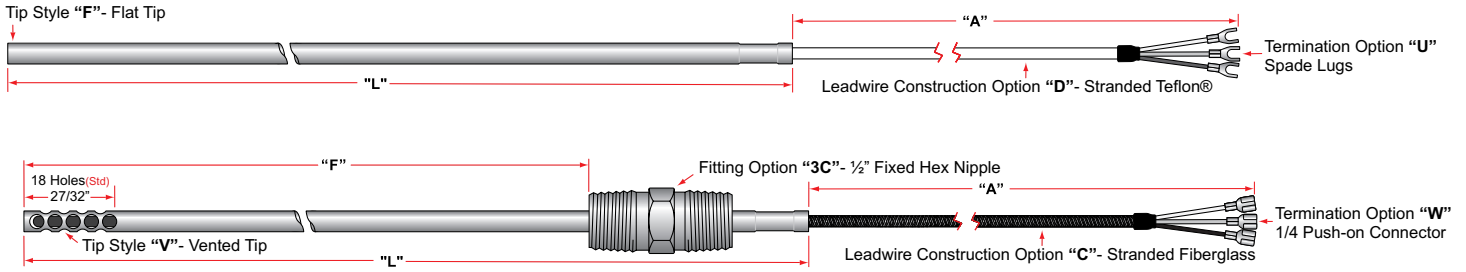


# Resistance Temperature Detectors (RTD)

## Style B – Basic Rigid Tube Assembly



### 1. RTD Element Type

Material	Resistance	Temp. Coefficient
A = Platinum (Std)	100 ohms @ 0°C	.00385 ohm/ohm/°C
B = Platinum	100 ohms @ 0°C	.00392 ohm/ohm/°C
C = Platinum	500 ohms @ 0°C	.00385 ohm/ohm/°C
D = Platinum	1000 ohms @ 0°C	.00385 ohm/ohm/°C
F = Nickel	120 ohms @ 0°C	.00672 ohm/ohm/°C
G = Copper	10 ohms @ 25°C	.00427 ohm/ohm/°C
H = NiFe	604 ohms @ 0°C	.00519 ohm/ohm/°C

### 2. Tip Style / Element Accy. (See Diagram TS-RTD)

	.01%	.02%	.03%	.05%	.10%	.50%	1.00%
Flat Tip:	M	L	K	P	F (Std)	I	J
Round Tip:	H	E	D	A	G	B	C
Vented Tip:	Q	U	T	W	V	R	S

### 3. Configuration (See Diagram RTD)

A = 2 Wire - Single Element	D = 4 Wire - Dual Element
B = 3 Wire - Single Element (Std)	E = 6 Wire - Dual Element
C = 4 Wire - Single Element	Z = Other

### 4. Sheath Operating Temperature

A = -200°C to 260°C (500°F) (Std)	C = -200°C to 600°C (1200°F)
B = -200°C to 400°C (750°F)	Z = Other

### 5. Sheath Material (See page 14 for other Materials)

4 = 304SS (1650°F) (Std)	0 = 310SS (2100°F)
6 = 316SS (1650°F)	I = INCONEL (2150°F)

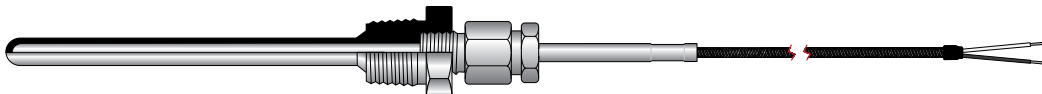
### 6. Sheath Diameter (Metric sizes also available)

G = .125*	I = .250*	M = .375
H = .188*	Q = .313	Z = Other

\* Quick delivery

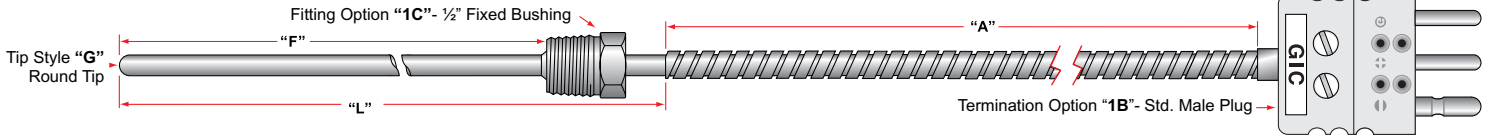
### 7. Sheath Length "L" (Example 12.5 = 12-1/2 inches)

0.25 - 99.9 inches	Z = greater than 99.9 inches (Consult Factory)
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Shown Here with a Mini-Protection Tube and a compression fitting (See page 11 for details)

The **Style B - Basic Rigid Tube Assembly** with precise and repeatable readings over a full temperature span of -320F to 1200F, can be made in a variety of designs, including field bendable and cuttable. These RTDs cover the full temperature span of the international IEC-751 standards. They are durable, stable and provide the best accuracy over a long period of time.



**16. Bend Location "C"** (inches from tip, see "Diagram BEND" page 49) N = No Bend (Std)

**15. Bend Angle**  
 N = None(Std) G = 45 Degree Bend S = 90 Degree Bend Z = Other

**14. Special Options** (Choose all that apply - See Page 17 for more information)

N = None (Std)	J = Coated Armor	T = Coated Probe
F = Field Bendable	L = Mating Connector	Y = Certificate of Conformance
G = Shielded leadwire	K = Copper Tip (Fast Response)	6 = Tip Sensitive Element
I = SS ID Tag	M = MgO Construction	Z = Other (Consult Factory)

**13. Fitting Location "F"** (inches from tip) N = No Fitting Location (Std)

**12. Fittings** (See page 18 for more info and other fittings) (Metric fittings also available)

N = None (Std) FB = Fixed Bayonet Fitting (.188 and .250 Dia only) Z = Special

NPT Fittings	1/8" NPT	1/4" NPT	1/2" NPT	3/4" NPT	SPECIAL
Fixed Bushing (Stainless)	1A	1B	1C	1D	1Z
Fixed Hex Nipple (Steel)	2A	2B	2C	2D	2Z
Fixed Hex Nipple (Stainless)	3A	3B	3C	3D	3Z
Spring Loaded Hex Nipple (Stainless)	-	-	4C	-	4Z
Compression (Brass) one time adj.	5A	5B	5C	-	5Z
Compression (Stainless) one time adj.	6A	6B	6C	-	6Z
Compression (Stainless) re-adjustable*	7A	7B	7C	-	7Z

\*Teflon® gland standard (400°F) for other gland options such as Lava (1200°F) see page 18

**11. Leadwire Terminations** (See Diagram LT-RTD)

N = No Split/ No Strip(Std)	<b>PLUGS &amp; JACKS</b> (2 and 3 wire only) Std Temp (425°F) w/ clamp w/o clamp
T = Split Leads (std = 2" split/3/8" strip)	
U = Spade Lugs (std = 2" split)	
V = Ring Lugs (std = 2" split)	
W = 1/4 Push-on (std = 2" split)	
X = Bx Connector w/ #8 lugs	
Z = Other	

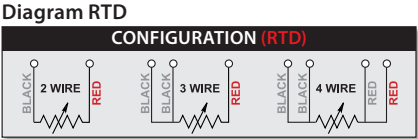
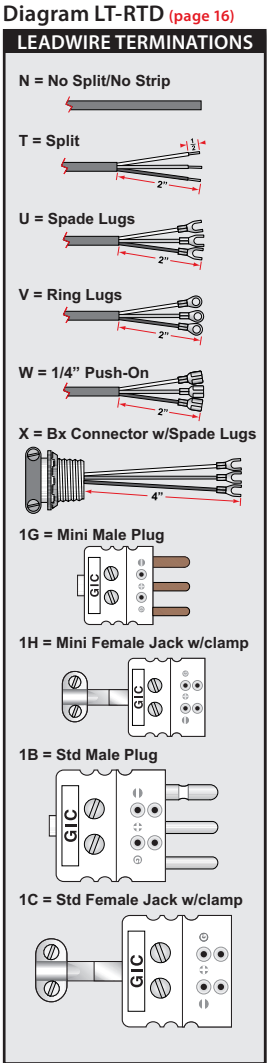
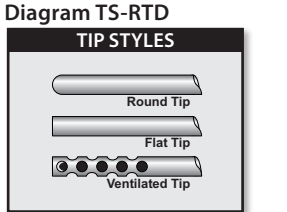
Std Male Plug	1A	1B
Std Female Jack	1C	1D
Mini Male Plug	1F	1G
Mini Female Jack	1H	1L

**10. Leadwire Length "A"** (Example 12.5 = 12-1/2 inches)

**9. Leadwire Gauge**  
 A = 26 gauge (Std) B = 24 gauge C = 20 gauge (.125 Dia & .greater probes)

**8. Leadwire Construction** Z=Other

	Standard	Overbraid	Armor
Stranded wire			
Fiberglass (900°F)	C	H	O
Teflon® (400°F)	D (Std)	I	P
Kapton® (700°F)	Q	R	S

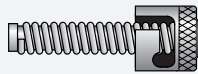


**Special Options (T/C and RTD's):** Chose as many special options needed. If you require two of the same option like two Weld Pads or ID tags put a letter for each item required.

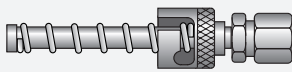
- Option A - **Special Limits of Error (T/C only):** This qualifies the accuracy of the sensor based on specified standard test points (EMF vs Temperature) set by the industry. This designates the highest tolerances available. (See page 13 for more info.)
- Option B - **RTD Transmitter:** Head mounted transmitter, fully Linearized, Pt100 input only. **Mp82800R** (See page 70 for more info.)
- Option C - **Programmable RTD Transmitter:** Head mount transmitter, fully linearized. Push-button Programmable, can be programmed in the field. Pt100 RTD 3-wire input only. **Mp82850R**. (See page 70 for more info.)
- Option D - **Universal Transmitter:** Scalable over the entire range of 8 RTD's and 12 Thermocouples. Fully-Isolated; Fully-Linearized. Hart protocol option. **Mp82700** (See page 70 for more info.)
- Option E - **Economy Multi-input transmitter:** – Pt100 RTD & Thermocouples. Fully-linearized head mount transmitter. **Mp82800**. (page 66)
- Option F - **Field Bendable:** Sensor is able to be bent in the field. This option must be specified for Rigid Tube assemblies, T/C and RTD. Mineral Insulated (**MgO**) assemblies are field bendable – option not required.
- Option G - **Shielded leadwire:** Shield with Drain Wire Reduces Electrical Noise. (Specify -Shield open or Shield grounded to probe)
- Option H - **High Vibration:** Assemblies are reinforced to help prevent damage/failure in extreme applications.
- Option I - **SS ID Tag:** Product Identification plate. (Electro-etching standard)
- Option J - **Coated Armor:** Provides a moisture seal for this durable and abrasion resistant wire protection. PVC or Teflon.
- Option K - **(Open)**
- Option L - **Mating Connector:** Assembly will be supplied with a mating connector.
- Option M - **MgO Construction:** Metal sheathed mineral insulation provides best construction for high temperature or heavy vibration applications. Multiple sizes and materials.
- Option O - **Separate Ungrounded:** Isolated junction type used in dual and triplex MGO assemblies (See Diagram "JT" page 15.)
- Option P - **Electro-etching:** Part number or other information permanently etched on probe sheath.
- Option Q - **Ground Screw:** For head assemblies if a ground screw is required. Not available on all connection head styles.
- Option R - **Faster Response Construction:** Greatly increases response time in ungrounded/Isolated sensors.
- Option S - **Spring Loaded:** Allows probe retraction for best contact with process surface. Pressure on the junction tip provides and maintains faster response.
- Option T - **Coated Probe:** Sheath is sealed with Teflon or PVC to provide added protection in highly corrosive applications.
- Option U - **Butt Welded Junction:** Optional welding procedure of wire thermocouples instead of twist welded.
- Option V - **Field Cuttable:** RTD probes can be cut down to a minimum 3" length using a standard tube cutter. Sealed construction for outdoor/moisture applications. Also available on some Thermocouple assemblies.
- Option W - **Weld Pad:** Tig welded to sheath. Formed to match tube diameter. Used to weld sensor to process surface. (See page 16)
- Option X - **X-Ray Junction:** Sensors are x-rayed in two or four planes for weld integrity and junction location.
- Option Y - **Certificate of Conformance or Calibration:** Conformance certifies the material being provided meets the specifications and requirements of the purchase order. Calibration certifies the sensor at specific temperatures. If a Certificate of Conformance is selected, specify the number of points and temperatures.
- Option 2 - **High Temperate Oxidation Coating:** A special coating to help prevent oxidation at high temperatures.
- Option 3 - **Test at Process Temperature:** Sensor tested at required temperature (2000°F max) for extended period or cycled. The sensor is tested at a specific temperature point for a specified period. This is not a calibration certificate.
- Option 4 - **BX Connector:** 1/2 inch BX connector added to the sensor leadwire where required. (Specify Location)
- Option 5 - **Soak Test: (Ungrounded junctions only)** Sensor junction is immersed in water for a minimum of four hours to check for potential cracks in the sheath or weld. The sensor must then pass a 100 VDC meg check immediately after it is removed from the water. This test is standard on all GIC utility sensors.
- Option 6 - **Tip Sensitive RTD:** For applications that require a tip sensitive element instead of the standard area sensitive element.
- Option 7 - **Rigid Tube Construction:** Sheath is made from rigid metal tubing instead of MgO filled.
- Option 8 - **No Heat Shrink on Probe:**
- Option 9 - **No Crimp on Probe:**
- Option Z - **Special: (Consult Factory)** For anything special about a assmby that isn't called out elsewhere. Put a "Z" for each special option needed and give a detailed description for each in the order notes.

For more information on Special Options: [www.GICThermodynamics.com](http://www.GICThermodynamics.com)

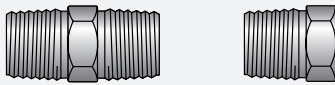
## Fittings



The fixed bayonet fitting with lockcap provides spring loaded pressure designed for holding probes in place without tapping or drilling. For use with .188" diameter probes only.

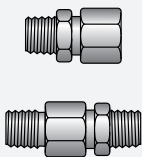


An Adjustable bayonet compression fitting, designed for use with .125" probes, can be positioned at the time of installation. (Available from stock. See page 10)



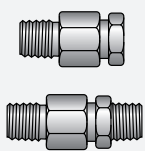
Fittings are brazed or welded to the sheath at the time of manufacture. Available in multiple bore sizes, threads (NPT and metric), materials and designs.

## One time adj. Compression Fittings (Stainless Ferrule)



Fittings can be positioned to the exact length at the time of installation. The metal ferrules, brass or stainless, cannot be moved or repositioned once they are installed and compressed.

## Readjustable Compression Fittings



The use of various sealant gland materials allows the compression fitting to be repositioned several times after it has been installed. The glands are rated up to 3000 psi and the following temperatures:

\*Teflon® gland (Standard) (400°F)  
Neoprene gland (200°F) and Lava Gland (1200°F) Also available.

## Flanges (T/C and RTD's)



GIC can provide any size flange, including custom designs, in large or small quantities. Fixed Flanges can be welded or brazed on. Adjustable flanges are also available.

For complete list of Sheath Fittings, Transitions, Transition potting materials and specifications:

[www.GICSensors.com](http://www.GICSensors.com)

## Transitions ( Style F - T/C and RTD's)

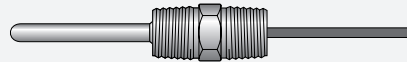
Durable stainless tube which allows for the mechanical and electrical attachment of the lead wire to the metal sheathed, mineral insulated thermocouple or RTD probe. Standard potting is epoxy based and moisture resistant to 500°F. The Hi-Temp potting is ceramic based and good for temperatures to 1100°F. Custom configurations and compounds for extreme temperatures and conditions are also available.



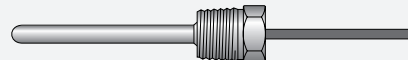
A = Standard Transition w/Relief Spring (500°F)(Std)  
C = Hi-Temp Transition w/Relief Spring (1100°F)



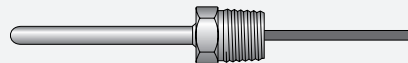
B = Standard Transition (500°F)  
D = Hi-Temp Transition (1100°F)



E = Hex Nipple Transition (500°F) Specify size.  
F = Hi-Temp Hex Nipple (1100°F) Specify size.



G = Bushing - Threads toward Tip (500°F) Specify size.  
H = Hi-Temp Bushing - Threads toward Tip (1100°F) Specify size.



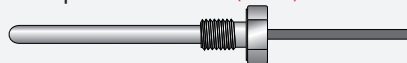
I = Bushing - Threads toward Leads (500°F) Specify size.  
J = Hi-Temp Bushing - Threads toward Leads (1100°F) Specify size.



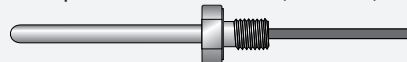
K = Smooth Transition (500°F)  
L = Hi-Temp Smooth Transition (1100°F)



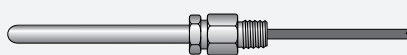
M = Mini-Transition (500°F)  
O = Hi-Temp Mini Transition (1100°F)



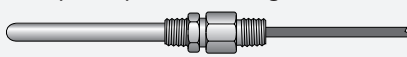
P = Bolt Transition - Threads toward Tip (500°F) Specify size.  
Q = Hi-Temp Bolt - Threads toward Tip (1100°F) Specify size.



V = Bolt Transition - Threads toward Leads (500°F) Specify size.  
W = Hi-Temp Bolt - Threads toward Leads (1100°F) Specify size.



R = Compression Fitting - Threads toward Leads (500°F) Specify size.  
S = Hi-Temp Compression Fitting - Threads toward Leads (1100°F)



T = Compression - Double Ended (500°F) Specify size.  
U = Hi-Temp Compression - Double Ended (1100°F) Specify size.



N = No Transition - Lead wires welded or brazed to sensor  
Z = Special

# Resistance Temperature Detectors (RTD)

## RTD Assemblies

The principal of the Resistance Temperature detector (RTD) is not nearly as complex as that of a thermocouple. Basically, the principal of operation depends on the fact that the electrical resistance of metals varies directly with temperature, and is reproducible to a high degree of accuracy. The curve of temperature versus resistance for a given wire material can thus be predicted by employing a constant, known as the temperature coefficient of resistance. Useful sensitive elements of RTD'S are those which show a resistance temperature relationship of acceptable magnitude. Two such metals are Platinum and Nickel.

### RTD Accuracy.

RTD's are commonly used in sensitive areas requiring much tighter accuracy than thermocouples. But accuracy is dependent on the RTD leadwire configuration. Leadwire error can have a significant effect on accuracy. Adding leadwire between the RTD and control will add additional resistance to readings. Since resistance increases with temperature it is not recommended to use a 2-wire RTD when a high accuracy is required.

### Configurations

2-wire configuration is the least accurate RTD configuration. The lead wire resistance is not compensated for by the transmitter or controller. The increased resistance will cause temperature to be higher than the actual temperature.

3-wire configuration is the most commonly used. The added lead wire resistance is calculated by the control through a third wire. The leadwire resistance is then subtracted from the loop resistance and true resistance is given. Through this method the controller or transmitter "compensates" the lead wire giving an accurate temperature display.

4-wire configuration provide slightly better compensation, but are generally found only in laboratory equipment and other areas where high accuracy is required but must be used in conjunction with a 4-wire instrument.

### Construction

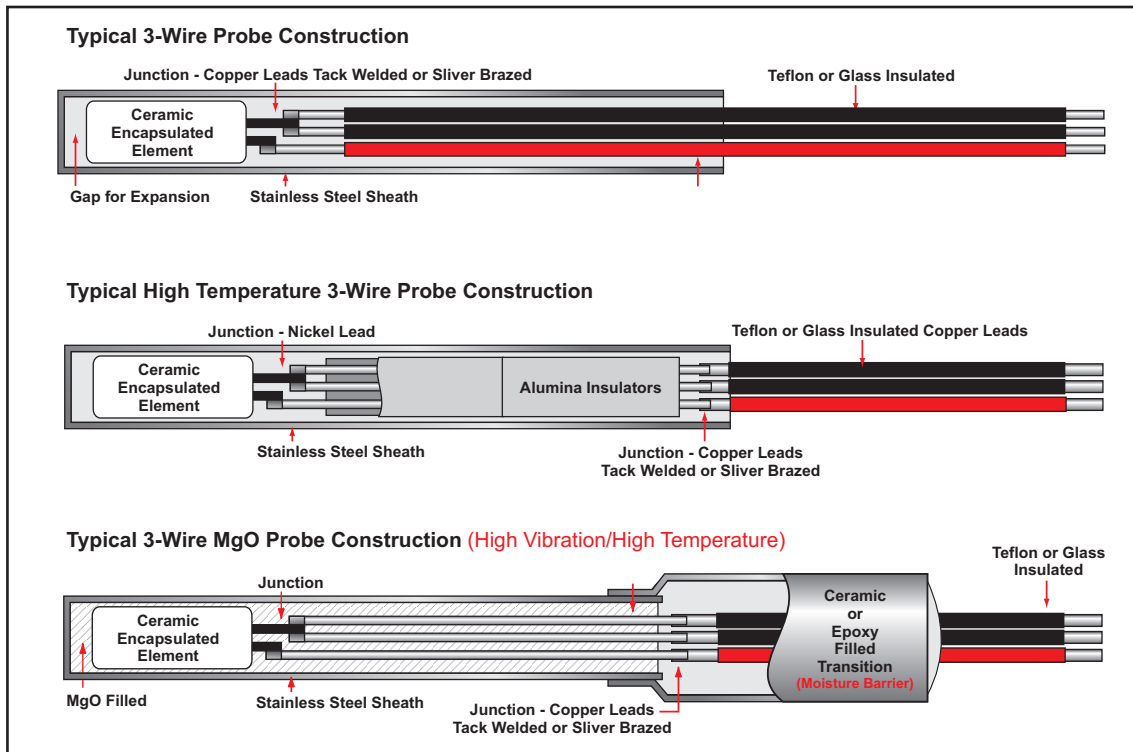
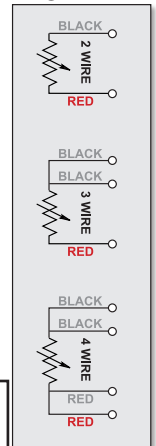


Diagram RTD



GIC Thermodynamics' sales and engineering staff will assist you with designing the best RTD sensor style to fit your process and application. Selecting the proper sensor style is very important, as each application or process has its own specific inherent problems that require careful consideration in order to determine the sensors life, accuracy, and dependability. When choosing a sensor it is important to consider its location, temperature range, accuracy required, how rapidly the temperature cycles, heat conduction, process environment, vibration, and ease of installation. If you need additional assistance with the selection of a sensor for your application, please feel free to contact our sales and engineering staff