

Weld-in thermowell bar stock design

Design description

Badotherm thermowell model TW234 is a bar stock, solid machined type thermowell with a weld-in process connection. The construction is available with straight, stepped, or tapered stem. The standard material is AISI 316(L) and optionally various exotic materials are available. Thermowells are designed to protect the temperature bulb from corrosive effect, extreme pressure, or other process conditions. It also allows replacing the temperature instrument without disturbing the process..

Wetted part materials

Material common name	UNS	Wst.
AISI 316(L)	S31603	1.4404
AISI 304L	S30400	1.4306
AISI 310 MoLn	S31050	1.4466
AISI 316 UG	S31600	1.4435
AISI 321	S32100	1.4541
AISI 904(L)	N08904	1.4539
Alloy 20	N08020	2.4660
Alloy 400	N04400	2.4360
Alloy 600	N06600	2.4816
Alloy 625	N06625	2.4856
Alloy 825	N08825	2.4858
Alloy B2	N10665	2.4617
Alloy C-22	N06022	2.4602
Alloy C-276	N10276	2.4810
Duplex F44	S31254	1.4547
Duplex F51/F60	S32205	1.4462
Duplex F53	S32750	1.4410
Duplex F55	S32750	1.4410
Nickel 201	N02201	2.4068
Titanium Gr. 2 ¹	R50250	2.7025
Zirconium 702 ¹	R60702	-



Process connection

Process connection is a bar that is machined to a specific size according the DIN 43772 type 4. On request other dimensions can be machined.

Instrument connection

Standard	Female thread
ISO 228-1 (BSP)	G 1/2 – G 3/4
ANSI B 1.20.1 (NPT)	1/2" NPT – 3/4" NPT

Material Certification

Material traceability and related certification are applicable for all process wetted parts. Material certification possibilities depend on the type of seal, the assembly construction and the materials used. Material certification is in accordance with EN10204 3.1.

Additional material certification and testing can be provided on request, such as Positive Material Identification (PMI), Intergranular corrosion (IGC) testing, material certification in accordance with EN10204 3.2, NACE conformity for ISO-15156 (MR-0175) and/or ISO-17945 (MR-0103), NORSOK M-630 and many more.

-> Please note that the responsibility for material selection always rests with the user.

Marking & Traceability

All parts are marked with heat number, material designation, size, and rating. Badotherm adds a Badotherm reference number, heat number of the stem and the manufacturers name to the flange for traceability purposes.

Materials and origin

All materials according to the applicable standards. The standard sourcing of flanges is of international origin. Optionally regional preference can be requested, for example materials from EU origin.

Testing

All thermowells are tested by means of an internal pressure test of 1.5x the maximum allowed working pressure of the flange taking the material into account. The test media of with which the thermowell is pressure tested is water with a chloride level <30 ppm.

Cleanliness of the wetted parts

All parts are standard cleaned from excessive oil and grease. When additional requirements are needed, the parts can be cleaned according customer requirements and cleaning specifications.

Thermocal performance calculation

For critical applications it is recommended to perform a performance calculation for the thermowell. The in-house developed Wake Frequency Calculator "Thermocal" gives the result according to the calculations of the ASME PTC 19.3 TW-2016 including engineering recommendations when the thermowell exceeds the allowed stress.

Dimensional limits

The ASME PTC 19.3 TW-2016 prescribes several limits. Outside these limits the WFC can not be generated. Thermowells outside restriction from below tables can be supplied without WFC calculation.

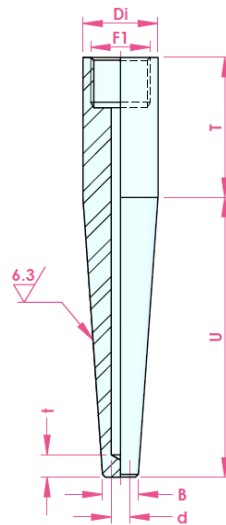
Tapered thermowells

Description	Symbol	Minimum	Maximum
Unsupported length	L	63.5	610
Bore diameter	d	6.1	21.0
Tip diameter	B	12.6	46.5
Taper ratio	B/A	0.6	1.0
Bore ratio	d/B	0.16	0.71
Minimum wall thickness	(B-d)/2	3	

All dimensions in mm (except ratio)

For tapered executions L>240 of max 240mm. Rest of stem is straight (l-240)

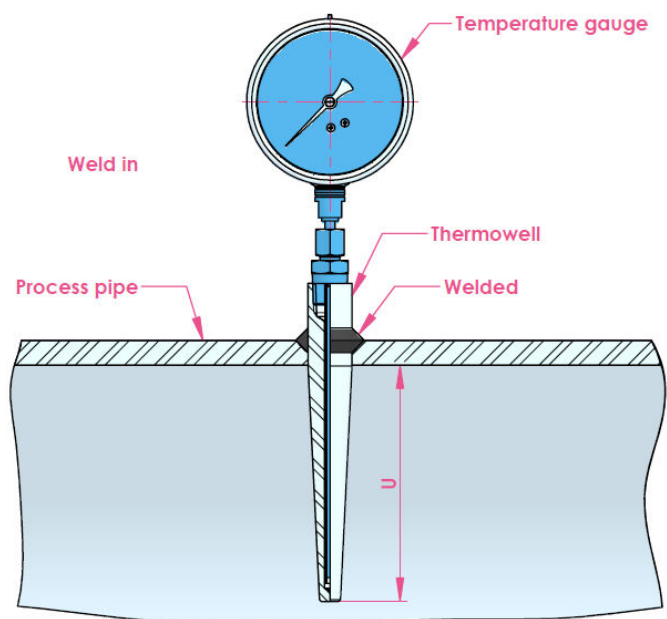
Dimensions table:



Di	F1	B	T ¹⁾	t	d	U
24 h7	M18x1.5	12.5	50.0	6.0	7	variable
26 h7	G 1/2 A (M20x1.5)	15			6.2	
		17			7	
		12.5			9	
32 h7	G 3/4 A (M27x2)	15			11	
		17			6.2	
		12.5	7			
					9	
					11	

All dimensions in mm
 1) Size T is standard 50mm. Other dimensions are on demand

Principle drawing:



Thermowell selection

Selection	Suffix	Description	
Thermowell type	BDTW234	Tapered stem – weld-in bar stock thermowell	
Process connection size	W24M	24 h7 weld connection	
	W26M	27 h7 weld connection	
	W32M	32 h7 weld connection	
Instrument thread size	N12F	½" NPT	
	N34F	¾" NPT	
	G12F	G ½"	
	G34F	G ¾"	
	M18F	M18x1.5	
	M20F	M20x1.5	
Insertion length	U...	U length followed by U length in mm	
Bore diameter	B62	6.2mm	
	B70	7.0mm	
	B90	9.0mm	
	B11	11.0mm	
Bore diameter may be selected in all dimensions. Please check if the ratio's for wall thickness and bore ratio are in line with the tables for dimensional limits.			
Tip diameter	...mm	Diameter of the thermowell on the tip of the thermowell	
Material selection of wetted parts	S316	AISI 316(L)	S31600/S31603
	S304	AISI 304L	S30403
	S310	AISI 310 MoLn	S31050
	U316	AISI 316 UG	S31603 (mod)
	S321	AISI 321	S32100
	S904	AISI 904(L)	S08904
	A020	Alloy 20	S 08020
	A400	Alloy 400	S04400
	A600	Alloy 600	S06600
	A625	Alloy 625	S06625
	A825	Alloy 825	S08825
	AB02	Alloy B2	S10665
	AC22	Alloy C-22	S06022
	A276	Alloy C-276	S10276
	DF44	Duplex F44	S31254
	DF51	Duplex F51/F60	S31803/S32205
	DF53	Duplex F53	S32750
	DF55	Duplex F55	S32760
	N201	Nickel 201	N02201
TG02	Titanium Gr. 2 ¹²	S R50400	
Z702	Zirconium 702 ¹²	S R60702	

option selection

Options		
Accessory	PCH	Plug and chain mounted to the thermowell
Treatments	K1	Cleaned from oil and grease
Certificates and testing ⁶	N75	2.1 NACE ISO 15156 (MR 01 75)
	LTPA	2.1 Static pressure leak test certificate acc ASME B16.5 (1.5 x MWP) ⁵
	LTCE	2.1 Static pressure leak test certificate acc PED 2014/68/EU (1.43 x MWP) ⁵
	PMI	2.2 Positive Material Identification
Special options	IC32	3.2 Material certificate on materials
	RD	Rush Delivery
	EU	European Origin materials

⁵:MWP is limited by flange rating, MWP pressure instrument, and MWP seal construction. Lowest value is used in order to prevent permanent damage.

⁶: Test report and 3.1 certificate on wetted parts is standard part of supply.

Order related options

Options on complete order		
Certificates and testing	PMI 3PI	2.2 Positive Material Identification Third party inspection of goods
Packing	SW	Seaworthy packing

Change log

Date	Change
7-11-2023	Added T dimension in table

Holland – Romania – India – Thailand – Dubai – USA

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