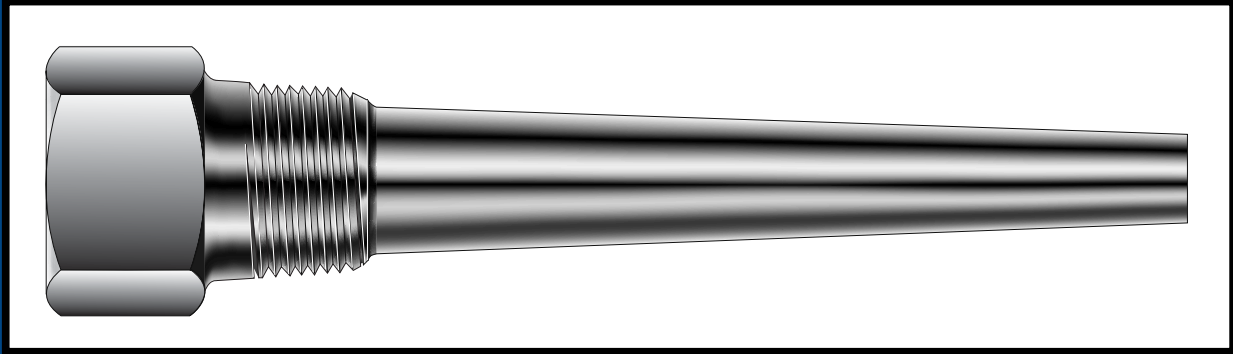


## SECTION 3

# THERMOWELLS



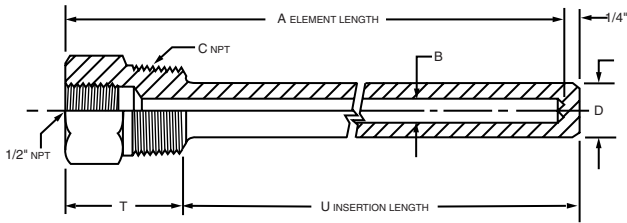
### THERMOWELLS INDEX - SECTION 3:

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# THERMOWELLS



## Straight-Threaded Barstock-100S Series



### Order Example

103S - R - 4.5 - 1.75

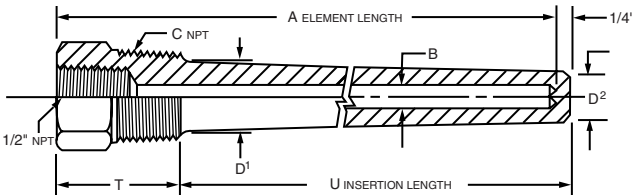
Basic Part No. →  
 Material Code From Page 52 →  
 U Insertion Length →  
 T Length Including Lag →

PART No.	"A" HEX SIZE	"B" BORE	"C" NPT	"D" STEM DIA.	"T" LENGTH
100S	1.125	.265	1/2"	.625	1.75
101S	1.125	.390	1/2"	.625	1.75
102S	1.125	.390	3/4"	.750	1.75
103S	1.125	.265	3/4"	.750	1.75
104S	1.125	.515	3/4"	.875	1.75
105S	1.125	.437	3/4"	.750	1.75
106S	1.375	.515	1"	.875	1.75
107S	1.375	.437	1"	.875	1.75
108S	1.375	.390	1"	.875	1.75
109S	1.375	.265	1"	.750	1.75

\*\*\*Other Sizes Available - Consult TMS

MATERIAL	TEMPERATURE - DEGREES F						
	70	200	400	600	800	1000	1200
Brass	5000	4200	1000	-----	-----	-----	-----
Carbon Steel	5200	5000	4800	4600	3500	1500	-----
304S/S	7000	6200	5600	5400	5200	4500	1650
316S/S	7000	7000	6400	6200	6100	5100	2500
Monel	6500	6000	5400	5300	5200	1500	-----

## Tapered-Threaded Barstock-100T Series



### Order Example

103T - P - 6 - 1.75

Basic Part No. →  
 Material Code From Page 52 →  
 U Insertion Length →  
 T Length Including Lag →

PART No.	"A" HEX SIZE	"B" BORE	"C" NPT	D1 DIA.	D2 DIA.	"T" LENGTH
100T	1.125	.265	1/2"	.688	.625	1.75
101T	1.125	.390	1/2"	.688	.625	1.75
102T	1.125	.390	3/4"	.875	.750	1.75
103T	1.125	.265	3/4"	.875	.750	1.75
104T	1.125	.515	3/4"	.875	.750	1.75
105T	1.125	.437	3/4"	.875	.750	1.75
106T	1.375	.515	1"	1.000	.750	1.75
107T	1.375	.437	1"	1.000	.875	1.75
108T	1.375	.390	1"	1.000	.750	1.75
109T	1.375	.265	1"	1.000	.750	1.75

\*\*\*Other Sizes Available - Consult TMS

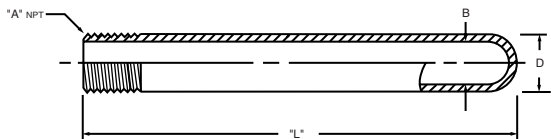
MATERIAL	TEMPERATURE - DEGREES F						
	70	200	400	600	800	1000	1200
Brass	5000	4200	1000	-----	-----	-----	-----
Carbon Steel	5200	5000	4800	4600	3500	1500	-----
304S/S	7000	6200	5600	5400	5200	4500	1650
316S/S	7000	7000	6400	6200	6100	5100	2500
Monel	6500	6000	5400	5300	5200	1500	-----

# THERMOWELLS



## METALLIC PROTECTION TUBES

### Tubes-No Bushings



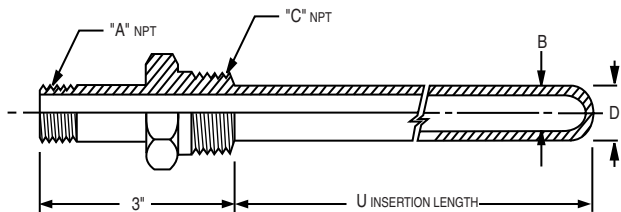
**Order Example**

203 - R - 12

Basic Part No.      Material Code From Page 52      "L" Length

PART NO.	"A" NPT	"B" BORE	"D" DIA.
200	1/4"	.364	.540
201	1/4"	.302	.540
202	1/2"	.622	.843
203	1/2"	.546	.843
204	3/4"	.824	1.050
205	3/4"	.742	1.050
206	1"	1.049	1.312
207	1"	.957	1.312

### Tubes-With Mounting Bushing



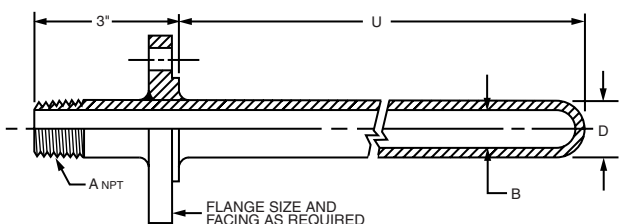
**Order Example**

302- R - 12 - 3

Basic Part No.      Material Code From Page 52      "T" Length      U Insertion Length

PART NO.	"A" NPT	"B" BORE	"C" NPT	"D" DIA.
300	1/4"	.364	1/2"	.540
301	1/2"	.622	3/4"	.843
302	1/2"	.622	1"	.843
303	1/2"	.622	1 1/2"	.843
304	3/4"	.824	1"	1.050
305	3/4"	.824	1 1/2"	1.050
306	1"	1.049	1 1/2"	1.312
307	1"	1.049	2"	1.312

### Tubes-Flanged



**Order Example**

401 - R - CUR - 12 - 3

Basic Part No.      Material Code From Page 52      Flange Code From Chart      "U" Insertion Length      "T" Length

PART NO.	"A" NPT	"B" BORE	"D" DIA.
400	1/4"	.364	.540
401	1/2"	.622	.843
402	3/4"	.824	1.050
403	1"	1.049	1.312
404	1/4"	.302	.540
405	1/2"	.546	.843
406	3/4"	.742	1.050
407	1"	.957	1.312

**FLANGE SIZES AND RATINGS**

SIZE	CODE	RATING	CODE	FACING	CODE
3/4"	A	150 LB	U	FLAT FACE	F
1"	B	300 LB	V	RAISED FACE	R
1 1/2"	C	600 LB	W	RING JOINT	J
2"	D	900 LB	X		
2 1/2"	E	1500 LB	Y		
3"	G	2500 LB	Z		
4"	H	OTHER-SPECIFY			
4 1/2"	K				
5"	L				
5 1/2"	M				
6"	N				

\*\*Add "FP" After Flange Facing For Full Penetrant Weld.

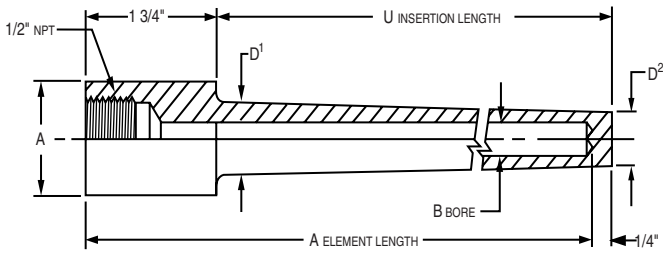
\*\*Add "SF" After Flange Facing For Smooth Finish 125-250 RMS.

\*\*\*NOTE-Other Sizes Available. Consult TMS\*\*\*

# THERMOWELLS



## Socket-Weld



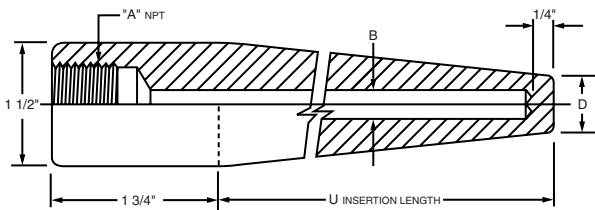
### Order Example

501 - R - 7.5 - 4.75

Basic Part No.      "T" Length  
Material Code From Page 52      "U" Insertion Length

PART NO.	PIPE SIZE	"A" DIA.	"B" BORE	"T" LENGTH	D1 DIA.	D2 DIA.
500	3/4"	1.050	.390	1.75	.812	.750
501	3/4"	1.050	.265	1.75	.812	.750
502	1"	1.312	.265	1.75	1.000	.750
503	1"	1.312	.390	1.75	1.000	.750
504	1 1/4"	1.660	.265	1.75	1.000	.750
505	1 1/4"	1.660	.390	1.75	1.000	.750
506	3/4"	1.050	.265	1.75	.812	.812
507	3/4"	1.050	.390	1.75	.812	.812
508	1"	1.312	.265	1.75	1.000	1.000
509	1"	1.312	.390	1.75	1.000	1.000
510	1 1/4"	1.660	.265	1.75	1.000	1.000
511	1 1/4"	1.660	.390	1.75	1.000	1.000

## Weld-in, Barstock



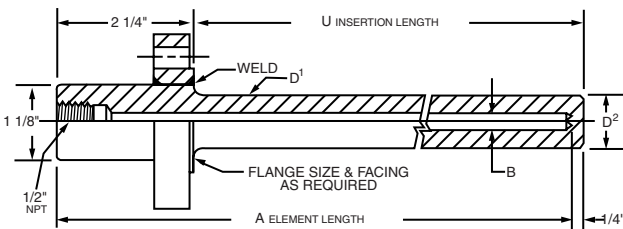
### Order Example

603- P - 12 - 3

Basic Part No.      "T" Length + Lag (If Any)  
Material Code From Page 52      "U" Insertion Length

PART NO.	"A" NPT	"B" BORE	"D" DIA.
600	1/2"	.515	.875
601	1/2"	.437	.875
602	1/2"	.390	.750
603	1/2"	.265	.750

## Flanged Barstock



### Order Example

705 - R - CYJ - 12 - 4.25

Basic Part No.      "T" Length + Lag (If Any)  
Material Code From Page 52      "U" Insertion Length  
Flange Code From Chart

PART NO.	B BORE	D1	D2	FLANGE
700	.515	.937	.937	Specify Flange Size And Rating From Chart
701	.437	.875	.875	
702	.390	.750	.750	
703	.265	.750	.750	
704	.390	.875	.875	
705	.265	.875	.750	
706	.343	1.062	.750	
707	.265	1.062	.625	
708	.390	1.000	.750	
709	.265	1.000	.750	

### FLANGE SIZES AND RATINGS

SIZE	CODE	RATING	CODE	FACING	CODE
3/4"	A	150 LB	U	FLAT FACE	F
1"	B	300 LB	V	RAISED FACE	R
1 1/2"	C	600 LB	W	RING JOINT	J
2"	D	900 LB	X		
2 1/2"	E	1500 LB	Y		
3"	G	2500 LB	Z		
4"	H	OTHER-SPECIFY			
4 1/2"	K				
5"	L				
5 1/2"	M				
6"	N				

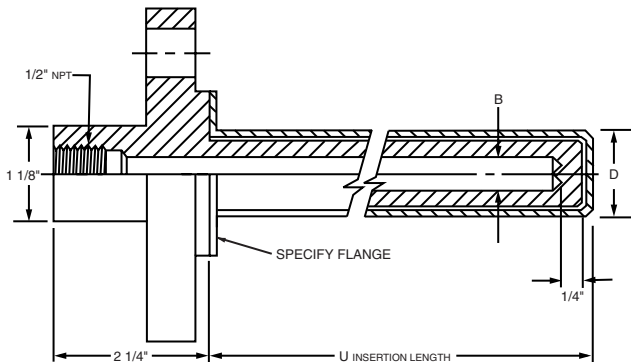
\*\*Add "FP" After Flange Facing For Full Penetrant Weld.

\*\*Add "SF" After Flange Facing For Smooth Finish 125-250 RMS.

# THERMOWELLS



## Flanged-Tantalum Sleeve



PART NO.	"B" BORE	"D" DIA.	FLANGE
800	.265	.500	Specify From Chart Below.
801	.390	.500	
802	.390	.750	
803	.265	.750	

### FLANGE SIZES AND RATINGS

SIZE	CODE	RATING	CODE	FACING	CODE
3/4"	A	150 LB	U	FLAT FACE	F
1"	B	300 LB	V	RAISED FACE	R
1 1/2"	C	600 LB	W	RING JOINT	J
2"	D	900 LB	X		
2 1/2"	E	1500 LB	Y		
3"	G	2500 LB	Z		
4"	H	OTHER-SPECIFY			
4 1/2"	K				
5"	L				
5 1/2"	M				
6"	N				

\*\*Add "FP" After Flange Facing For Full Penetrant Weld.

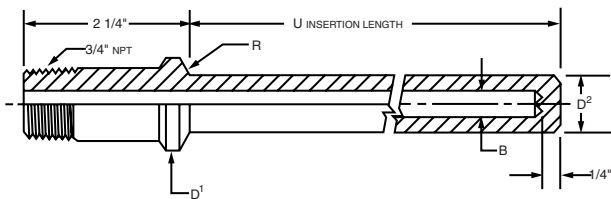
\*\*Add "SF" After Flange Facing For Smooth Finish 125-250 RMS.

### Order Example

800- R - CVR - 10 - 2.25

Basic Part No. Material Code From Page 52  
 "R" Flange Code From Chart  
 "CVR" "T" Length + Lag (If Any)  
 "10" "U" Insertion Length  
 "2.25" "D" Dia.

## Ground Joint



PART NO.	"B" BORE	D <sup>1</sup> DIA.	D <sup>2</sup> DIA.	"R" RADIUS
900	.515	1.375	.875	1.000
901	.390	1.375	.750	1.000
902	.265	1.375	.750	1.000
903	.515	1.750	.875	1.250
904	.390	1.750	.750	1.250

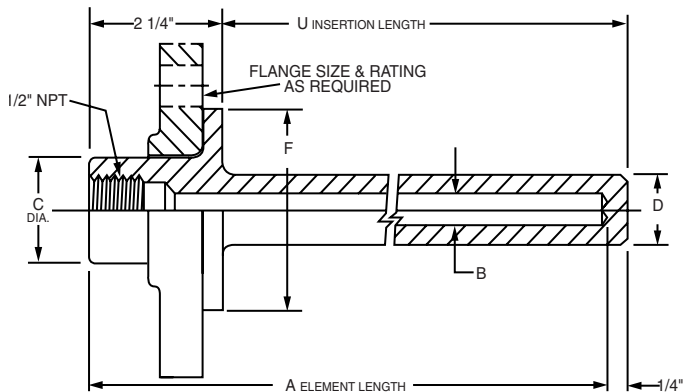
\*\*Shown With O.D. Threads. Internally Threaded Thermowells Are Available. Consult TMS.

### Order Example

900 - J - 12 - 2.25

Basic Part No. Material Code From Page 52  
 "J" "R" Radius  
 "12" "T" Length + Lag (If Any)  
 "2.25" "U" Insertion Length  
 "2.25" "D" Dia.

## Van Stone



PART NO.	"F" DIA.	"B" BORE	"C" DIA.	"D" DIA.	FLANGE SIZE
1000	2.000	.265	1.312	.750	1"
1001	2.000	.390	1.312	.875	1"
1002	2.875	.265	1.900	.750	1 1/2"
1003	2.875	.390	1.900	.875	1 1/2"

\*\*\*Other Sizes Available. Consult TMS\*\*\*  
 \*\*\*Backing Flanges Are Available Upon Request\*\*\*

### Order Example

1000 - P- 12 - 2.25

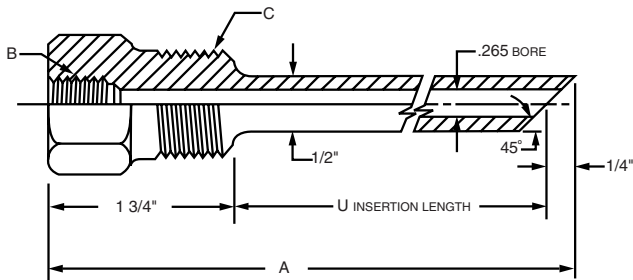
Basic Part No. Material Code From Page 52  
 "P" Flange Code  
 "12" "T" Length + Lag (If Any)  
 "2.25" "U" Insertion Length  
 "2.25" "D" Dia.

# THERMOWELLS



## Sample Probes

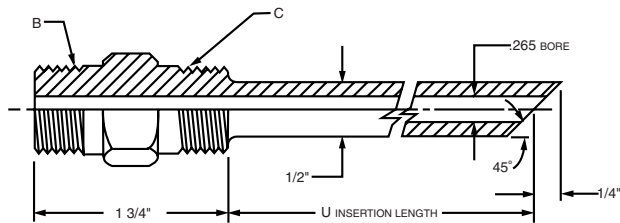
Type 1073, 1074, 1075



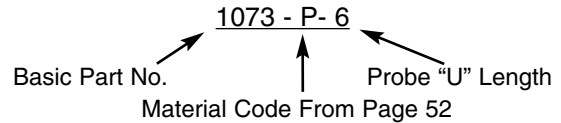
PART NO.	"B" INSTRUMENT CONNECTIO-NPT	"C" PROCESS CONNECTION	"D" DIA.
1073	1/4" ID Thread	1/2" OD Thread	.500
1074	1/4" ID Thread	3/4" OD Thread	.500
1075	1/4" ID Thread	1" OD Thread	.500
1076	1/2" OD Thread	1/2" OD Thread	.500

\*\*Standard sample probes are machined from drilled barstock and have 45 degree angled tip. Straight tipped sample probes are available. Sample probes are also available from welded tubing in lieu of drilled barstock. Consult TMS.

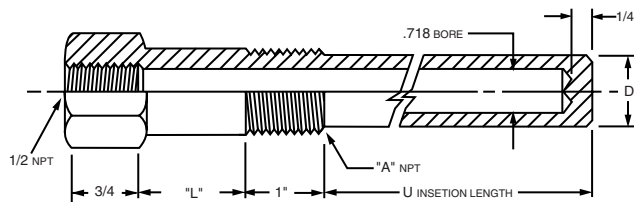
Type 1076



### Order Example



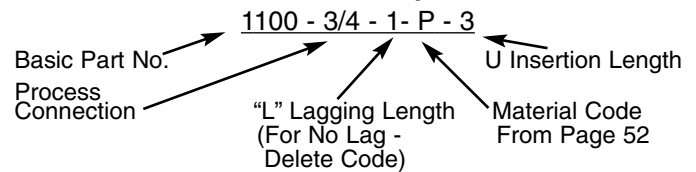
## Type 1100-Large Bore For 1 1/16" Diameter Bulbs



"A" NPT	3/4 NPT or 1 NPT
"U" Length	2", 3", 4", 6", 10", 12"
"D" DIA.	.879 For 3/4 NPT
"D" DIA.	1.100 For 1" NPT

\*\*Other Length Available - Consult TMS\*\*

### Order Example

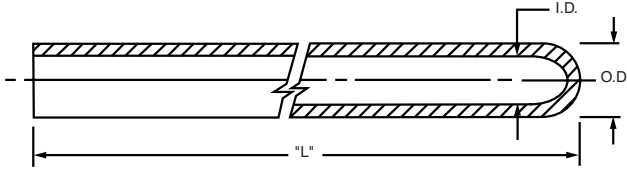


# THERMOWELLS

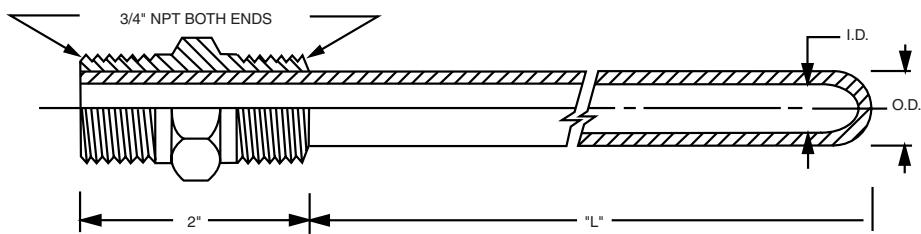


## Ceramic Protection Tubes

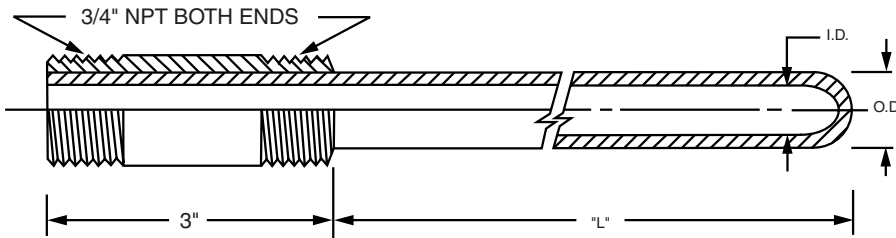
### Type 1200 - No Bushing



### Type 1201 - Hex Nipple



### Type 1202 - Standard Nipple



Basic Part No. **12XX - 3 - A - 17** "L" Length  
 Tube Size Code                      Material Code

TUBESIZE	I.D.	O.D.
1	.250	.375
2	.375	.500
3	.437	.688

Material: A = Alumina and M= Mullite  
 Other Sizes And Material Available. Consult TMS.

### Protection Tube Materials

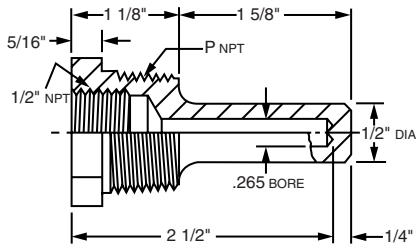
MATERIAL	GRADE	MAX. USE TEMP (AIR)	THERMAL SHOCK RESISTANCE	REMARKS
Hexoloy SA	Sintered	3000° F	Excellent	Impermeable at 300° F. maintains strength to 3000° F excellent corrosion resistance, does not creep, attacked by halides, fused caustics and ferrous metals
Halsic I	Reaction bonded silicon infiltrated	2450° F	Very Good	Extremely good oxidation resistance, corrosion resistant against strong acids and alkalis
Halsic R	Recrystallized SiC	2900° F	Very Good	Reliable bonding of coatings, resistant against strong acids and alkalis
Metal Ceramic	LT1	2500° F	Must be preheated to 900° F before immersion into molten metals at 2000° F Temp. or above	Not recommended in carburizing, Nitrogen atmospheres, high vacuum or in molten Aluminum
Alumina	99.7%	3100° F	Fair preheating rrecommended	Creeps at 2900° F
Mullite		3100° F	Poor must be preheated to 900° F	Non-Ferrous Metals

# THERMOMETER WELLS

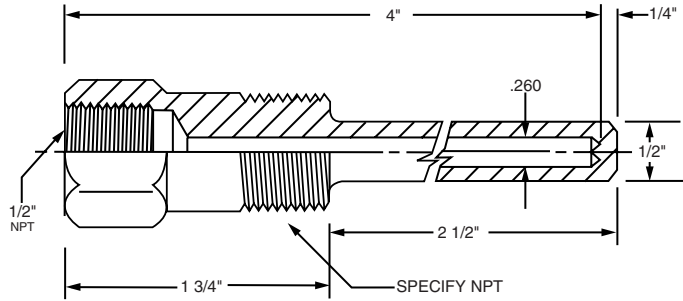


## Threaded Bimetal Thermometer Wells

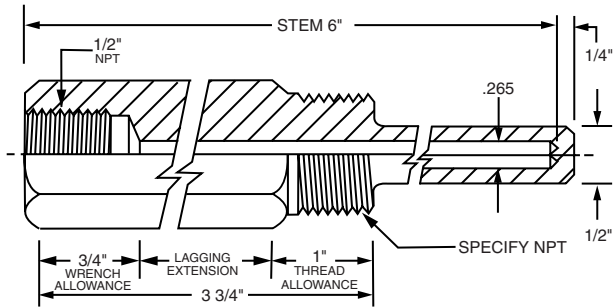
**Type T100 For 2.5" Stem Thermometers**



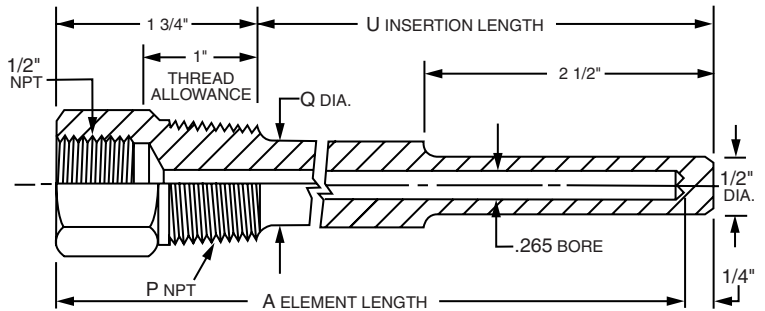
**Type T101 For 4" Stem Thermometers**



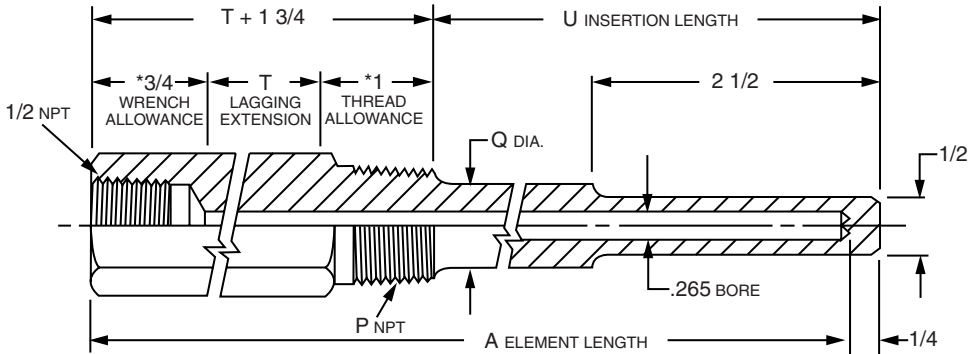
**Type T102 With 2" Lag For 6" Stem Thermometers**



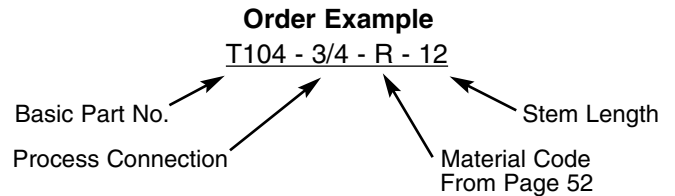
**Type T103 For 6" And Longer Stem Thermometers**



**Type T104 With 3" Lag For 9" And Longer Bimetal Thermometers**



"P" PROCESS CONNECTION	"Q" SHANK DIA.
1/2"	.625
3/4"	.750
1"	.875



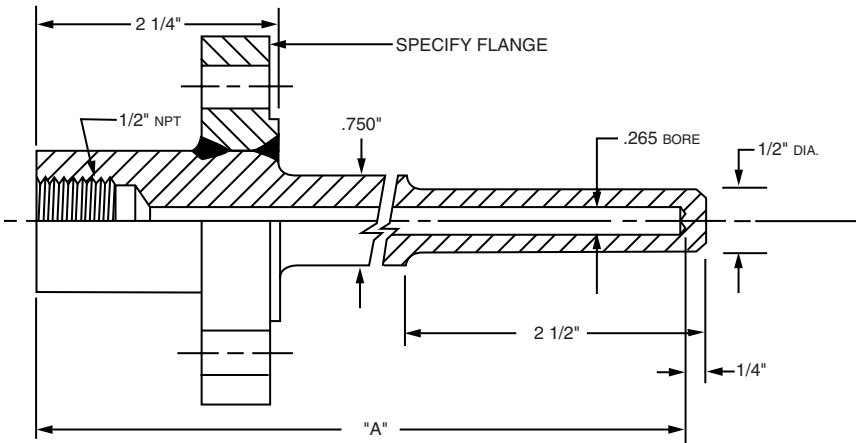
**\*\*Note:** Thermowells for 2 1/2" stem length with 1/2" NPT Process Connections will have a "U" length of 1 1/2" in order to accommodate 1/2" internal and 1/2" external threads.

# THERMOMETER WELLS



## Flanged Thermowells For Bimetal Thermometers

### Type T200



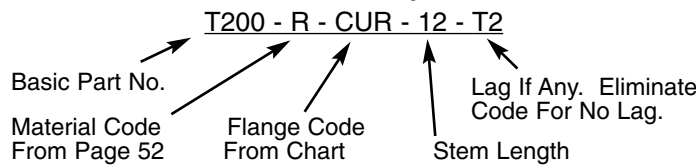
#### FLANGE SIZES AND RATINGS

SIZE	CODE	RATING	CODE	FACING	CODE
3/4"	A	150 LB	U	FLAT FACE	F
1"	B	300 LB	V	RAISED FACE	R
1 1/2"	C	600 LB	W	RING JOINT	J
2"	D	900 LB	X		
2 1/2"	E	1500 LB	Y		
3"	G	2500 LB	Z		
4"	H	OTHER-SPECIFY			
4 1/2"	K				
5"	L				
5 1/2"	M				
6"	N				

\*\*Add "FP" After Flange Facing For Full Penetrant Weld.

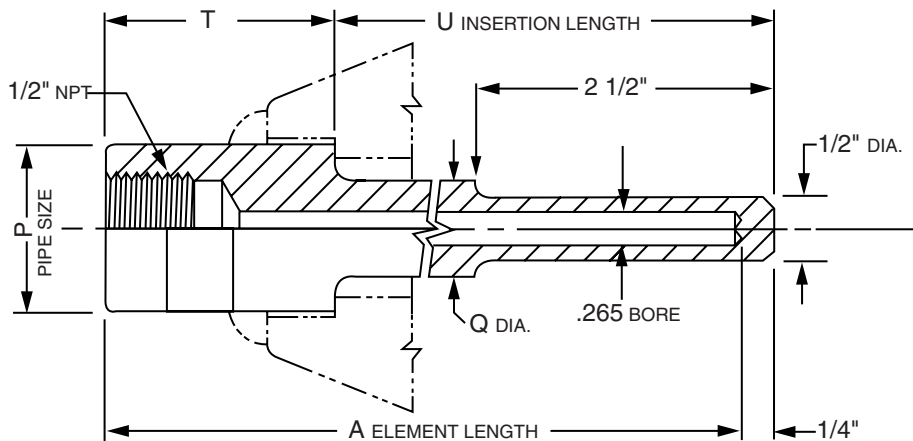
\*\*Add "SF" After Flange Facing For Smooth Finish 125-250 RMS.

#### Order Example

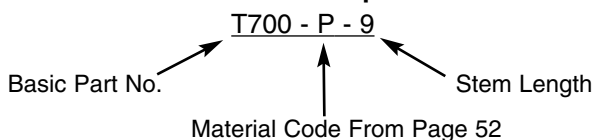


## Socket Weld Thermowells For Bimetal Thermometers

### Type T700



#### Order Example

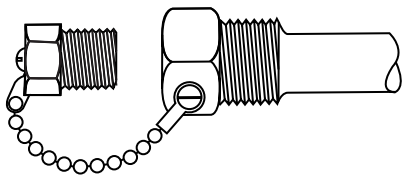


PART NO.	PIPE SIZE	"P" DIM.	"T" LENGTH	"Q" DIA.**
T700	3/4"	1.050	1.75	.750
T701	1"	1.312	1.75	.875

# THERMOWELLS



## Plugs And Chains



Plug and Chains are available for internal threaded Thermowells. Standard materials are brass and stainless steel. To order specify the code for material desired at the end of Thermowell part number. BP - Brass Plug and Chain. SP - Stainless Plug and Chain

## Material Codes

MATERIAL	CODE	MATERIAL	CODE
304S/S	P	Incoloy 800	F
316S/S	R	Inconel 600	J
310S/S	Q	Monel 400	L
321S/S	U	Monel 500	M
347S/S	D	Nickel 200	N
304LS/S	E	F11	A
316LS/S	G	F22	B
410S/S	V	Carbon Steel	CS
446S/S	Y	A-105	T
Alloy 20	C	Brass	BR
HR160	W	Titanium	TI
Hastelloy B	HB	Other (Specify)	X
Hastelloy C	HC		

\*\*\*Material selection is critical to the life of the Thermowell. Corrosion and temperatures are major deciding factors in the selection of materials suitable for a particular application. Recommended materials are given in the "Material Selection Guide". If further assistance is needed, please consult TMS. Our sales staff will assist you in which materials may be suitable for your particular application.

## Material Specifications

This chart will serve as a guide for selection of Thermowell materials. There are instances where special conditions exist and therefore, special applications should be submitted to "TMS" for recommendations.

Media	Temp. °F.	Conc.	Recom. Material	Media	Temp. °F.	Conc.	Recom. Material
Acetic Acid	212	All	Monel	Fatty Acids	500	All	316SS
Acetic Anhydride	300		Nickel	Ferric Chloride	75	All	Hast. C
Acetone	212	All	304SS	Ferric Sulfate	300	All	304SS
Acetylene	400		304SS	Formaldehyde	212	40%	316SS
Alcohols	212	All	304SS	Formic Acid	300	All	316SS
Alum (Potassium or Sodium)	300	All	Hast. C	Freon	300		Steel
Aluminum Chloride	212	All	Hast. B	Fluorine, Anhydrous	100		304SS
Aluminum Sulfate	212	All	316SS	Furfural	450		316SS
Ammonia, Dry	212	All	304SS/316SS	Gasoline	300		Steel
Ammonium Hydroxide	212	All	304SS/316SS	Glucose	300		304SS
Ammonium Chloride	300	50%	Monel	Glue PH 6-8	300	All	304SS
Ammonium Nitrate	300	All	304SS	Glycerine	212	All	Brass
Ammonium Sulphate	212	All	316SS	Hydrobromic Acid	212	All	Hast. C.
Amyl Acetate	300	All	Monel	Hydrochloric Acid (37 - 38%)	225	All	Hast B.
Aniline	75		304SS	Hydrogen Chloride, Dry	500		304SS
Asphalt	250		304SS	Hydrocyanic Acid	212	All	304SS
Barium Compounds (See Calcium)				Hydrofluoric Acid	212	60%	Monel
Beer	70		304SS	Hydrogen Flouride, Dry	175		Steel
Benzine	70		Steel	Hydrofluogilicic Acid	212	40%	Monel
Benzoic Acid	212	All	316SS	Hydrogen Peroxide	125	10 - 100%	304SS
Bleaching Powder	70	15%	Monel	Kerosene	300	All	Steel
Borax	212	All	Brass	Lacquers & Thinners	300	All	304SS
Bordeaux Mixture	200		304SS	Lactic Acid	300	All	316SS
Boric Acid	400	All	316SS	Lime	212	All	316SS
Bromine	125	Dry	Monel	Linseed Oil	75		Steel
Butane	400	All	Steel	Magnesium Chloride	212	50%	Nickel
Butyl Alcohol (See Alcohol)				Magnesium Hydroxide (Or Oxide)	75	All	304SS
Butyric Acid	212		Hast. C	Magnesium Sulfate	212	40%	304SS
Calcium Bisulphite	75	All	Hast. C	Mercuric Chloride	75	10%	Hast. C
Calcium Chloride	212	All	Hast. C	Mercury	700	100%	Steel
Calcium Hydroxide	300	20%	Hast. C	Methylene	212	All	304SS
Calcium Hypochlorite (See Bleaching Powder)				Methyl Chloride, Dry	75		Steel
Carbolic Acid (See Phenol)				Milk, Fresh Or Sour	180		304SS
Carbon Dioxide, Dry	800	All	Brass	Molasses (See Glucose)			
Carbonated Water	212	All	304SS	Natural Gas	70		304SS
Carbonated Beverages	212		304SS	Nitric Acid	75	All	304SS
Carbon Disulfide	200		304SS	Nitric Acid	110	All	316SS
Carbon Tetrachloride	125	All	Monel	Oxygen	75	All	Steel
Chlorine, Dry	100		Monel	Oleic Acid (See Fatty Acid)	212	All	Monel
Chlorine, Moist	100	All	Monel	Oxalic Acid	212	All	Monel
Chloroacetic Acid	212	All	Monel	Photographic Bleaching	100	All	304SS
Chloroform, Dry	212		Monel	Palmitic Acid (See Fatty Acid)	212	All	316SS
Chromic Acid	300	All	Hast. C	Phosphoric Acid	212	All	316SS
Cider	300	All	304SS	Phenol	212	All	316SS
Citric Acid	212	All	Hast. C	Potassium Compounds (See Sodium Compounds)			
Copper (10) Chloride	212	All	Hast. C	Propane	300		Steel
Copper (10) Nitrate	300	All	316SS	Rosin	700	100%	316SS
Copper (10) Sulfate	300	All	316SS	Sea Water	75		Monel
Copper Plating Solution (Cyanide)	180		304SS	Soap & Detergents	212	All	304SS
Copper Plating Solution (Acid)	75		304SS	Sodium Bicarbonate	212	20%	316SS
Corn Oil	200		304SS	Sodium Bisulphite	212	20%	316SS
Creosote	200	All	304SS	Sodium Bisulphate	212	20%	304SS
Crude Oil	300		Monel	Sodium Carbinatate	212	40%	316SS
Ethyl Acetate (See Lacquer Thinner)				Sodium Chloride	300	30%	Monel
Ethyl Chloride, Dry	500		Steel	Sodium Chromate	212	All	316SS
Ethanol (See Alcohol)				Salt Or Brine (See Sodium Chloride)			
Ethylene Glycol (Uninhibited)	212	All	304SS	Sodium Cyanide	212	All	304SS
Ethylene Oxide	75		Steel	Sodium Hydroxide	212	30%	316SS
				Sodium Hypochlorite	75	10%	Hast. C
				Sodium Nitrate	212	40%	304SS

Media	Temp. °F.	Conc.	Recom. Material	Media	Temp. °F.	Conc.	Recom. Material
Sodium Nitrate	75	20%	316SS	Sulphuric Acid	212	10%	316SS
Sodium Phosphate	212	10%	Steel	Sulphuric Acid	212	10%-90%	Hast. B
Sodium Silicate	212	10%	Steel	Sulphuric Acid	212	90 - 100%	Hast. B
Sodium Sulfate	212	30%	316SS	Sulphuric Acid, Fuming	175		Alloy 20
Sodium Sulfide	212	10%	316SS	Sulfurous Acid	75	20%	316SS
Sodium Sulfide	212	30%	304SS	Titanium Tetrachloride	75	All	316SS
Sodium Sulfite	212	30%	304SS	Tannic Acid	75	40%	Hast. B
Sodium Thiosulfate	212	All	304SS	Toluene	75		Steel
Steam				Trichloroacetic Acid	75	All	Hast. B
Stearic Acid	(See Fatty Acid)			Trichlorethylene	300	Dry	Monel
Sugar Solution	(See Glucose)			Turpentine	75		316SS
Sulphur	500		304SS	Varnish	150		Steel
Sulfur Chloride	75	Dry	316SS	Zinc Chloride	212	All	Hast. B
Sulfur Dioxide	500	Dry	316SS	Zinc Sulfate	212	All	316SS
Sulfur Trioxide	500	Dry	316SS				

## Specialty Thermowells

The following Thermowells while not shown in this catalog are available upon request. Consult TMS for part numbers and pricing on these items.

- Sanitary Thermowells
- Navy Class Thermowells
- Industrial Thermometer Wells
- Thermowells For Lab Type Thermometers
- Test Thermowells

## Services

The following services are available. Consult TMS for information and pricing on these services:

- Coatings - Teflon, Kynar and other materials are available for Thermowell Coatings.
- Hard Facings - Hard Facings such as Stellite are available for abrasive services.
- Hydrostatic Testing - TMS can Hydrostatic Test your Thermowells on site.
- Dye Penetrant Testing - Dye Penetrant Testing of weld joints.
- Velocity Calculations - Velocity Calculations performed to ASME PTC 19.3 specifications.
- Special Machine Shop Services - TMS can provide special machine shop services per your drawings.

## Technical information

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In many temperature measurement applications, the temperature element cannot be placed directly into the media it is to measure. In these instances a thermowell must be used to protect the temperature element.

### **MATERIALS**

The materials selected for service is governed by the environment the thermowell will be subject to. Corrosion resistance is one of the major concerns in regard to material selection for a particular application.

### **CONNECTIONS**

Connections on the thermowell to the process may be made in any manner approved by the ASME Boiler and Pressure Vessel Piping Code.

### **INSERTION LENGTH**

The insertion length should be long enough to allow the total temperature sensitive portion of the element to project into the media to be measured.

A thermometer bulb should be placed into liquid an amount equivalent to the bulbs sensitive length plus a minimum of one inch. In gas or air, the bulb should be placed a minimum of three inches plus the bulbs sensitive length.

Thermocouples have short temperature sensitive lengths and can be used with the smallest of insertion lengths.

Bimetal thermometers, RTD elements and liquid-in-glass thermometers have sensitive lengths of approximately one to two inches.

Filled system thermometers have various sensitive lengths. The sensitive length must be determined before deciding on the proper insertion length.

Be sure to take into account any fittings or walls that must be passed through when deciding on the proper insertion length for the thermowell.

### **BORE SIZE**

Be sure to select a bore diameter compatible with the element being used.

### **DESIGN (Pressure and Velocity Ratings)**

The factors required to provide increased thermowell strength reduces the accuracy and response time of temperature elements. Thermowell designs must carefully balance all factors so that accuracy effect is kept at a minimum while maintaining adequate strength.

ASME PTC19.3 offers procedures and guidelines in determining whether a particular thermowell will be suitable for a particular application.

Thermowell failure is caused by vibration, pressure and steady state flow. Separate evaluations are required to determine the suitability for any application in question. Failures are not normally due to pressure or temperature. Calculations are necessary in choosing proper diameters (wall thickness) and materials for a given application.

Vibrational effects are more likely to cause thermowell failure. Fluid flowing by the thermowell forms what is known as the Von Karman Trail. This is a turbulent wake that has a frequency based on the diameter of the thermowell and the velocity of the fluid or media. The thermowell must have sufficient stiffness so that the wake frequency will never equal the natural frequency of the thermowell. If the natural frequency and the wake frequency becomes equal, the thermowell will vibrate to destruction. Calculations can be utilized to determine if a thermowell is acceptable under given conditions for a particular service.

The sales staff at TMS is capable of offering assistance in selecting materials and/or thermowells for a given service. Suggestions can be offered based on information about the particular application.

## Warranty

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Temperature Measurement Systems (TMS) warrants its products to be free from defects in materials and workmanship. We are pleased to offer suggestions on the use of products; however, we assume no responsibility for any errors and/or omissions. We assume no liability for any damages resulting from use of suggested products.

Temperature Measurement Systems (TMS) makes no warranties or representations of any kind whatsoever, expressed or implied, except that of title. All implied warranties including any warranty for merchantability and fitness for a particular purpose are hereby disclaimed.

The remedies of the purchaser set forth herein are exclusive and the total liability of Temperature Measurement Systems (TMS) whether based on contract, warranty, negligence, indemnification, strict liability or otherwise shall not exceed the purchase price of the component upon which liability is based. Temperature Measurement Systems (TMS) sole responsibility will be to replace the material found defective in workmanship and/or material. In no event shall Temperature Measurement Systems (TMS) be liable for any damages or losses, whether direct, indirect, incidental, special or consequential. Warranty is limited to the purchaser only and cannot be transferred to third parties.

Materials furnished by Temperature Measurement Systems (TMS) is not intended for use in any nuclear installation or activity or in medical applications or used on humans. Should any product be used in or with any of the above or misused in any way, Temperature Measurement Systems (TMS) assumes no responsibility as set forth in the above warranty disclaimer. Purchaser will hold Temperature Measurement Systems (TMS) harmless from any liability or damage whatsoever arising out of the use of products in any of these manners.

Materials are warranted for 12 months from startup or 24 months from shipment date.