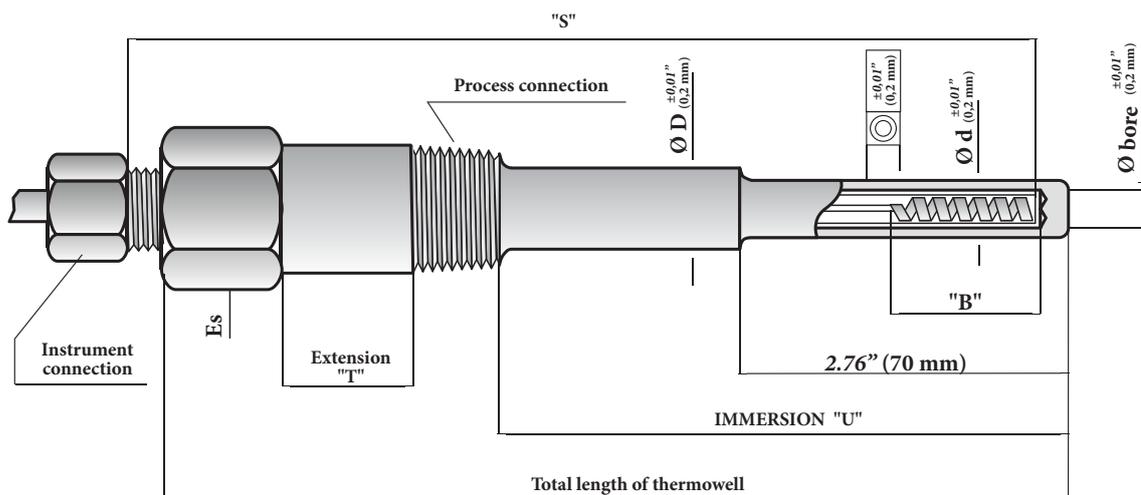


introduction to thermowells



Thermowells are used to protect bulbs from the effects of corrosion and pressure, from the process fluid flow velocity and to allow the thermometer to be interchanged, recalibrated, or replaced, without affecting the process.



DEFINITIONS

Immersion "U"

This is the part of the thermowell extending from the underside of the process connection (threaded or flanged) to the tip of the shank that is immersed into the process fluid. The length varies from a minimum of 2.76" (70 mm) to a maximum of 196" (5000 mm) and has to be properly sized to suit the length of the sensitive part of thermometer bulbs and the section of the process pipe.

Extension "T"

This part of the thermowell goes from the upper tip of the process connection (threaded or flanged) to the lower edge of the hexagon, and it is used to isolate the body of the temperature instrument, or the electrical connections in the case of thermocouples and RDT, from the process pipe.

Shank shape

The shank is the portion of the thermowell that is inserted into the process whose shape depends on the characteristics of the process fluid. A tapered shank style, for example, is the most suitable for applications with vapour at high temperature and speed, because it is particularly resistant to the effects of vibrations produced by the speed of the process fluid.

"S" dimension

This dimension is related to the temperature sensors, rather than the thermowells. However, it is essential for a perfect coupling between the two. The "S" dimension can be calculated as follows: total length of the thermowell minus 10 mm.

Sensitive portion "B"

This is another dimension concerning the temperature sensors and not the thermowells. When a temperature sensor is connected to a thermowell the sensitive part of the bulb must be located within the "U" immersion area.

HOW TO CHOOSE A THERMOWELL

MATERIALS

The thermowell resistance to corrosion by the process fluid has to be taken into account when choosing the material. Resistance to corrosion by the process fluid. A mirror polishing of the part immersed in the process gives an excellent resistance to corrosion to the thermowell. In addition to the standard materials detailed on the following pages, rod-machined thermowells can also be constructed from MONEL 400, Hastelloy C276, Alloy 825, Alloy 625, Duplex SAF 2205, and Duplex SAF 2507. For special corrosion-resistance requirements, some thermowells may also be coated with PTFE.

PROCESS CONNECTIONS

The threads on thermowell connectors are produced according to the ASME B1.20.1 standards for NPT threads, and to DIN 3852 form A for Gas threads (UNI 338-BSP). Flanged thermowells have special threaded connectors which are welded to flanges according to the ANSI B16.5 or DIN-UNI standards. In these thermowells, the mechanical strength is assured by the threaded connection between the flange and thermowell, while the weld just acts as a seal.

IMMERSION DEPTH "U"

For optimal measurement accuracy of the temperature sensing element (thermometer or RDT), it is essential that the sensitive portion of the element is located entirely within the immersion depth.

Therefore, when selecting a thermowell it is essential to know the exact length of the sensitive portion of the temperature instrument. On bimetallic thermometers and those filled with inert gases and liquid, the sensitive portions vary depending on the measuring range. See catalogue data sheets TB and TG where the dimensions are listed.

THERMOWELL BORE

Almost all installations require a variety of different instruments for measuring temperature. The use of standard bore diameters allow to interchange the temperature sensors more easily. The thermowells described in this catalogue come in the following bore diameters:

Ø 0.28" (7 mm) bore

For bimetallic thermometers (BT) with Ø 0.24" (6 mm) or Ø 0.26" (6,5 mm) (1/4") bulb diameter. For thermocouples or RDT.

Ø 0.39" (10 mm) bore

For bimetallic thermometers (BT) with Ø 0.31" (8 mm) or Ø 0.38" (9,6 mm) bulb diameter. For inert gas thermometers with Ø 0.31" (8 mm) and Ø 0.38" (9,6 mm) bulb diameter.

Ø 0.47" (12 mm) bore.

For inert gas thermometers with Ø 0.45" (11,5 mm) bulb diameter.

Process fluid speed

When a thermowell is inserted into a process creates a turbulent wave (Von Karman Trail), whose frequency depends on the thermowell diameter and on the process fluid speed. It is important to choose the right thermowell dimensions so that the frequency of the Karman wave is lower than the resonant frequency of the thermowell. If these two frequencies coincide, the resulting vibrations might damage the thermowell permanently.

The maximum speeds and the admissible lengths for the W50-60 range and W74-75-93 model thermowells at a temperature of 400 °C are shown alongside (the graph must be taken as a guide and does not replace the checking procedure which must be carried out accurately).

Pressure -temperature ratio

The thermowell wall thickness and temperature are essential to establish the maximum working pressure of the thermowell. In the following pages graphics are provided to show the maximum operating pressures for thermowells in AISI 304 or in AISI 316, without taking the process fluid speed into consideration.

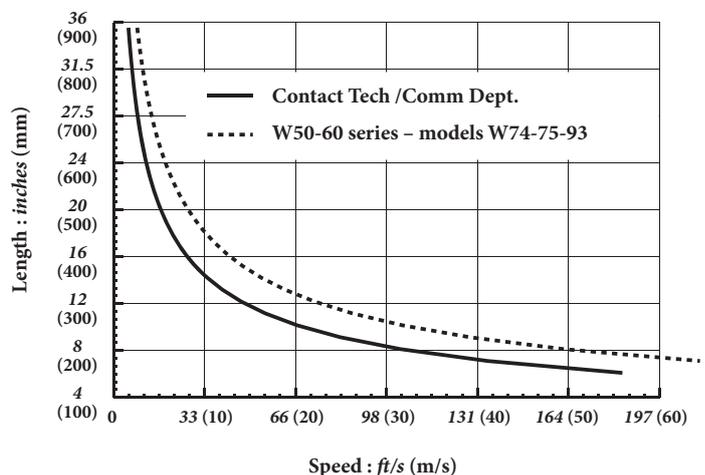
Verification of Conformity

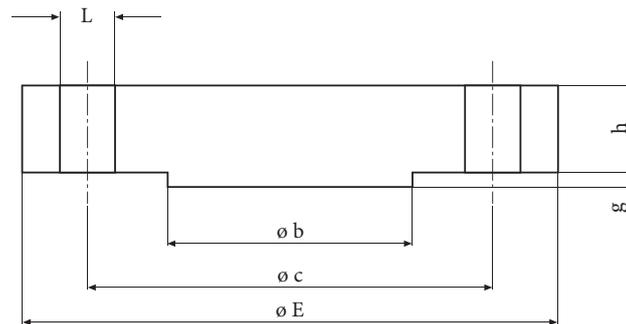
The thermowell is checked by our Technical Department, according to standards ASME PTC 19.3. Once this procedure is accomplished, a certificate of conformity is issued declaring that the thermowell has been verified and is suitable and conform to the plant's operating

conditions.

When this service is required, the following information must be provided:

- Exact thermowell immersion dimensions (bore Ø, point and connections);
- thermowell material;
- pressure, temperature, speed and density of process fluid.





FLANGED CONNECTIONS TO ASME STANDARDS: DIMENSIONS

dimensions : inches

DN	Class-psi (1)	Cod.	E	b	h	g	c	L	N (2)
3/4"	150	5AA	3.88	1.69	0.96	0.06	2.75	0.63	0.16
3/4"	300	5BA	4.63	1.69	1.14	0.06	3.25	0.75	0.16
3/4"	600	5DA	4.63	1.69	1.14	0.25	3.25	0.75	0.16
3/4"	900	5EA	5.12	1.69	1.22	0.25	3.25	0.87	0.16
3/4"	1500	5FA	5.12	1.69	1.22	0.25	3.25	0.87	0.16
1"	150	6AA	4.25	2	0.96	0.06	3.13	0.63	0.16
1"	300	6BA	4.88	2	1.2	0.06	3.50	0.75	0.16
1"	600	6DA	4.88	2	1.2	0.25	3.50	0.75	0.16
1"	900	6EA	5.87	2	1.38	0.25	4	1.02	0.16
1"	1500	6FA	5.87	2	1.38	0.25	4	1.02	0.16
1 1/2"	150	AAA	5	2.87	0.93	0.06	3.87	0.63	0.16
1 1/2"	300	ABA	6.12	2.87	1.28	0.06	4.5	0.87	0.16
1 1/2"	600	ADA	6.12	2.87	1.28	0.25	4.5	0.87	0.16
1 1/2"	900	AEA	7.01	2.87	1.46	0.25	4.37	1.14	0.16
1 1/2"	1500	AFA	7.01	2.87	1.46	0.25	4.37	1.14	0.16
2"	150	BAA	6	3.63	0.96	0.06	4.75	0.75	0.16
2"	300	BBA	6.5	3.63	1	0.06	5	0.75	0.32
2"	600	BDA	6.5	3.63	1	0.25	5	0.75	0.32
2"	900	BEA	8.5	3.63	1.5	0.25	6.5	1	0.32
2"	1500	BFA	8.5	3.63	1.5	0.25	6.5	1	0.32

FLANGED CONNECTIONS TO UNI-DIN STANDARDS: DIMENSIONS

dimensions : mm

DN	NP-bar (1)	Cod.	E	b	h	g	c	L	N (2)
20	6	PO0	90	50	12	2	65	11	4
20	10...16	PQ0	105	58	14	2	75	14	4
20	25...40	PS0	105	58	16	2	75	14	4
20	100	PU0	130	58	20	2	90	18	4
25	6	QO0	100	60	12	2	75	11	4
25	10...16	QQ0	115	68	14	2	85	14	4
25	25...40	QS0	115	68	16	2	85	14	4
25	100	QU0	140	65	22	2	100	18	4
40	6	SO0	130	80	11	3	100	14	4
40	10...16	SQ0	150	88	13	3	110	18	4
40	25...40	SS0	150	88	15	3	110	18	4
40	100	SU0	170	85	23	3	125	22	4
50	6	TO0	140	90	11	3	110	14	4
50	10...16	TQ0	165	102	15	3	125	18	4
50	25...40	TS0	165	102	17	3	125	18	4
50	100	TU0	195	95	25	3	145	27	4

- 1) The pressure applied must not exceed 1,5 times the NP for a 20U30AC flange and 1 times the NP for a 340 AC flange.
- 2) N° boring right through.

TOLERANCE AND MANUFACTURING CHARACTERISTICS

OUTSIDE DIAMETER:
 $\pm 0,01''$ (0,2 mm)

BORE DIAMETER:
 $\pm 0,01''$ (0,2 mm)

BORE CONCENTRICITY:
 10% of the thermowell wall thickness.

BASE THICKNESS:
 $\pm 0,04''$ (1 mm)

LENGTHS:
 $\pm 0,04''$ (1 mm)

IMMERSION FINISH (for bar-stock thermowells):

Ra 3,2Hm; Rz 12,5 Hm; 125 AARH standard finish
 Ra 0,8 Hm; Rz 3,2 Hm; 32 AARH for polished finish – to be indicated in order

WELDING

All welds carried out on stainless steel thermowells are done in inert gas atmospheres, with or without the addition of material. Flanged thermowells with full penetration welds are available upon request.

MARKING

The threaded thermowells have the following markings on the hexagon or round bar:

Material – Immersion – Client's Logo
 E.G. AISI 316 - U=125 - TW 1256

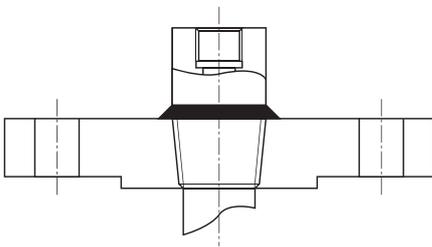
The flange of flanged thermowells have the following markings:
 Flange rating – Material – Immersion – Client's Logo

E.G. 1" 150 RF 125AARH - ASTM A 105 - U=250 - TW1256
 If the thermowell is made of material that is different from that of the flange, the material type will be marked on the thermowell.

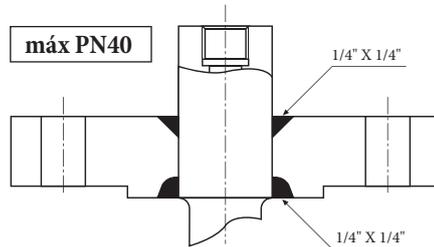
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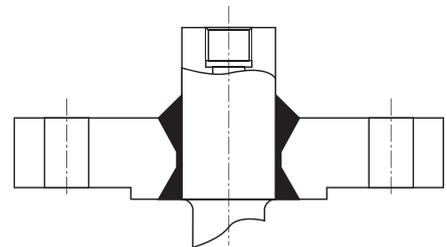
Standard welding



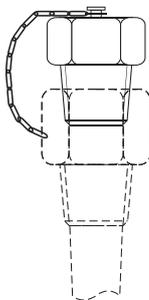
Double welding



Full - penetration welding



Cap and chain



Nipple + 5.12" (130 mm) hose

