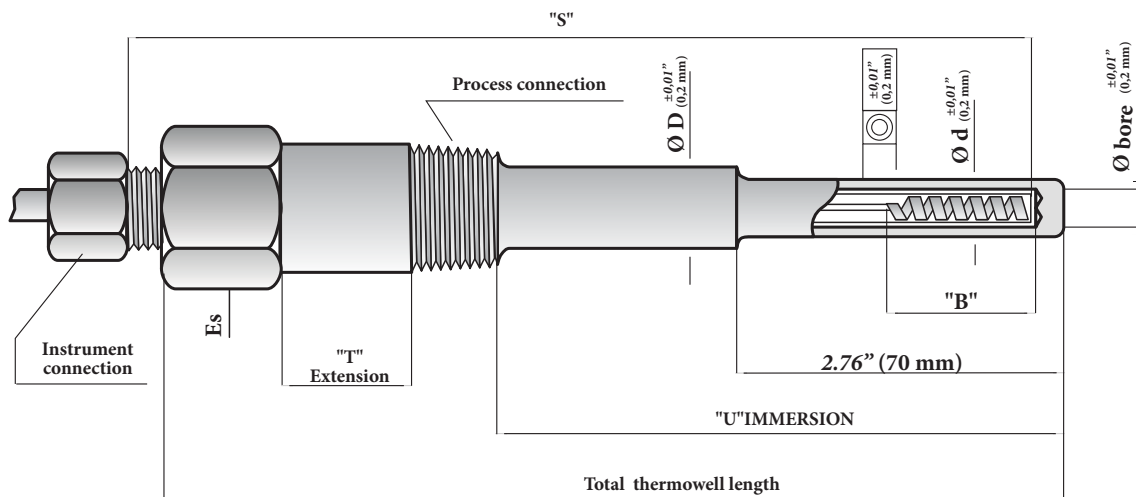


introduction to thermowells



Thermowells are used to protect bulbs from being affected by corrosion and by the process high-speed fluid flow and allow to replace, recalibrate or interchange the thermometer without affecting the process.



DEFINITIONS

"U" Immersion

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

"T" Extension

This part of the thermowell is situated between the upper tip of the process connection (threaded or flanged) to the lower edge of the hexagon, and it makes space between the body of the temperature instrument, or the electrical connections in the case of thermocouples and thermal resistors, and the process pipe.

Shank style

The shank is a thermowell part which is in full contact with the process and whose shape depends on the characteristics of the process fluid. A tapered shank style, for example, is the most suitable one for applications with vapour at high temperature and speed, because it resists particularly well to the effects of vibrations produced by the process fluid speed particularly well.

"S" dimension

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

Sensitive part "B"

This is another dimension concerning temperature sensors, not 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

Materials are usually chosen considering resistance features against corrosion caused by the process fluid. The thermowell part which is in contact with the process is mirror-polished that is why the thermowell is completely corrosion-proof. In addition to the standard materials detailed on the following pages, rod-machined thermowells can also be constructed using 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 in PTFE.

PROCESS CONNECTIONS

As far as NPT threads are concerned, threads on thermowell connectors conform to the ASME B1.20.1 standards and to DIN 3852 form A as far as Gas threads (UNI 338-BSP) are concerned. Flanged thermowells have special threaded connectors which are welded to flanges that conform to the ANSI B16.5 or DIN-UNI standards. These thermowells are very resistant from a mechanical point of view because they are provided with a threaded connection between the flange and the thermowell, while the welding acts just as a seal.

"U" IMMERSION DEPTH

For a full measurement accuracy of the temperature sensing element (thermometer or thermistor), the sensitive portion of the element has to be entirely immersed into the fluid.

Therefore, when choosing a thermowell the the temperature instrument sensitive part length has to be as accurate as possible. The sensitive part of bimetallic thermometers and inert gases and liquid filled thermometers may vary depending on the measuring range. For further information about the sensitive part dimensions please refer to catalogue data sheets TB and TG.

THERMOWELL BORE

One plant may require the installation of different thermowells models in order to measure temperature. Thanks to the application of standard bore diameters temperature sensors may be replaced more easily. Thermowells listed in this catalogue are available with 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 thermistors.

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.

Process fluid speed

When a thermowell is immersed into a process, fluid speed may create 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 Von Karman Trail is less than the thermowell resonant frequency. Should the two frequencies coincide, the resulting vibrations may damage the thermowell permanently.

The maximum speed and admissible length for the W50-60 range and W74-75-93 models at temperature of 400 °C are shown alongside (the graphic should be considered as a guide and not as a verification test which must be carried out with extreme care).

Pressure/temperature ratio

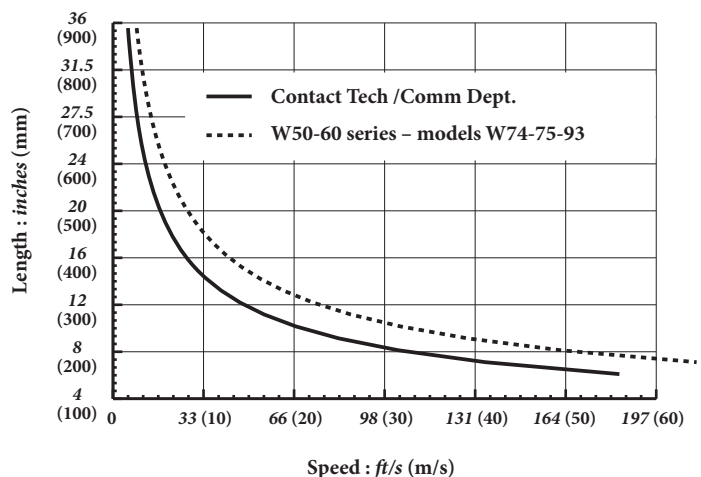
The maximum permitted working pressure varies according to the thermocouple wall thickness and temperature. In the following pages graphics show the maximum operating pressures for thermowells made of AISI 304 or AISI 316, without considering the process fluid speed.

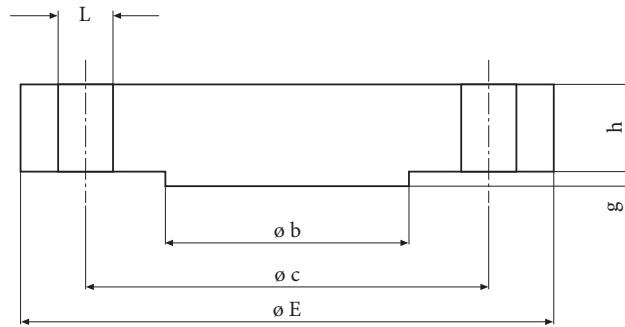
Conformity test

After selection, thermowells may be checked by our Technical Department according to the ASME PTC 19.3 standard. As a result, a certification is issued in which the thermowell conformity to the plant operating conditions is certified.

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

- thermowell immersion dimensions (bore Ø, point and connections);
- thermowell material;
- pressure, temperature, speed and density of the 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	QO0	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) 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° of bores

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 weldings carried out on stainless steel thermowells are performed in inert gas atmospheres, with or without extra material. Flanged thermowells with full penetration welds are available upon request.

MARKING

Threaded thermowells are marked on the hexagon or round bar as follows:

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

The flange of flanged thermowells have the following markings:

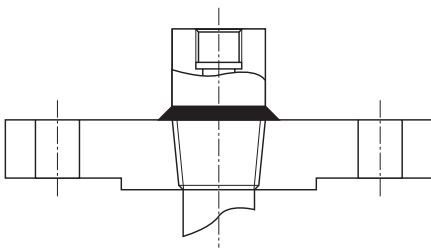
Flange rating – Material – Immersion – Client's Logo
 E.G. 1" 150 RF 125AARH - ASTM A 105 - U=250 - TW1256

If the thermowell and the flange materials are different, the thermowell is also marked with the flange material name.

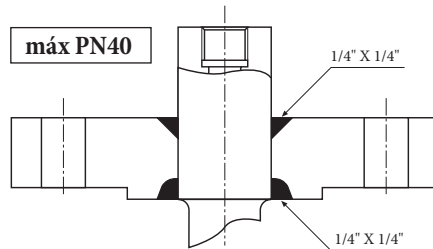
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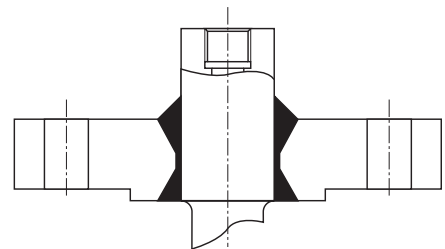
Standard welding



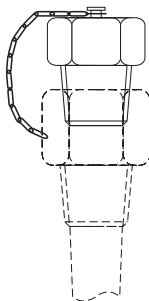
Double welding



Full - penetration welding



Cap and chain



Nipple + 5.12" (130 mm) hose

