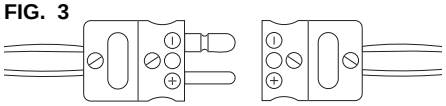


FIG. 4

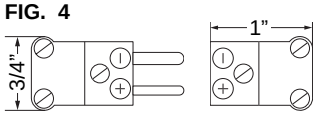
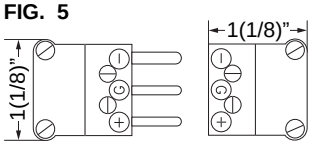


FIG. 5



EXAMPLE ORDER NUMBER: 61J or 61J-M

CODE		DESCRIPTION			
STANDARD PLUGS	*STANDARD JACKS*	NO. PINS	PIN TYPE	TEMP RATING	FIG. NO.
61[1]	62[1]	2	Hollow	350 ºF	1
61[1] - 3	62[1] - 3	3	Hollow	350 °F	2
61[1] - M	62[1] - M	2	Hollow	500 °F	1
61[1] - H	62[1] - H	2	Solid	800 °F	1
2 Pin JAB - In Connectors (solid)					
61[1] - J	62[1] - J	14 ga. max		350 °F	3
61K - E	62K - E	8 ga. max		350 °F	3
[1] = Insert calibration code J,K,T,E,N,R,S, or U					

EXAMPLE ORDER NUMBER: 64K-M

CODE		DESCRIPTION		
MINIATURE PLUGS	*MINIATURE JACKS*	NO. PINS	TEMP RATING	FIG. NO.
63[1]	64[1]	2	350 ºF	4
63[1] - 3	64[1] - 3	3	350 °F	5
63J - M	64J - M	2	500 °F	4
63K - M	64K - M	2	500 °F	4

Temperature ratings for plugs and jacks are for continuous use. All standard and jab-in connectors have 7/16" pin spacing. All miniature connectors have 5/16" pin spacing. Type N supplied in 2 pin, 350 °F, standard and miniature size only.
[1] Insert calibration code J, K, T, E, N, R, S, or U.

MOUNTING HARDWARE for PLUGS and JACKS

FIG. 6

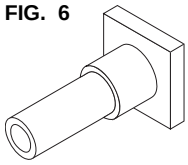


FIG. 7

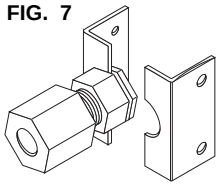


FIG. 9

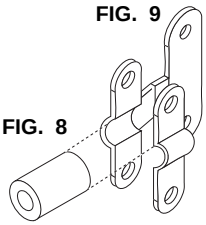
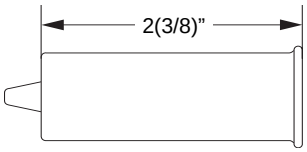


FIG. 8

FIG. 10

FIG. 11



EXAMPLE ORDER NUMBER: 6S1 or 6S2-2

Mounting Hardware

CODE	DESCRIPTION	FIG. NO.
6S1	Std. size cable clamp for 350 and 500 °F connectors	9
6S2 - [1]	Std. size brass crimp adaptor for 350 and 500 °F connectors	6
6S3 - [1]	Std. size compression bracket for 350 and 500 °F connectors	7
6S1 - H	Standard size cable clamp for 800 °F connectors	9
6S2 - [1]H	Standard size brass crimp adaptor for 800 °F connectors	6
6S3 - [1]H	Compression bracket for 800 °F connectors	7
6M1	Mini cable clamp (2 pin only)	9
6M2 - [1]	Mini brass crimp adaptor	6
[1] = Insert tube size code where required 1 = 1/16" 2 = 1/8" 3 = 3/16" 4 = 1/4" (1/4" OD is not available with mini brass crimp)		

Miscellaneous Hardware

CODE	DESCRIPTION	FIG. NO.
Standard Connectors		
611	Rubber boot for 350 °F connectors	11
616	Wire grommet for 350 °F connectors	10
629	Cable clamp bushing	8
Miniature Connectors		
621	Wire grommet	10
631	Rubber boot	11
629	Cable clamp bushing	8

THERMOCOUPLE AND RTD JACK PANELS FOR FS CONDUIT BOX MOUNTING

All listed panels are 2(3/4)" w x 4(1/2)" h aluminum plates

FIG. 1

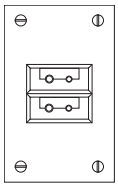


FIG. 2

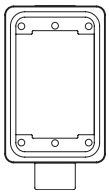
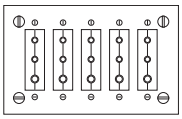


FIG. 3



EXAMPLE ORDER NUMBER: FMF-K-3

Thermocouple Jack Panels

CODE		DESCRIPTION	
STANDARD SIZE	*MINIATURE SIZE*	NO. CIRCUITS	FIG. NO.
FSB - [1] - 1	FMF - [1] - 1	1	1
FSB - [1] - 2	FMF - [1] - 2	2	1
FSB - [1] - 3	FMF - [1] - 3	3	1
FSB - [1] - 4	FMF - [1] - 4	4	1
FSB - [1] - 5	FMF - [1] - 5	5	1
FSB - [1] - 6	FMF - [1] - 6	6	1
[1] = Insert calibration code J,K,T,E,N,R,S, or U (type N supplied in standard size only).			

RTD Jack Panels

CODE		DESCRIPTION	
STANDARD SIZE	*MINIATURE SIZE*	NO. CIRCUITS	FIG. NO.
FSF - U - 1 - T	FMF - U - 1 - T	1	3
FSF - U - 2 - T	FMF - U - 2 - T	2	3
FSF - U - 3 - T	FMF - U - 3 - T	3	3
FSF - U - 4 - T	FMF - U - 4 - T	4	3
FSF - U - 5 - T	FMF - U - 5 - T	5	3
FSF - U - 6 - T	FMF - U - 6 - T	6	3
Above panels are 3 pin connections.			

FS Conduit Boxes For Above Jack Panels

CODE	BOX MATERIAL	MAX. NUMBER OF CIRCUITS	CONDUIT OPENING (inches)	FIG. NO.
638	Diecast aluminum	4	3/4 NPT	2
640	Diecast aluminum	5	3/4 NPT	2
639	Glass/nylon	6	3/4 NPT	2

THERMOCOUPLE AND RTD JACK PANELS

FIG. 4

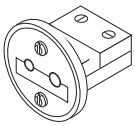


FIG. 5

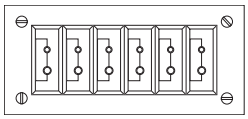
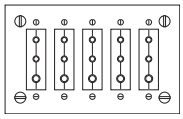


FIG. 6



EXAMPLE ORDER NUMBER: SSB-T-8

Thermocouple Jack Panels

CODE		DESCRIPTION	
STANDARD SIZE	*MINIATURE SIZE*	NO. CIRCUITS	FIG. NO
62 - [1] - R	64 - [1] - R	1	4
SSB - [1] - 6	SMF - [1] - 6	6	5
SSB - [1] - 8	SMF - [1] - 8	8	5
SSB - [1] - 10	SMF - [1] - 10	10	5
SSB - [1] - 12	SMF - [1] - 12	12	5
[1] = Insert calibration code J,K,T,E,N,R,S, or U. (type N supplied in standard size only)			

RTD Jack Panels

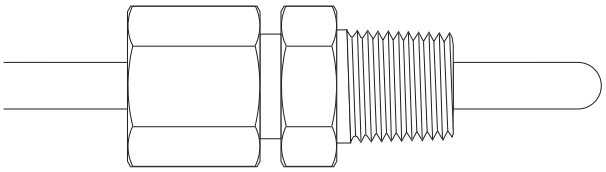
CODE		DESCRIPTION	
STANDARD SIZE	*MINIATURE SIZE*	NO. CIRCUITS	FIG. NO
SSF - U - 6 - T	Consult Factory	6	6
SSF - U - 8 - T		8	6
SSF - U - 10 - T		10	6
SSF - U - 12 - T		12	6
Above panels are 3 pin connections.			

Jack Panels Dimensions

NO. CIRCUITS	WIDTH (inches)	LENGTH (inches)	WIDTH (inches)	LENGTH (inches)
	STANDARD SIZE		*MINIATURE SIZE*	
6	3 1/4	5 3/4	2	5
8	3 1/4	7 1/4	2	6
10	3 1/4	8 3/4	2	7 1/4
12	3 1/4	10 1/4	2	8 1/2
1	Conduit knockout sizes for round panel jacks. Standard size: 3/4"Miniature size: 1/2"			

Standard and miniature jack panels can be custom designed to provide other dimensions, number of jacks, or mixed calibrations. Consult factory for availability.

RE-ADJUSTABLE COMPRESSION FITTINGS



Stainless Steel with Teflon® Ferrule

CODE	TUBE SIZE (inches)	PROCESS THREAD (inches)	LENGTH (inches)
6109T-1A	1/16 OD	1/8 NPT	1 1/4
6109T-2A	1/8 OD	1/8 NPT	1 1/4
6109T-3A	3/16 OD	1/8 NPT	1 1/4
6109T-4B	1/4 OD	1/4 NPT	2 1/2
6109T-6B	3/8 OD	1/4 NPT	2 1/2
6109T-4C	1/4 OD	1/2 NPT	2 1/2
6109T-6C	3/8 OD	1/2 NPT	2 1/2

Stainless Steel Re-Adjustable Spring-Loaded Well Fittings with Teflon® Ferrule

CODE	TUBE SIZE (inches	PROCESS THREAD (inches)	LENGTH (inches)
6109TSL-3C	3/16 OD	1/2 NPT	2 3/8
6109TSL-4C	1/4 OD	1/2 NPT	2 3/8
6109TSL-6C	3/8 OD	1/2 NPT	2 3/8

Brass with Teflon® Ferrule

CODE	TUBE SIZE (inches)	PROCESS THREAD (inches)	LENGTH (inches)
6122T-1A	1/16 OD	1/8 NPT	1
6122T-2A	1/8 OD	1/8 NPT	1 1/4
6122T-3A	3/16 OD	1/8 NPT	1 1/4
6122T-2B	1/8 OD	1/4 NPT	1 3/8
6122T-3B	3/16 OD	1/4 NPT	1 1/2
6122T-4B	1/4 OD	1/4 NPT	1 1/2
6122T-6B	3/8 OD	1/4 NPT	1 9/16
6122T-4C	1/4 OD	1/2 NPT	1 13/16
6122T-6C	3/8 OD	1/2 NPT	1 13/16

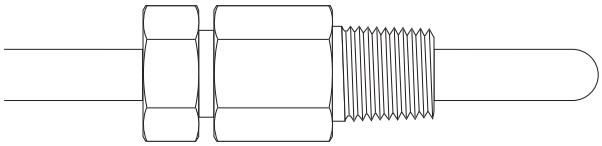
Teflon® with Teflon® Ferrule

CODE	TUBE SIZE (inches)	PROCESS THREAD (inches)	LENGTH (inches)
61TT-4B	1/4 OD	1/4 NPT	1 3/4
61TT-4C	1/4 OD	1/2 NPT	2 1/8

Ferrule Temperature Ratings

CODE	MATERIAL	MAX. TEMP.
N	Neoprene	200 °F
T	Teflon®	450 °F
L	Lava	1600 °F
Substitute ferrule code N or L for the letter T for fittings supplied with other than Teflon® ferrules.		

ONE-TIME ADJUSTABLE COMPRESSION FITTINGS

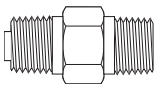
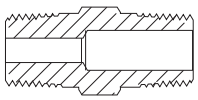
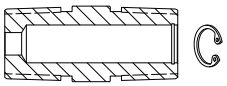
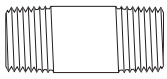


Stainless Steel with SS Ferrule

CODE	TUBE SIZE (inches)	PROCESS THREAD (inches)	LENGTH (inches)
6009-1A	1/16 OD	1/8 NPT	1 1/4
6009-2A	1/8 OD	1/8 NPT	1 1/4
6009-3A	3/16 OD	1/8 NPT	1 1/4
6009-4A	1/4 OD	1/8 NPT	1 1/4
6008-2B	1/8 OD	1/4 NPT	1 7/16
6008-3B	3/16 OD	1/4 NPT	1 1/2
6008-4B	1/4 OD	1/4 NPT	1 9/16
6008-6B	3/8 OD	1/4 NPT	1 5/8
6008-2C	1/8 OD	1/2 NPT	1 5/8
6008-4C	1/4 OD	1/2 NPT	1 3/4
6008-6C	3/8 OD	1/2 NPT	1 7/8

Brass with Brass Ferrule

CODE	TUBE SIZE (inches)	PROCESS THREAD (inches)	LENGTH (inches)
6022-2A	1/8 OD	1/8 NPT	1 1/16
6022-3A	3/16 OD	1/8 NPT	1 1/16
6022-4A	1/4 OD	1/8 NPT	1 3/16
6022-3B	3/16 OD	1/4 NPT	1 3/16
6022-4B	1/4 OD	1/4 NPT	1 1/4
6022-6B	3/8 OD	1/4 NPT	1 5/16
6022-4C	1/4 OD	1/2 NPT	1 3/8
6022-6C	3/8 OD	1/2 NPT	1 1/2

FIG. 1  FIG. 2  FIG. 3  FIG. 4  FIG. 5 

Machined Double Thread Hex Fittings

CODE	SHEATH SIZE (inches)	DESCRIPTION	FIG. NO
CARBON STEEL 1/2" NPT x 1/2" NPT			
6HN-CC-125-B	0.125	Braze hub	1
6HN-CC-188-B	0.188	Braze hub	1
6HN-CC-250-B	0.250	Braze hub	1
6HN-CC-375-B	0.375	Braze hub	1
6HN-CC-188-SL	0.188	Spring-loaded	2
6HN-CC-250-SL	0.250	Spring-loaded	2
6HN-CC-188-SC[1]	0.188	Self contained spring-loaded	3
6HN-CC-250-SC[1]	0.250	Self contained spring-loaded	3
316SS 1/2" NPT x 1/2" NPT			
8HN-CC-125-W	0.125	Weld hub	1
8HN-CC-188-W	0.188	Weld hub	1
8HN-CC-250-W	0.250	Weld hub	1
8HN-CC-375-W	0.375	Weld hub	1
8HN-CC-188-SL	0.188	Spring-loaded	2
8HN-CC-250-SL	0.250	Spring-loaded	2
8HN-CC-188-SC[1]	0.188	Self contained spring-loaded	3
8HN-CC-250-SC[1]	0.250	Self contained spring-loaded	3
316SS 3/4" NPT x 1/2" NPT			
8HN-DC-250-W	0.250	Weld hub	1
304SS 1/4" NPT x 1/4" NPT			
9HN-BB-125-P	0.125	Plain end, no hub	
9HN-BB-188-P	0.188	Plain end, no hub	
9HN-BB-250-P	0.250	Plain end, no hub	
[1] Requires snap-ring pliers to install.			

Hex Head Reducing Bushings

CODE		THREAD SIZE (inches)	LENGTH (inches)	FIG. NO
BRASS	*316SS*			
22RB-BA	8RB-BA	1/4 NPT x 1/8 NPT	11/16	4
22RB-QA	8RB-QA	3/8 NPT x 1/8 NPT	3/4	4
22RB-QB	8RB-QB	3/8 NPT x 1/4 NPT	3/4	4
22RB-CA	8RB-CA	1/2 NPT x 1/8 NPT	15/16	4
22RB-CB	8RB-CB	1/2 NPT x 1/4 NPT	15/16	4
22RB-CQ	8RB-CQ	1/2 NPT x 3/8 NPT	15/16	4
22RB-DA	8RB-DA	3/4 NPT x 1/8 NPT	1	4
22RB-DB	8RB-DB	3/4 NPT x 1/4 NPT	1	4
22RB-DC	8RB-DC	3/4 NPT x 1/2 NPT	1	4
22RB-EC	8RB-EC	1 NPT x 1/2 NPT	1 3/16	4
22RB-ED	8RB-ED	1 NPT x 3/4 NPT	1 3/16	4
	8RB-FC	1 1/4 NPT x 1/2 NPT	1 1/8	4
	8RB-FD	1 1/4 NPT x 3/4 NPT	1 1/8	4
	679	1 1/4-18 NEF x 1/2 NPT	15/16	4

Pipe Nipples (Schedule 40)

CODE		THREAD (inches)	LENGTH (inches)	FIG. NO
CARBON STEEL	*316SS*			
6PN - C - CL	8PN - C - CL	1/2 NPT	1	5
6PN - C - 2	8PN - C - 2	1/2 NPT	2	5
6PN - C - 3	8PN - C - 3	1/2 NPT	3	5
6PN - C - 4	8PN - C - 4	1/2 NPT	4	5
6PN - C - 5	8PN - C - 5	1/2 NPT	5	5
6PN - C - 6	8PN - C - 6	1/2 NPT	6	5

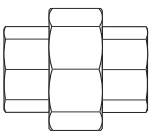
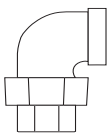
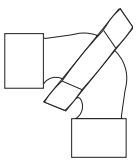
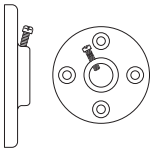
FIG. 6  FIG. 7  FIG. 8 

FIG. 9  FIG. 10 

Union Fittings

CODE	NPT SIZE (inches)	DESCRIPTION	FITTING MATERIAL	FIG. NO
6FU - C	1/2	Female union-150#	Malleable iron	6
8FU - C	1/2	Female union-150#	316 SS	6
6FU - C - X	1/2	Explosion proof female union	Zinc plated steel	6
6UE - C	1/2	90° union elbow-150#	Malleable iron	7
6UE - D	3/4	90° union elbow-150#	Malleable iron	7
6UN - C - X	1/2	90° adjustable union elbow UNA fitting	Malleable iron	8

Malleable Iron Mounting Flanges

CODE	NPT PIPE SIZE (inches)	DESCRIPTION	FIG. NO
6FF - B	1/4	Internal threads	9
6FF - C	1/2		9
6FF - D	3/4		9
6FF - E	1		9
6BF - B	1/4	Slip fit bore for indicated pipe size	10
6BF - C	1/2		10
6BF - D	3/4		10
6BF - E	1		10

Bare Base Metal Thermocouple Wire

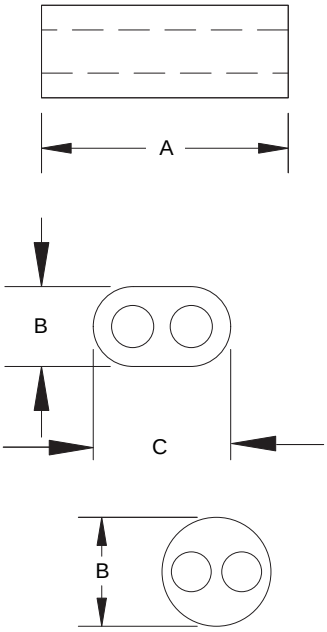
CODE	TYPE / POL.	MATERIAL	GA.	FT. / LB.
JP08B	J (+)	Iron	8	23
JN08B	J (-)	Constantan	8	20
JP14B	J (+)	Iron	14	91
JN14B	J (-)	Constantan	14	80
JP20B	J (+)	Iron	20	365
JN20B	J (-)	Constantan	20	323
KP08B	K (+)	Chromel	8	21
KN08B	K (-)	Alumel	8	21
KP14B	K (+)	Chromel	14	83
KN14B	K (-)	Alumel	14	83
KP20B	K (+)	Chromel	20	313
KN20B	K (-)	Alumel	20	313

Bare Noble Metal Thermocouple Wire

CODE	TYPE / POL.	MATERIAL	GA.	IN. / TROY OZ.
RP24B	R (+)	Plat. 13% Rh	24	309
SP24B	S (+)	Plat. 10% Rh	24	302
PN24B	R S (-)	Pure Platinum	24	282
RP26B	R (+)	Plat. 13% Rh	26	482
SP26B	S (+)	Plat. 10% Rh	26	473
PN26B	R S (-)	Pure Platinum	26	440

NOTES: All wire supplied bright annealed. Wire orders must be for equal amounts of both legs. All listed wire is supplied as standard limits of error.

INSULATOR DIMENSIONS



Cordierite Insulators (2250 ºF max)

CODE	STYLE	GA.	A DIM. (inches)	B DIM. (inches)	C DIM. (inches)	NO BORE(S)
408-1C	Oval	8	1	0.281	0.500	2
408-1R	Round	8	1	0.465		2
408-3C	Oval	8	3	0.281	0.500	2
408-3R	Round	8	3	0.465		2
408-B	Fish spine	8	1/4	0.26		1
408-12S[1]	Fish spine	8	12	0.260		1
411-1C	Oval	11	1	0.218	0.375	2
411-3C	Oval	11	3	0.218	0.375	2
414-1C	Oval	14	1	0.188	0.313	2
414-1R	Round	14	1	0.250		2
414-3C	Oval	14	3	0.188	0.313	2
414-B	Fish spine	14	1/4	0.200		1
414-12S[1]	Fish spine	14	12	0.200		1
420-1C	Oval	20	1	0.188	0.172	2
420-12S[1]	Fish spine	20	12	0.125		1

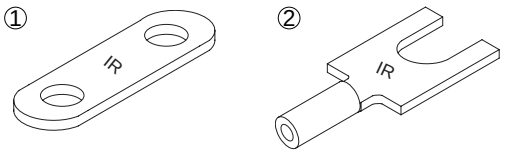
Alumina Insulators (3400 ºF max)

CODE	STYLE	GA.	A DIM. (inches)	B DIM. (inches)	C DIM. (inches)	NO BORE(S)
424-12	Round	24	12	0.188		4
424-18	Round	24	18	0.188		4
424-24	Round	24	24	0.188		4
424-30	Round	24	30	0.188		4

[1] 12S fish spine insulators supplied in continuous 12" sleeves.

Thermocouple Alloy Terminal and Spade Lugs

TERMINAL LUG CODE [1]	SPADE LUG CODE [2]	ANSI LETTER DESIGNATION	THERMOCOUPLE ALLOY
460053	460060	KP, EP	Chromel
460052	460059	KN	Alumel
460056	460063	JP	Iron
460054	460061	JN, EN, TN	Constantan
460055	460062	TP, RP, SP	Copper
460051	460116	RN, SN	Alloy #11



[1] Terminal lugs fit Cinch Jones Series #141 and equivalent Barrier terminal blocks with 27/64" screw spacing and #6-32 terminal screws.

[2] Spade lugs are crimp-on style to fit #6-32 terminal screws and 18 awg. wire or smaller.

COMPLETE COMPENSATED TERMINAL BLOCKS

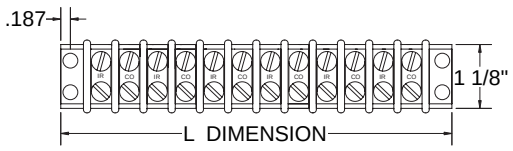
EXAMPLE ORDER NUMBER: 26 - 240 - 08

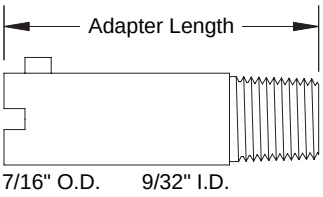
Terminal Block Thermocouple Type

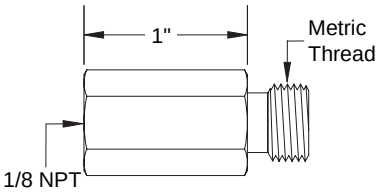
PREFIX CODE	T/C TYPE	THERMOCOUPLE ALLOY	
		POSITIVE	*NEGATIVE*
26 - 220	E	Chromel	Constantan
26 - 230	J	Iron	Constantan
26 - 240	K	Chromel	Alumel
26 - 250	R-S	Copper	Alloy #11
26 - 260	T	Copper	Constantan
26 - 270	U	Copper	Copper
Consult factory for combination blocks.			

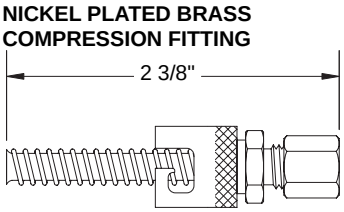
Number of Circuits

SUFFIX CODE	CIRCUITS (TERMINALS)	L DIMENSION (inches)
02	2 (4)	2 1/2
04	4 (8)	4 1/2
05	5 (10)	5 3/8
06	6 (12)	6
08	8 (16)	7 3/4
10	10 (20)	9 1/2
Consult factory for other number of circuits.		









Bayonet Fitting Adapters

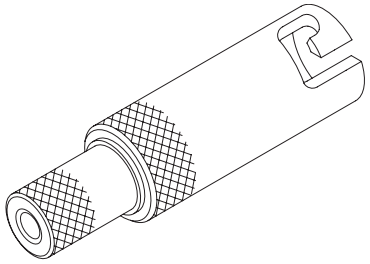
CODE	LENGTH (inches)	THREAD (inches)
705-0.88	7/8	1/8 NPT
705-1.25	1 1/4	1/8 NPT
705-1.5	1 1/2	1/8 NPT
705-2	2	1/8 NPT
705-2.25	2 1/4	1/8 NPT
705-2.5	2 1/2	1/8 NPT
705-3.5	3 1/2	1/8 NPT
735-0.88	7/8	3/8 - 24
735-1.5	1 1/2	3/8 - 24
735-2.5	2 1/2	3/8 - 24
735-3.5	3 1/2	3/8 - 24
745-1	1	12mm x 1
The plated steel bayonet adapter accommodates the bayonet lock cap assembly to bottom the hot junction in holes in machine walls, cylinder, or dies.		

Metric to 1/8” NPT Adapters

CODE	METRIC THREAD (mm)
40001	10 x 1.5
40002	12 x 1
40003	12 x 1.5
40004	14 x 1.5
40005	14 x 2
Adds 1" to bayonet adapter length.	

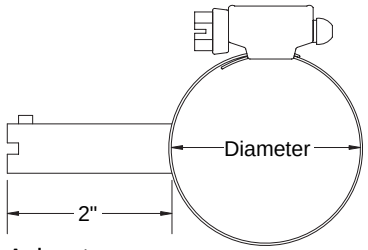
Adjustable Bayonet Cap

CODE	SHEATH SIZE (inches)	DESCRIPTION
718	1/16	Adjustable bayonet cap and spring
728	1/8	



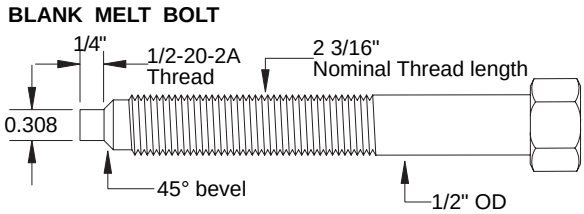
Positive Bottoming Indicating Bayonet Cap

CODE	DESCRIPTION
D702 - A - 2	Adjustable bayonet cap for 0.210" OD flex with red bottoming indication.



Pipe Clamp Adapters

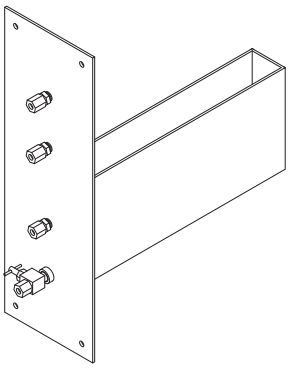
CODE	CLAMP DIA. MIN. / MAX. (inches)	PIPE SIZE (inches)	PIPE DIAMETER (inches)
PCA-075	1 1/16 - 1 1/4	1/2 - 3/4 IPS	0.840 - 1.050
PCA-150	1 1/16 - 2	1 - 1 1/2 IPS	1.315 - 1.900
PCA-250	2 1/16 - 3	2 - 2 1/2 IPS	2.375 - 2.875
PCA-350	3 5/16 - 4 1/4	3 - 3 1/2 IPS	3.500 - 4.000
PCA-400	4 1/8 - 5	4 IPS	4.500
Use 2(3/4)" sensor 'A' dimension when using fixed bayonet type thermocouples with above adapters.			

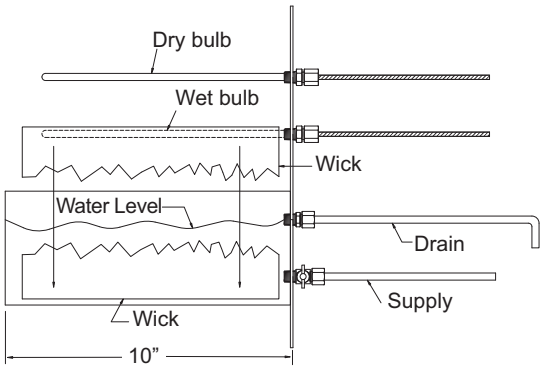


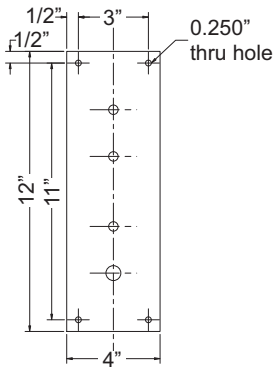
Blank Melt Bolts

CODE	DESCRIPTION
743	3” blank bolt
746	6” blank bolt

WET AND DRY BULB TANK ASSEMBLY







CODE	DESCRIPTION
26001	304SS tank with 12 ga. mounting flange
26001 - 01	Package of 5 cloth wicks, 9” long [1]
26001 - 02	Water flow needle valve - 1/4” OD tube connection [1]
6022 - 4A	Brass compression fitting - 1/4” OD tube connection [1]
6109T - 3A	Stainless steel re-adj. compression fitting- 3/16” OD tube connection [1]
[1] One set supplied with tank assembly (#26001).	

RTD or thermocouple probes for tank assembly are to be 3/16” OD x 9” long.
Configure part number from appropriate catalog section.

MOLTEN NON-FERROUS METAL LANCES AND THERMOCOUPLE TIPS

FIG. 1

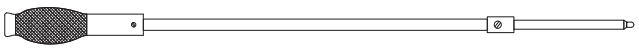


FIG. 2

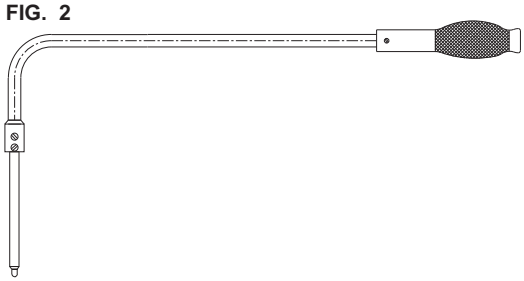


FIG. 3

CODE	DESCRIPTION	FIG. NO.
26 - 101P[1]	Ladle type, straight lance handle with plastic grip, 43” long	1
26 - 501P [1]	Furnace type, 90° lance handle with plastic grip, 43” long	2
26 - 501T - 8	8” Type K 446SS thermocouple tip with 43” leads	3
26 - 501T - 12	12” Type K 446SS thermocouple tip with 43” leads	3
26 - 501T - 15	15” Type K 446SS thermocouple tip with 43” leads	3
26 - 501T - 18	18” Type K 446SS thermocouple tip with 43” leads	3
[1] Does not include sensor.		

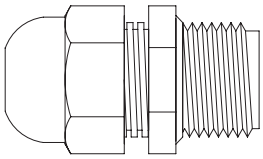


FIG. 1

FIG. 2

Nylon Weatherproof Cord Grips

CODE	CABLE SIZE RANGE (inches)	NPT SIZE (inches)
1397	0.125 to 0.188	3/8
1398	0.188 to 0.250	3/8
1399	0.197 to 0.348	1/2

Stainless Steel Square Lock Flexible Armor

CODE	ID (inches)	OD (inches)	COATING	FIG. NO.
FX188SL	3/16	0.275	None	1
FX125SL	1/8	0.207	None	1
FX250SL	1/4	0.345	None	1
FX188SLP	3/16	0.328	PVC (black)	2
FX188SLF	3/16	0.313	Teflon® (white)	2

FIG. 3

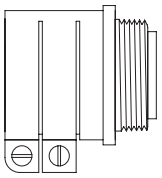
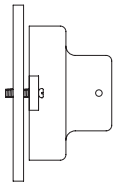
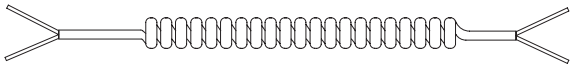


FIG. 4





Holding Fixtures for Silicon Carbide Tubes

CODE	DESCRIPTION	FIG. NO.
18J SERIES TUBES		
370006	3/4" NPT x 1(7/8)" ID	3
18JC SERIES TUBES		
370007	Support casting with flange	4

Coil Cords

CODE	DESCRIPTION	RETRACTED LENGTH (inches)	EXTENDED LENGTH (inches)
[1]32060-0	Polyurethane, 2 free ends,stripped	12	60
[1]32120-0	Polyurethane, 2 free ends,stripped	24	120
RTD32060-0	Polyurethane, 3 conductor with 2 free ends,stripped	12	60
[1] Insert calibration code: J, K, T, E, R, S, U Consult factory for availability of other lengths			

FIG. 6

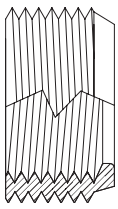
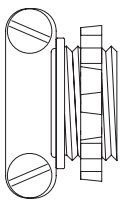


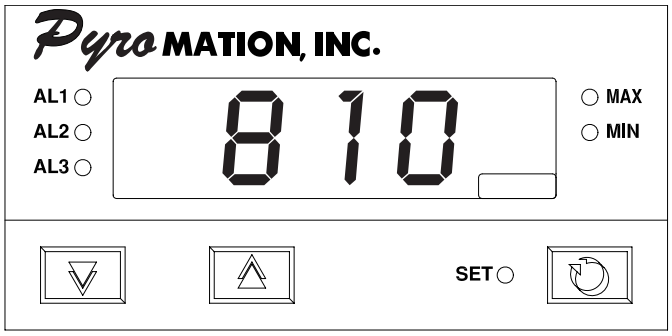
FIG. 7



Miscellaneous Items

CODE	DESCRIPTION	FIG. NO.
440017	3/4 oz. silicone rubber head sealant (RTV)	
440040	10cc heat transfer compound (300 °F max)	
6EB - DC	3/4" x 1/2" reducing face bushing for 300 series heads	6
710	1/2" box connector	7

The Series 810 1/8 DIN Panel Indicator is loaded with standard and optional features that provide a flexible and economical solution for almost any application. Customize the unit with just the functions your application requires, minimizing your cost. Features flexible input/output options and large LED display. The digital indicator is fitted with one latchable relay as standard. Plug-in modules allow two additional relays, process variable retransmission, or transmitter power supply. Each alarm has its own LED indicator for fast identification of alarms. Configuration can be modified in the field through the front panel or through use of a computer interface.



Features and Benefits

- Four-digit LED display
- Up To 3 Alarms
- Transmitter Power Supply Option
- Min/Max Value Hold
- Engineering Units
- PC Configuration
- Process Variable Retransmit Option

TECHNICAL DATA

General

Output Configuration	Up to 3 total, max 3 for alarms, max 1 for retransmit of PV, max 1 transmitter power supply
Alarm Types	Process high, process low, direct acting, process high, process low reverse and logical OR
Human Interface	3 button operation, 4 digit 13 mm high red display, plus set-up alarm, min and max indicators
PC Configuration	Off-line configuration from serial port to dedicated configuration socket

Output and Options

Alarms Relay(s)	Contacts: SPDT 2 resistive at 240 V ac, > 500,000 operations, latching or non-latching
Retransmit Output	(0 to 20) mA or (4 to 20) mA, (0 to 10) V or (0 to 5) V into 500 Ω min. Accuracy typically ± 0.25%
Transmitter Power Supply	(20 to 28) V dc (24 V nominal) max load 910 Ω (22 mA at 20 V)

Inputs

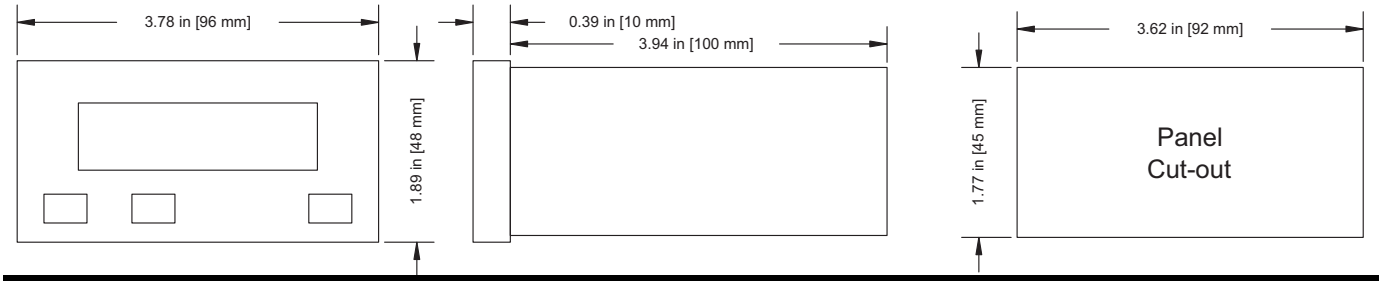
Thermocouple Types	J,K,R,S,T,B,L, & N
RTD	3 wire Pt100 (α = 0.003 85 $^{o}C^{-1}$), 50 Ω per lead maximum (balanced)
DC Linear	(0 to 20) mA or (4 to 20) mA, (0 to 50) mV or (10 to 50) mV, (0 to 5) V or (1 to 5) V, (0 to 10) V or (2 to 10) V. Scalable -1999 to 9999, decimal point available
Impedance	> 100 MΩ for Thermocouple and mV ranges, 47 KΩ for V ranges and 4.7 Ω for mA ranges
Accuracy	± 0.25% of input span ± 1 LSD (T/C CJC better than 0.7 ^{o}C)
Sampling	4 s, 14 bit resolution (approximately)
Sensor Break Detection	< 2 second (except zero based DC ranges), high alarms activate (low for RTD, mA or V)

Operating Conditions

Temperature & RH	(0 to 55) ˚C, 20% to 95% RH non-condensing, (-20 to 80) ˚C for storage
Power supply	(100 to 240) V ac 50/60 Hz 7.5VA (optional (20 to 50) V ac 7.5 VA or (22 to 65) V dc 4 W)
Front Panel Protection	IEC IP66 (Behind panel protection is IP20)

Approvals

CE marked	Unit complies with the legal requirements set forth by the EU regulations.
c UL us	UL Recognized Component



ORDER CODES

Unconfigured Order Number: **810** - **00** (1)

Configured Order Number: **810** - **00** (1) - **2** (2) **1** (3) **7** (4) **0** (5) - **T1419** (6)

1

CODE	DESCRIPTION
00	(100 to 240) V ac
02	(24 to 50) V ac or (22 to 65) V dc

2

CODE	DESCRIPTION
1	3 wire RTD or DC mV
2	Thermocouple
3	DC mA
4	DC Voltage

3

CODE	DESCRIPTION
1[1]	Relay Alarm Output
[1] Standard on all meters	

4

CODE	DESCRIPTION
0	Not fitted
1	Relay
3	(0 to 10) V dc Retransmit
4	(0 to 20) mA Retransmit
5	(0 to 5) V dc Retransmit
7	(4 to 20) mA Retransmit

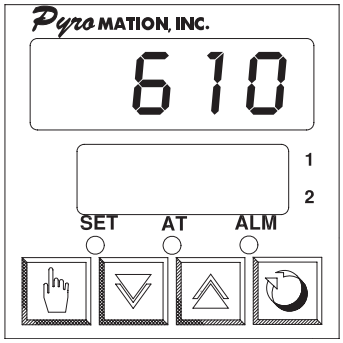
5

CODE	DESCRIPTION
0	Not Fitted
1	Relay
8	Transmitter Power Supply

6

CODE			DESCRIPTION		
00			Non-Configured		
THERMOCOUPLE			**RTD Pt100** (α = 0.003 85 °C^{-1})		
CODE	TYPE	**RANGE**	CODE	TYPE	**RANGE**
T1419	J	(-200 to 1200) °C	T7220	RTD	(-199 to 800) °C
T1420	J	[-328 to 2192] °F	T7221	RTD	[-328 to 1472) °F
T6709	K	(-240 to 1373) °C	T2297	RTD	(-128 to 537.7) °C
T6710	K	[-400 to 2503] °F	T2298	RTD	[-199.9 to 999.9) °F
T1525	T	(-240 to 400) °C	**LINEAR**		
T1526	T	[-400 to 752] °F	T4445	V dc	(0 to 5) V dc
T5371	N	(0 to 1399) °C	T4434	V dc	(1 to 5) V dc
T5324	N	[32 to 2551] °F	T4446	V dc	(0 to 10) V dc
T1127	R	(0 to 1759) °C	T4450	V dc	(2 to 10) V dc
T1128	R	[32 to 3198] °F	T3413	mA dc	(0 to 20) mA
T1227	S	(0 to 1762) °C	T3414	mA dc	(4 to 20) mA
T1228	S	[32 to 3204] °F	--------	--------	--------
T1934	B	[211 to 3315] °F	--------	--------	--------
T1938	B	(100 to 1824) °C	--------	--------	--------
Consult factory for availability of other ranges					

The Series 610 1/16 DIN Controller is loaded with standard and optional features that provide a flexible and economical solution for almost any application. Customize the unit with just the functions your application requires, minimizing your cost. Features flexible input/output options and large LED display. The digital controller is fitted with one latchable relay as standard. Plug-in modules allow two additional relays, process variable retransmission, or transmitter power supply. May be auto or manual tuned. Configuration can be modified in the field through the front panel or through use of a computer interface.



Features and Benefits

- Heat/Cool operation
- Two Process Alarms
- Loop Alarm
- Auto/Manual Tuning
- PC Configuration
- Process Variable Retransmit Option

TECHNICAL DATA

General

Control Types	Full PID with Pre-tune, Self-tune, Manual Tuning, or On-Off control. Heat only or heat and cool.
Output Configuration	Up to 3 total, max 2 for control (Heat and Cool), max 2 for Alarms, max 1 for retransmit of PV
Alarm Types	Process high, process low, SP deviation, band, logical OR and hysteresis. Also 1 loop alarm.
Human Interface	4 button operation, dual 4 digit 10 mm and 8 mm high LED display, plus 3 LED indicators.
PC Configuration	Off-line configuration from serial port to dedicated configuration socket.

Output and Options

Control & Alarm Relay(s)	Contacts: SPDT 2 A resistive at 240 V ac, > 500,000 operations
Control SSR	Drive capability > 4.2 V dc in 1 K Ω minimum
Solid State (Triac)	(0.01 to 1) A ac (20 to 280) V, (47 to 63) Hz
Retransmit Output	(0 to 20) mA or (4 to 20) mA into 500 Ω max, (0 to 10) V or (0 to 5) V into 500 Ω min. Accuracy typically ± 0.25 %

Inputs

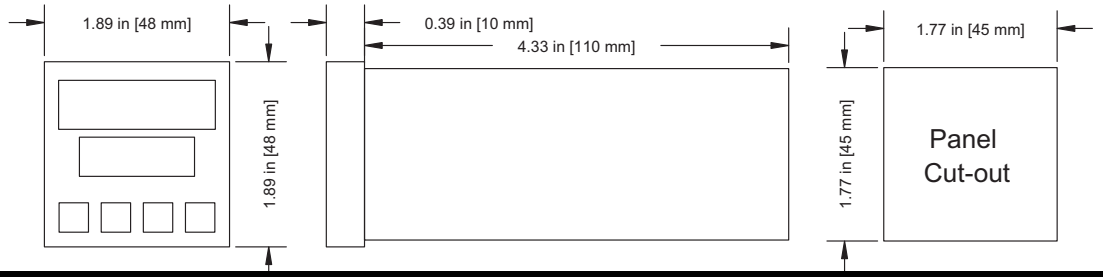
Thermocouple Types	J,K,R,S,T,B,L,N & Pt100 Rh 20% vs Pt Rh 40%
RTD	3 wire Pt100 (α = 0.003 85 $^{o}C^{-1}$), 50 Ω per lead maximum (balanced)
DC Linear	(0 to 20) mA or (4 to 20) mA, (0 to 50) mV or (10 to 50) mV, (0 to 5) V or (1 to 5) V, (0 to 10) V or (2 to 10) V. Scalable -1999 to 9999, decimal point available
Impedance	> 100 M Ω for Thermocouple and mV ranges, 47 K Ω for V ranges and 5 Ω for mA ranges
Accuracy	± 0.1% of input span ± 1 LSD (T/C CJC better than 1 ˚C)
Sampling	4 s, 14 bit resolution (approximately)
Sensor Break Detection	< 2 second (except zero based DC ranges), control O/P's turn off, high alarms activate for T/C and mV ranges, low alarms activate for RTD, mA or V ranges.

Operating Conditions

Temperature & RH	(0 to 55) ˚C, 20% to 95% RH non-condensing, (-20 to 80) ˚C for storage
Power supply	(100 to 240) V ac 50/60 Hz 7.5VA (optional (20 to 48) V ac 7.5 VA or (22 to 65) V dc 5 W)
Front Panel Protection	IEC IP66 (Behind panel protection is IP20)

Approvals

CE marked	Unit complies with the legal requirements set forth by the EU regulations.
c UL us	UL Recognized Component



ORDER CODES

Unconfigured Order Number: **610 - 00** (1)

Configured Order Number: **610 - 00 - 2 1 7 0 - T1419** (1) (2) (3) (4) (5) (6)

1

CODE	DESCRIPTION
00	(100 to 240) V ac
02	(24 to 48) V ac or (22 to 65) V dc

2

CODE	DESCRIPTION
1	3 wire RTD or DC mV
2	Thermocouple
3	DC mA
4	DC Voltage

3

CODE	DESCRIPTION
1*	Relay Alarm Output
*Standard on all meters	

4

CODE	DESCRIPTION
0	Not fitted
1	Relay
2	SSR Control
3	(0 to 10) V dc Retransmit
4	(0 to 20) mA Retransmit
5	(0 to 5) V dc Retransmit
7	(4 to 20) V dc Retransmit
8	Triac Control

5

CODE	DESCRIPTION
0	Not Fitted
1	Relay
2	SSR Control
3	(0 to 10) V dc Retransmit
4	(0 to 20) mA Retransmit
5	(0 to 5) V dc Retransmit
7	(4 to 20) V dc Retransmit

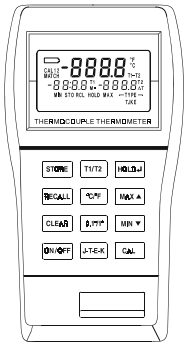
6

CODE			DESCRIPTION		
00			Non-Configured		
THERMOCOUPLE			**RTD Pt100** (α = 0.003 85 °C^{-1})		
CODE	TYPE	**RANGE**	CODE	TYPE	**RANGE**
T1419	J	(-200 to 1200) °C	T7220	RTD	(-199 to 800) °C
T1420	J	[-328 to 2192] °F	T7221	RTD	[328 to 1472] °F
T6709	K	(-240 to 1373) °C	T2297	RTD	(-128 to 537.7) °C
T6710	K	[-400 to 2503] °F	T2298	RTD	[-199 to 999.9] °F
T1525	T	(-240 to 400) °C	**LINEAR**		
T1526	T	[-400 to 752] °F	T4445	V dc	(0 to 5) V dc
T5371	N	(0 to 1399) °C	T4434	V dc	(1 to 5) V dc
T5324	N	[32 to 2551] °F	T4446	V dc	(0 to 10) V dc
T1127	R	(0 to 1759) °C	T4450	V dc	(2 to 10) V dc
T1128	R	[32 to 3198] °F	T3413	mA dc	(0 to 20) mA
T1227	S	(0 to 1762) °C	T3414	mA dc	(4 to 20) mA
T1228	S	[32 to 3204] °F	--------	--------	--------
T1934	B	[211 to 3315] °F	--------	--------	--------
T1938	B	(100 to 1824) °C	--------	--------	--------
Consult factory for availability of other ranges					

Easy to use automatic field calibration ensures accurate readings. IP54-rated case provides splash and dust resistance. Intrinsically safe UL listed - certified for Class I. Groups A, B, C, and D, Division 1. All models feature an ergonomic design, sealed silicone rubber keypad, IP54 splash - and dust resistant ABS/polycarbonate case, and a built-in tilt stand. They accept a wide variety of thermocouple probes with miniconnectors. Features automatic field calibration-simply place the probe in a container packed with ice, fill with water, and press the “CAL” button; meter automatically recognizes the freezing point.

Displays temperatures in ºF or ºC on large LCD. HOLD feature lets you freeze the display for later reading. Resolution is autoranging. Above 299.9º and below - 99.9º, thermometer automatically switched from standard 0.1º resolution to 1º resolution.

Each thermometer is individually factory calibrated on a NIST-traceable calibrator. The thermometer has ±0.05 ºF conformity to NIST calibration tables.



FEATURES	MODEL 28 - 02800
Thermocouple Input Type	J,K,T & E
Number of Inputs	2
LCD Display	•
Mini T/C Plug Connection(s)	•
Selectable °F or °C	•
Temperature Hold	•
Low Battery	•
Field Calibration	•
Calibration Lockout	•
Differential Temperature	•
Minimum Temperature	•
Maximum Temperature	•
Memory Store	•
Recall	•

SPECIFICATIONS

ACCURACY:
02 - 02800
Below -150 °C [-328 °F]: ± 0.25% of rdg + 1 ºC [2 ºF]
Above -150 °C [-328 °F]: ± 0.1% of rdg + 0.4 ºC [0.7 ºF]

RESOLUTION:
02 - 02800
Below -150 °C: auto ranging to 1 ºC
For (-150 to 999.9) ºC: 0.1 ºC
Above 999.9 °C: 1 ºC

USEFUL RANGES:
(J) (-200 to 1000) °C [-328 to 1832] °F
(K) (-250 to 1372) °C [-418 to 2501] °F
(T) (-250 to 400) °C [-418 to 752] °F
(E) (-250 to 1000) °C [-418 to 1832] °F

BATTERY: Two AA Batteries (>750 hours battery life)

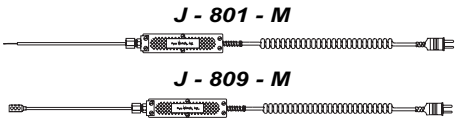
SIZE (in): 3.3 W × 6.2 H × 1.2 D

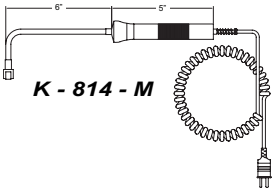
APPROVALS: CE Marked (EN 61 326-1)
This product is energy limited for intrinsically safe operation in hydrogen atmospheres per Class I, Division 1, Groups A,B,C, and D hazardous (classified) locations for UL per UL913 and CSA per C22.2 No. 0-M1982 and No. 157-M1987. Maximum surface temperature: 135 °C(T4); UL file No. E182612 (1997).

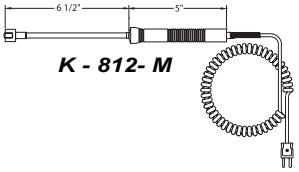
ORDER CODES

CODE	DESCRIPTION	CODE	DESCRIPTION
28 - 02800	Meter only (J, K, T, & E Inputs)	PROBES	See Handheld Probes listed later in instrument section

The hand pyrometer thermocouple probes listed below are suitable for use in many process and laboratory applications for "spot checking" temperatures of a variety of products and air flows. The probes are designed for use with Pyromation's and other manufacturers' handheld pyrometers. All probes are supplied with retractable coiled cordset leads with an expandable length of 5 feet.







ORDER CODES

Hand Pyrometer Probes

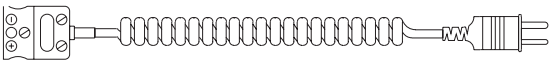
CODES COMPLETE ASSEMBLY	PROBE STYLE	DESCRIPTION
J - 801 - M	Insertion probe	1/8" x 3" long sheath w/ a 1/16" x 3/4" long hypodermic needle tip
J - 803 - M	General purpose probe	1/8" OD x 6" long pointed sheath
J - 805 - M	Heavy duty general purpose	3/16" OD x 6" long pointed sheath
J - 809 - M	Air / gas shielded tip	1/8" OD x 6" long w/radiation shield
[1]K-812-M	Surface probe - straight	Heavy-Duty, Fast Responding Tip 6 1/2" long
[1]K-814-M	Surface probe - 90° bend	Heavy-Duty, Fast Responding Tip 6 1/2" long

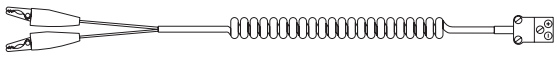
[1] Only Available in Type "K"

To order other calibrations, change prefix letter to J or T.
All probes are supplied with 316 Stainless Steel sheaths.
To order thermocouples with sheath lengths other than what is specified, add the letter "X" after the calibration prefix and specify length. Example: JX-803-M X=12

INSTRUMENTS — **HAND PYROMETER EXTENSIONS**

The hand pyrometer extensions listed below are provided with 12" retractable coiled cordset leads that expand to 5 feet in length and a variety of end terminations to satisfy most application requirements.





Example Part Number: JE6 (1) - C3060 (2) - AC (3)

1 Terminations

CODE	DESCRIPTION
JE4	Standard plug
JE5	Standard jack
JE6	Miniature plug
JE7	Miniature jack
For type E, K, or T thermocouples replace J in order code with required letter designation.	

2 Extension Leadwire

C3060	PVC insulated - stranded conductor - coil cord

3 Terminations

CODE	DESCRIPTION
4	Standard plug
5	Standard jack
6	Miniature plug
7	Miniature jack
AC	Alligator clip