

Accessories

Accessory Overview

Watlow offers a full line of thermowells and protecting tubes to meet varying requirements. While both types are designed to protect your sensor in an application, the two are different in terms of their construction and capabilities.

Thermowells

Manufactured from drilled bar stock, Watlow thermowells provide a pressure-tight connection at the point of installation. With thick walls, thermowells are sturdy enough to handle high pressure, high velocity and corrosive environments. They are frequently used in petrochemical and power plant applications.

Highly critical or demanding applications may require thermowells not only for protection of the temperature sensor, but also to withstand high pressure or erosion or both, caused by material flows through vessels.

Watlow offers numerous standard thermowell constructions, and special configurations can be designed on request.

Protecting Tubes

Both ceramic and metal (pipe type) protecting tubes serve the purpose of protecting the temperature sensor from harsh environments. Unlike thermowells, they are not primarily designed for pressure tight applications. Protection tubes are often used in heat treatment furnaces, ovens, open containers, flues and ducts.

Protecting tube construction styles are more limited than thermowells. The tubes offer the advantages of economy, corrosion resistance and, in some cases, higher temperature capabilities.



**For more information on
Watlow's protecting tubes
see page 149.**

Note: All accessories subject to minimum purchase quantities.

Accessories

Thermowells



Watlow designs and manufactures all types of thermowells. The thermowell designs shown in this catalog section are representative of the types of basic styles in popular usage throughout the industry. Special designs as well as modifications of our standard offerings are also available.

Drilled from solid bar stock, the thermowell protects the temperature sensor from corrosion, high pressure and high velocity environments.

Features and Benefits

Numerous standard thermowell constructions available

- Special configurations can be designed on request

The bar stock used (when available) to manufacture thermowells

- Protection against corrosion
- Round bar with wrench flats is substituted when hex not available

Plug and chain available for an additional charge

- Specify brass or stainless steel

Applications

- Petrochemical
- Chemical
- Oil refineries
- Power plants
- Storage tanks and lines

Manufacturing Standards	
Bar Stock	Mill Standards (± 0.010 inch approximately)
Process Connection	Threaded: Inspected with Standard Ring Gauge Flanged: Front J groove welds are $\frac{1}{4}$ inch wide by $\frac{1}{4}$ inch deep. Welds are machined, leaving $\frac{1}{8}$ inch radius. Rear welds are $\frac{1}{8}$ inch wide by $\frac{1}{8}$ inch deep "V". Welds are machined, leaving $\frac{1}{4}$ inch radius. Full penetration welds are available upon request. Must be specified.
Stem O.D.	Straight: ± 0.015 inch Tapered: ± 0.015 inch (Minor dimension)
U Dimension	$\pm \frac{1}{8}$ inch
Overall Dimension	$\pm \frac{1}{8}$ inch
End Thickness	$\frac{1}{4}$ inch $\pm \frac{1}{16}$ inch
Finish	63 RMS
Bore	+0.005 inch -0.003 inch
Tapered Wells	The maximum taper on all thermowells is 16 inches +0.5 - 1.0.

These specifications listed are for standard thermowells, or for thermowells manufactured where no other specifications prevail.

Note: All accessories subject to minimum purchase quantities.

Accessories

Thermowells

Thermowell Material Selection Guide

Application	Protecting Tube Material
Heat treating	
Annealing Up to 704°C (1300°F) Over 704°C (1300°F)	Black steel Inconel® 600, Type 446 SS
Carburizing hardening Up to 816°C (1500°F) 816 to 1093°C (1500 to 2000°F) Over 1093°C (2000°F) Nitriding salt baths Cyanide	Black steel, Type 446 SS Inconel® 600, Type 446 SS Ceramic* Type 446 SS Nickel (CP)
Neutral	Type 446 SS
High speed	Ceramic*
Iron and steel	
Blast furnaces Downcomer Stove dome Hot blast main Stove trunk Stove outlet flue	Inconel® 600, Type 446 SS Silicon carbide Inconel® 600 Inconel® 600 Black steel
Open hearth Flues and stack Checkers Waste heat boiler	Inconel® 600, Type 446 SS Inconel® 600, Cermets Inconel® 600, Type 446 SS
Billet heating slab heating and butt welding Up to 1093°C (2000°F) Over 1093°C (2000°F)	Inconel® 600, Type 446 SS Silicon ceramic carbide*
Bright annealing batch Top work temperature Bottom work temperature	Not required (use bare Type J thermocouple) Type 446 SS
Continuous furnace section	Inconel® 600, ceramic*
Forging	Silicon carbide, ceramic*
Soaking pits Up to 1093°C (2000°F) Over 1093°C (2000°F)	Inconel® 600 Silicon ceramic carbide*
Nonferrous metals	
Aluminum Melting Heat treating	Hexoloy® Black steel
Brass or bronze	Not required (use dip-type thermocouple)
Lead	Type 446 SS, black steel
Magnesium	Black steel, cast iron
Tin	Extra heavy carbon steel
Zinc	Extra heavy carbon steel
Pickling tanks	Chemical lead
Cement	
Exit flues Kilns, heating zone	Inconel® 600, Type 446 SS Inconel® 600
Ceramic	
Kilns	Ceramic* and silicon carbide*
Dryers	Silicon carbide, black steel
Vitreous enameling	Inconel® 600, Type 446 SS
Barium chloride, all concentration, 21°C (70°F)	Monel®, Hastelloy C®

* Due to susceptibility to cracking, sudden thermal shocks should be avoided.

Inconel® and Monel® are registered trademarks of the Special Metals Corporation.

Hexoloy® is a registered trademark of Carborundum Company.

Hastelloy C® is a registered trademark of Haynes International.

Note: All accessories subject to minimum purchase quantities.

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Accessories

Thermowells

Thermowell Material Selection Guide

Continued

Application	Protecting Tube Material
Barium hydroxide, all concentration, 21°C (70°F)	Low carbon steels
Barium sulphite	Nichrome®, Hastelloy C®
Brines	Monel®
Bromine	Tantalum, Monel®
Butadiene	Type 304 SS
Butane	Type 304 SS
Butylacetate	Monel®
Butyl alcohol	Type 304 SS
Calcium chlorate, dilute, 21 to 66°C (70 to 150°F)	Type 304 SS
Calcium hydroxide 10 to 20%, 100°C (212°F) 50%, 100°C (212°F)	Type 304 SS, Hastelloy C® Type 316 SS, Hastelloy C®
Carbolic acid, all, 100°C (212°F)	Type 316 SS
Carbon dioxide, wet or dry	2017-T4 aluminum, Monel®, nickel
Chlorine gas Dry, 21°C (70°F) Moist, -7 to 100°C (20 to 212°F)	Type 316 SS, Monel® Hastelloy C®
Chromic acid, 10 to 50% 100°C (212°F)	Type 316 SS, Hastelloy C® (all concentrations)
Citric acid 15%, 21°C (70°F) 15%, 100°C (212°F) Concentrated, 100°C (212°F)	Type 304 SS, Hastelloy C® (all concentrations) Type 316 SS, Hastelloy C® (all concentrations) Type 316 SS, Hastelloy C® (all concentrations)
Copper nitrate	Types 304 SS, 316 SS
Copper sulphate	Types 304 SS, 316 SS
Cresols	Type 304 SS
Cyanogen gas	Type 304 SS
Dow therm®	Low carbon steels
Ether	Type 304 SS
Ethyl acetate	Monel®, Type 304 SS
Ethyl chloride, 21°C (70°F)	Type 304 SS, low carbon steel
Ethyl sulphate, 21°C (70°F)	Monel®
Ferric chloride, 5%, 21°C (70°F) to boiling	Tantalum, Hastelloy C®
Ferric sulphate, 5%, 21°C (70°F)	Type 304 SS
Ferrous sulphate, dilute, 21°C (70°F)	Type 304 SS
Formaldehyde	Types 304 SS, 316 SS
Formic acid, 5%, 21 to 66°C (70 to 150°F)	Type 316 SS
Freon	Monel®
Gallic acid, 5%, 21 to 66°C (70 to 150°F)	Monel®
Gasoline, 21°C (70°F)	Type 304 SS, low carbon steel
Glucose, 21°C (70°F)	Type 304 SS
Glycerine, 21°C (70°F)	Type 304 SS
Glycerol	Type 304 SS
Hydrobromic acid, 98%, 100°C (212°F)	Hastelloy B®
Hydrochloric acid 1%, 5% 21°C (70°F) 1%, 5% 100°C (212°F) 25%, 21 to 100°C (70 to 212°F)	Hastelloy C® Hastelloy B® Hastelloy B®
Hydrofluoric acid, 60%, 100°C (212°F)	Hastelloy C®, Monel®
Hydrogen peroxide, 21 to 100°C (70 to 212°F)	Types 316 SS, 304 SS
Hydrogen sulphide, wet and dry	Type 316 SS

CONTINUED

Nichrome® is a registered trademark of the Driver-Harris Co.

Dow therm® is a registered trademark of the Dow Chemical Corporation.

* Due to susceptibility to cracking, sudden thermal shocks should be avoided.

Note: All accessories subject to minimum purchase quantities.

Accessories

Thermowells

Thermowell Material Selection Guide

Continued

Application	Protecting Tube Material
Glass	
Fore hearths and feeders	Platinum thimble
Lehrs	Black steel
Tanks	
Roof and wall	Ceramic*
Flues and checkers	Inconel® 600, Type 446 SS
Paper	
Digesters	Type 316 SS, Type 446 SS
Petroleum	
Dewaxing	Types 304, 310, 316, 321, 347 SS, carbon steel
Towers	Types 304, 310, 316, 321, 347 SS, carbon steel
Transfer lines	Types 304, 310, 316, 321, 347 SS, carbon steel
Factioning column	Types 304, 310, 316, 321, 347 SS, carbon steel
Bridgewall	Types 304, 310, 316, 321, 347 SS, carbon steel
Power	
Coal-air mixtures	304 SS
Flue gases	Black steel, Type 446 SS
Preheaters	Black steel, Type 446 SS
Steel lines	Types 347 or 316 SS
Water lines	Low carbon steels
Boiler tubes	Types 304, 309, or 310 SS
Gas producers	
Producer gas	Type 446 SS
Water gas	
Carburetor	Inconel® 600, Type 446 SS
Superheater	Inconel® 600, Type 446 SS
Tar stills	Low carbon steels
Incinerators	
Up to 1093°C (2000°F)	Inconel® 600, Type 446 SS
Over 1093°C (2000°F)	Ceramic (primary) Hexoloy® (secondary)*
Food	
Baking ovens	Black steel
Charretort, sugar	Black steel
Vegetables and fruit	Type 304 SS
Chemical	
Acetic acid	
10 to 50%, 21°C (70°F)	Type 304, Hastelloy C®, Monel®
50%, 100°C (212°F)	Type 316, Hastelloy C®, Monel®
99%, 21 to 100°C (70 to 212°F)	Type 430, Hastelloy C®, Monel®
Alcohol, ethyl, methyl	
21 to 100°C (70 to 212°F)	Type 304
Ammonia	
All concentration 21°C (70°F)	Types 304, 316 SS
Ammonium chloride	
All concentration 100°C (212°F)	Types 316 SS, Monel®
Ammonium nitrate	
All concentration 21 to 100°C (70 to 212°F)	Type 316 SS
Ammonium sulphate, 10% to saturated	
100°C (212°F)	Type 316 SS

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Accessories

Thermowells

Thermowell Material Selection Guide

Continued

Application	Protecting Tube Material
Iodine, 21°C (70°F)	Tantalum
Lactic acid	
5%, 21°C (70°F)	Type 304 SS, 316 SS
5%, 66°C (150°F)	Type 316 SS
10%, 100°C (212°F)	Tantalum
Magnesium chloride	
5%, 21°C (70°F)	Monel®, nickel
5%, 100°C (212°F)	Nickel
Magnesium sulphate, hot and cold	Monel®
Muriatic acid, 21°C (70°F)	Tantalum
Naptha, 21°C (70°F)	Type 304 SS
Natural gas, 21°C (70°F)	Types 304 SS, 316 SS, 317 SS
Nickel chloride, 21°C (70°F)	Type 304 SS
Nickel sulphate, hot and cold	Type 304 SS
Nitric acid	
5%, 21°C (70°F)	Types 304 SS, 316 SS
20%, 21°C (70°F)	Types 304 SS, 316 SS
50%, 21°C (70°F)	Types 304 SS, 316 SS
50%, 100°C (212°F)	Types 304 SS, 316 SS
65%, 100°C (212°F)	Type 316 SS
Concentrated, 21°C (70°F)	Types 304 SS, 316 SS
Concentrated, 100°C (212°F)	Tantalum
Nitrobenzene, 21°C (70°F)	Type 304 SS
Oleic acid, 21°C (70°F)	Type 316 SS
Oleum, 21°C (70°F)	Type 316 SS
Oxalic acid	
5% hot and cold	Type 304 SS
10%, 100°C (212°F)	Monel®
Oxygen	
21°C (70°F)	Steel
Liquid	SS
Elevated temperatures	SS
Palmitic acid	Type 316 SS
Pentane	Type 340 SS
Phenol	Types 304 SS, 316 SS
Phosphoric acid	
1%, 5%, 21°C (70°F)	Type 304 SS
10%, 21°C (70°F)	Type 316 SS
10%, 100°C (212°F)	Hastelloy C®
30%, 21 to 100°C (70 to 212°F)	Hastelloy B®
85%, 21 to 100°C (70 to 212°F)	Hastelloy B®
Picric acid, 21°C (70°F)	Type 304 SS
Potassium bromide, 21°C (70°F)	Type 316 SS
Potassium carbonate, 1%, 21°C (70°F)	Types 304 SS, 316 SS
Potassium chlorate, 21°C (70°F)	Type 304 SS
Potassium hydroxide	
5%, 21°C (70°F)	Type 304 SS
25%, 100°C (212°F)	Type 304 SS
60%, 100°C (212°F)	Type 316 SS
Potassium nitrate	
5%, 21°C (70°F)	Type 304 SS
5%, 100°C (212°F)	Type 304 SS

* Due to susceptibility to cracking, sudden thermal shocks should be avoided.

CONTINUED

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Accessories

Thermowells

Thermowell Material Selection Guide

Continued

Application	Protecting Tube Material
Potassium permanganate, 5%, 21°C (70°F)	Type 304 SS
Potassium sulphate, 5%, 21°C (70°F)	Types 304 SS, 316 SS
Potassium sulphide, 21°C (70°F)	Types 304 SS, 316 SS
Propane	Type 304 SS, low carbon steel
Pyrogalllic acid	Type 304 SS
Quinine bisulphate, dry	Type 316 SS
Quinine sulphate, dry	Type 304 SS
Seawater	Monel® or Hastelloy C®
Salicylic acid	Nickel
Sodium bicarbonate All concentration, 21°C (70°F) 5%, 66°C (150°F)	Type 304 SS Types 304 SS, 316 SS
Sodium carbonate, 5%, 21 to 66°C (70 to 150°F)	Types 304 SS, 316 SS
Sodium chloride 5%, 21 to 66°C (70 to 150°F) Saturated, 21 to 100°C (70 to 212°F)	Type 316 SS Type 316 SS, Monel®
Sodium fluoride, 5%, 21°C (70°F)	Monel®
Sodium hydroxide	Types 304 SS, 316 SS, Hastelloy C®
Sodium hypochlorite, 5% still	Type 316 SS, Hastelloy C®
Sodium nitrate, fused	Type 316 SS
Sodium peroxide	Type 304 SS
Sodium sulphate, 21°C (70°F)	Types 304 SS, 316 SS
Sodium sulphide, 21°C (70°F)	Type 316 SS
Sodium sulphite, 30%, 66°C (150°F)	Type 304 SS
Sulphur dioxide Moist gas, 21°C (70°F) Gas, 302°C (575°F)	Type 316 SS Types 304 SS, 316 SS
Sulphur Dry molten Wet	Type 304 SS Type 316 SS
Sulphuric acid 5%, 21 to 100°C (70 to 212°F) 10%, 21 to 100°C (70 to 212°F) 50%, 21 to 100°C (70 to 212°F) 90%, 21°C (70°F) 90%, 100°C (212°F)	Hastelloy B®, 316 SS Hastelloy B® Hastelloy B® Hastelloy B® Hastelloy D®
Tannic acid 21°C (70°F)	Type 304 SS, Hastelloy B®
Tartaric acid 21°C (70°F) 66°C (150°F)	Type 304 SS Type 316 SS
Toluene	2017-T4 aluminum, low carbon steel
Turpentine	Types 304 SS, 316 SS
Whiskey and wine	Type 304 SS, nickel
Xylene	Copper
Zinc chloride	Monel®
Zinc sulphate 5%, 21°C (70°F) Saturated, 21°C (70°F) 25%, 100°C (212°F)	Types 304 SS, 316 SS Types 304 SS, 316 SS Types 304 SS, 316 SS

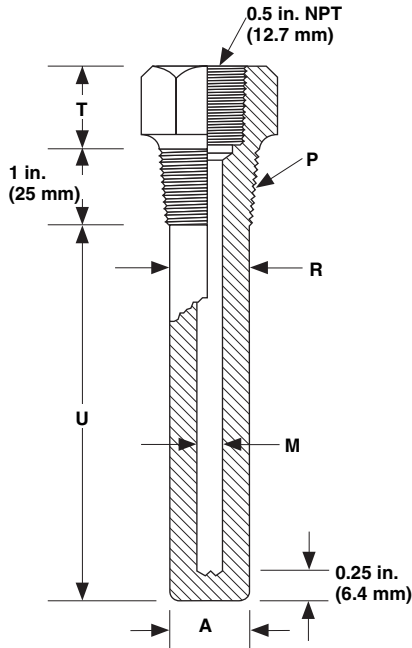
Reference charts and tables on pages 139 to 143 courtesy of the American Society for Testing and Materials. Taken from publication MNL 12, ***“Manual on the Use of Thermocouples in Temperature Measurement.”***

Note: All accessories subject to minimum purchase quantities.

Accessories

Thermowells

Threaded Type—Straight



Standard Bore Size: 0.260 inch
Standard Materials: 304 SS, 316 SS, Monel®, Hastelloy C®

Typical Dimensions

Process Conn. NPT P in.	A in.	R in.	T in.
1	$\frac{49}{64}$	$\frac{49}{64}$	$\frac{3}{4}$
$\frac{3}{4}$	$\frac{49}{64}$	$\frac{49}{64}$	$\frac{3}{4}$

Rapid Ship Sensors

Rapid Ship straight thermowells come in four lengths in 316 SS with a $\frac{1}{4}$ inch NPT process connection, a $\frac{1}{4}$ inch lag length and a 0.260 bore diameter with a $\frac{1}{2}$ inch NPT connection.

"U" Length		Part Number
in.	(mm)	
2.5	64	TTS024CD00006A0
4.5	114	TTS044CD00006A0
7.5	191	TTS074CD00006A0
10.5	267	TTS104CD00006A0

Custom Ordering Information—Items in **Bolded Green Type** are preferred with shorter lead times.

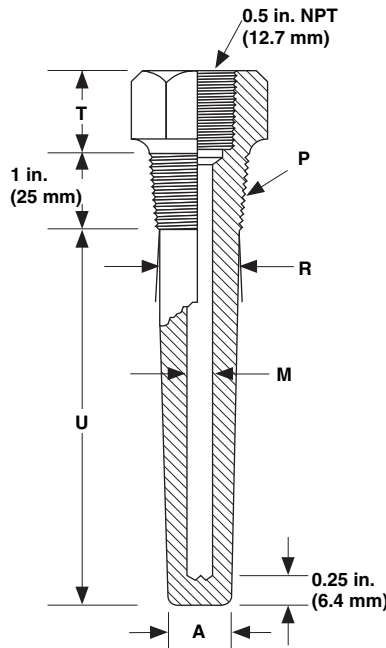
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	T	T	S												
2. Thermowell Style	T = Threaded														
3. Stem Configuration	S = Straight														
4-5. "U" Dimension (inches)	Whole inches: 00 to 99														
6. "U" Dimension (fractional inch)	0 = 0 4 = $\frac{1}{2}$ 1 = $\frac{1}{8}$ 5 = $\frac{3}{8}$ 2 = $\frac{1}{4}$ 6 = $\frac{1}{2}$ 3 = $\frac{3}{8}$ 7 = $\frac{5}{8}$														
7. Thermowell Material	A = 304 SS C = 316 SS H = Monel® M = Hastelloy C-276® X = Other														
8. Process Connection Size "P" (inch)	D = $\frac{1}{4}$ NPT E = 1 NPT X = Other														
9. Flange Rating	0 = No flange														
10. Flange Face Type	0 = No flange														
11. Flange Material	0 = No flange														
12. Lag "T" (inches)	Whole inches: 0 to 9														
13. Lag "T" (fractional inch)	0 = 0 4 = $\frac{1}{2}$ 1 = $\frac{1}{8}$ 5 = $\frac{3}{8}$ 2 = $\frac{1}{4}$ 6 = $\frac{1}{2}$ Industry Standard 3 = $\frac{3}{8}$ 7 = $\frac{5}{8}$														
14. Bore Diameter "M" (inch)	A = 0.260 B = 0.385 X = Other														
15. Special Options	0 = None X = Special requirements, consult factory														

Note: All accessories subject to minimum purchase quantities.

Accessories

Thermowells

Threaded Type–Tapered



Standard Bore Size: 0.260 inch
Standard Materials: 304 SS, 316 SS, Monel®, Hastelloy C®

Typical Dimensions

Process Conn. NPT P in.	A in.	M in.	R in.	T in.
1	4/64	0.385	1 1/16	3/4
3/4	4/64	0.385	7/8	3/4
1	5/8	0.260	1 1/16	3/4
3/4	5/8	0.260	7/8	3/4

Rapid Ship Sensors

Rapid Ship tapered thermowells come in four lengths in 316 SS with a 3/4 inch NPT process connection, a 3/8 inch lag length and a 0.260 bore diameter with a 1/2 inch NPT connection.

"U" Length in.	(mm)	Part Number
2.5	64	TTT024CD00006A0
4.5	114	TTT044CD00006A0
7.5	191	TTT074CD00006A0
10.5	267	TTT104CD00006A0

Custom Ordering Information—Items in **Bolded Green Type** are preferred with shorter lead times.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	T	T	T												
2. Thermowell Style	_____														
T = Threaded															
3. Stem Configuration	_____														
T = Standard taper															
4-5. "U" Dimension (inches)	_____														
Whole inches: 00 to 99															
6. "U" Dimension (fractional inch)	_____														
0 = 0 4 = 1/2															
1 = 1/8 5 = 3/8															
2 = 1/4 6 = 1/2															
3 = 3/8 7 = 3/4															
7. Thermowell Material	_____														
A = 304 SS															
C = 316 SS															
H = Monel®															
M = Hastelloy C-276®															
X = Other															
8. Process Connection Size "P" (inch)	_____														
D = 3/4 NPT															
E = 1 NPT															
X = Other															
9. Flange Rating	_____														
0 = No flange															
10. Flange Face Type	_____														
0 = No flange															
11. Flange Material	_____														
0 = No flange															
12. Lag "T" (inches)	_____														
Whole inches: 0 to 9															
13. Lag "T" (fractional inch)	_____														
0 = 0 4 = 1/2															
1 = 1/8 5 = 3/8															
2 = 1/4 6 = 1/2 Industry Standard															
3 = 3/8 7 = 3/4															
14. Bore Diameter "M" (inch)	_____														
A = 0.260															
B = 0.385															
X = Other															
15. Special Options	_____														
0 = None															
X = Special requirements, consult factory															

Note: All accessories subject to minimum purchase quantities.

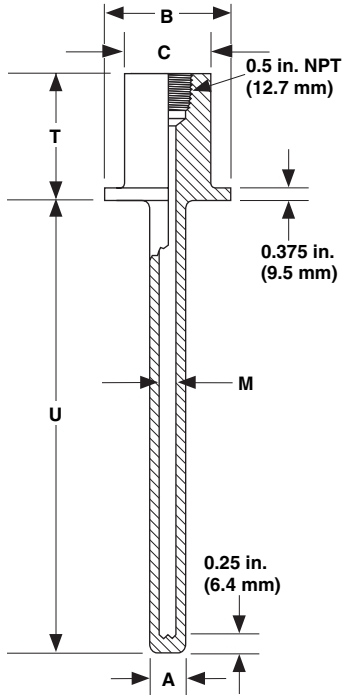
Accessories

Thermowells

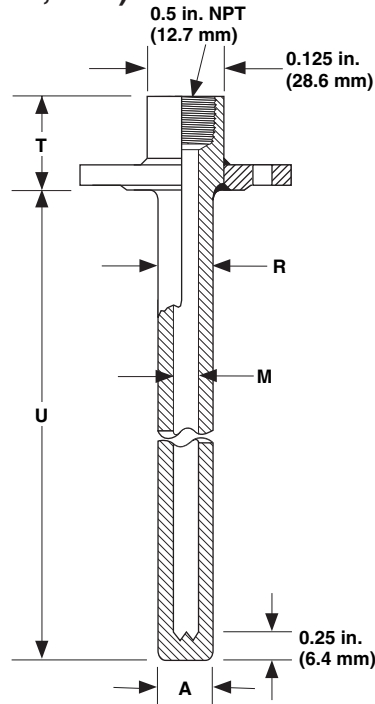
Other Available Thermowells

Consult factory for availability and pricing.

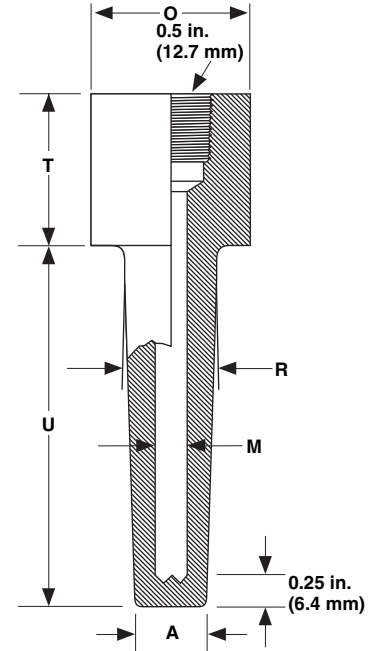
Van Stone Type (TVS)



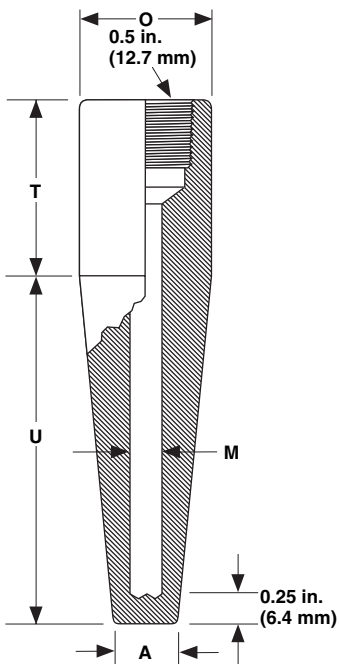
Welded Flange Well (TFS, TFT)



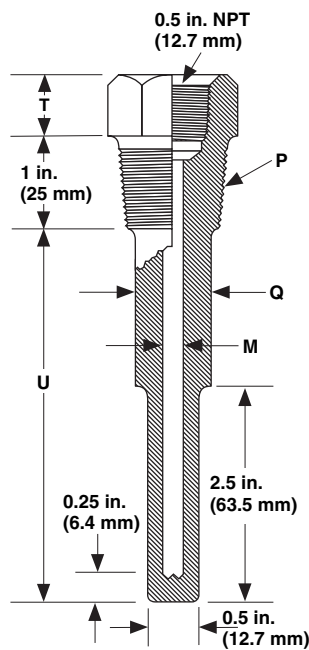
Socket Weld Type (TST)



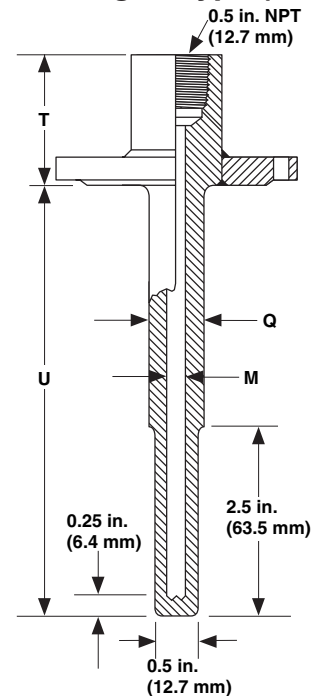
Weld-In Type (TWT)



Bimetallic Thermometer Wells—Threaded Type (TBD)

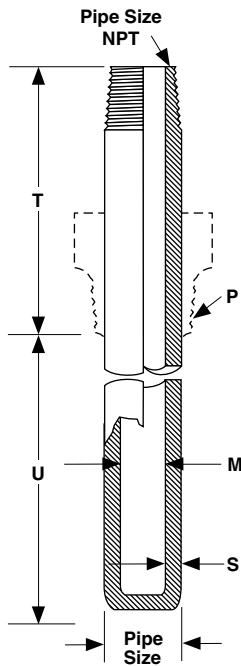


Bimetallic Thermometer Well—Flanged Type (TFD)



Accessories

Thermowells Pipe Type



Standard Materials: 304 SS and 316 SS, 446 SS and Alloy 601

Note: When no bushing or flange is required, "U" becomes the overall length.

Standard "T" Dimension: 3 inches

Custom Ordering Information—Items in **Bolded Green Type** are preferred with shorter lead times.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	P		N												
2. Pipe Size (inch)	_____														
C = ½ E = 1															
D = ¾															
3. Pipe Type "S"	_____														
N = Schedule 40															
4-5. "U" Dimension (inches)	_____														
Whole inches: 00 to 99															
6. "U" Dimension (fractional inch)	_____														
0 = 0 2 = ¼ 4 = ½ 6 = ¾															
1 = ⅛ 3 = ⅜ 5 = ⅝ 7 = ⅞															
7. Pipe Material	_____														
A = 304 SS K = 446 SS															
C = 316 SS W = Alloy 601															
8. Process Connection Size "P" (inch)	_____														
* Nonflanged or with Mounting Bushing	_____														
Flanged: Flange Size	_____														
D = ¾ NPT	1 = ¾														
E = 1 NPT	2 = 1														
F = 1 ¼ NPT	3 = 1 ½														
0 = No bushing or flange	4 = 2														
	5 = 3														
9. Flange Rating (lbs)	_____														
0 = No flange															
A = 150															
B = 300															
C = 600															
10. Flange Face Type	_____														
0 = No flange															
1 = Raised face															
2 = Flat face															
11. Flange or Bushing Alloy	_____														
0 = No flange or bushing K = 446 SS															
A = 304 SS W = Alloy 601															
C = 316 SS															
G = Carbon steel															
12. Lag "T" (inches)	_____														
Whole inches: 0 to 9															
13. Lag "T" (fractional inch)	_____														
0 = 0 4 = ½															
1 = ⅛ 5 = ⅝															
2 = ¼ 6 = ¾															
3 = ⅜ 7 = ⅞															
14. Bore Diameter "M" (inch)	_____														
J = Per pipe size															
15. Special Options	_____														
0 = None															
X = Special requirements, consult factory															

*Must be at least one size larger than pipe size.

Note: All accessories subject to minimum purchase quantities.

Accessories

Thermowells

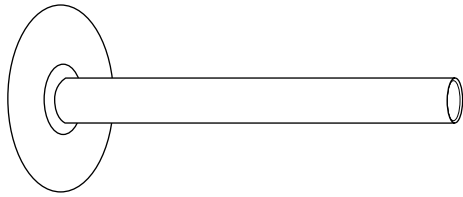
Pipe Type

Continued

Dimensions of Welded and Seamless Pipe

Nominal Pipe Size	O.D.	Nominal Wall Thickness		
		SCH 40	SCH 80	SCH 160
1/8	0.405	0.068	0.095	—
1/4	0.540	0.088	0.119	—
3/8	0.675	0.091	0.126	—
1/2	0.840	0.109	0.147	0.187
3/4	1.050	0.113	0.154	0.218
1	1.315	0.133	0.179	0.250
1 1/4	1.660	0.140	0.191	0.250
1 1/2	1.900	0.145	0.200	0.281
2	2.375	0.154	0.218	0.344
2 1/2	2.875	0.203	0.276	0.375
3	3.50	0.216	0.300	0.438
3 1/2	4.00	0.226	0.318	—
4	4.50	0.237	0.337	0.531

Options



Tantalum Oversheaths for Thermowells

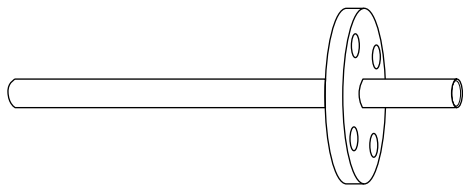
Tantalum oversheaths provide protection to thermowells with unequaled efficiency. In applications of corrosive processes such as chlorine, bromine, hydrochloric, nitric and sulphuric acids, oversheaths withstand product contamination without measurable deterioration.

Tantalum oversheaths are designed with thin walls. This has the advantages of economy and efficiency. Tantalum's high thermal conductivity and thin-wall design make rapid heat transfer possible, and its low fouling factor extends the operational life of

the oversheath and the thermowell. Since corrosion and metal loss are not problems with the use of tantalum, it is best suited for thermowells immersed directly into the corrosive process.

Standard oversheaths are designed for thermowell sizes of 1/8, 1/4, 3/8 and 1 inch stem O.D.s up to 60 inches in length; and for 1, 1 1/2, 2, 3 and 4 inch flanges. Standard oversheaths are constructed with 0.013 inch thin-wall welded and redrawn tubing with a 0.013 inch tantalum formed cup at the bottom of the well (0.015 inch is also available.)

Note: To ensure proper fit, please order with thermowell.



Coated Thermowells

Coated thermowells are recommended in applications of severe abrasion, corrosion, impact, high temperature and oxidation. The purpose of coated thermowells is to achieve longer

thermowell life, better thermowell performance, and both hardness and strength. We offer coatings of Stellite® No. 1, Stellite® No. 6, chromium carbide, Teflon®, Kynar®, glass and ceramic.

Stellite® is a registered trademark of Cabot Corporation.

Teflon® is a registered trademark of E.I. du Pont de Nemours & Company.

Kynar® is a registered trademark of Pennwalt Corporation.

Note: All accessories subject to minimum purchase quantities.

Accessories

Protection Tubes and Assemblies

Protecting Tube Application Data

Material	Grade	Max. Use Air	Flexural Strength (X10 ³ psi)	Thermal Conduct. W/m.K 1475°K	Thermal Shock Resistance	Remarks	Typical Applications
Hexoloy SA® <i>See page 154</i>	Sintered	1650°C (3000°F)	67	54.0	Excellent	Maintains strength to 1650°C (3002°F), exceptional corrosion resistance, does not creep, attacked by halides, fused caustics and ferrous metals	Incineration, molten aluminum and non-ferrous metals, flue gas, hydrofluoric and sulfuric acids, bauxite calcining
Silicon Carbide <i>See page 151</i>	Oxide Bonded	1650°C (3000°F)		15-20	Good	Permeable	Non-ferrous metals
Alumina <i>See page 150</i>	99.9%	1900°C (3450°F)	50	6.3	Fair—preheating to 482°C (900°F) recommended	Creeps (sags) at 1900°C (3452°F) ferrous metals, dry H ₂	Barium, crown glass; non-ferrous metals; gas-tight protection for noble metal thermocouples in excess of 1316°C (2400°F)
	96%	1700°C (3100°F)	49	5.4	Same as above	Creeps at 1900°C (3452°F)	
Mullite <i>See page 150</i>	—	1700°C (3100°F)	12	2.1	Poor—must be preheated to 482°C (900°F)	Creeps at 1700°C (3092°F), attacked by halides—contains silica	Non-ferrous metals; gas-tight protection for base metal thermocouples to 1316°C (2400°F)
Metal Ceramic <i>See page 151</i>	LT-1	1400°C (2500°F)	45	29.0 (R.T.)	Must be preheated to 482°C (900°F) before immersion into molten metal at 1093°C (1999°F) or higher	Not recommended in carburizing, nitrogen atmospheres, high vacuum or in molten aluminum	Molten non-ferrous metals; calcining kilns, oxidizing atmospheres up to 1400°C (2552°F)
Coated Protection Tubes (1100 SERIES) <i>See page 152</i>		760°C (1400°F)			Excellent	Do not exceed 760°C (1400°F)	Molten aluminum, zinc and galvanizing; maximum operating temperature 745°C (1373°F)

* Hot face temperature

Note: Other mounting fittings available; please consult factory.

Note: All accessories subject to minimum purchase quantities.

Accessories

Protection Tubes and Assemblies

Ceramic Protecting Tubes

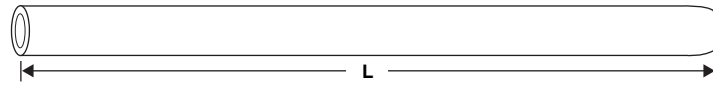
Order - Part No.

Code - Length

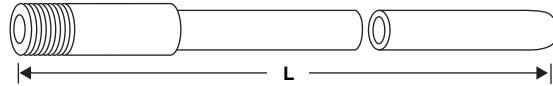
Example: 1152-12

1152-N-12

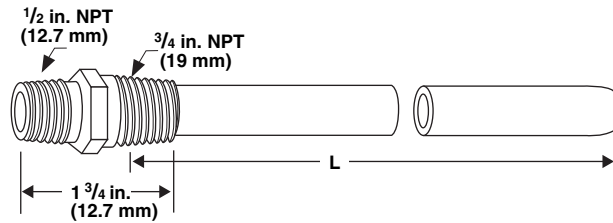
1153-191-24



Mullite or Alumina Protecting Tube, Plain End



Mullite or Alumina Protecting Tube with TH-43 or TH-50 Ferrule



Mullite or Alumina Protecting Tube with TH-190 or TH-191 Fitting (3/4 inch of Tube Enters Fitting)

Mullite Protecting Tubes*

Code No.	I.D. X O.D. in.	Construction	Length in.
1152-	1/4 x 3/8	Plain end	12, 18, 24, 30, 36, 42, 48, 54, 60
1153-	7/16 x 1/16		
1154-	1 x 1 1/4		
1155-	3/4 x 1		
1152-N-	1/4 x 3/8		
1153-N-	7/16 x 1/16	With TH-43 ferrule 7/8 - 27 threads	
1153-190-	7/16 x 1/16	With TH-190 1/2" x 3/4" brass	
1153-191-		With TH-191 1/2" x 3/4" steel	

Alumina (99% Minimum Purity) Protecting Tubes

Order - Part No.

Code - Length

Example: 1146-18

1146-N-36

1147-190-30

Code No.	I.D. X O.D. in.	Construction	Length in.
1146	1/4 x 3/8	Plain end	12, 18, 24, 30, 36, 42, 48
1147	7/16 x 1/16	Plain end	12, 18, 24, 30, 36, 42, 48, 54, 60
1148	3/4 x 1	Plain end	12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72
1149	1 x 1 1/4	Plain end	12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72
1146-N	1/4 x 3/8	TH-50 ferrule 7/8-27 threads	12, 18, 24, 30, 36, 42, 48
1147-N	7/16 x 1/16	TH-43 ferrule 7/8-27 threads	12, 18, 24, 30, 36, 42, 48, 54, 60
1147-190	7/16 x 1/16	With TH-190 1/2" x 3/4" brass	12, 18, 24, 30, 36, 42, 48, 54, 60
1147-191	7/16 x 1/16	With TH-191 1/2" x 3/4" steel	12, 18, 24, 30, 36, 42, 48, 54, 60

Dimension Tolerance: Up to one inch, ±5 percent or 0.025 inch, whichever is greater; over one inch, ±4 percent or 0.050 inch, whichever is greater.

Note: All accessories subject to minimum purchase quantities.

Accessories

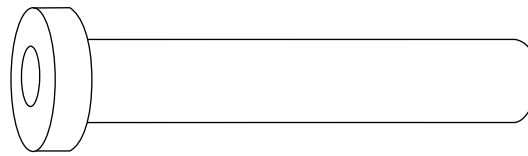
Protection Tubes and Assemblies

Silicon Carbide and Cast Iron Protecting Tubes

Order - Part No.

Code - Length

Example: 1080-18



Silicon Carbide Protecting or Target Tube

Silicon Carbide Protecting Tubes—Oxide Bonded

Code No.	I.D. X O.D. in.	Construction	Length in.	Weight per in.
1080	1 x 1 3/4	Plain end	12, 18, 24, 30, 36	0.15 lbs
1081	1 x 1 3/4	Collar, 3 inch dia.*		0.17 lbs

*Back edge of flange rounded.

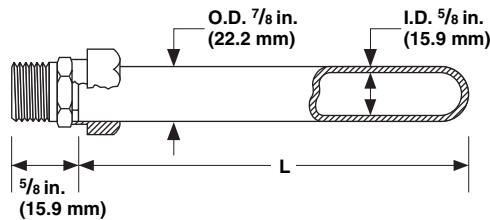
Special Application Protecting Tubes

Order - Part No.

Code - Length

Example: 1161-36

Metal-Ceramic Protecting Tube



Watlow's SERV-RITE® metal-ceramic protecting tube is composed of metallic chromium and aluminum oxide. The metal imparts shock resistance and high thermal conductivity for fast, precise readings; the stable ceramic resists deformation, corrosive attack, abrasion and oxidizing atmospheres over 1205°C (2200°F).

Thermocouples can be installed directly, eliminating the expense of multi-tube assemblies. Metal-ceramics resist surface deformation below the maximum recommended operating temperature of 1355°C (2500°F). They are useful in calcining kilns, for preheat temperature control of open hearth furnaces, for continuous immersion in molten brass, bronze, copper, zinc and lead and in sulphurous gases.

In use, excess thermal or mechanical shock should be avoided. Though superior to ceramics, metal-ceramic tubes are not as shock resistant as metal alloys, and may require preheating for certain applications.

Note: Not recommended in molten aluminum.

Code No.	I.D. X O.D. in.	Construction	Length in.
1161	5/8 x 7/8	Std. 3/4 inch conduit connector	12, 18, 24, 30, 36

Note: All accessories subject to minimum purchase quantities.

Accessories

Protection Tubes and Assemblies

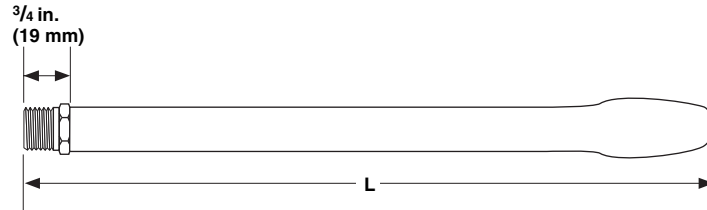
Coated Protecting Tubes for Molten Aluminum, Zinc and Galvanizing Applications

Order - Part No.

Code - Length

Example: 1100-24

SERIES 1100 Protecting Tube



With a tough refractory laminated coating, SERIES 1100 protecting tubes resist erosion from molten aluminum, zinc or galvanizing baths. They stay strong, even at higher temperatures, and require no washing or maintenance to prolong their service life. A special protective cap at the tip provides fast response time,

while permitting thermal expansion without damage to the refractory laminate.

The 0.493 inch I.D. easily accommodates up to an eight-gauge beaded thermocouple. Stocked for immediate shipment. The maximum operating temperature for the SERIES 1100 is 745°C (1400°F).

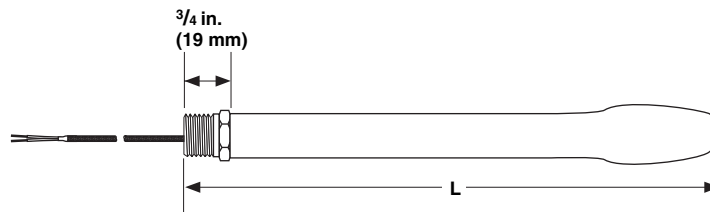
Code No.	I.D. in.	Nominal O.D. in.	Fitting in.	Tube Length in.
1100	0.493	1 ½ Max.	¾ NPT	12, 18, 24, 30, 36, 42, 48

Order - Part No.

Code - Length

Example: 1101-12

SERIES 1101 Protected Thermocouple



Watlow's SERIES 1101 protected thermocouple assemblies incorporate a mineral-insulated stainless steel sheathed XACTPAK® thermocouple hermetically sealed within a refractory laminated SERIES 1100 protecting tube. Standard calibration is Type K (part no. 402-2107),

complete with 36 inches of high temperature insulated thermocouple wire.

Like the 1100, the 1101 assembly requires no washing or maintenance to prolong its service life, yet gives fast, accurate readings in molten aluminum, zinc and galvanizing baths.

Code No.	Calibration	Nominal O.D. in.	Fitting in.	Lead Length in.	Tube Length in.
1101	K	1 ½ Max.	¾ NPT	36	12, 18, 24, 30, 36, 42, 48

Note: All accessories subject to minimum purchase quantities.

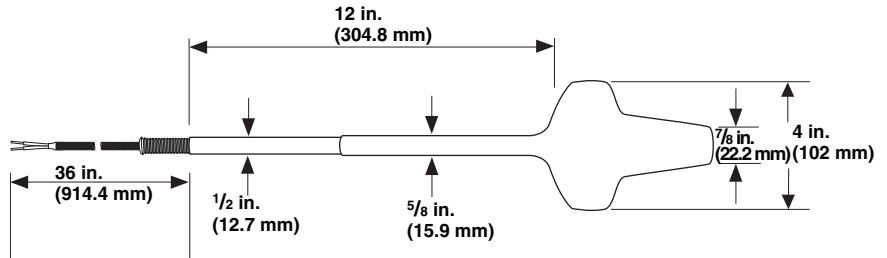
Accessories

Protection Tubes and Assemblies

Coated Protecting Tubes for Molten Aluminum, Zinc and Galvanizing Applications

Continued

SERIES 1102 Floating Protected Thermocouple



A thermocouple that floats! It contains a 0.125 inch O.D. XACTPAK ASTM E 230 Type K stainless steel sheathed thermocouple for quick, accurate temperature indication approximately three inches below the surface of the melt or bath—where control is needed most. This trouble-free unit gives you continuous temperature indication at dip-out depth—regardless of metal level. Chances of breakage are minimized, thanks to a patented buoyant fiber collar that absorbs shock if struck by ladles or

skimmers. The SERIES 1102 floats easily aside to permit unobstructed skimming.

High temperature, 36 inch insulated thermocouple wire is standard (optional stainless steel overbraid, part no. 1112). A metal sleeve with strain relief spring at the top protects against molten metal splash and wire abrasion. The thick, rugged refractory laminated thermocouple protecting cone provides rapid heat transfer and full physical protection.

Part No.	Wire Type	Calibration in.	Nominal O.D. in.	Lead Length in.	Stem Length
1102-12	Fiberglass	K	4	36	12
1112-12	Fiberglass with stainless steel overbraid				

Note: All accessories subject to minimum purchase quantities.

Accessories

Protection Tubes and Assemblies

Hexoloy SA® Tubes



* Composition code: Si = Free Silicon Metal; C = Free Graphite; SiC = Silicon Carbide; TiB = Titanium Diboride

** Test Bar Size: 1/8 x 1/4 x 2 inch (3.2 x 6.4 x 50.8 mm), Outer Span = 1.5 inch; Inner Span = 0.75 inch

① Dependent upon dopants in Hexoloy SA® SiC which will decrease electrical resistivity to a desired range

Physical Properties of Hexoloy® Materials—Technical Data

Typical Values	Hexoloy® Grade
Physical Properties	SA
Composition* (Phases)	SiC
Density kg/m ³ (g/cm ³)	3100 (3.10)
Hardness-Knopp (Kg/mm ²)	2800
Flexural Strength 4 pt. @ RT** MPa (x 103 lb/in ²)	460 (67)
Flexural Strength 3 pt. @ RT** MPa (x 103 lb/in ²)	550 (80)
Compressive Strength RT MPa (x 103 lb/in ²)	3900 (560)
Modulus of Elasticity RT GPa (x 106 lb/in ²)	410 (59)
Weibull Modulus (2 Parameter)	10
Poisson Ratio	0.14
Fracture Toughness @ RT Double Torsion and SENB MPa/√m (x 103 lb/in ² /√in)	4.60 (4.20)
Coefficient of Thermal Expansion RT-700°C (68°-1,292°F) x 10 ⁻⁶ mm/mmK (x 10 ⁻⁶ in/in°F)	4.02 (2.20)
Maximum Service Temp. (Air) °C (°F)	1650 (3000)
Mean Specific Heat @ RT (J/gm K)	0.67
Thermal Conductivity @ RT W/m K (BTU/ft h °F)	125.6 (72.6)
Thermal Conductivity 200°C W/m K (BTU/ft h °F)	102.6 (59.3)
Thermal Conductivity 400°C W/m K (BTU/ft h °F)	77.5 (44.8)
Electrical Resistivity ^① RT, ohm-cm	0.2 to 300 ^①
1000°C, ohm-cm	0.01 to 0.2 ^①
Emissivity	0.9
Max Warpage	0.005/inch

How to Order

To order, specify the following part numbers and lengths required for your application.

Order - Part No.

Code - Length

Example: 1040-12

Cemented mounting fittings are available for most tubes. Contact the factory or your local Watlow sales representative or distributor for further information.

Code No.	O.D./I.D. in.	Lengths in.
1040	3/8 x 1/4	6, 12, 18, 24, 30, 36
1041	5/8 x 3/8	
1042	3/4 x 1/2	

Tubes with Optional Mounting Fittings

Tube Code No.	Head Mount	Process Mount	Fitting Description	Lengths in.
1040-L	1/2 NPT	1/2 NPT	Cemented hex nipple	6, 12,
1041-M	3/4 NPT	3/4 NPT	Cemented hex nipple	18, 24,
1042-P	3/4 NPT	3/4 NPT	Cemented hex nipple	30, 36

Example: 1041-M-24 is a 5/8 x 3/8 inch Hexoloy® tube 24 inches long with a single 3/4 inch NPT cemented hex fitting.

Note: Maximum recommended temperature rating of cemented fitting is 538°C (1000°F) continuous.

Note: All accessories subject to minimum purchase quantities.

Accessories

Hardware

Watlow offers a variety of hardware components for use with our thermocouples. These include:

- Thermocouple heads
- Connector blocks
- Open terminations
- Thermocouple mounting fittings
- Thermocouple insulators and accessories

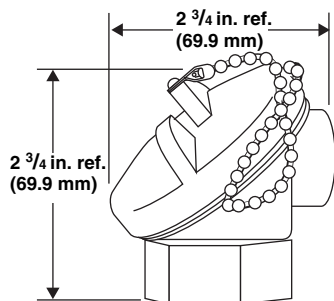


Note: All accessories subject to minimum purchase quantities.

Accessories

Hardware

Thermocouple Heads and Connector Blocks



Approximate Assembled Dimensions:
2 3/16 in. H x 2 3/4 in. L x 2 3/4 in. W

Standard Thermocouple Heads

(Assembly ordering options D or E)

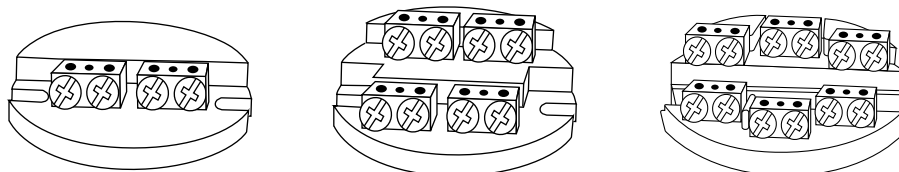
Watlow's standard heads are made of cast iron or aluminum. A plated chain attaches the gasketed cover to the body. Flats are provided for tightening. The connector block, held

in place with two screws, can be a single, duplex or triplex. These heads have 1, 3/4 or 1/2 inch NPT openings for protecting tubes or drilled wells. The conduit outlet is 3/4 inch NPT. Epoxy coating is available on the aluminum head. Maximum operating temperature is 441°C (825°F).

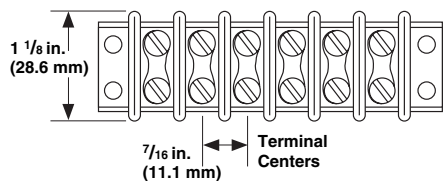
Cast Iron Head Only Part No.	Aluminum Head Only Part No.	Sensor Opening (NPT) in.	Conduit Connection in.
70900201	—	1	3/4
70900202	—	3/4	3/4
70900203	70900301*	1/2	3/4

*Available with epoxy coating (70900302)

Terminal Blocks for Standard Heads



Part No.	Description
50500401	Single element, maximum operating temperature 540°C (1000°F)
50500501	Dual, maximum operating temperature 540°C (1000°F)
50500601	Triplex, maximum operating temperature 540°C (1000°F)



Note: All accessories subject to minimum purchase quantities.

Barrier Type Terminal Strips

Standard barrier type terminal strips made of molded phenolic blocks with nickel plated brass terminals are available with two to 18 terminals. Terminal strips using thermocouple material also are available. **Note:** Two terminals required for each thermocouple.

Ordering Information:

Specify 4201- _____ -BR

Insert the number of terminals desired (02 to 18) in the blank. For terminals of thermocouple material, insert thermocouple calibration symbol in place of BR (K, J, E, T and R/S). Terminal strips then will be supplied with alternate positive and negative strips.

Accessories

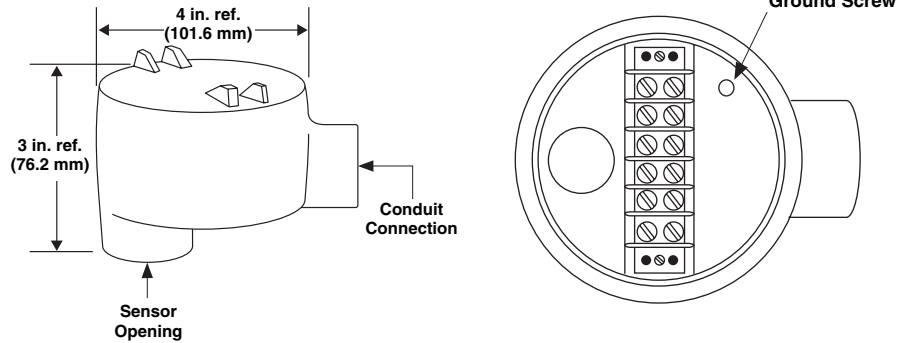
Hardware

Thermocouple Heads and Connector Blocks

Continued

Explosion Proof Thermocouple Heads

(Assembly ordering option H)



Approximate Assembled Dimensions:
4 in. H x 2 1/4 in. L x 3 in. W

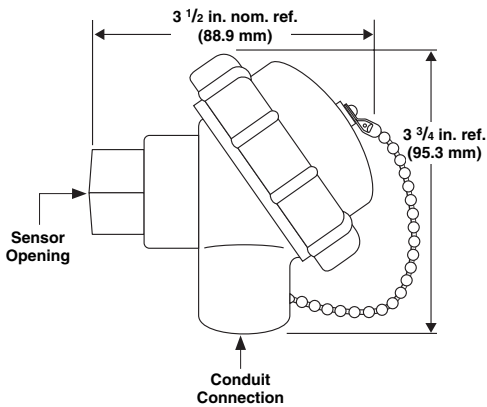
XP Head Shown with TH-615 Block

Part No.	Sensor Opening in.	Conduit Connection in.
XP-11	3/4	3/4
XP-12	1/2	3/4

For hazardous locations. Underwriter's Laboratories Listed Class 1, Groups C, D; Class 2, Groups E, F, G; Class 3, all Groups.

All XP explosion-proof heads use a TH-615 (six terminal) block. **Order separately.**

Also approved for CSA Class I, Groups C and D; Class II, Groups E and F; and Class III.



PT Polypropylene Head and Connector Blocks

(Assembly ordering option C)

PT Polypropylene Heads

Part No. Head Only	Sensor Opening in.	Conduit Connection in.
PT-20	1/2	1/2
PT-30	1/2	3/4
RT-30-WHT	1/2	3/4

Terminal Blocks for PT Heads

Part No.	Description
50500701	Single element block
50500801	Dual element block

The polypropylene head is the answer to many of the corrosion problems facing connection heads. The U.V. stabilized polypropylene head is impervious to practically all corrosive media and is rated for continuous operation up to 105°C (220°F). The PT-20 and PT-30 are black and the RT-30-WHT is white in color.

Note: All accessories subject to minimum purchase quantities.

Accessories

Hardware

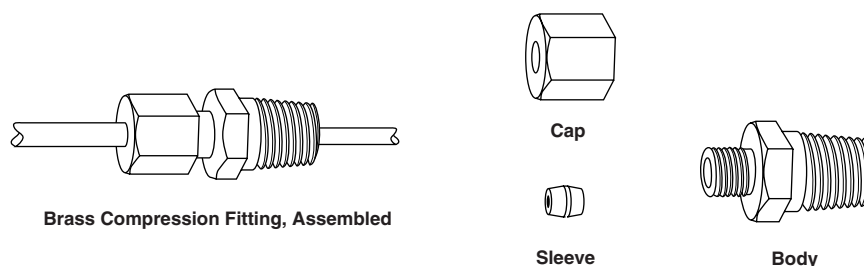
Sensor Mounting Fittings

Non-Adjustable Compression Type

Non-adjustable compression type fittings allow the exact immersion length to be set in the field at the time the sensor is installed. However, because the compression sleeve and sheath are deformed in application,

the fitting cannot be relocated along the sheath after tightening. When ordered as a part of a sensor for mounting the thermocouple, all compression type fittings are shipped finger-tight on the sheath.

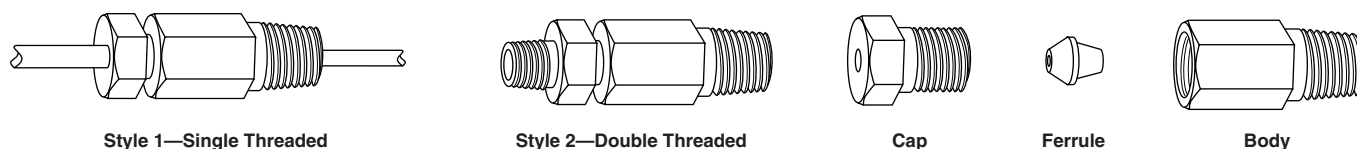
Brass Compression Fitting, Non-Adjustable



Part No.	Sheath O.D. in.	Material	Bore +0.10, -0.000 in.	Male NPT in.	Length in.
TH-185-2	0.125	Brass	0.130	1/8	1
TH-185-3	0.188	Brass	0.192	1/8	1 1/8
TH-185-4	0.250	Brass	0.256	1/8	1 1/16
TH-185-5	0.250	Brass	0.256	1/4	1 3/8
TH-185-6	0.313	Brass	0.318	1/4	1 3/8
TH-185-7	0.375	Brass	0.380	1/4	1 7/16
TH-185-9	0.250	Brass	0.256	1/2	1 3/4

Stainless Steel Compression Fitting, Non-Adjustable

Made entirely of 303 stainless steel.



Style 1—Single Threaded		Style 2—Double Threaded		Sheath O.D. in.	Bore ±0.001 in.	Male NPT in.	Hex Across Flats in.
Part No.	Length in.	Part No.	Length in.				
TH-2745-063	1 1/4	TH-2749-063	1 1/16	0.063	0.067	1/8	1/2
TH-2745-125	1 1/4	TH-2749-125	1 1/16	0.125	0.129	1/8	1/2
TH-2745-188	1 5/16	TH-2749-188	1 1/16	0.188	0.194	1/8	1/2
TH-2745-250	1 5/16	TH-2749-250	1 1/16	0.250	0.257	1/8	1/2

Note: All accessories subject to minimum purchase quantities.

Accessories

Hardware

Sensor Mounting Fittings

Continued

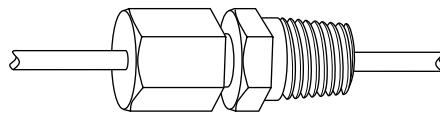
Adjustable Compression Type

Adjustable compression type fittings can be relocated at different positions along the sheath whenever changes in the immersion length are necessary. To relocate an adjustable compression fitting simply loosen the cap, slide the fitting to the new

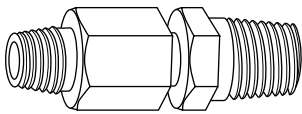
location and retighten the cap. It is recommended that lava sealant glands be replaced after each tightening. Neoprene and TFE sealant glands should withstand several relocations before replacement is necessary.

Stainless Steel Adjustable Compression Fitting

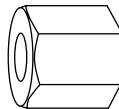
Except for their sealant glands, these fittings are made entirely of 303 stainless steel. Sealant glands are available in neoprene, -40 to 95°C (-40 to 200°F); lava, -184 to 540°C (-300 to 1000°F); TFE, -184 to 260°C (-300 to 500°F). Unless otherwise specified*, neoprene sealant glands will be furnished. Depending on temperature and sheath diameter, the fittings are pressure rated up to 3,000 psi.



Style 1—Single Threaded



Style 2 - Double Threaded



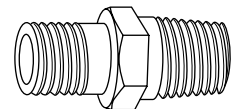
Style 1 Cap Shown



Follower



Sealant Gland

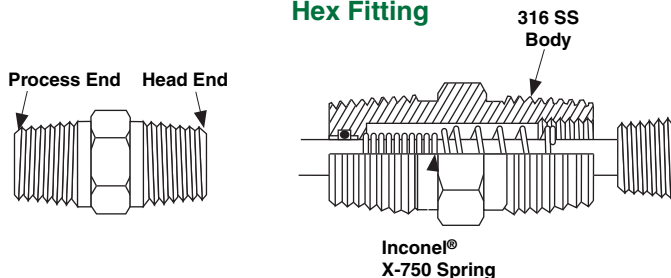


Body

Style 1—Single Threaded		Style 2—Double Threaded		Sheath O.D. in.	Bore +0.002 in.	Male NPT in.	Hex Across Flats in.	Replacement Sealant Glands, Neoprene
Part No.*	Length in.	Part No.*	Length in.					
TH-2747-N-063	1 ¼	TH-2751-N-063	1 ½	0.063	0.067	¼	½	TH-279-N-063
TH-2747-N-125	1 ¼	TH-2751-N-125	1 ½	0.125	0.136	¼	½	TH-279-N-125
TH-2747-N-188	1 ¼	TH-2751-N-188	1 ½	0.188	0.193	¼	½	TH-279-N-188
TH-2748-N-250	2 ⅞	TH-2752-N-250	3 ¼	0.250	0.257	¼	¾	TH-280-N-250
TH-2748-N-313	2 ⅞	TH-2752-N-313	3 ¼	0.313	0.316	¼	¾	TH-280-N-313
TH-2748-N-375	2 ⅞	TH-2752-N-375	3 ¼	0.375	0.386	¼	¾	TH-280-N-375

*If lava or TFE sealant glands are desired, substitute L or T in place of the N in the part number.

Adjustable Spring-Loaded Hex Fitting



The adjustable spring-loaded fitting has a stainless steel body and end cap, an Inconel® X-750 spring. Designed for use with 0.250 inch O.D. sheath thermocouples and RTDs.

Note: All accessories subject to minimum purchase quantities.

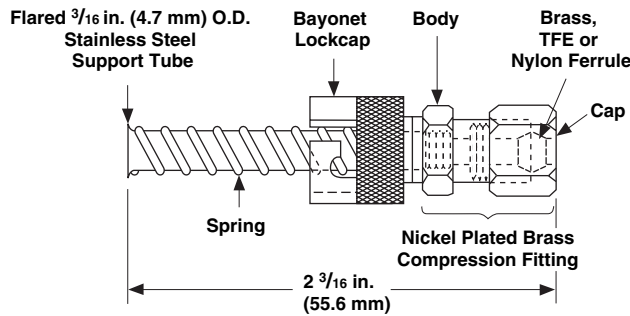
Inconel® is a registered trademark of the Special Metals Corporation.

Part No.	Sheath			Male NPT in.	Hex Across Body Flats in.	Hex Across Cap Flats in.
	Length in.	O.D. in.	Material			
6556-250	2	0.250	316 SS	¼	¾	⅝

Accessories

Hardware Bayonet Fittings

Adjustable Bayonet Compression Fitting



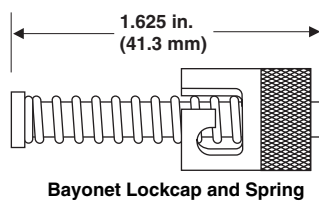
This fitting combines the features of the fixed bayonet fitting in a compact unit which does not require brazing to assemble.

The fitting is designed for 0.125 in. (3 mm) O.D. sensor and is available with either brass, TFE or nylon ferrules.

With either the TFE or nylon ferrules, this fitting may be relocated at different positions along the sheath whenever changes in the immersion length are necessary. Brass ferrules cannot be relocated once they are set.

Part No.	Description
TH-2762-BR	Adjustable bayonet fitting with brass ferrule
TH-2762-NY	Adjustable bayonet fitting with nylon ferrule
TH-2762-T	Adjustable bayonet fitting with TFE ferrule

Fixed Bayonet Fitting



Part No.	Description
TH-2760	Lockcap, spring and spring stop

When used together, a bayonet fitting and bayonet adapter act as a spring-loading device for bottoming a thermocouple hot junction in a hole. The fitting is designed for use on 0.188 inch O.D. sensor. The TH-2760 includes the lockcap, spring and spring stop, which require brazing for assembly.

The adapter requires a tapped 1/8 inch NPT or 3/8 24 hole for mounting. All components are nickel plated steel.

Note: All accessories subject to minimum purchase quantities.

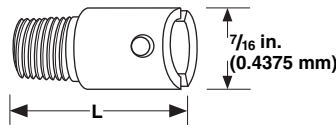
Accessories

Hardware

Bayonet Fittings

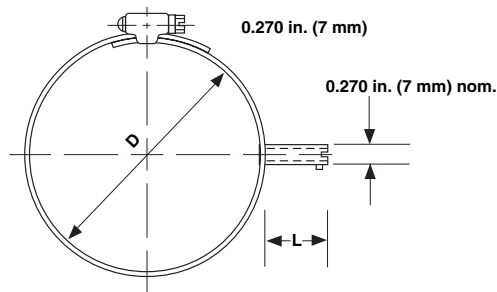
Continued

Bayonet Adapter



Part No.	Description	L Length in.	Thread in.
TH-295-1	Bayonet Adapter	7/8	1/8
TH-295-2		1	1/8
TH-295-3		1 1/2	1/8
TH-295-4		2	1/8
TH-295-5		2 1/2	1/8
TH-298-1		7/8	3/8-24
TH-298-2		1 1/2	3/8-24

Pipe Clamp with Bayonet Adapter



The pipe clamp band with bayonet adapter is designed for use in conjunction with a bayonet style thermocouple. It allows temperature measurement without drilling or tapping. Thermocouple replacement is extremely fast and simple and is accomplished without disturbing the surroundings, such as pipe insulation.

1-2. Construction Code

90 = Pipe clamp band with bayonet adapter

3. "D" Clamp Band Diameter Range (inch)

- A = 1/8 to 1 1/4
- B = 1 1/4 to 2 1/4
- C = 2 1/4 to 3 1/4
- D = 3 1/4 to 4 1/4
- E = 4 1/4 to 5
- F = 5 to 6
- G = 6 to 7

4. "L" Bayonet Adapter Length inches

- 1 = 1 (use with thermocouple that has "B" dimension = 2 inch)
- 2 = 2 (use with thermocouple that has "B" dimension = 3 inch)

All combinations are available for next day shipment.

1 2 3 4
9 0

Note: All accessories subject to minimum purchase quantities.

Accessories

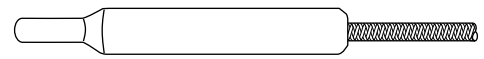
Hardware

Transition Fittings and Accessories

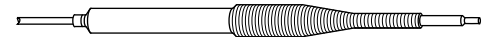
Watlow's complete line of stainless steel transition fittings offers durable, potted connections between XACTPAK® type sheathed thermocouple material and insulated wire. When the distance between the thermocouple and the instrument is known in advance, this type of assembly can be connected directly to your instrument, minimizing field installation time.

When making a sensor with a transition fitting, the thermocouple and connecting wires are first securely brazed together. The appropriate transition body is then positioned over the splice and either crimped or brazed to the sheath material. The transition body is then filled with a potting compound which effectively insulates and strengthens the splice.

A coiled spring strain relief on the 700 and 701 protects the connecting wire against sharp bends at the transition area.



702 Transition Fitting



700 or 701 Transition Fitting, Assembled
U.S. Patent Number 3,811,958



703 Heavy Duty Transition

Part No.	Sheath O.D. in.	Max. Dia. Extension Wire	Transition Body inches		Spring Strain Relief	Length Including Spring in.	Method of Attachment to Sheath
			O.D.	Length Less Spring (if any)			
702-020*	0.020	0.100	$\frac{5}{32}$	1	no	—	Braze
702-032	0.032	0.100	$\frac{5}{32}$	1	no	—	Braze
700-040*	0.040	0.136	$\frac{1}{4}$	$1 \frac{3}{16}$	yes	$2 \frac{1}{4}$	Crimp or braze
702-040	0.040	0.100	$\frac{5}{32}$	1	no	—	Braze
700-063	0.063	0.136	$\frac{1}{4}$	$1 \frac{3}{16}$	yes	$2 \frac{1}{4}$	Crimp or braze
701-063	0.063	0.210	$\frac{3}{8}$	$1 \frac{3}{16}$	yes	$2 \frac{1}{2}$	Crimp or braze
702-063	0.063	0.100	$\frac{5}{32}$	1	no	—	Braze
700-125	0.125	0.136	$\frac{1}{4}$	$1 \frac{3}{16}$	yes	$2 \frac{1}{4}$	Crimp or braze
701-125	0.125	0.210	$\frac{3}{8}$	$1 \frac{3}{16}$	yes	$2 \frac{1}{2}$	Crimp or braze
701-188	0.188	0.210	$\frac{3}{8}$	$1 \frac{3}{16}$	yes	$2 \frac{1}{2}$	Crimp or braze
701-250	0.250	0.210	$\frac{3}{8}$	$1 \frac{3}{16}$	yes	$2 \frac{1}{2}$	Crimp or braze
703-250	0.250	0.320	$\frac{1}{2}$	2	no	—	Braze

*Sleeved down from larger size to accept smaller O.D. sheath material.

Note: All accessories subject to minimum purchase quantities.

Accessories

Hardware

Transition Fittings and Accessories

Continued



TH-195 Stainless Steel Flexible Tubing



TH-213 or TH-249 Screw on Adapter Ferrule



TH-524 Crimp on Adapter Ferrule

Flexible Tubing and Adapter Ferrule

When it is desirable to protect the connection wire, either for a short distance at a connector or transition fitting, or for the full length, this stainless steel flexible tubing may be used. It can be used with either 700

or 701 SERIES transition fittings. An adapter ferrule is used in place of the coiled spring strain relief to firmly secure the flexible tubing to the transition body.

Part No.	Description
TH-195	Stainless steel flexible tubing, 0.188 inch I.D. x 0.265 inch O.D. (0.175 inch maximum wire size)
TH-195-PVC	Same as the TH-195 with extruded PVC overall
TH-213	Screw on adapter ferrule for code no. 701 transition
TH-249	Screw on adapter ferrule for code no. 700 transition
TH-524	Crimp on adapter ferrule for code no. 700 transition (may be used as a combination transition fitting and adapter ferrule on 0.250 inch O.D. XACTPAK)

Thermocouple Insulators and Accessories



Thermocouple insulators are usually selected for their ability to withstand elevated temperatures or to resist thermal shock. This listing groups SERV-RITE® thermocouple insulators in these classifications for convenient selection. Some sizes and lengths are available in more than one classification. The thermocouple insulators listed below are generally carried in stock for quick delivery. Other sizes can be made to suit individual requirements. Prices and delivery quoted upon request.

Mullite Insulators

- High temperature
- Low thermal expansion
- Good mechanical strength
- Maximum continuous temperature 1450°C (2640°F)
- Maximum intermittent temperature 1650°C (3000°F)

Oval—Double Hole

Part No.	AWG	Dimensions inches*			
		Width	Thickness	Bore	Length
372	8	0.468	0.281	0.156	3

Round—Double Hole

Part No.	AWG	Dimensions inches*		
		Diameter	Bore	Length
376-1	18	0.156	0.046	1
376-3	18	0.156	0.046	3
377-12	16	0.250	0.062	12
333-12	22	0.125	0.031	12
333-24	22	0.125	0.031	24

*Nominal

Note: All accessories subject to minimum purchase quantities.

Accessories

Hardware

Thermocouple Insulators and Accessories

Mullite Insulators

Continued

Round—Four Hole

Part No.	AWG	Dimensions inches*		
		Diameter	Bore	Length
360	12	0.312	0.093	1
378	18	0.187	0.046	1

Accessories

Code No.	Description	Dimensions inches*	
		I.D.	O.D.
339	Mullite hot junction cup	0.375	0.687

Steatite Insulators

- Excellent physical strength
- Poor heat shock resistance
- Good electrical properties
- Maximum continuous temperature 1000°C (1830°F)
- Maximum intermittent temperature 13000°C (2370°F)

Oval—Double Hole

Part No.	AWG	Dimensions inches*			
		Width	Thickness	Bore	Length
380	8	0.500	0.284	0.156	1
381-¼	14	0.313	0.187	0.080	¼
381-1	14	0.313	0.187	0.080	1
382-1	20	0.172	0.118	0.042	1
383-1	24	0.144	0.091	0.028	1

Round—Double Hole

Part No.	AWG	Dimensions inches*		
		Diameter	Bore	Length
385-1	14	0.245	0.073	1
385-2	14	0.245	0.073	2
385-3	14	0.245	0.073	3
386	18	0.150	0.046	2

Ball and Socket Insulators—Fish Spine

Part No.	AWG	Dimensions inches*			No. Per lbs
		Width	Bore	Length	
349	4	0.54	0.240	0.54	160
344	8	0.26	0.156	0.26	1720
342	14	0.20	0.092	0.20	3100
341	16	0.17	0.068	0.17	5200
340-1	17	0.11	0.056	0.11	18160

*Nominal

Note: All accessories subject to minimum purchase quantities.

Accessories

Hardware

Thermocouple Insulators and Accessories

Continued

Cordierite Insulators

- Excellent thermal shock resistance
- Fair physical strength and electrical properties
- Maximum continuous temperature 1250°C (2280°F)
- Maximum intermittent temperature 1300°C (2370°F)

Alumina Insulators

- Excellent high temperature insulation
- Good electrical and mechanical properties
- Maximum continuous temperature 1650°C (3000°F)
- Maximum intermittent temperature 1815°C (3300°F)

Round—Single Hole

Part No.	AWG	Dimensions inches*		
		Diameter	Bore	Length
316	8	0.250	0.156	3

Round—Double Hole

Part No.	AWG	Dimensions inches*		
		Diameter	Bore	Length
321	6	0.505	0.188	1
327	8	0.375	0.140	3
384		0.490	0.156	1
323	14	0.281	0.080	1
326		0.250	0.080	2 ½
328	16	0.187	0.062	1

Oval—Double Hole

Part No.	AWG	Dimensions inches*			
		Width	Thickness	Bore	Length
300	4	0.718	0.412	0.218	1
306	6	0.531	0.281	0.170	3
301		0.531	0.281	0.170	1
302		0.531	0.281	0.170	¾
303		8	0.437	0.250	0.156
311	0.437		0.250	0.156	¾
304	11	0.375	0.217	0.110	1
305		0.375	0.217	0.110	5
309	12	0.313	0.187	0.090	3

*Nominal

Round—Double Hole

Part No.	AWG	Dimensions inches*		
		Diameter	Bore	Length
391-24	22	0.125	0.031	24

*Nominal

Note: All accessories subject to minimum purchase quantities.

Accessories

Connector Systems

Many varieties of thermocouple connectors are available from Watlow. Whether you're looking for high impact strength, fast installation, or high temperature capabilities, you'll find the right connector system for your application at Watlow.

Listed below are the various connectors and systems from which to choose:

- Standard thermocouple connectors
- Quick-attach thermocouple connectors
- High temperature connectors
- Three-pole connectors for RTD applications
- Miniature thermocouple connectors

Watlow's standard line of connector systems are lightweight, rugged and accurate and features a clamping mechanism that is unique in the industry.

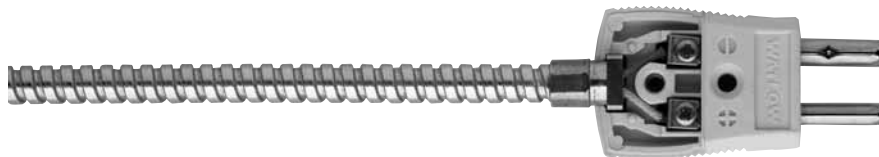
The new, easy-to-use clamping connection will replace the traditional screw and wire wrap. This new device allows a straight-in application, which squeezes the wire and forms a tight connection assuring a clean, strong signal.

US Patent Number D424016, additional patent pending.

Applications and Technical Data

To eliminate measuring errors, all Watlow connectors are made exclusively of matching metal alloys. If the connector material had different thermal EMF characteristics from the thermocouple or lead wire, a uniform temperature would have to be maintained across the connector. This is not always easily obtainable, nor is it practical.

Note: All accessories subject to minimum purchase quantities.



If a temperature gradient did exist across the connector made of a third metal, unwanted EMFs generated between the thermoelectric materials and the extremities of the connectors would cause an error appearing at the thermocouple output. The larger the gradient the larger the error. In some cases and depending on the calibration, net errors may occur that are even larger than the gradient.

Features and Benefits

ASTM color coded

- Assures easy identification

Compensated alloys

- Provides accuracy in readings

Glass-filled thermoplastic

- Provides high impact strength

Captive cap screws

- Secure connection

Connection hardware

- Redesigned to eliminate a number of components

Meets requirements for ASTM E1129

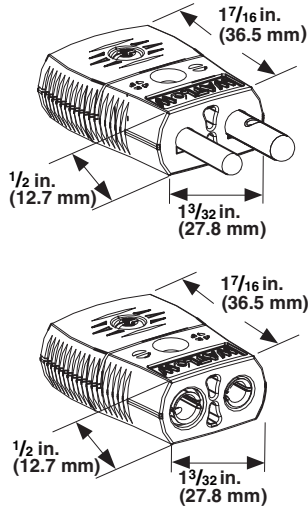
- Ensures adequate pin spacing, dimensions and contact resistance

Rated to 215°C (425°F)

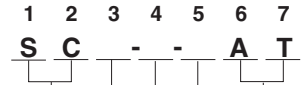
Accessories

Connector Systems

“S” SERIES Standard Connectors, 425°F



Ordering Information—To order, complete the part number on the right with the information below:



1-2. “S” SERIES Standard Connector, 215°C (425°F)

3. Style

- M = Male (plug)
- F = Female (jack)

4. Calibration

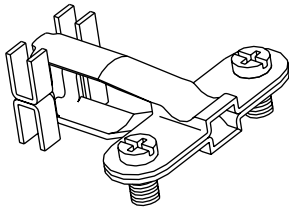
- E = Type E
- J = Type J
- K = Type K
- S = Type S/Type R
- T = Type T
- U = Uncompensated

5. Name Plate

- W = With Watlow name
- N = Without name label (For J and K calibrations only)

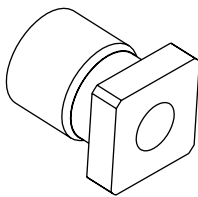
6-7. Color Code

- AT = ASTM E 230 color code/uncompensated = white

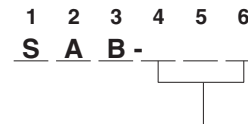


Cable Clamp Style for Male or Female

SAC-220

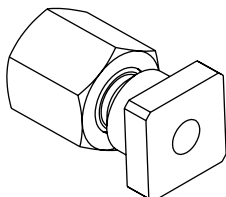


Crimp/Braze Style

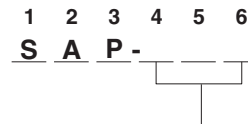


4-6. Sheath size

- 040 = 0.040 inches
- 063 = 0.063 inches
- 090 = 0.090 inches
- 125 = 0.125 inches
- 188 = 0.188 inches
- 250 = 0.250 inches
- 30M = 3.0 mm
- 60M = 6.0 mm



Compression Style



4-6. Sheath size

- 063 = 0.063 inches
- 125 = 0.125 inches
- 188 = 0.188 inches
- 250 = 0.250 inches
- 30M = 3.0 mm
- 60M = 6.0 mm

Note: All accessories subject to minimum purchase quantities.

Accessories

Connector Systems

Quick-Attach Thermocouple Connectors, 425°F

Watlow's time-saving thermocouple connectors are fast and convenient to use. No loose parts, no cap removal, no need to wrap wires around terminal screws. Simply insert stripped wire ends into plug or jack, tighten down two terminal screws, and you're finished. There is no need to remove Watlow cable clamp, either.

Accepts solid or stranded wires to 16 gauge. Available in Type J, K and T calibrations, ASTM E 230 color-coded. The connector is made of a high impact strength, 215°C (425°F) rated glass filled thermoplastic with matching thermocouple materials throughout. Other features and specifications are identical to standard Watlow "S" SERIES quick-disconnect connectors.

Ordering Information—To order, complete the part number on the right with the information below:

1 2 3 4 5 6 7 8 9 10 11
S K - -W A T-A S S Y

1-2. "S" SERIES Standard Connector, 215°C (425°F)

3. Style

- M = Male (plug)
- F = Female (jack)

4. Calibration

- J = Type J
- K = Type K
- T = Type T

5. Name Plate

- W = With Watlow name

6-7. Color Code

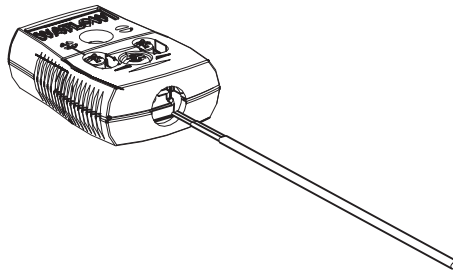
- AT = ASTM E 230 color code

8, 9, 10-11.

- ASSY = Comes with cap assembly on body

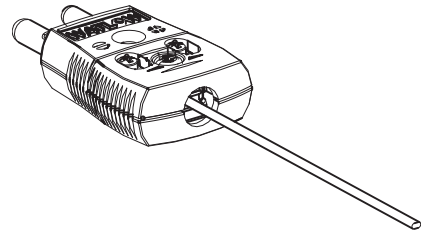
Step 1.

Simply insert stripped wires into connector.



Step 2.

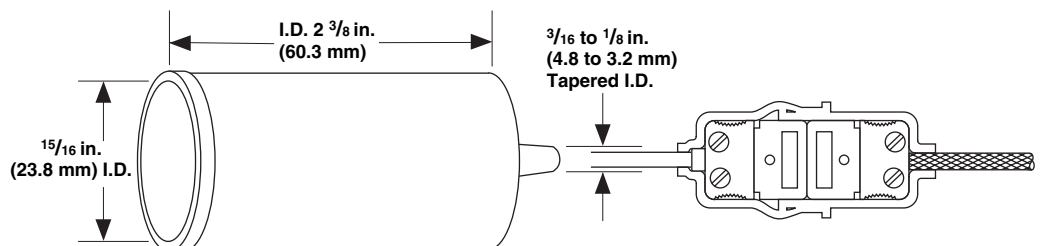
Tighten down two terminal screws, and you are finished.



Weatherproof Boots

Part No. 943

Used in pairs as illustrated, these flexible neoprene rubber boots add moisture protection to standard plug-to-jack connections.



Note: All accessories subject to minimum purchase quantities.

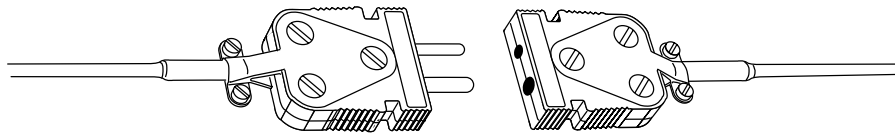
Accessories

Connector Systems

High Temperature Connectors, 1000°F

The ASTM E 230 color-coded bodies of these high temperature ceramic connectors are practical for temperatures up to 540°C (1000°F). Colors are permanent and will not fade even after exposure to temperature. The positive-locking screw type terminals are captive for easy assembly. Solid plug pins and collet inserts are made of thermocouple alloys (except Types R/S which are compensated).

Calibration must be specified when ordering. Both plug and jack are marked for polarity. Standard 7/16 inch pin spacing.

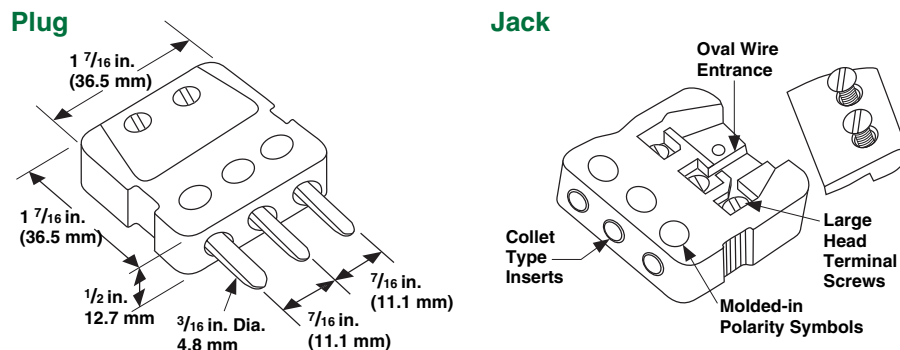


Code Number	Description
912-*	Ceramic plug (specify calibration J, K, R/S or E)
913-*	Ceramic jack (specify calibration J, K, R/S or E)
Part Number	Description
925-125	XACTPAK adapter for plug or jack (0.125 inch sheath O.D.)
925-188	XACTPAK adapter for plug or jack (0.188 inch sheath O.D.)
925-250	XACTPAK adapter for plug or jack (0.250 inch sheath O.D.)
926	Cable clamp for ceramic plug or jack

* Insert calibration letter for full part number 912-J

Three-Pole Connectors for RTD Applications, 400°F

- Three pins to accommodate most RTD sensor applications
- Rated to 200°C (400°F) continuous
- Jacks have spring-loaded inserts for positive contact
- Larger diameter negative pin prevents user from reversing polarity



Part Number	Description
TH-335	3-pole connector plug with copper pins
TH-336	3-pole connector jack with copper inserts
TH-337-125	Compression-type adapter for 0.125 inch tube
TH-337-188	Compression-type adapter for 0.188 inch tube
TH-337-250	Compression-type adapter for 0.250 inch tube
80701201	Cable clamp for 3-pole connector

Note: All accessories subject to minimum purchase quantities.

Accessories

Connector Systems

Miniature Thermocouple Connector System, 200°C (400°F)

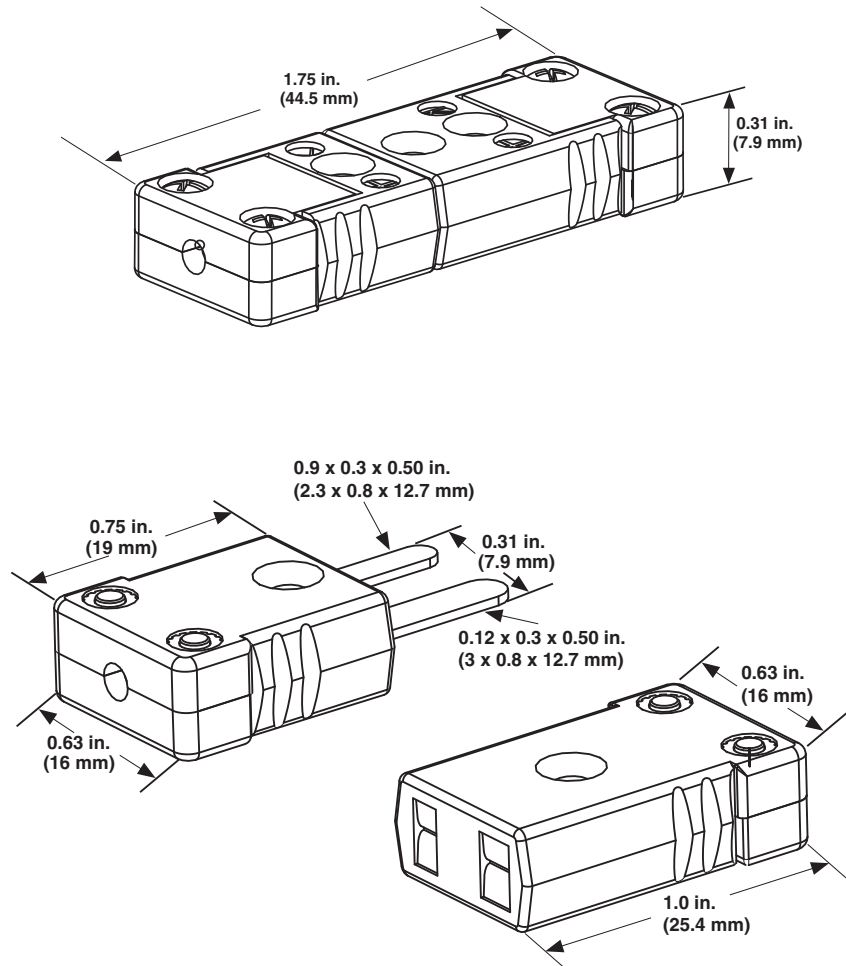
- Miniature design—mates with other miniature size thermocouple connectors
- Molded-in pin contacts assure precise alignment (no loose, wobbly parts)
- Rugged, high quality, high performance connectors
- Employ matching thermocouple alloy materials
- Available in all standard calibrations and copper-copper, ASTM E 230 color-coded
- Exclusive channel design isolates the wires for clean, strong signals.

Connection Method

Simply insert the stripped ends of your thermocouple wire between contact base and washer, tighten down the two terminal screws and you're finished. There are no loose parts to contend with. Do not wrap conductors around the terminal screws.

Watlow miniature connectors can accommodate wire sizes from 0.001 inch diameter up to 24 AWG, stranded. The connector is made of high impact strength, 200°C (400°F) rated, glass-filled thermoplastic. To maintain the highest measurement accuracy, matching thermocouple alloy materials are employed throughout. The same fine features and high quality performance characteristics found in Watlow's standard connectors also apply with the miniature connectors.

Miniature Connectors Compared with Standard Connectors

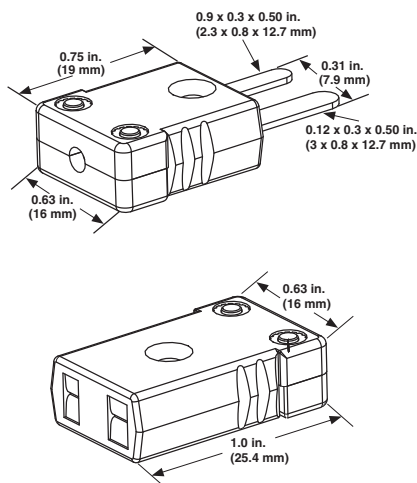


Note: All accessories subject to minimum purchase quantities.

Accessories

Connector Systems

Miniature Thermocouple Connector System, 200°C (400°F)



Ordering Information—To order, complete the part number on the right with the information below:

1 2 3 4 5 6 7
M C - - A T

1-2. "M" SERIES Miniature Connector, 204°C (400°F)

3. Style

- M = Male (plug)
- F = Female (jack)

4. Calibration

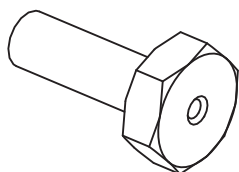
- E = Type E
- J = Type J
- K = Type K
- N = Type N
- R = Type R
- S = Type S
- T = Type T
- U = Uncompensated

5. Name Plate

- W = With Watlow name
- N = Without name label

6-7. Color Code

- AT = ASTM E 230 color code/uncompensated = white

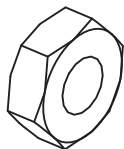


Crimp Style

1 2 3 4 5 6
M B C - - -

4-6. Sheath size

- 040 = 0.040 inches
- 063 = 0.063 inches



Braze Style

1 2 3 4 5 6
M B B - - -

4-6. Sheath size

- 040 = 0.040 inches
- 063 = 0.063 inches
- 125 = 0.125 inches

Note: All accessories subject to minimum purchase quantities.

Accessories

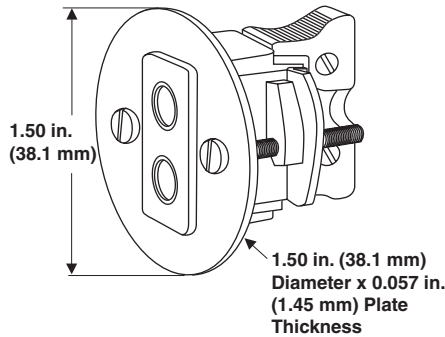
Connector Systems

Panel Mount Hardware

Single Panel Mount Hardware, 425°F

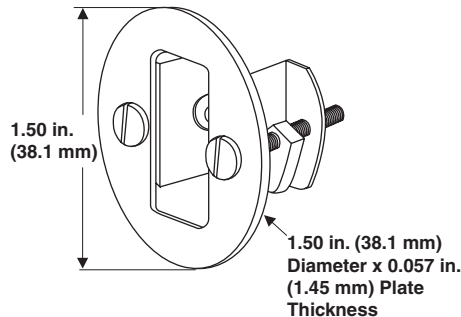
Designed for use with Watlow's "S" standard thermocouple connectors, these units fit panels up to 7/16 inch thick. Panel cutout: 1 1/8 inch to 1 5/32 inch hole. Units fit into standard 3/4 inch knockouts.

SKP Style



Single circuit panel mount with quick-disconnect jack included. Available calibrations J, K, T, R/S and Cu/cu.

SNP Style



Panel mount hardware only without Watlow name.*

Ordering Information—To order, complete the part number on the right with the information below:

1 2 3 4 5 6 7
S K P - -W A T

1-2-3. "SKP" SERIES Single Panel Mount Standard Connector, 218°C (425°F)

4. Calibration

J = Type J

K = Type K

T = Type T

5. Name Plate

W = With Watlow name

6-7. Color Code

AT = ASTM E 230 color code

Note: All accessories subject to minimum purchase quantities.