

Thermowell for lap flanges per ASME B16.5 (solid-machined) Vanstone design, per petrochemical standards Model TW31

WIKA data sheet TW 95.31

Applications

- Oil and gas, petrochemical industry
- For high process loads

Special features

- Exceptionally heavy-duty design in typical Shell design
- Solid-machined version without weld seam
- Dimensions in accordance with Shell drawing S38.113 and S38.114 (all revisions)
- Design in accordance with Shell MES-C (Materials and Equipment Standards and Code)
- For lap flanges per ASME B16.5

**Thermowell model TW31 (lap flange, optional)**

Description

Each thermowell is an important component of any temperature measuring point. It is used to separate the process from the surrounding area, thus protecting the environment and operating personnel and keeps aggressive media, high pressures and flow rates from the temperature probe itself and thereby enables the thermometer to be exchanged during operation.

Based on the almost limitless application possibilities, there are a large number of variants, such as thermowell designs or materials. The type of process connection and the basic method of manufacture are important design differentiation criteria. A basic differentiation can be made between threaded and weld-in thermowells, and those with flange connections.

Furthermore, one can differentiate between fabricated and solid-machined thermowells. Fabricated thermowells are constructed from a tube, that is closed at the tip by a welded solid tip. Solid-machined thermowells are manufactured from bar stock or from forged blanks.

The TW31 series of solid-machined thermowells for lap flanges are suitable for use with numerous electrical and mechanical thermometers from WIKA.

Due to the exceptionally heavy-duty design, these thermowells in accordance with Shell design are the first choice for use in the petrochemical and also the oil and gas industries.

Standard version

Thermowell material

Stainless steel 316, stainless steel 316L, Duplex F51, alloy 400, alloy 625

Connection to thermometer

½ NPT female thread (due to the recessed position, only for use with 1/2" neck tubes)

Bore size

7 mm, stepped down 8 to 6.5 mm

Shell standard length L

230, 255, 305, 355, 405, 455 mm

Thermowells with length L = 230 or 255 mm are roughened at a length of 120 mm to $R_a = 6 \mu\text{m}$.

Shell drawing	Shell standard length L	Insertion length U
S38.113	230	215
	255	240
	305	290
	355	340
	405	390
	455	440
S38.114 ¹⁾	230	210
	255	235

Note:

The installation length U below the sealing face is not defined in accordance with the Shell drawing, but is mandatory for a wake frequency calculation in accordance with ASME PTC 19.3 TW-2016 as "unsupported length".

Permissible flow rates in accordance with Shell S38.113/114 specification

Rev. ²⁾	Liquids v_{max}	Gases v_{max}	Calculation to ASME PTC 19.3 TW-2016
0	8 m/s (26 ft/s)	40 m/s (131 ft/s)	Recommended for 0, A, B
A	8 m/s (26 ft/s)	40 m/s (131 ft/s)	Recommended for 0, A, B
B	8 m/s (26 ft/s)	16 m/s (52 ft/s)	Recommended for 0, A, B
C	12 m/s (40 ft/s)	12 m/s (40 ft/s)	Required if $v_{\text{process}} > v_{\text{max}}$
D	12 m/s (40 ft/s)	12 m/s (40 ft/s)	Required if $v_{\text{process}} > v_{\text{max}}$
E	12 m/s (40 ft/s)	12 m/s (40 ft/s)	Required if $v_{\text{process}} > v_{\text{max}}$
F	12 m/s (40 ft/s)	12 m/s (40 ft/s)	Required if $v_{\text{process}} > v_{\text{max}}$

1) The lengths 305, 355, 405 and 455 mm are basically not defined according to S38.114 and thus cannot be designed in accordance with the MESC specification.

2) Shell recommends using the current revision status

Permissible pressure ratings for ASME B16.5 lap flanges in accordance with the Shell standard

S38.113: 150 ... 1,500 lbs

S38.114: 150 ... 2,500 lbs

Thermowell specification

- in accordance with Shell standard drawing
 - Dimensions per Shell drawing S38.113 or S38.114 of all revision levels
 - Materials in accordance with ASTM specifications
- in accordance with MESC (Materials and Equipment Standards and Code)
 - Thermowell stamped with MESC number
Through the MESC number (e.g. 768337.071.1), the thermowell will be clearly allocated a design and material. Deviations from this are not permitted.
 - Dimensions exclusively in accordance with Shell drawing S38.113/114
 - Materials in accordance with ASTM and additional MESC specifications
 - If the flow rates specified in Shell drawing S38.113/114 are exceeded, a wake frequency calculation in accordance with ASME PTC 19.3 TW-2016 is required. For this the medium velocity, the process temperature, process pressure and density are required.
 - Any changes to the design that may be necessary due to the wake frequency calculation must be within the MESC specifications (design specifications).

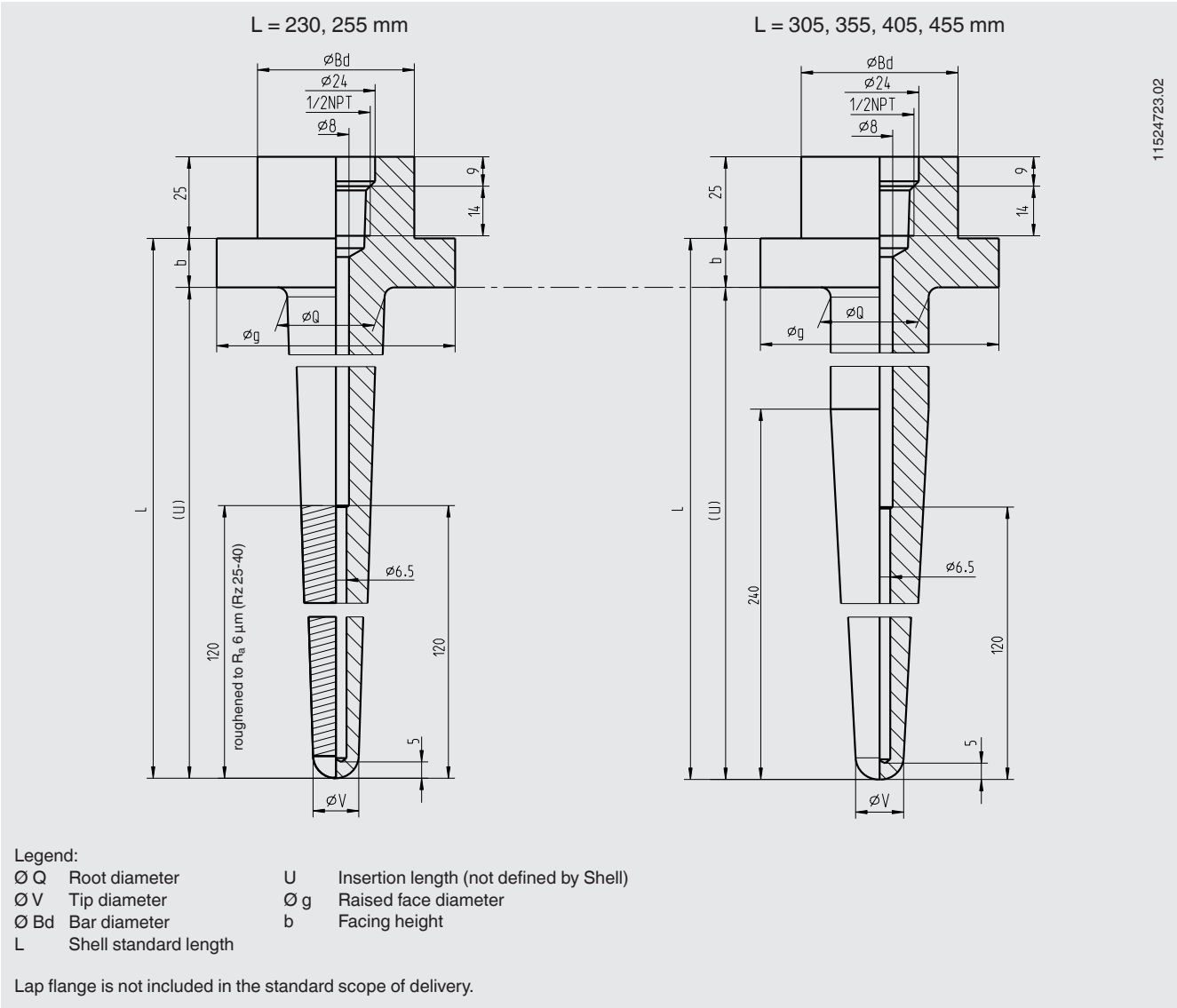
Options

- Other dimensions and materials (not MESC compliant)
- Quality certificates
- The calculation in accordance with ASME PTC 19.3 TW-2016 of individual thermowells minimises the risk of dynamic damage that can be caused by the vortex shedding of a Kármán vortex street (Vortex Induced Vibration; VIV). In addition, the static loads are calculated depending on the temperature, due to lateral flow and the process pressure. The calculation can be carried out independently using an online tool or as a WIKA engineered service (subject to charges). Attention: Certain specific design details (e.g. roughened surface, stepped bores or thermowell dimensions) lie outside the scope of ASME PTC 19.3 TW-2016

For further information, see technical information IN 00.15 "Wake frequency calculation".

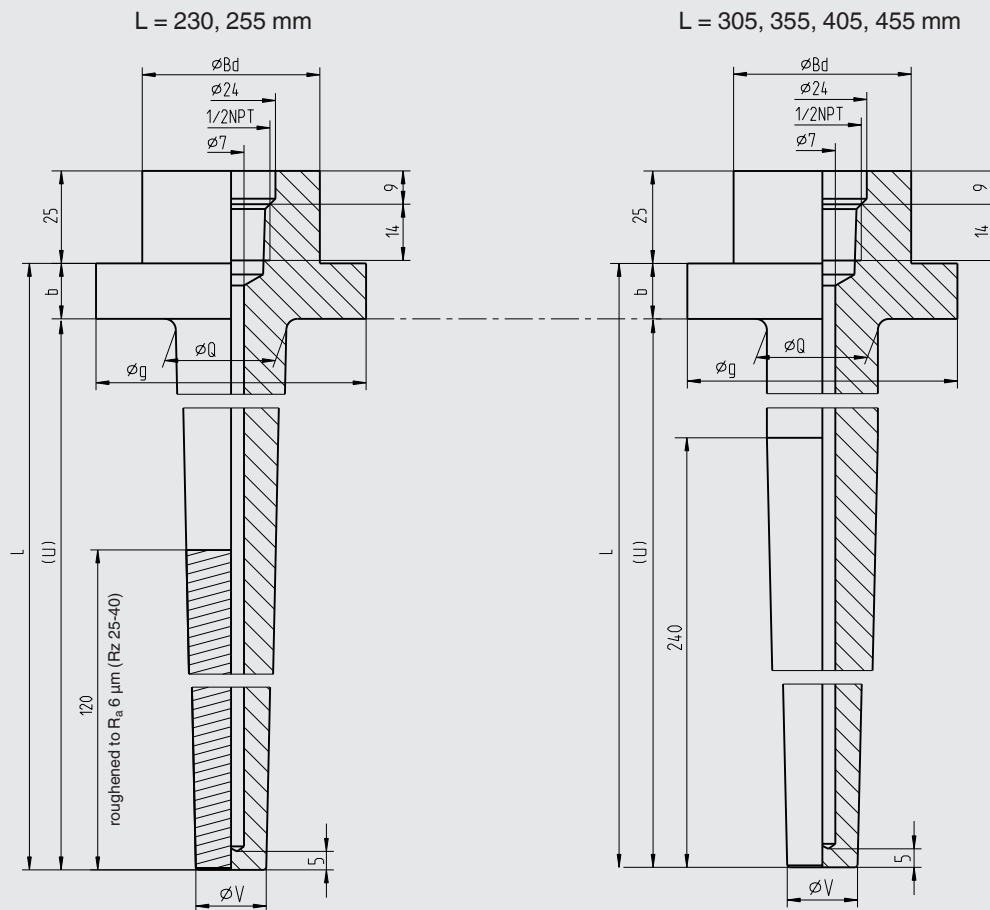
Dimensions in mm

Version S38.113-0/A/B, S38.114-0/A/B (Shell recommends using the current revision status)



Shell standard	Dimensions in mm						Weight in kg
	Ø g	L	Ø Q	Ø V	Ø Bd	b	
S38.113 for 1.5" (DN 40) lap flanges in accordance with ASME B16.5	73	230	30	14	48	15	1.6
	73	255	30	14	48	15	1.7
	73	305	30	14	48	15	1.8
	73	355	30	14	48	15	2.0
	73	405	30	14	48	15	2.1
	73	455	30	14	48	15	2.3
S38.114 for 2" (DN 50) lap flanges in accordance with ASME B16.5	92	230	30	16	60	20	1.6
	92	255	30	16	60	20	1.7
	92	305 ¹⁾	30	16	60	20	1.8
	92	355 ¹⁾	30	16	60	20	2.0
	92	405 ¹⁾	30	16	60	20	2.1
	92	455 ¹⁾	30	16	60	20	2.3

1) L = 305 ... 455 mm is not part of the Shell S38.114 standard



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Legend:

Ø Q	Root diameter	U	Insertion length
Ø V	Tip diameter	Ø g	Raised face diameter
Ø Bd	Bar diameter	b	Facing height
L	Shell standard length		

Lap flange is not included in the standard scope of delivery.

Shell standard	Dimensions in mm							Weight in kg
	Ø g	L	Ø Q	Ø V (rev. C)	Ø V (rev. D)	Ø Bd	b	
S38.113 for 1.5" (DN 40) lap flanges in accordance with ASME B16.5	73	230	30	14	19	48	15	1.6
	73	255	30	14	19	48	15	1.7
	73	305	30	14	19	48	15	1.8
	73	355	30	14	19	48	15	2.0
	73	405	30	14	19	48	15	2.1
	73	455	30	14	19	48	15	2.3
S38.114 for 2" (DN 50), lap flange in accordance with ASME B16.5	92	230	30	16	19	60	20	1.6
	92	255	30	16	19	60	20	1.7
	92	305 ¹⁾	30	16	19	60	20	1.8
	92	355 ¹⁾	30	16	19	60	20	2.0
	92	405 ¹⁾	30	16	19	60	20	2.1
	92	455 ¹⁾	30	16	19	60	20	2.3

1) L = 305 ... 455 mm is not part of the Shell S38.114 standard

Flange pressure rating	Pressure rating in lbs	Weight of the lap flange in kg
1.5" (DN 40) for thermowells per S38.113	150	1.3
	300	2.4
	600	2.9
	900/1,500	5.3
2" (DN 50) for thermowells per S38.114	150	2.0
	300	2.8
	600	3.6
	900/1,500	9.8
	2500	14.7

Suitable sensor lengths for electrical thermometers or stem lengths for mechanical thermometers with compression fitting (BF4) and ½ NPT female thread for TW31 thermowells:

Mechanical: Neck tube length L + thermowell standard length L + 6 mm [0.25 inch] = insertion length l_1

Electrical: Thermometer A length (insertion length U_2) = thermowell standard length L + 15 mm [0.6 inch]

Sealing face roughness

Flange standard	AARH in μ inch	R_a in μ m
ASME B16.5 Stock finish	125 ... 250	3.2 ... 6.3

Wake frequency calculation to ASME PTC 19.3 TW-2016

ASME PTC 19.3 TW-2016 does not include any thermowells with stepped internal bores (version S38.113-0/A/B, S38.114-0/A/B) and excludes thermowells with a surface rougher than R_a 0.81 μ m (32 μ in) from the scope of the standard. Furthermore, straight stem shapes with conical tip are not defined in the standard. For these reasons, the calculation results in accordance with ASME PTC 19.3 TW-2016 of Shell standard S38.113 and S38.114 thermowells, which are roughened to R_a 6 μ m (R_z 25 ... 40) in the tip area or have a stepped bore, are only informative in character.

Ordering information

Model / Customer drawing / Material / Standard length L / Root diameter / Tip end diameter / Flange size / Flange material / Options

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