



# **THERMODYNAMICS**



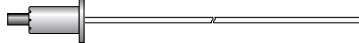




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**Manufacturing Custom Temperature  
Sensors for Over 40 Years**

**BEARING SENSOR CATALOG  
-Preliminary Release Rev 2.1-**








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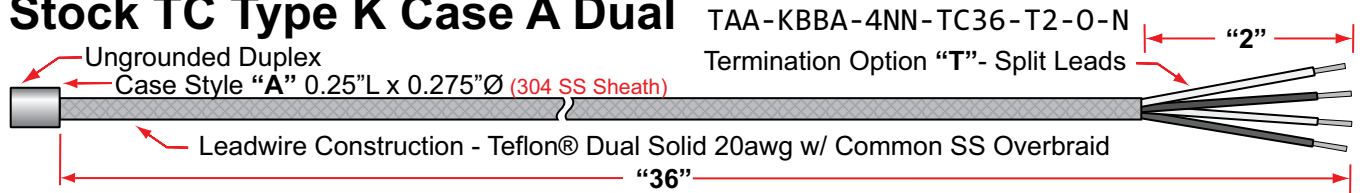
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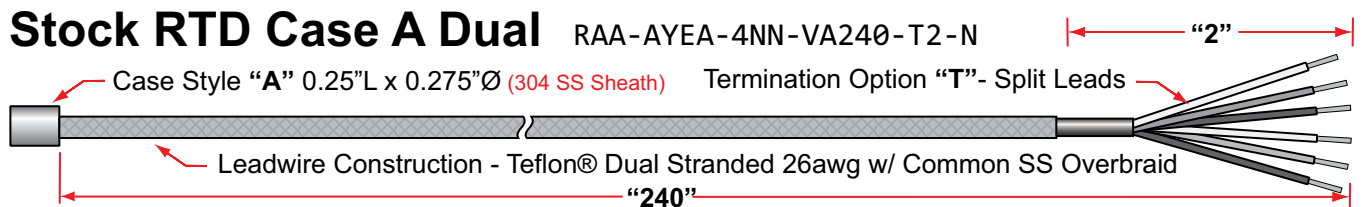
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# Stock Sensors and Wire

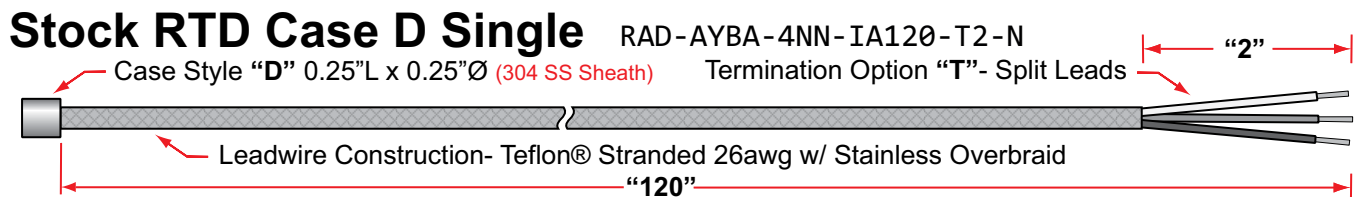
## Stock TC Type K Case A Dual



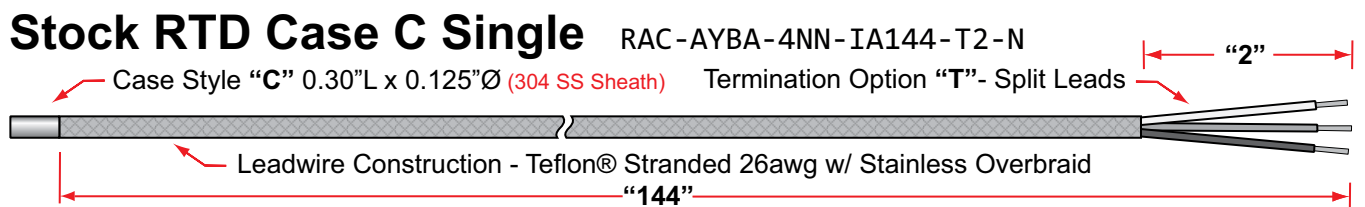
## Stock RTD Case A Dual



## Stock RTD Case D Single



## Stock RTD Case C Single



**Thermocouple and RTD wire coming soon!**

# Thermocouple Assemblies

## When It Comes to Thermocouples “There IS a Difference”!

**Thermocouples** are the most common and versatile sensors used to measure temperature. They can be designed to work in any application where a temperature measurement is required ranging from minus 300 °F to over 4000 °F.

Thermocouples operate on the principle of thermal emf (Electromotive Force). Thomas Seebeck observed in 1821 that two dissimilar metal wires, if joined at both ends, produce a current when the junctions are at different temperatures. The current produced is a function of the junction temperature and the type of metals used. This relationship between thermal emf and temperature is now known as the Seebeck effect.

The thermal emf can be measured by breaking the thermocouple loop at any point and measuring the open circuit voltage. For example, a thermocouple, made of Chromel/Alumel metals (Type K) generates about 40 microvolts per degree Celsius.

The voltage/temperature relationship varies depending on the metals used. The metal combinations used depend on the output voltage required and the temperature range monitored. ANSI Thermocouples are tested and graded against the American National Standards Institute standards and are available in Standard and Special Limits grades (see table below). The Special Limits grade has only half the error of the Standard grade and is recommended for high temperature applications.

Thermocouples are considered to be “tip sensitive” because they measure temperature at the junction, which is located at the end or tip of the sensor. Care should be given when considering the best assembly to fit an application. To acquire accurate temperature readings, careful consideration should be given to the design and sensor location in the process. (See page 15 for “Thermocouple Installation & Maintenance Suggestions”)

GIC Thermodynamics’ sales and engineering staff will assist you with designing the best thermocouple 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.

### ANSI Conductor Characteristics: Temperature & Limits of Error

ISA CODE	CONDUCTOR & CHARACTERISTICS		TEMPERATURE RANGE (F)	SINGLE CONDUCTOR COLOR CODE		LIMITS OF ERROR		APPLICATION NOTES
	POSITIVE	NEGATIVE		STANDARD	SPECIAL			
J	Iron (magnetic)	Constantan (non-magnetic)	0 to 530 F 530 to 1400 F	J+ White J- Red		+/- 4F +/- 3/4%	+/- 2F +/- 2/5%	Reducing atmosphere recommended. Iron oxides rapidly at elevated temperatures.
T	Copper (non-magnetic)	Constantan (non-magnetic)	-75 to 200 F 200 to 700 F	T+ Blue T- Red		+/- 1-1/2F +/- 3/4%	+/- 3/4F +/- 2/5%	Can be used in oxidizing or reducing atmospheres rust and corrosion resistant. Fine for Cryogenic.
K	Chromel (non-magnetic)	Alumel (magnetic)	0 to 530 F 530 to 2300 F	K+ Yellow K- Red		+/- 4F +/- 3/4%	+/- 2F +/- 2/5%	Oxidizing atmosphere recommended. Vented protection tube suggested in reducing atmosphere.
E	Chromel (non-magnetic)	Constantan (non-magnetic)	0 to 600 F 600 to 1600 F	E+ Purple E- Red		+/- 3F +/- 1/2%	+/- 2F +/- 2/5%	Oxidizing atmosphere recommended. Highest emf output of thermocouples commonly used.
S	Platinum 10% Rhodium (non-magnetic)	Platinum (non-magnetic)	0 to 1200 F 1200 to 2700 F	E+ Orange E- Red		+/- 5F +/- 1/2%	+/- 2-1/2F +/- 1/4%	Oxidizing atmosphere recommended. Easily contaminated. The accepted laboratory standard in premium grade due to its reproducibility.
R	Platinum 13% Rhodium (non-magnetic)	Platinum (non-magnetic)	0 to 1200 F 1200 to 2700 F	N+ Black N- Red		+/- 3F +/- 1/4%	+/- 1F +/- 1/10%	Same conditions as 10% above but has 13% Rhodium slightly higher emf. Mostly used in industrial apps.
N	Nicrosil (non-magnetic)	Nisil (non-magnetic)	0 to 530 F 530 to 2300 F	S+ Black S- Red		+/- 4F +/- 3/4%	+/- 2F +/- 2/5%	Better Resistance to Oxidation and longer life at high temperatures than Type K.
B	Platinum 30% Rhodium	Platinum	1000 to 3200 F	B+ Grey B- Red		+/- 1/2%	+/- 1/2%	Can be used in a vacuum with limited life.

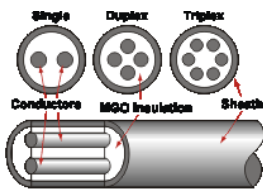
### Special Note:

Certain characteristics and tolerances of thermocouple materials change over time and usage, including the emf vs Temperature relationship. As a result of these changes, it is not recommended to recalibrate used sensors once they are out of tolerance. The useful life of a thermocouple depends on several factors including wire gauge, environment and temperature range. For longer sensor life, we recommend using the largest diameter probe possible. But consider the larger the diameter the slower the response time ( See Approximate MgO Response time chart on page 5).

# Mineral Insulated (MgO) Thermocouples

When It Comes to Thermocouples “There IS a Difference”!

## Magnesium Oxide (MgO) Insulated Thermocouples



MgO thermocouples offer the greatest variety of features of all styles of thermocouples making them the best choice for most applications. They are made in all calibrations with a wide variety of sheath diameters and materials. MgO assemblies are annealed and field bendable. They can be bent to a minimum radius of twice the sheath diameter without damage to the insulation and mounting hardware can be brazed or welded to the sheath.

MgO sensors are recommended where a moisture proof, non-porous insulation is required and for applications where high pressure, high vibration and high temperature conditions are encountered. These variations make them the logical choice for applications from test labs to heavy industry.

GIC uses high purity MgO in our assemblies which is recommended for high temperature applications. MgO filled metal insulated thermocouples are available in sizes from 0.010 to 0.500 inch diameters. Choosing the proper diameter for an application depends on the process environment, process temperatures, and desired response time. A good rule to consider is the higher the temperature, the larger the diameter probe. Also, the faster the response time required, the smaller the diameter, providing high temperatures are not involved. For ungrounded sensors with a faster response time see GIC’s new “Faster Response Time” at [www.gicsensors.com](http://www.gicsensors.com).

## Approximate MgO Response times

MgO Diameter	Grounded Junction	Ungrounded Junction
.020	.10 Sec.	.40 Sec.
.032	.14 Sec.	.50 Sec.
.040	.19 Sec.	.65 Sec.
.063	.22 Sec.	.75 Sec.
.090	.37 Sec.	.88 Sec.
.125	.52 Sec.	1.25 Sec.
.188	1.00 Sec.	2.40 Sec.
.250	2.20 Sec.	4.30 Sec.
20 Gauge Bare wire	.45 Sec.	-
14 Gauge Bare wire	.50 Sec.	-

## Diagram SM

### Sheath Materials

The sheath material gives the MgO insulation its protection from the environment, contamination and potential mechanical damage. There is no material that is appropriate for all applications; you must consider the process temperature, corrosiveness, mechanical strength, cost and intended service life when selecting the material.

- **304SS (4)** maximum temperature is 1650°F (900°C). It is most often used in low temperature processes and is the lowest cost of the stainless steels. Widely used in beverage, food, chemical and other industries where mild corrosion resistance is needed. It is susceptible to carbide precipitation at temperatures of 900 to 1600°F (480 to 870°C).
- **310SS (0)** maximum temperature is 2100°F (900°C). It contains 25% Chromium and 20% Nickel. Its corrosion resistance and mechanical strength is similar to 304SS but slightly better, has good heat resistance but not as ductile as the 304 stainless steel.
- **316SS (6)** maximum temperature is 1700°F (900°C). It has the best corrosion resistance of all the stainless steel grades. It is susceptible to carbide precipitation at temperatures of 900 to 1600°F (480 to 870°C). It is widely used in the chemical and food industry.
- **Inconel 600 (I)** maximum temperature is 2100°F (1175°C). It is the most predominately used sheath material due to it’s high temperature strength, resistance to chloride ion stress, corrosion resistance, oxidation resistance at elevated temperatures and it fairs well in nitriding environments. Inconel 600 must not be used in sulfur bearing environments.
- **Monel (M)** maximum temperature is 1000°F (540°C). Nickel-copper alloy. Excellent resistance to salt water, sulfuric acid, hydrofluoric acid, hydrochloric acid and most alkalies.
- **Hastelloy® X (H)** maximum temperature is 2200°F (1205°C). Resistant to reducing, oxidizing and neutral atmospheric conditions. Superior high temperature strength and excellent oxidizing resistance.

Other sheath materials are available for special applications, please consult the factory for your special request.

## Diagram MgO

RECOMMENDED SHEATH MATERIALS (MgO)			
MATERIAL	MAX IN AIR (°F)	OPERATING ATMOSPHERE	MAX CONTINUOUS TEMPERATURE (°F)
<b>304 Stainless</b>	<b>1900</b>	<b>ORNV</b>	<b>1650</b>
<b>310 Stainless</b>	<b>2550</b>	<b>ORNV</b>	<b>2100</b>
<b>316 Stainless</b>	<b>2500</b>	<b>ORNV</b>	<b>1700</b>
<b>INCONEL</b>	<b>2550</b>	<b>ONV<sup>b</sup></b>	<b>2100</b>
O = Oxidizing N = Neutral		R = Reducing V = Vacuum	V <sup>b</sup> = Very sensitive to sulfur corrosion

## Leadwire Terminations (T/C and RTD's)

**No Split/No Strip (N):** The lead wire is cut to the "A" Dimension specified. No splitting or stripping is done to the lead wire.

**Split Leads (T) (Standard):** Ideal for crimping and stripped wire terminals. The lead wire is cut to the "A" Dimension specified. The outer insulating jacket is stripped back 2 inches standard. The individual conductor insulating jackets are then striped back 3/8". (If a different split or strip length is required please request at time of order.)

**Spade Lugs (U):** Ideal for easy connection to terminal screws. The lead wire is cut to the "A" Dimension specified. The outer insulating jacket is stripped back 2 inches standard. Standard Spade Lugs are crimped to the individual conductors. (If specific size Spade Lug or different split length is required please request at time of order. Uncompensated standard, compensated spade lugs special order.)

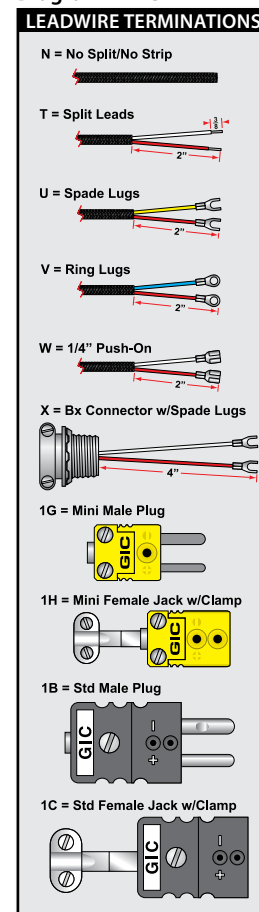
**Ring Lugs (V):** For a secure connection to terminal screws. Great for high vibration applications. The lead wire is cut to the "A" Dimension specified. The outer insulating jacket is stripped back 2 inches standard. Standard Ring Lugs are crimped to the individual conductors. (If specific size Ring Lug or different split length is required please request at time of order. Uncompensated standard, compensated ring lugs special order.)

**1/4" Push-On Connector (W):** The lead wire is cut to the "A" Dimension specified. Outer insulating jacket is stripped back 2 inches standard. 1/4" Push-On Connectors are crimped to the individual conductors. (If a different split length is required please request at time of order. Uncompensated Only)

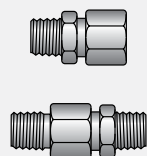
**Bx Connector W/Spade Lugs (X):** For connecting to junction boxes and panels with 1/2" knockouts or 1/2" conduit connections. The lead wire is cut to the "A" Dimension specified. The outer insulating jacket is stripped back 4 inches. Standard Spade Lugs are crimped to the individual conductors. (If specific size spade lug or different split length is required please request at time of order. Uncompensated standard, compensated spade lugs special order.)

**Plugs and Jacks (1A thru 3L):** Designed for quick disconnect and change out. Color coded to calibration and available in both Standard and Miniature sizes. They are available in three temperature ranges ("Std Temp" - Up to 425°F continuous, "High Temp" - Up to 660°F continuous and "Ceramic" - Up to 1200°F continuous. GIC Plugs and Jacks are also available with wire clamps.

Diagram LT-TC

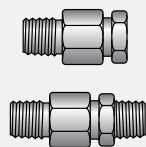


### One time adj. Compression Fittings (Stainless Ferrule)



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 available in the following temperatures:

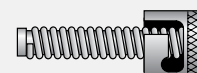
- \*Teflon® gland (Standard) (400°F)
- Neoprene gland (200°F)

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

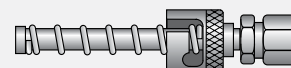


GIC can provide any size flange, including custom designs, in large or small quantities. Fixed Flanges can be welded or brazed on. Adjustable flanges are also available.

### 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.

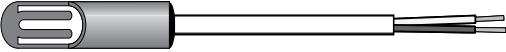

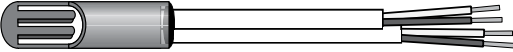

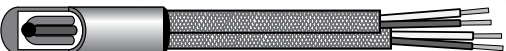
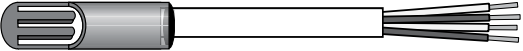






An Adjustable bayonet compression fitting, designed for use with .125" probes, can be positioned at the time of installation.

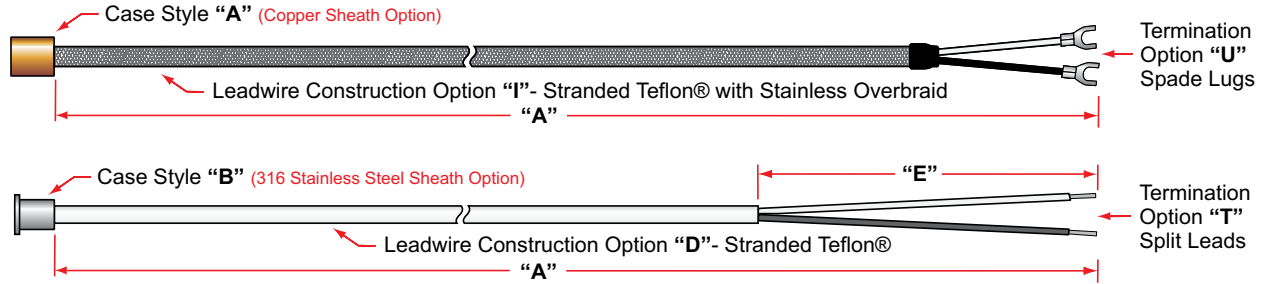


Fittings are brazed or welded to the sheath at the time of manufacture. Available in multiple bore sizes, threads (NPT and metric), materials and designs.

# GIC Common Wire Codes

	Stranded Wire	Solid Wire Code	Option Code
<b>Single Element</b>			
Grounded Junction (Teflon®) 	D	B	
Grounded Junction (SS Overbraid) 	I	G	
<b>Duplex Elements Independent Jackets</b>			
Grounded Junctions (Teflon®) 	I	B	
Separate Ungrounded Junctions (SS Overbraid) 	D	G	
Common Ungrounded Junctions (SS Overbraid) 	D	G	
<b>Duplex Elements Common Jackets (24 gauge wire standard for Dual Elements)</b>			
Grounded Junctions (Teflon®) 	2	U	
Separate Ungrounded Junctions (SS Overbraid) 	V	T	
Common Ungrounded Junctions (SS Overbraid) 	V	T	
<b>Individual Independent Leads</b>			
Duplex Grounded Junctions (Teflon®) 			Q
Single Grounded Junctions (Teflon®) 			Q

### Style A – Embedment Bearing Assembly



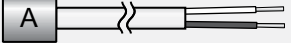
**Style A - Embedment Assembly** - Designed for monitoring bearing temperatures to provide advanced warning of lubrication oil breakdown before catastrophic bearing failure. Available in several case sizes, configurations and sheath materials. Standard operating range -32 to 266°F.

\*Case B supplied with spring and retaining ring.


**T A** 1 - 2 3 4 **A** - 5 6 **N** - 7 8 9 10 11 12 - **N**

#### 1. Case Style

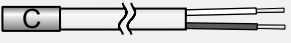
A = Case A - 0.250" L, 0.275 Ø



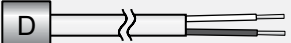
B = Case B - 0.250" L, 0.188 Ø  
0.250 Ø Flange



C = Case C - 0.300" L, 0.125 Ø



D = Case D - 0.250" L, 0.250 Ø



#### 2. Calibration (See page 4 for other Cals)

J = Type J (1400°F) T = Type T (700°F)  
K = Type K (2300°F) E = Type E (1600°F)

#### 3. Junction

Grounded	Ungrounded
Flat Tip	F
	B

#### 4. Element Type

A = Single B = Duplex\*

\* Common Ungrounded is Standard for Ungrounded Junctions  
For Separated Ungrounded choose "O" under Special Options

#### 5. Sheath Material

4 = 304 6 = 316SS C = Copper B = Brass  
K = Nickel Plated Copper U = Tin Plated Copper

#### 6. Babbitt Tip

N = None B = Babbitt Tip (Styles A, B, and D only)  
Reduces chance of overheating during installation

#### 7. Leadwire Length "A" (inches)

#### 8. Leadwire Gauge (Case Style dependent)

B = 24 gauge (Std) D = 30 gauge  
C = 20 gauge (Single Element Only)

#### 8. Leadwire Construction (See page 6 for other more options)

	(solid wire)		(stranded wire)	
	Standard	Overbraid	Standard	Overbraid
Teflon® (400°F)				
Single / Dual Leads	B	G	D	I
Dual Common Jacket	U	T	2	V

Not all wire gauge combinations available for dual common jacket

#### 9. Leadwire Length "A" (inches)

#### 10. Leadwire Terminations:

N = No Split/ No Strip (Std)  
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)  
Z = Special

PLUGS & JACKS	Std Temp (425°F)	
	w/ clamp	w/o clamp
Std Male Plug	1A	1B
Std Female Jack	1C	1D
Mini Male Plug	1F	1G
Mini Female Jack	1H	1L

High Temp Plugs Also Available

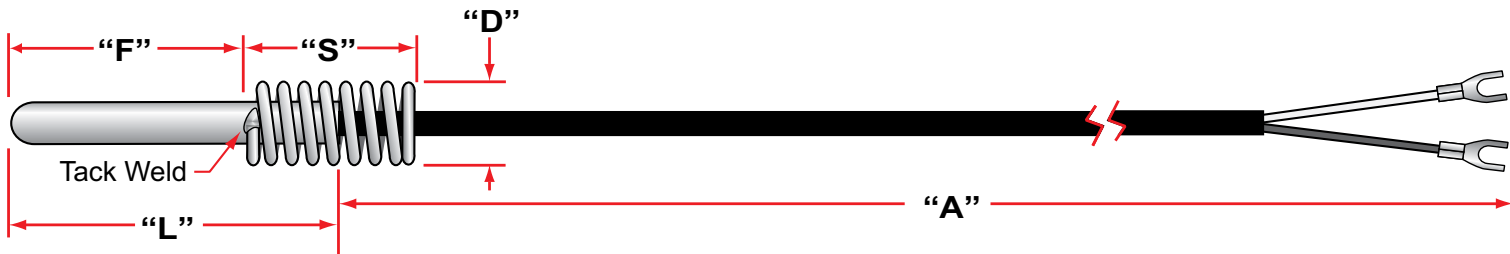
#### 11. Split Length "E" (inches)

#### 12. Options

N = None  
A = Special Limits of Error  
G = Shielded leadwire \*  
O = Separate Ungrounded Junction  
Q = Individual Leadwires (3/8" Strip)  
Z = Special (Consult Factory)

\* End part number with A152 for bonded to probe,  
end part number with A157 for isolated from probe

### Style GS – Rigid Tube Spring Assembly



#### 1. Calibration (See page 4 for other Cals)

J = Type J (1400°F) T = Type T (700°F)  
K = Type K (2300°F) E = Type E (1600°F)

#### 2. Junction

	Grounded	Ungrounded
Round Tip	G (Std)	U
Flat Tip	F	B
118° Drill Tip	D	C

#### 3. Element Type

A = Single B = Duplex\* C = Triplex\*

\* Common Ungrounded is Standard for Ungrounded Junctions  
For Separated Ungrounded choose "O" under Special Options

#### 4. Sheath Operating Temperature

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

#### 5. Sheath Material (See page 4 for other Materials)

4 = 304SS (1650°F)(Std) I = INCONEL (2100°F)  
6 = 316SS (1650°F) C = Copper (1200°F)

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

H = .188\* I = .250\* Q = .313 M = .375 \* Quick delivery

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

0.25 - 999 inches Z = greater than 999 inches (Consult Factory)

#### 8. Leadwire Construction (See page 6 for other more options)

Single / Dual Leads	(solid wire)		(stranded wire)	
	Standard	Overbraided	Standard	Overbraided
Fiberglass (900°F)	A	F	C	H
Teflon® (400°F)	B	G	D	I
Kapton® (700°F)	E	J	Q	R
Dual Common Jacket				
Teflon® (400°F)	U	T	2	V

Not all wire gauge combinations available for dual common jacket

#### 9. Leadwire Gauge

B = 24 gauge (Std) C = 20 gauge D = 30 gauge

#### 10. Leadwire Length "A" (Example 012 = 12 inches)

#### 15. Spring Length "S"

#### 14. Options

N = None  
A = Special Limits of Error  
G = Shielded leadwire \*  
L = Mating Connector  
O = Separate Junctions  
Q = Individual Leadwires (3/8" Strip)  
Z = Other (Consult Factory)

#### 13. Spring Location "F" (inches from tip)

#### 12. Spring Size "D" (Stainless Steel)

Code	Spring OD	Spring Thk	Spring ID	Probe DIA
SA	0.187"	0.026"	0.135"	0.125"
SB	0.250"	0.032"	0.186"	0.188"
SC	0.260"	0.026"	0.208"	0.188"
SD	0.312"	0.032"	0.248"	0.250"
SE	0.315"	0.032"	0.263"	0.250"
SF	0.375"	0.026"	0.311"	0.313"
SG	0.438"	0.041"	0.356"	0.313"
SH	0.500"	0.054"	0.392"	0.375"
SZ	Custom Spring Size*			

\*GIC can supply almost any size spring.  
Contact Factory for more information

#### 11. Leadwire Terminations:

N = No Split/ No Strip  
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

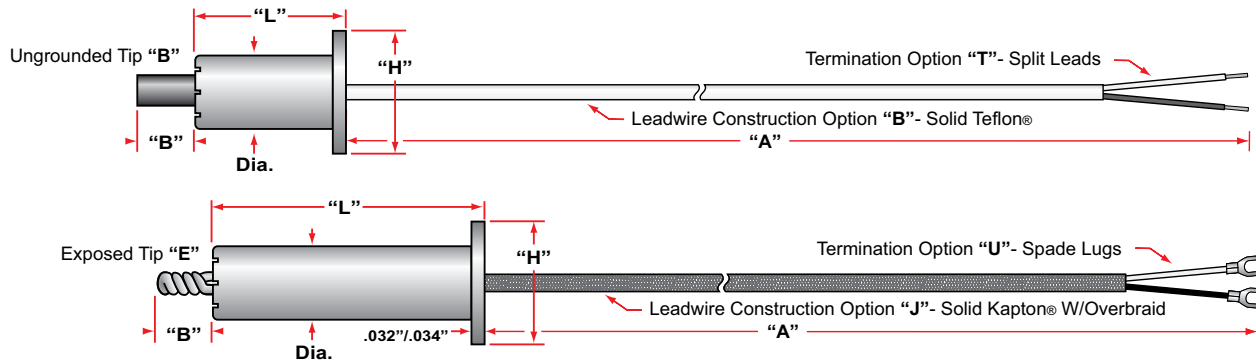
#### PLUGS & JACKS Std Temp (425°F)

	w/clamp	w/o clamp
Std Male Plug	1A	1B
Std Female Jack	1C	1D
Mini Male Plug	1F	1G
Mini Female Jack	1H	1L

High Temp Plugs Also Available

\* End part number with A152 for bonded to probe, end part number with A157 for isolated from probe

### Style GB – Internal Spring Loaded Bearing



Style GB - Bearing sensor has an internal spring to assure the sensor has contact with the surface being monitored.

**TGB- 1 2 3 N- 4 5 6 - 7 8 9 - 10 11 - 12 - 13**

**1. Calibration** (See page 4 for other Cals)

J = Type J (1400°F) T = Type T (700°F)  
 K = Type K (2300°F) E = Type E (1600°F)

**2. Junction** (See Diagram TS-TC)

	Grounded	Ungrounded
Flat Tip	-	B
Exposed Tip	E	-

**3. Element Type**

A = Single B = Duplex\*

\* Common Ungrounded is Standard for Ungrounded Junctions  
 For Separated Ungrounded choose "O" under Special Options

**4. Sheath Material**

4 = 304SS (1650°F)(Std) 6 = 316SS (1650°F)

**5. Sheath Diameter** (Metric sizes also available)

H = .188 I = .250 Z = \_\_\_\_\_in/(mm)

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

0.28 - 3.0 inches (Over 3" Consult Factory)

**7. Leadwire Construction** (Page 6 for more)

	(solid wire)	
	Standard	Overbraid
Teflon® (400°F)	B	G
Kapton® (700°F)	E	J

**8. Leadwire Gauge**

B = 24 gauge (Std) D = 30 gauge  
 C = 20 gauge (Only - Single element w/.250" sheath)

**9. Leadwire Length "A"** (Example 012 = 12 inches)

**10. Leadwire Terminations:**

N = No Split/ No Strip  
 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

PLUGS & JACKS	Std Temp (425°F)	
	w/ clamp	w/o clamp
Std Male Plug	1A	1B
Std Female Jack	1C	1D
Mini Male Plug	1F	1G
Mini Female Jack	1H	1L

High Temp Plugs Also Available

**11. Tip Length "B"** (Inches)

**12. Options**

N = None  
 A = Special Limits of Error  
 G = Shielded leadwire \*  
 L = Mating Connector  
 O = Separate Junctions  
 Q = Individual Leadwires (3/8" Strip)  
 Z = Other (Consult Factory)

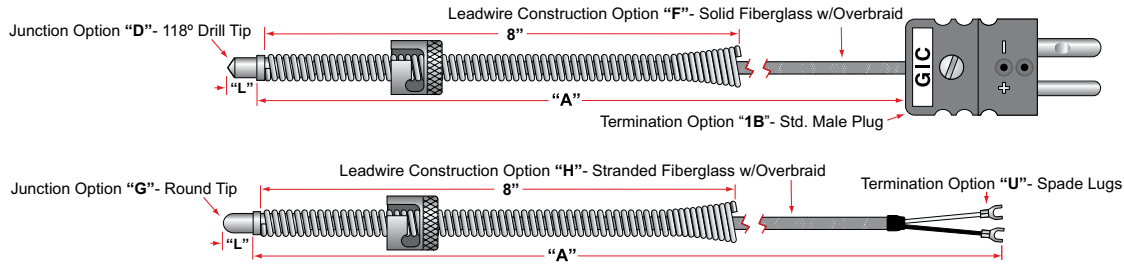
**13. Cap Size "H"** (Inches)

.188" Dia. Probe Cap		
.250	.313	.345(Std)
.250" Dia. Probe Cap		
.313	.345(Std)	

Custom sizes also available

\* End part number with A152 for bonded to probe, end part number with A157 for isolated from probe

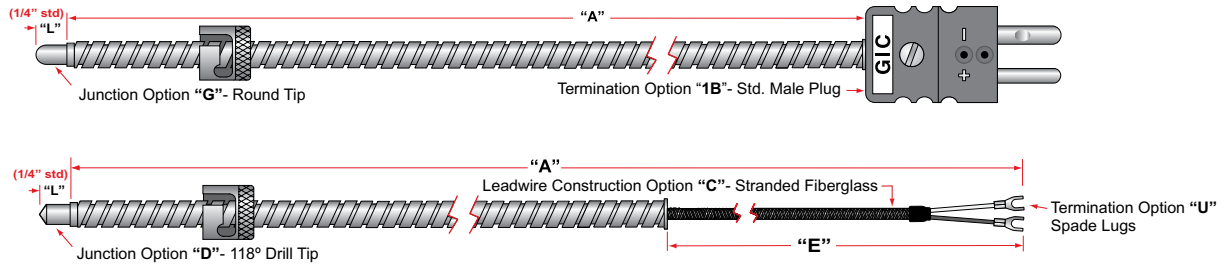
## Style L – Lockcap Spring Assembly



**Style L** - Lockcap Spring assembly is adjustable from 1/2" to 7" or 1/2" to 11" immersion depths depending on spring length chosen. It is used in combination with a bayonet adapter (see page 5) and is designed for quick installation and removal. The Style L can be used in a variety of applications.

	T L 1 - 2 3 4 N - 5 6 7 - 8 9 10 - 11 - 12																																													
<b>1. Spring Length</b>	A = 8" Spring B = 12" Spring C = Other																																													
<b>2. Calibration</b> (See page 4 for other Cals)	J = Type J (1400°F) T = Type T (700°F) K = Type K (2300°F) E = Type E (1600°F)																																													
<b>3. Junction</b>	<table border="1"> <thead> <tr> <th></th> <th>Grounded</th> <th>Ungrounded</th> </tr> </thead> <tbody> <tr> <td>Round Tip</td> <td>G (Std)</td> <td>U</td> </tr> <tr> <td>Flat Tip</td> <td>F</td> <td>B</td> </tr> <tr> <td>118° Drill Tip</td> <td>D</td> <td>C</td> </tr> </tbody> </table>													Grounded	Ungrounded	Round Tip	G (Std)	U	Flat Tip	F	B	118° Drill Tip	D	C																						
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Flat Tip	F	B																																												
118° Drill Tip	D	C																																												
<b>4. Element Type</b>	A = Single B = Duplex* * Common Ungrounded is Standard for Ungrounded Junctions For Separated Ungrounded choose "O" under Special Options																																													
<b>5. Sheath Material</b> (See page 4 for other Materials)	4 = 304SS (1650°F) 6 = 316SS (1650°F) I = INCONEL (2150°F)																																													
<b>6. Sheath Diameter</b>	G = .125 H = .188(Std)																																													
<b>7. Sheath Length "L"</b>	.125 - 99.9 inches (Example .625 = 5/8 inch)																																													
<b>8. Leadwire Construction</b> (See page 6 for other more options)	<table border="1"> <thead> <tr> <th rowspan="2">Single / Dual Leads</th> <th colspan="2">(solid wire)</th> <th colspan="2">(stranded wire)</th> </tr> <tr> <th>Standard</th> <th>Overbraid</th> <th>Standard</th> <th>Overbraid</th> </tr> </thead> <tbody> <tr> <td>Fiberglass (900°F)</td> <td>A</td> <td>F</td> <td>C</td> <td>H</td> </tr> <tr> <td>Teflon® (400°F)</td> <td>B</td> <td>G</td> <td>D</td> <td>I</td> </tr> <tr> <td>Kapton® (700°F)</td> <td>E</td> <td>J</td> <td>Q</td> <td>R</td> </tr> <tr> <td>Dual Common Jacket</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Teflon® (400°F)</td> <td>U</td> <td>T</td> <td>2</td> <td>V</td> </tr> </tbody> </table> Not all wire gauge combinations available for dual common jacket												Single / Dual Leads	(solid wire)		(stranded wire)		Standard	Overbraid	Standard	Overbraid	Fiberglass (900°F)	A	F	C	H	Teflon® (400°F)	B	G	D	I	Kapton® (700°F)	E	J	Q	R	Dual Common Jacket					Teflon® (400°F)	U	T	2	V
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<b>12. Options</b> (Choose all that apply)	N = None A = Special Limits of Error L = Mating Connector K = Copper Tip (Fast Response) O = Separate Ungrounded Junctions Y = Certificate of Conformance Z = Other (Consult Factory)																																													
<b>PLUGS &amp; JACKS</b>	<table border="1"> <thead> <tr> <th></th> <th colspan="2">Std Temp (425°F)</th> </tr> <tr> <th></th> <th>w/ clamp</th> <th>w/o clamp</th> </tr> </thead> <tbody> <tr> <td>Std Male Plug</td> <td>1A</td> <td>1B</td> </tr> <tr> <td>Std Female Jack</td> <td>1C</td> <td>1D</td> </tr> <tr> <td>Mini Male Plug</td> <td>1F</td> <td>1G</td> </tr> <tr> <td>Mini Female Jack</td> <td>1H</td> <td>1L</td> </tr> </tbody> </table> High Temp Plugs Also Available													Std Temp (425°F)			w/ clamp	w/o clamp	Std Male Plug	1A	1B	Std Female Jack	1C	1D	Mini Male Plug	1F	1G	Mini Female Jack	1H	1L																
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G95	.875"	1/8" NPT	303 SS																																											
G95-Ni	.875"	1/8" NPT	Ni plated CS																																											

## Style LN – Lockcap Armor Assembly



**1. Calibration** (See page 4 for other Cals)  
 J = Type J (1400°F)    T = Type T (700°F)  
 K = Type K (2300°F)    E = Type E (1600°F)

**2. Junction**    **Grounded**    **Ungrounded**

Round Tip	G (Std)	U
Flat Tip	F	B
118° Drill Tip	D	C

**3. Element Type**  
 A = Single    B = Duplex\*  
 \* Common Ungrounded is Standard for Ungrounded Junctions  
 For Separated Ungrounded choose "O" under Special Options

**4. Sheath Material** (See page 4 for other Materials)  
 4 = 304SS (1650°F)    6 = 316SS (1650°F)

**5. Sheath Diameter**  
 G = .125    H = .188(Std)

**6. Sheath Length "L"** (.25" Std)  
 0.25 - 99 inches    Z = greater than 99 inches (Consult factory)

**8. Leadwire Construction** (See page 6 for other more options)

Single / Dual Leads	(solid wire)		(stranded wire)	
	Standard	Overbraid	Standard	Overbraid
Fiberglass (900°F)	A	F	C	H
Teflon® (400°F)	B	G	D	I
Kapton® (700°F)	E	J	Q	R
Dual Common Jacket	U	T	2	V

Not all wire gauge combinations available for dual common jacket

**8. Leadwire Gauge**  
 B = 24 gauge (Std)    D = 30 gauge  
 C = 20 gauge (.188 Dia.)

**9. Armor Length "A"** (Example 12.5 = 12-1/2)

**10. Leadwire Terminations:**

N = No Split/ No Strip	<b>PLUGS &amp; JACKS</b> Std Temp (425°F)	
T = Split Leads (std = 2" split/3/8" strip)	w/ clamp	w/o clamp
U = Spade Lugs (std = 2" split)	Std Male Plug	1A    1B
V = Ring Lugs (std = 2" split)	Std Female Jack	1C    1D
W = 1/4 Push-on (std = 2" split)	Mini Male Plug	1F    1G
X = Bx Connector w/ #8 lugs	Mini Female Jack	1H    1L
Z = Other	High Temp Plugs Also Available	

**12. Options**

- N = None
- A = Special Limits of Error
- G = Shielded leadwire \*
- I = SS ID Tag
- L = Mating Connector
- Q = Individual Leadwires (3/8" Strip)
- Y = Certificate of Conformance
- Z = Special (Consult Factory)

**Choose all that apply**

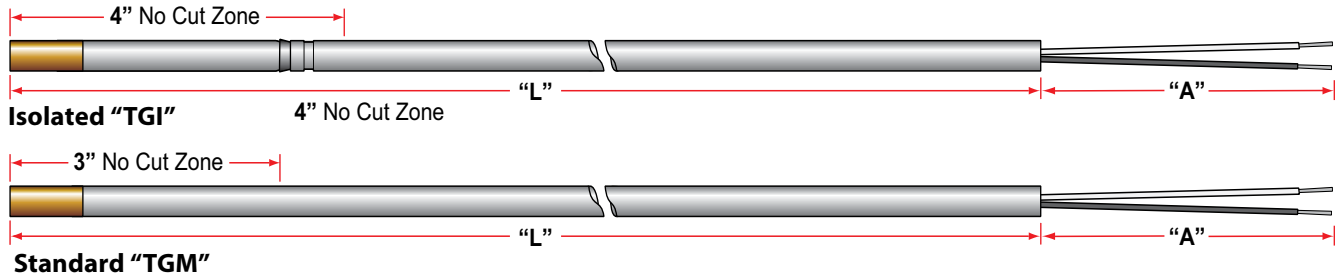
**11. Leadwire Length "E"**

**Bayonet Adapters**

Series	NUMBER	LENGTH (L)	THREAD SIZE	MATERIAL
	G95	.875"	1/8" NPT	303 SS
	G95-Ni	.875"	1/8" NPT	Ni plated CS

\* End part number with A152 for bonded to probe, end part number with A157 for isolated from probe

### Style GM/GI – Motor/ Generator (Cut-to-Length)



**Style GM/GI - Motor/Generator** - Tip sensitive, cut-to-length bearing thermocouple with a fast response copper tip. Available in both standard and isolated configurations.

**T G** 1 - 2 3 4 5 - 6 7 8 - 9 10 11 - 12 **NN** - 13 - **NN**

**1. Construction**  
M = Standard (Std)  
I = Isolated Tip

**2. Calibration** (See page 4 for other Cals)  
J = Type J (1400°F) T = Type T (700°F)  
K = Type K (2300°F) E = Type E (1600°F)

**3. Junction**  
Flat Tip      Grounded    Ungrounded  
                    F                    B

**4. Element Type**  
A = Single    B = Duplex\*  
\* Common Ungrounded is Standard for Ungrounded Junctions  
For Separated Ungrounded choose "O" under Special Options

**5. Sheath Operating Temperature**  
A = -20°C to 200°C (450°F)

**6. Sheath Material** (See page 4 for other Materials)  
4 = 304SS (1650°F)(Std)    E = Epoxy Glass

**7. Sheath Diameter** (Metric sizes also available)  
H = .188\*    I = .250\*    Q = .215    \* Quick delivery

**8. Sheath Length "L"** (Example 12.5 = 12-1/2 inches)  
4 - 36 inches (Consult Factory for longer lengths)

**8. Leadwire Construction** (See page 6 for other more options)

Single / Dual Leads	(solid wire)		(stranded wire)	
	Standard	Overbraided	Standard	Overbraided
Fiberglass (900°F)	A	F	C	H
Teflon® (400°F)	B	G	D	I
Kapton® (700°F)	E	J	Q	R
Dual Common Jacket				
Teflon® (400°F)	U	T	2	V

Not all wire gauge combinations available for dual common jacket

**10. Leadwire Gauge**  
B = 24 gauge (Std)    C = 20 gauge    D = 30 gauge

**11. Leadwire Length "A"** (Example 012= 12 inches)

**12. Leadwire Terminations:**  
N = No Split/ No Strip  
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)  
Z = Other

PLUGS & JACKS	Std Temp (425°F)	
	w/ clamp	w/o clamp
Std Male Plug	1A	1B
Std Female Jack	1C	1D
Mini Male Plug	1F	1G
Mini Female Jack	1H	1L

High Temp Plugs Also Available

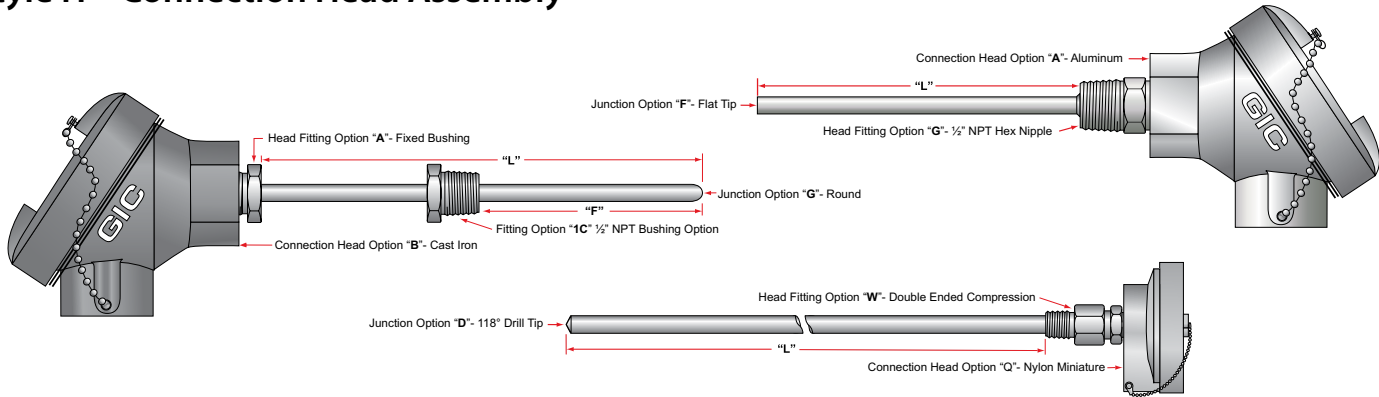
\* All connectors will be provided loose so that they can be installed after cutting to length.

**13. Options**  
N = None  
A = Special Limits of Error  
G = Shielded leadwire \*  
L = Mating Connector  
O = Separate Junctions  
Q = Individual Leadwires (3/8" Strip)  
Z = Other (Consult Factory)

\* End part number with A152 for bonded to probe, end part number with A157 for isolated from probe

# Mineral Insulated (MgO) Thermocouples

## Style H – Connection Head Assembly



### 0. Industry

T = Standard    U = Utility

### 1. Connection Head

A = Aluminum	G = 316 Stainless Steel
B = Cast Iron	L = Oversized Aluminum
C = Explosion Proof*	O = Open - Ceramic Block
D = Poly Black	Q = Nylon Miniature
E = FDA Poly - Latch	V = Dan
F = Nylon	M = Alum. Miniature
R = Canister	

### 2. Calibration (See page 4 for other Cals)

J = Type J (1400°F)    T = Type T (700°F)  
 K = Type K (2300°F)    E = Type E (1600°F)

### 3. Junction (See Diagram TS-TC)

	<u>Grounded</u>	<u>Ungrounded</u>
Round Tip	G (Std)	U
Flat Tip	F	B

### 4. Element Type

A = Single    B = Duplex\*    C = Triplex\*  
 \*Common Ungrounded is Standard for Ungrounded Junctions  
 For Separated Ungrounded choose "O" under Special Options

### 5. Sheath Operating Temperature

A = -200°C to 260°C (500°F)	D = 0°C to 900°C (1650°F)
B = -200°C to 400°C (750°F)	E = 0°C to 1150°C (2100°F)
C = -200°C to 600°C (1200°F)	Z = Other

### 6. Sheath Material (See page 4 for other Materials)

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

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

F = .063\*    H = .188\*    Q = .313    P = .500    Z = Other  
 G = .125\*    I = .250\*    M = .375    \*Quick delivery

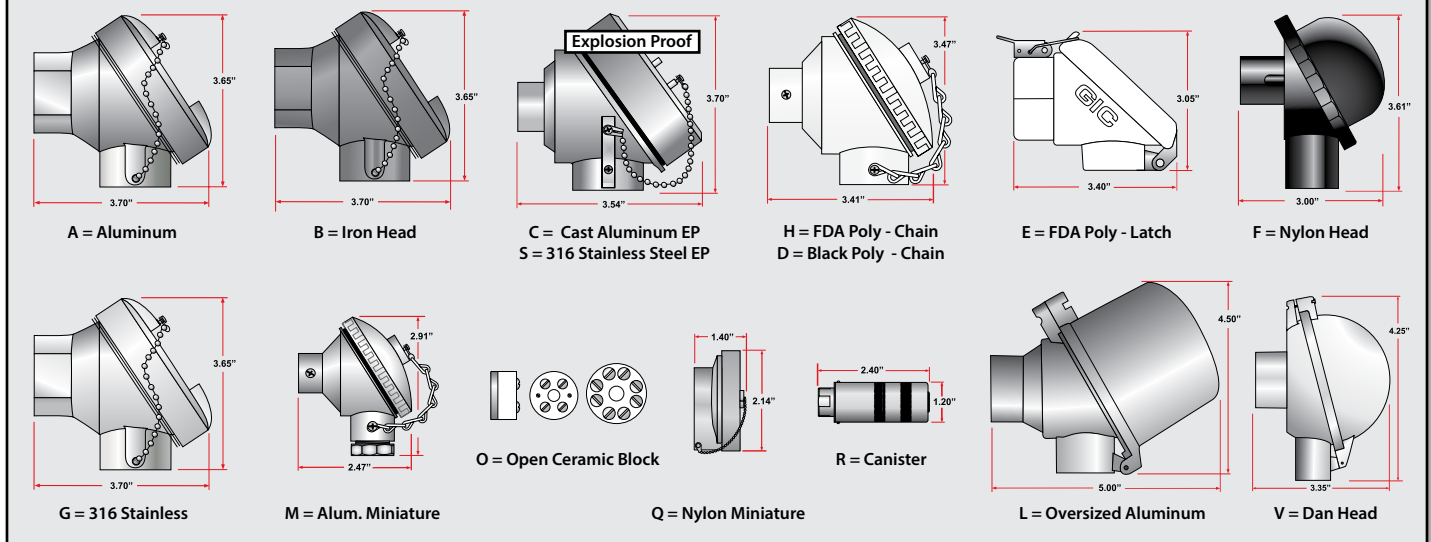
### 8. Sheath Length "L" (Example 12.5 = 12-1/2 inches)

0.25 - 999 inches    Z = greater than 999 inches (Consult Factory)

**Style H Assemblies** - GIC offers a variety of protection head assemblies designed to meet the most demanding applications. Quality units can be made to your exact specifications and/or are available from stock in select sheath diameters, lengths and calibrations. Connection heads protect wiring against dust, moisture and harsh environments. Style H Assemblies are available with a variety of optional, linearized head mounted transmitters.

**Utility Sensors Include** - X-ray in two planes, 1 Hour soak test, Annealed sheath, Full function tests, 100% Quality control check. Optional testing up to 2000°F available

## CONNECTION HEAD OPTIONS



For more Connection Head options go to [www.GICThermodynamics.com](http://www.GICThermodynamics.com)

### 14. Bend Location "C" (Inches from tip)

N = No Bend (Std)

### 13. Bend Angle

N = None(Std) G = 45 Degree Bend S = 90 Degree Bend Z = Other

### 12. Options

N = None  
 A = Special Limits of Error  
 D = Universal Transmitter\*  
 E = Economy Multi-input Transmitter\*  
 H = High Vibration  
 I = SS ID Tag  
 O = Separate Ungrounded Junctions  
**R = Faster Response Construction**

P = Electro-etching  
 S = Spring Loaded  
 T = Coated Probe  
 Y = Certificate of Conformance  
 W = Weld Pad  
 X = X-Ray Junction  
 Z = Special (Consult Factory)

\* Not available on some head styles

Junction Tip Style	Grounded Junction	Ungrounded Junction
Round Tip	G(Std)	U
Flat Tip	F	B
118° Drill Tip	D	C
Needle Tip	P	M
Reduced Tips	R	Q
Exposed Tip	-	E

### 11. Fitting Location "F" (Inches from tip)

N = No Fitting Location (Std)

### 10. Fittings (See page 5 for more info and other fittings) (Metric fittings also available)

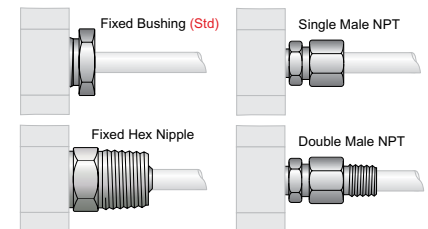
N = None (Std) FB = Fixed Bayonet Fitting (.188 and .250 Dia only) Z = Special

NPT Fittings	1/8" NPT	1/4" NPT	1/2" NPT	3/4" NPT	SPECIAL
Fixed Bushing (Stainless)	1A	1B	1C	1D	1Z
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 (1000°F) consult factory

### Diagram HF

#### HEAD MOUNTING FITTINGS



### 9. Head Mounting Fittings (See Diagram HF)

A = Fixed Bushing (No process threads) (Stainless) (Std) P = Pipe Nipple (specify in notes) N = None Z = Special

Hex Nipple Connection	1/4" NPT	1/2" NPT	3/4" NPT	Compression Fitting Connection	1/8" NPT	1/4" NPT	1/2" NPT
Fixed Hex Nipple (Steel)	F	G	H	Single Male NPT (SS)	-	-	S
Fixed Hex Nipple (SS)	I	J	K	Double Male NPT (SS)	W	X	Y
Spring Loaded Oil Tight (SS)*	-	R	-				

\* .188 and .250 Dia. only

# Installation and Maintenance Suggestions

## THERMOCOUPLE INSTALLATION

1. Seat the thermocouple firmly into the area to be measured far enough to minimize errors. Select proper location and depth to avoid "stagnant areas" to get the best representative temperature
2. For maximum life and reliable readings use the largest diameter probe possible. And caution should be taken to insure that T/C's are not too close to a heating element or in a direct flame.
3. When measuring high temperatures install assemblies vertically to avoid tube sagging. With head assemblies take caution to keep excessive heat from the terminal block.
4. Use only compensating extension wire of the calibration designated on the Instrument being used.
5. Observe color coding (**negative lead is always red**) and make certain polarity is correct.
6. Avoid stray signal pick up. Install unit at least one foot from AC power lines. Use ungrounded sensors where high electrical noise is possible.
7. Do not run thermocouple wires in same conduit with electrical wires.
8. All wire hook ups must be good firm mechanical connections. Clean the wire ends to brightness.
9. Keep splices to a minimum (have none at all if possible). Silver solder all splices.
10. All connectors should be compensated including ring or spade lugs and terminal strips.
11. For maximum life use the largest diameter probe possible.
12. In high vibration environments use stranded leadwire.

## RTD INSTALLATION

1. Connect the RTD leads to the instrument per instructions noted by the instrument manufacturer.
2. All wire hook ups must be good firm mechanical connections.
3. Insert the probe into the area to be measured far enough to minimize conduction errors.
4. Do not exceed the temperature range of the RTD element.
5. Do not bend probe unless it has been designated as field bendable.

## THERMOCOUPLE MAINTENANCE

1. Thermocouples will deteriorate due to contamination from their environments. Regular periodic checks should be made of the thermocouples to determine their life cycle and replacement requirements.
2. Check or calibrate a thermocouple in its installed position and location if possible.
3. For reliable readings, thermocouples removed for tests or inspections should be returned to the same location and immersion depth.
4. Once a thermocouple has been used at one immersion depth it should not be used at any other depth.
5. Do not use a thermocouple to measure a low temperature once it has been used at a very high temperature.
6. Do not use a thermocouple with deteriorated protection tubes.
7. A deteriorated thermocouple will cause a low reading. Always replace a deteriorated thermocouple.
8. Tolerances of thermocouple change over time and usage so they have a finite useful life. Do not recalibrate thermocouples once they are out of tolerance.
8. Do not run two instruments in parallel from a single thermocouple. This will result in instrument imbalance. Use a dual element thermocouple.

## RTD MAINTENANCE

1. Check RTD's on a regular basis to determine replacement requirements.
2. Test probes periodically for ungrounded condition. Unit should read 100 meg ohms minimum at room temperature.
3. When a replacement probe is needed the new element must meet all the following specifications:

Element material	Temp. coefficient
Element accuracy	Maximum Temp.
4. The measuring current to the element should be kept to a minimum to keep self-heating at a negligible level. (3 MA or less)

# 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.

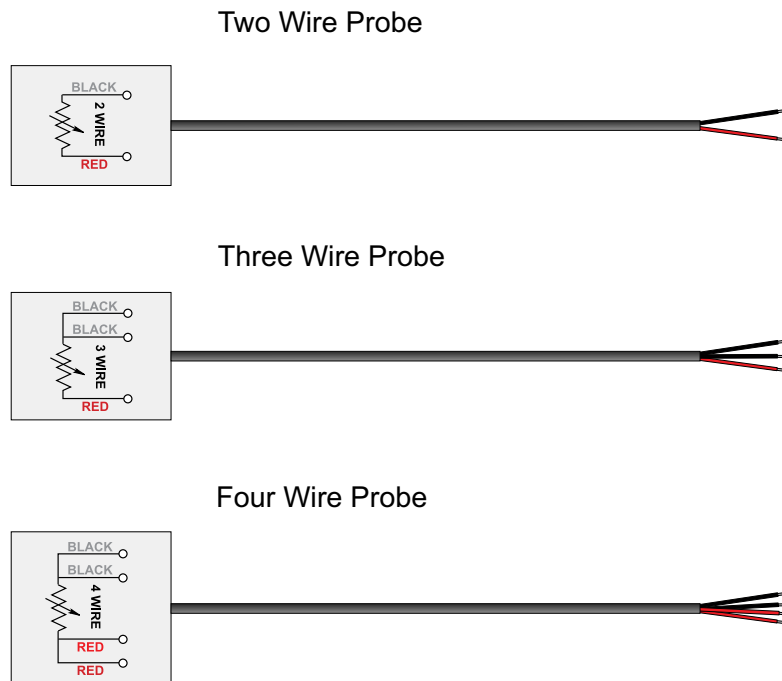
### Configurations

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.

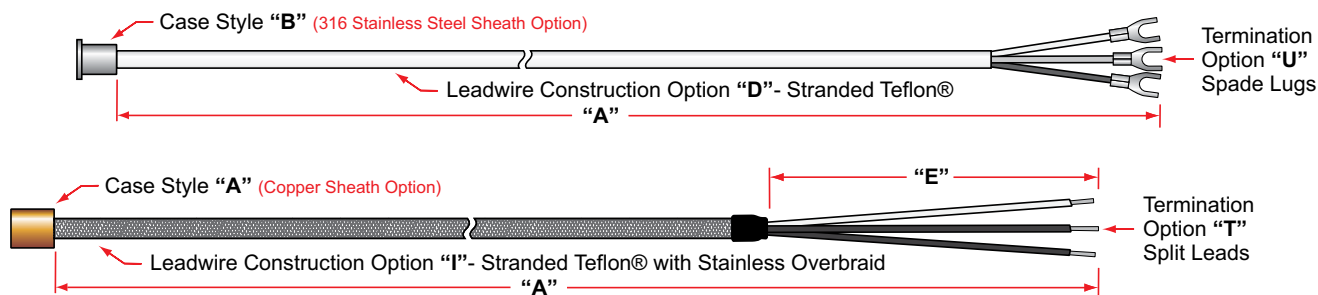
4-wire configuration provide slightly better compensation, but are generally found only in laboratory equipment and other areas where high accuracy is required but must be used in conjunction with a 4-wire instrument.

### Wiring



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

### Style A – Embedment Bearing Assembly



**Style A - Embedment Assembly** - Designed for monitoring bearing temperatures to provide advanced warning of lubrication oil breakdown before catastrophic bearing failure. Available in several case sizes, configurations and sheath materials. Standard operating range -32 to 266°F.



**1. Case Style**

A = Case A - 0.250" L, 0.275 Ø

B = Case B - 0.250" L, 0.188 Ø  
0.250 Ø Flange

C = Case C - 0.300" L, 0.125 Ø

D = Case D - 0.250" L, 0.250 Ø

**2. RTD Element Type**

Standard RTD Codes Available

A = 100 Ohm Platinum .00385

F = 120 Ohm Nickel .00672

**3. Tip Style / Element Accy.**

Standard Tip Styles

3 = Round, Y = Flat - 0.12% used with element code A

4 = Round, X = Flat - 0.24% used with element code C

G = Round, F = Flat - 0.10% Special order with bearings used with element code A

**4. 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

**5. Sheath Material**

4 = 304    6 = 316SS    C = Copper    B = Brass

K = Nickel Plated Copper    U = Tin Plated Copper

**6. Babbitt Tip**

N = None    B = Babbitt Tip (Styles A, B, and D only)

Reduces chance of overheating during installation

**12. Options**

N = None

G = Shielded leadwire \*

L = Mating Connector

Q = Individual Leadwires

Z = Special (Consult Factory)

**11. Split Length "E" (inches)**

**10. Leadwire Termination:**

N = No Split/ No Strip

T = Split Leads (Std)

U = Spade Lugs

V = Ring Lugs

W = 1/4 Push-on

Z = Special

PLUGS & JACKS	Std Temp (425°F)	
	w/ clamp	w/o clamp
Std Male Plug	1A	1B
Std Female Jack	1C	1D
Mini Male Plug	1F	1G
Mini Female Jack	1H	1L

**9. Leadwire Length "A" (inches)**

**8. Leadwire Gauge**

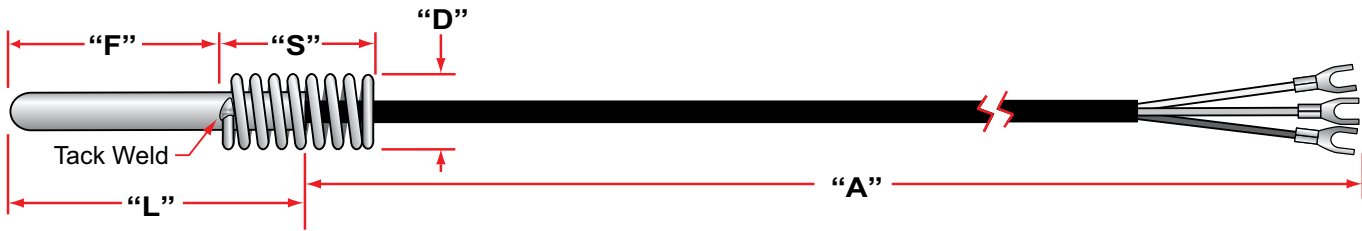
A = 26 gauge    D = 30 gauge

**7. Leadwire Construction**

Stranded wire	Standard	Overbraid	Individual Leads
Teflon® (400°F)	D (Std)	I	T

\* End part number with A152 for bonded to probe, end part number with A157 for isolated from probe

## Style GS – Rigid Tube Spring Assembly



**1. RTD Element Type**

Material	Resistance	Temp. Coefficient
A = Platinum (Std)	100 ohms @ 0°C	.00385 ohm/ohm/°C
C = Nickel	120 ohms @ 0°C	.00672 ohm/ohm/°C

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

Standard Tip Styles  
 3 = Round, Y = Flat - 0.12% used with element code A  
 4 = Round, X = Flat - 0.24% used with element code C  
 G = Round, F = Flat - 0.10% Special order with bearings used with element code A

**3. Element Type**

A = Single      B = Duplex\*

\* Common Ungrounded is Standard for Ungrounded Junctions  
 For Separated Ungrounded choose "O" under Special Options

**4. Sheath Operating Temperature**

A = -200°C to 260°C (500°F)    B = -200°C to 400°C (750°F)

**5. Sheath Material** (See page 5 for other Materials)

4 = 304SS (1650°F) (Std)      C = Copper (1200°F)  
 6 = 316SS (1650°F)

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

H = .188\*    I = .250\*    Q = .313    M = .375    \* Quick delivery

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

0.25 - 999 inches    Z = greater than 999 inches (Consult Factory)

**8. Leadwire Construction**

	(solid wire)		(stranded wire)	
	Standard	Overbraid	Standard	Overbraid
Fiberglass (900°F)	A	F	C	H
Teflon® (400°F)	B	G	D	I

**9. Leadwire Gauge**

A = 26 gauge    J = 22 gauge    D = 30 gauge

**10. Leadwire Length "A"** (Example 012 = 12 inches)

**15. Spring Length "S"**

**14. Options**

N = None  
 A = Special Limits of Error  
 G = Shielded leadwire \*  
 L = Mating Connector  
 O = Separate Junctions  
 Q = Individual Leadwires (3/8" Strip)  
 Z = Other (Consult Factory)

**13. Spring Location "F"** (inches from tip)

**12. Spring Size "D"** (Stainless Steel)

Code	Spring OD	Spring Thk	Spring ID	Probe DIA
SA	0.187"	0.026"	0.135"	0.125"
SB	0.250"	0.032"	0.186"	0.188"
SC	0.260"	0.026"	0.208"	0.188"
SD	0.312"	0.032"	0.248"	0.250"
SE	0.315"	0.026"	0.263"	0.250"
SF	0.375"	0.032"	0.311"	0.313"
SG	0.438"	0.041"	0.356"	0.313"
SH	0.500"	0.054"	0.392"	0.375"
SZ	Custom Spring Size*			

\*GIC can supply almost any size spring.  
 Contact Factory for more information

**11. Leadwire Terminations:**

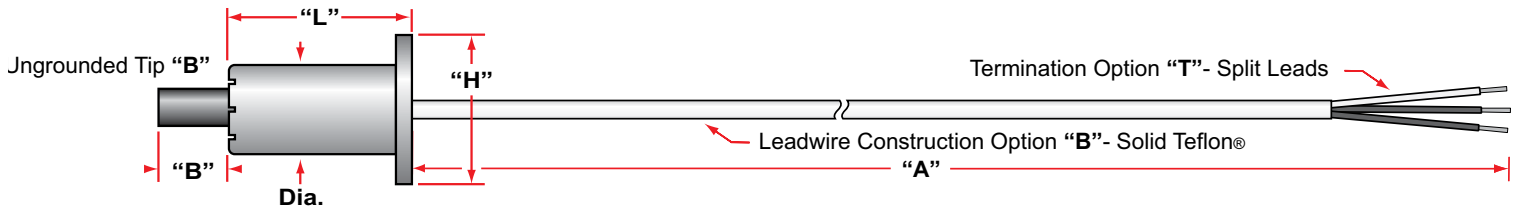
N = No Split/ No Strip  
 T = Split Leads (std = 2" split/3/8" strip)  
 U = Spade Lugs (std = 2" split)  
 V = Ring Lugs (std = 2" split)  
 W = 1/4 Push-on (std = 2" split)  
 X = Bx Connector w/ #8 lugs  
 Z = Other

PLUGS & JACKS	Std Temp (425°F)	
	w/ clamp	w/o clamp
Std Male Plug	1A	1B
Std Female Jack	1C	1D
Mini Male Plug	1F	1G
Mini Female Jack	1H	1L

High Temp Plugs Also Available

\*End part number with A152 for bonded to probe, end part number with A157 for isolated from probe

## Style GB – Internal Spring Loaded Bearing



**Style GB - Bearing sensor** has an internal spring to assure the sensor has contact with the surface being monitored.



**1. RTD Element Type**

Material	Resistance	Temp. Coefficient
A = Platinum(Std)	100 ohms @ 0°C	.00385 ohm/ohm/°C
B = Nickel	120 ohms @ 0°C	.00672 ohm/ohm/°C

**2. Tip Style / Element Accy.**  
 Standard Tip Styles  
 3 = Round, Y = Flat - 0.12% used with element code A  
 4 = Round, X = Flat - 0.24% used with element code C  
 G = Round, F = Flat - 0.10% Special order with bearings used with element code A

**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 Material**

4 = 304SS (1650°F)(Std)	6 = 316SS (1650°F)
-------------------------	--------------------

**5. Sheath Diameter (Metric sizes also available)**  
 H = .188 I = .250 Z = greater than 999 inches (Consult Factory)

**6. Sheath Length "L" (Example 12.5 = 12-1/2 inches)**  
 0.28 - 3.0 inches (Over 3" Consult Factory)

**7. Leadwire Construction**

	(solid wire)	
	Standard	Overbraided
Fiberglass (900°F)	A	F
Teflon® (400°F)	B	G

(Consult Factory for stranded or other leadwires)

**8. Leadwire Gauge**  
 B = 24 gauge (Std) C = 20 gauge (Only - Single element w/.250" sheath)

**9. Leadwire Length "A" (Example 012= 12 inches)**

**13. Cap Size "H" (Inches)**

.188" Dia. Probe Cap		
.250	.313	.345(Std)
.250" Dia. Probe Cap		
.313	.345(Std)	

Custom sizes also available

**12. Options**

N = None  
 G = Shielded leadwire \*  
 L = Mating Connector  
 Q = Individual Leadwires (3/8" Strip)  
 Z = Other (Consult Factory)

**11. Tip Length "B" (Inches)**

**10. Leadwire Terminations:**

N = No Split/ No Strip  
 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

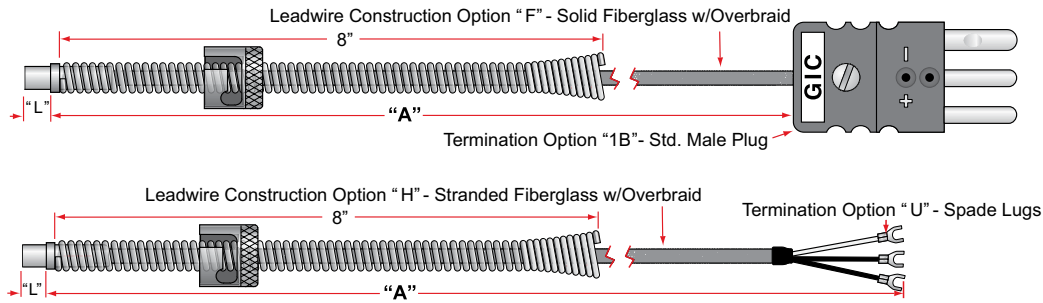
**PLUGS & JACKS** Std Temp (425°F)

	w/ clamp	w/o clamp
Std Male Plug	1A	1B
Std Female Jack	1C	1D
Mini Male Plug	1F	1G
Mini Female Jack	1H	1L

High Temp Plugs Also Available

\* End part number with A152 for bonded to probe, end part number with A157 for isolated from probe

Style L – Lockcap Spring Assembly



**1. Spring Length**  
 A = 8" Spring  
 B = 12" Spring  
 C = Other

**2. RTD Element Type**

Material	Resistance	Temp. Coefficient
A = Platinum(Std)	100 ohms @ 0°C	.00385 ohm/ohm/°C
C = Nickel	120 ohms @ 0°C	.00672 ohm/ohm/°C

**3. Tip Style / Element Accy.**  
 Standard Tip Styles  
 3 = Round, Y = Flat - 0.12% used with element code A  
 4 = Round, X = Flat - 0.24% used with element code C  
 G = Round, F = Flat - 0.10% Special order with bearings used with element code A

**4. 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

**5. 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

**6. Sheath Material (See page 5 for other Materials)**

4 = 304SS (1650°F)(Std)	6 = 316SS (1650°F)	C = Copper (600°F)
-------------------------	--------------------	--------------------

**7. Sheath Diameter**  
 H = .188(Std)

**8. Sheath Length "L"**

B = 1/8"	C = 3/16"	D = 1/4"(Std)	E = 3/8"
F = 1/2"	G = 5/8"	H = 3/4"	L = 7/8"
Z = Other			

**9. Leadwire Construction**

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

**10. Leadwire Gauge**  
 A = 26 gauge    J = 22 gauge (Std)    D = 30 gauge

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

**13. Options**  
 N = None (Choose all that apply)  
 H = High Vibration  
 L = Mating Connector  
 Y = Certificate of Conformance  
 6 = Tip Sensitive Element  
 Z = Other (Consult Factory)

**12. Leadwire Terminations**

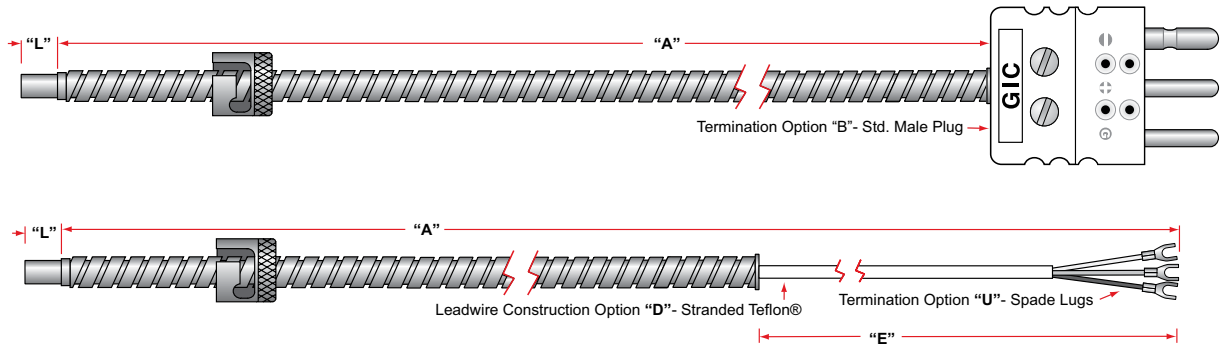
N = No Split/ No Strip(Std)  
 T = Split Leads (std = 2" split/3/8" strip)  
 U = Spade Lugs (std = 2" split)  
 V = Ring Lugs (std = 2" split)  
 W = 1/4 Push-on (std = 2" split)  
 X = Bx Connector w/ #8 lugs  
 Z = Other

PLUGS & JACKS	w/clamp	w/o clamp
Std Male Plug (500°F)	1A	1B
Std Female Jack (500°F)	1C	1D
Mini Male Plug (500°F)	1F	1G
Mini Female Jack (500°F)	1H	1L

**Bayonet Adapters**

Series NUMBER	LENGTH (L)	THREAD SIZE	MATERIAL
G95	.875"	1/8" NPT	303 SS
G95-Ni	.875"	1/8" NPT	Ni plated CS

## Style LN – Lockcap Armor Assembly



### 1. RTD Element Type

Standard RTD Codes Available  
 A = 100 Ohm Platinum .00385  
 F = 120 Ohm Nickel .00672

### 3. Tip Style / Element Accy.

Standard Tip Styles  
 3 = Round, Y = Flat - 0.12% used with element code A  
 4 = Round, X = Flat - 0.24% used with element code C  
 G = Round, F = Flat - 0.10% Special order with bearings used with element code A

### 4. 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\*    \* Not available on all Sheath Diameters

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

4 = 304SS (1650°F)    6 = 316SS (1650°F)

### 5. Sheath Diameter

G = .125    H = .188(Std)

### 6. Sheath Length "L" (.25" Std)

0.25 - 99 inches    Z = greater than 99 inches (Consult factory)

### 9. Leadwire Construction

Stranded wire    Standard    Overbraided    \* Not available on all Sheath Diameters  
 Teflon® (400°F)    D (Std)    I\*

### 8. Leadwire Gauge

A = 26 gauge    B = 24 gauge (Std)  
 J = 22 gauge    D = 30 gauge

### 9. Armor Length "A" (Example 12.5 = 12-1/2)

### 10. Leadwire Terminations:

N = No Split/ No Strip  
 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

#### PLUGS & JACKS

	Std Temp (425°F)	
	w/ clamp	w/o clamp
Std Male Plug	1A	1B
Std Female Jack	1C	1D
Mini Male Plug	1F	1G
Mini Female Jack	1H	1L

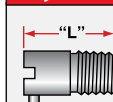
### 12. Options

N = None  
 A = Special Limits of Error  
 G = Shielded leadwire \*  
 I = SS ID Tag  
 L = Mating Connector  
 Q = Individual Leadwires (3/8" Strip)  
 Y = Certificate of Conformance  
 Z = Special (Consult Factory)

Choose all that apply

### 11. Leadwire Length "E"

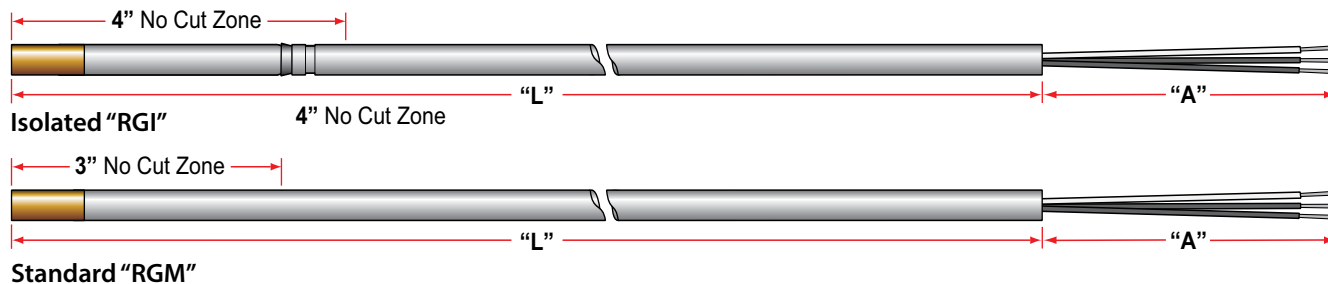
#### Bayonet Adapters



Series NUMBER	LENGTH (L)	THREAD SIZE	MATERIAL
G95	.875"	1/8" NPT	303 SS
G95-Ni	.875"	1/8" NPT	Ni plated CS

\* End part number with A152 for bonded to probe, end part number with A157 for isolated from probe

### Style GM/GI – Motor/ Generator (Cut-to-Length)



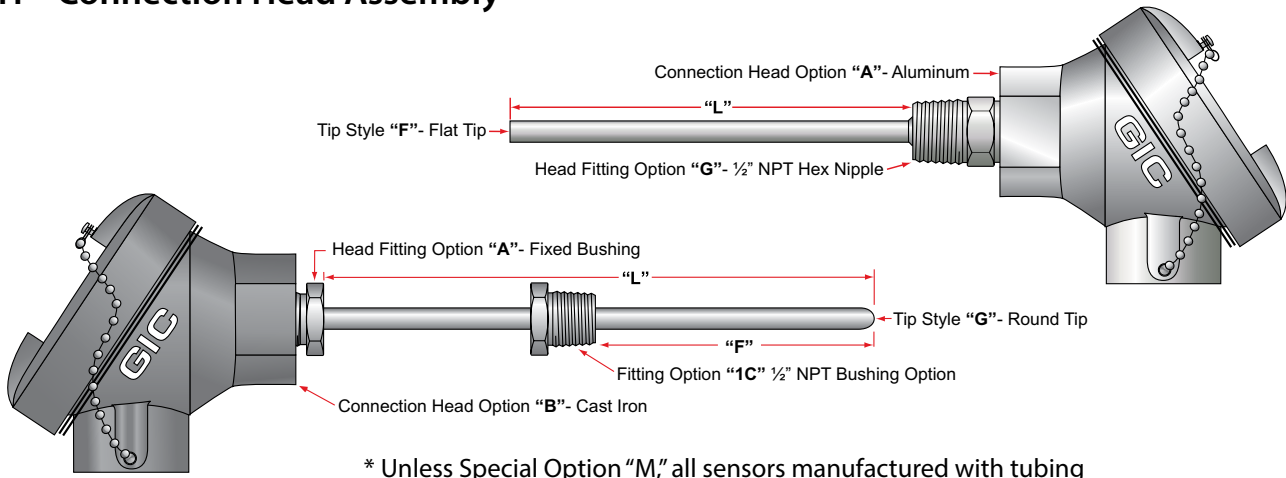
**Style GM/GI - Motor/Generator** - Tip sensitive, cut-to-length bearing RTD with a fast response copper tip. Available in both standard and isolated configurations.

<b>R G</b> 1 2 3 4 5 - 6 7 8 - 9 10 11 - 12 <b>N N</b> - 13 - <b>N N</b>												
<b>1. Construction</b>												
M = Standard (Std) I = Isolated Tip												
<b>2. RTD Element Type</b>												
Standard RTD Codes Available A = 100 Ohm Platinum .00385 F = 120 Ohm Nickel .00672												
<b>3. Tip Style / Element Accy.</b>												
Standard Tip Styles 3 = Round, Y = Flat - 0.12% used with element code A 4 = Round, X = Flat - 0.24% used with element code C G = Round, F = Flat - 0.10% Special order with bearings used with element code A												
<b>4. Configuration</b> (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*    * Not available on all Sheath Diameters												
<b>5. Sheath Operating Temperature</b>												
A = -20°C to 200°C (450°F)												
<b>6. Sheath Material</b> (See page 5 for other Materials)												
4 = 304SS (1650°F)(Std)      E = Epoxy Glass												
<b>7. Sheath Diameter</b> (Metric sizes also available)												
H = .188*    I = .250*    Y = .215      * Quick delivery												
<b>8. Sheath Length "L"</b> (Example 12.5 = 12-1/2 inches)												
4 - 36 inches    (Consult Factory for longer lengths)												
<b>9. Leadwire Construction</b>												
Stranded wire    Standard    Overbraid    * Not available on all Sheath Diameters Teflon® (400°F)    D (Std)    I*												
<b>10. Leadwire Gauge</b>												
A = 26 gauge (Std)    J = 22 gauge    D = 30 gauge												
<b>11. Leadwire Length "A"</b> (Example 012= 12 inches)												
<b>12. Leadwire Terminations:</b>												
N = No Split/ No Strip 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) Z = Other												
<b>13. Options</b>												
N = None G = Shielded leadwire * L = Mating Connector O = Separate Junctions Q = Individual Leadwires (3/8" Strip) Z = Other (Consult Factory)												
<b>PLUGS &amp; JACKS</b> Std Temp (425°F)												
w/ clamp    w/o clamp												
Std Male Plug    1A    1B												
Std Female Jack    1C    1D												
Mini Male Plug    1F    1G												
Mini Female Jack    1H    1L												
High Temp Plugs Also Available												
* All connectors will be provided loose so that they can be installed after cutting to length.												

\* End part number with A152 for bonded to probe, end part number with A157 for isolated from probe

# Resistance Temperature Detectors (RTD)

## Style H – Connection Head Assembly



NOTE: Connection head assemblies are not inherently tip sensitive. They are generally used in bearing oil reservoirs. If your application require tip sensitive, use option code 6.

**1. Connection Head** (See page 25 for other C-Heads)

A = Aluminum	G = 316 Stainless Steel
B = Cast Iron	S = 316SS Explosion Proof
C = FMCUS Alum. EXP	V = Dan
D = Poly Black - Chain	Y = APEX Aluminum EXP
E = FDA Ploy - Latch	(Consult Factory for Specialty Heads)

**2. RTD Element Type**

Material	Resistance	Temp. Coefficient
A = Platinum(Std)	100 ohms @ 0°C	.00385 ohm/ohm/°C
F = Nickel	120 ohms @ 0°C	.00672 ohm/ohm/°C

**3. Tip Style / Element Accy.**

	.10%	.12%	.24%
Flat Tip:	F	Y	X
Round Tip:	G	3	4

**4. 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

\* Not available for all head styles

**5. Sheath Operating Temperature**

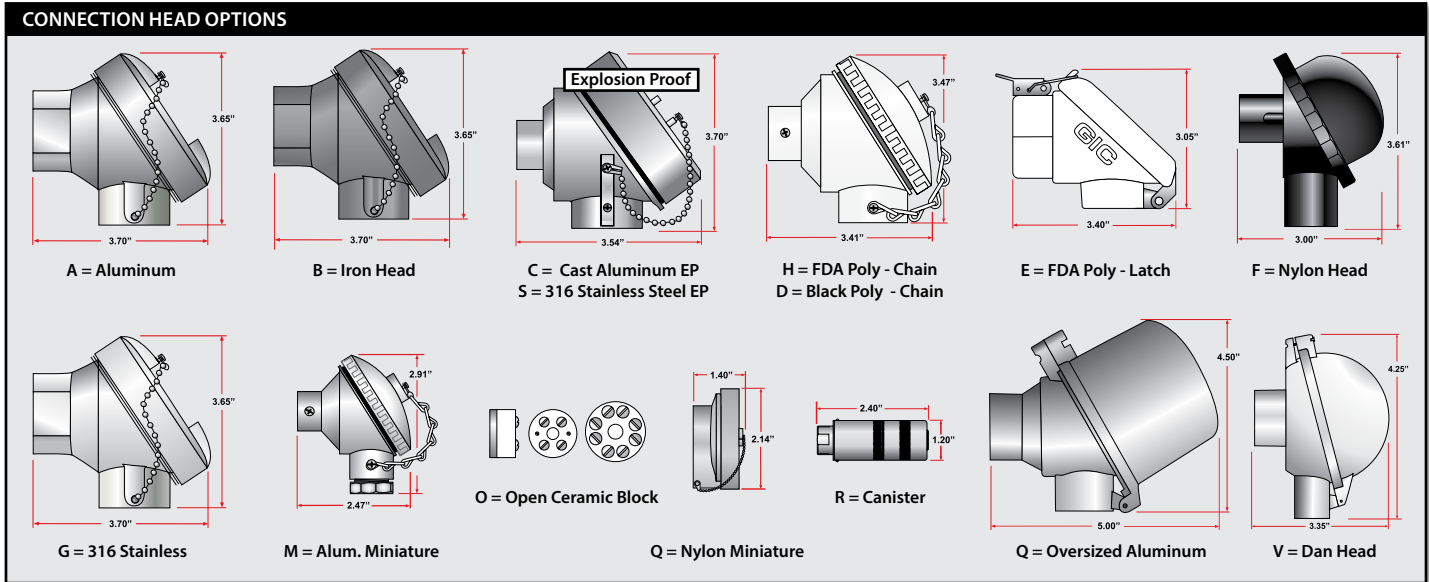
A = -200°C to 260°C (500°F)(Std)	C = -200°C to 600°C (1200°F)
B = -200°C to 400°C (750°F)	Z = Other

**6. Sheath Material** (See page 5 for other Materials)

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

**7. Sheath Diameter** (Metric sizes also available)

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



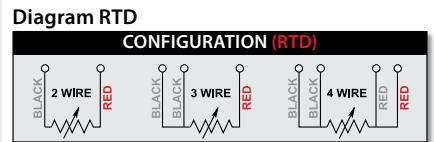
**14. Bend Location "C"** (Must be within 3" of tip for RTD)      N = No Bend(Std)

**13. Bend Angle** (For other bend angles, consult factory)  
 N = None(Std)    G = 45 Degree Bend    S = 90 Degree Bend    Z = Other

**12. Options** (Choose all that apply)

N = None	Q = Ground Screw
B = RTD Transmitter	S = Spring Loaded
C = Programmable Transmitter	T = Coated Probe (Specify Requirements)
H = High Vibration	Y = Certificate of Conformance
I = SS ID Tag	6 = Tip Sensitive Element
M = MgO Construction	Z = Special (Consult Factory)
P = Electro-etching	

\* Not available for all head styles



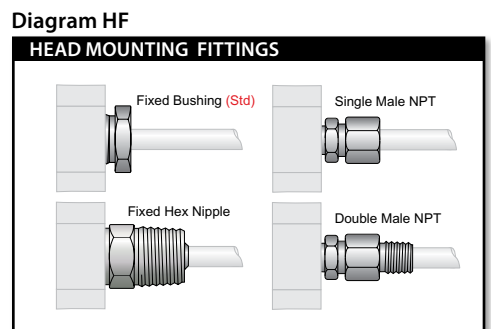
**11. Fitting Location "F"** (inches from tip)      N = No Fitting Location (Std)

**10. 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	SPECIAL
Fixed Bushing (Stainless)	1A	1B	1C	1Z
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<sup>®</sup> gland standard (400°F) for other gland options such as Lava (1200°F) consult factory



**9. Head Mounting Fittings** (See Diagram HF)

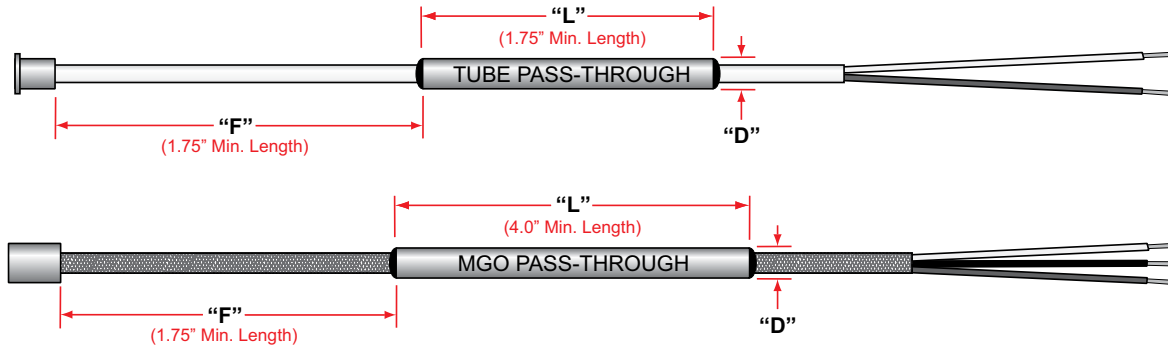
A = Fixed Bushing (No process threads) (Stainless) (Std)    P = Pipe Nipple (specify in notes)    N = None    Z = Special

Hex Nipple Connection	1/4" NPT	1/2" NPT	3/4" NPT	Compression Fitting Connection	1/8" NPT	1/4" NPT	1/2" NPT
Fixed Hex Nipple (Steel)	F	G	H	Single Male NPT (SS)	-	-	S
Fixed Hex Nipple (SS)	I	J	K	Double Male NPT (SS)	W	X	Y
Spring Loaded Oil Tight (SS)*	-	R	-				

\*.188 and .250 Dia. only

**8. Sheath Length "L"** (Example 12.5 = 12-1/2 inches)  
 0.25 - 99.9 inches    Z = greater than 99.9 inches (Consult Factory)

### Style PT – Pass-Through



**Pass-Through** - Provides an oil-tight seal to prevent the wicking of oil along the lead wires at the machine housing. To be used with standard compression fittings.

Available in two constructions: The Tube construction is an epoxy filled tube with each wire sealed at the individual conductor. It is rated to 25 psi and is most common and economical design. The MgO construction leadwires are cut and tack welded or brazed to an MgO transition giving an extra barrier to prevent oil wicking.

Pass-Throughs are most commonly used on bearing sensors but can be ordered with any sensor that requires an oil-tight seal at the leadwires.

**PT** 1 - 2 3 4 - 5 - 6

**1. Construction**

T = Tubing (Std)  
M = MgO

**2. Sheath Material**

4 = 304SS (Std)  
6 = 316SS

**3. Diameter "D"** (Metric available)

H = .188 I = .250 M = .375 (Std)

**4. Pass-Through Length "L"**

1.75" Min. Length (4.0" for MgO)

**5. Location "F"** (inches from Sensor)

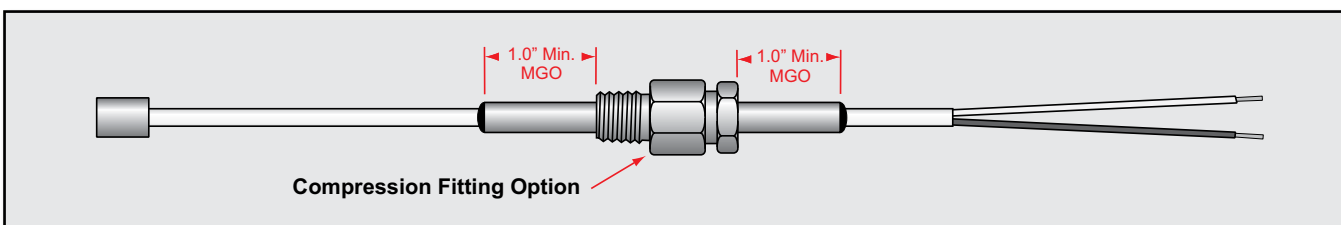
**6. Fitting** (Metric fittings also available)

N = None (Std)

NPT Fittings	1/8" NPT	1/4" NPT	1/2" NPT	SPECIAL
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	

\* Recommended for Tube Construction  
\*\* Teflon® glands not available on all NPT's

**Just need pass through?**  
We can make pass through connections without a sensor, please consult factory.



# Terms & Conditions

## ORDERING INFORMATION:

To order any item please refer to the proper catalog section and list quantity, catalog number and description. Should you have any questions regarding items shown, or special requirements that are not shown, please contact your nearest **Field Representative** or GIC Thermodynamics, 12575 US 31N, Charlevoix, MI, 49720. Phone: 800-876-4442, Fax: 248-280-0998, E-mail: sales@gicsensors.com.

## ENGINEERING:

If the unit you require is not shown in this catalog contact the factory or field representative. Our engineers will assist you in providing the right sensor for your application.

## QUANTITY (VIQ)

For all items carried in stock (including customer proprietary stock) GIC will ship the exact quantity requested on an order. In the manufacture of non-stock or made-to-order products however, it is necessary to allow for losses in production. We therefore reserve the right to ship and invoice the following variation in quantities (VIQ) of units unless a specific in-writing agreement to the contrary is made prior to the acceptance of the order. **No VIQ = add 5% to order value.** With the exception of pre-spooled lengths of Thermo-couple and Extension Wire carried in stock a +/- 5% variation in quantity applies to any purchase.

## MINIMUM PURCHASE REQUIREMENTS

Stock Inventory (only): \$50.00  
Made To Order (Per Item): \$100.00

## VARIATION IN QTY. (VIQ)

QTY ORDERED	VARIATION
1 to 9	No Variation
10 to 24	+/- 1 unit
25 to 49	+/- 2 units
50 to 99	+/- 3 units
100+	+/- 4%

## DELIVERY

**Stock Sensors:** Ship within one week.

**Standard Production Time:** 3 weeks ARO.

**Accelerated Delivery:** 1 day to 2 weeks depending on availability of parts and labor - for a nominal charge we can take care of your emergency situations. Standard delivery terms: are F.O.B. GIC Plant. Unless otherwise specified in the order GIC will select the carrier, prepay the freight and include charges on the invoice. Responsibility for the shipment will pass to the buyer at the F.O.B. point.

## PAYMENT TERMS

Standard payment terms are Net 30 days with approved credit. Most major credit cards and cash in advance accepted.

## CANCELLATION CHARGES

Orders are subject to a cancellation charge of which the amount will be determined by GIC, at the time of cancellation, based on the total of production completed. There is no charge for the cancellation of stock sensors.

## PROPRIETARY STOCK

Let GIC carry your finished sensor inventory. Get off the shelf delivery of custom sensors made to your exact specifications.

## BLANKET ORDERS

Advise us of your monthly or annual requirements for guaranteed scheduled deliveries at the best possible price.

## WARRANTY

GIC products are warranted against defects in workmanship and materials. No other express warranty, written or oral applies. No person is authorized to give any other warranty or assume any liability except by written statement from an officer of GIC Thermodynamics.

## WARRANTY PERIOD

Product warranty extends for 12 months from date of shipment from the factory or authorized distributor. Products must be installed and maintained in accordance with GIC instructions. Users are responsible for the suitability of the products to their application. There is no warranty against damage resulting from corrosion, misapplication, improper specification or other operating conditions beyond our control. Claims against carriers for damage in transit must be filed by the buyer.

## RETURN POLICY

Products returned to GIC must be accompanied by a Material Return Authorization (MRA). Contact the factory or field representative for the proper paperwork and return instructions. Upon receipt, items will be examined by GIC to confirm or determine the product defect. If the product has a manufacturing defect GIC will determine if the item will be repaired, replaced or if credit will apply.

## RESTOCK CHARGES

Stock sensors and accessories, which have not been used or modified, may be returned to GIC for a 20% restocking charge. All returns must be approved (MRA) for acceptance.