

Technical Information

iTHERM ModuLine TT411

Welded thermowell



Metric thermowell for hygienic and aseptic applications in the food, beverage, and pharmaceutical industries

Applications

- Specially designed for use in hygienic and aseptic applications in the Food & Beverages and Life Sciences industries
- Pressure range up to 40 bar (580 psi)
- For increased protection requirements of the temperature sensor regarding physical and chemical effects
- For use in pipes and containers or tanks
- Ideally suited to all measuring points that require regular recalibration by simply replacing the insert in closed processes

Your benefits

- iTHERM QuickNeck – cost and time savings thanks to simple, tool-free recalibration of the insert used
- Over 50 hygienic process connections
- Global portfolio with metric and imperial versions
- International certification: 3-A Sanitary Standard, EHEDG, ASME BPE, FDA, TSE Certificate of Suitability
- Optional: 1.4435 material, delta ferrite content < 0.5%
- Fast response time owing to reduced tips with thin walls
- State of the art T- and elbow thermowells, free of welds and dead legs with best-in-class hygienic design

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Installation

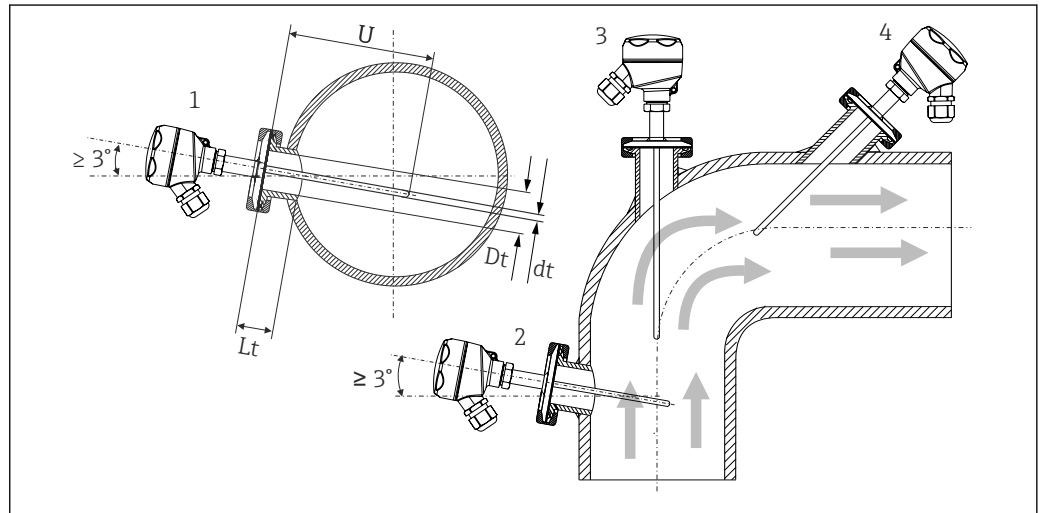
Orientation

No restrictions. However, self-draining in the process must be guaranteed. If there is an opening to detect leaks at the process connection, this opening must be at the lowest possible point.

Installation instructions

The immersion length of the thermometer can influence the measurement accuracy. If the immersion length is too small then measurement errors are caused by heat conduction via the process connection and the container wall. Therefore, if installing in a pipe, the immersion length should ideally correspond to half of the pipe diameter.

Installation options: Pipes, tanks or other plant components



1 Installation examples

1, 2 Perpendicular to the flow direction, installed at a min. angle of 3° to ensure self-draining

3 On elbows

4 Inclined installation in pipes with a small nominal diameter

U Immersion length

i In the case of pipes with a small nominal diameter, it is advisable for the tip of the thermometer to project well into the process so that it extends past the pipe axis. Installation at an angle (4) could be another solution. When determining the immersion length or installation depth, all the parameters of the thermometer and of the medium to be measured must be taken into account (e.g. flow velocity, process pressure).

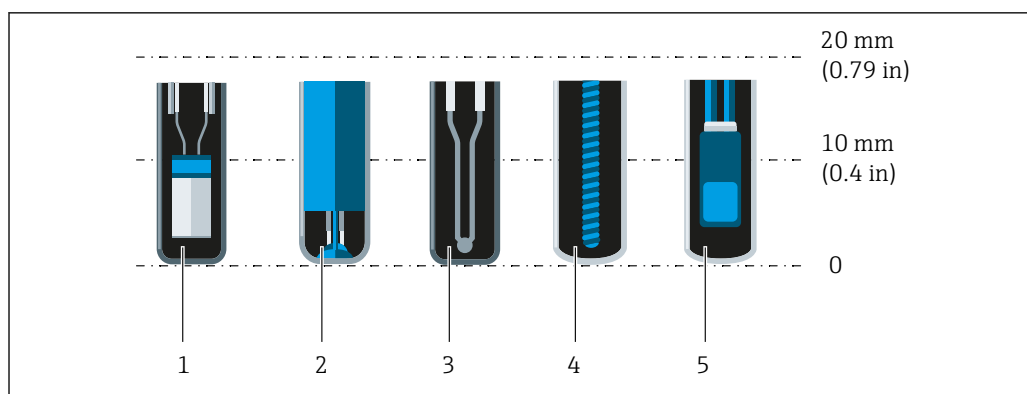
i The requirements of the EHEDG and the 3-A Sanitary Standard must be adhered to.

Installation instructions EHEDG/cleanability: $L_t \leq (D_t - d_t)$

Installation instructions 3-A/cleanability: $L_t \leq 2(D_t - d_t)$

Pay attention to the exact position of the sensor element in the thermometer tip.

Available options depend on product and configuration.



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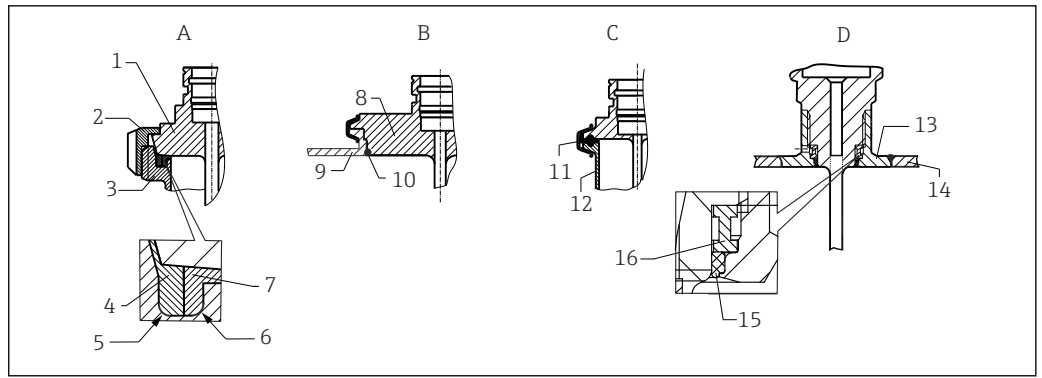
- 1 iTHERM StrongSens or iTHERM TrustSens for 5 to 7 mm (0.2 to 0.28 in)
- 2 iTHERM QuickSens for 0.5 to 1.5 mm (0.02 to 0.06 in)
- 3 Thermocouple (not grounded) for 3 to 5 mm (0.12 to 0.2 in)
- 4 Wire wound sensor for 5 to 20 mm (0.2 to 0.79 in)
- 5 Standard thin-film sensor for 5 to 10 mm (0.2 to 0.39 in)

To keep the influence of heat dissipation to a minimum and to achieve the best possible measurement results, 20 to 25 mm (0.79 to 0.98 in) should be in contact with the medium in addition to the actual sensor element.

This results in the following recommended minimum immersion lengths

- iTHERM TrustSens or iTHERM StrongSens 30 mm (1.18 in)
- iTHERM QuickSens 25 mm (0.98 in)
- Wire wound sensor 45 mm (1.77 in)
- Standard thin-film sensor 35 mm (1.38 in)

It is particularly important to take this into consideration for tee thermowells, as the immersion length is very short on account of their design, and the measurement error is higher as a result. It is therefore recommended to use elbow thermowells with iTHERM QuickSens sensors.



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2 Detailed installation instructions for hygiene-compliant installation (depends on the version ordered)

- A** Milk pipe connection according to DIN 11851, only in connection with EHEDG certified and self-centering sealing ring
- 1 Sensor with milk pipe connection
 - 2 Groove slip-on nut
 - 3 Counterpart connection
 - 4 Centering ring
 - 5 R0.4
 - 6 R0.4
 - 7 Sealing ring
- B** Varivent® process connection for VARINLINE® housing
- 8 Sensor with Varivent connection
 - 9 Counterpart connection
 - 10 O-ring
- C** Clamp according to ISO 2852
- 11 Molded seal
 - 12 Counterpart connection
- D** Process connection Liquiphant-M G1", horizontal installation
- 13 Weld-in adapter
 - 14 Vessel wall
 - 15 O-ring
 - 16 Thrust collar

NOTICE

The following actions must be taken if a sealing ring (O-ring) or seal fails:

- ▶ The thermometer must be removed.
- ▶ The thread and the O-ring joint/sealing surface must be cleaned.
- ▶ The sealing ring or seal must be replaced.
- ▶ CIP must be performed after installation.

i The counterpieces for the process connections and the seals or sealing rings are not supplied with the thermometer. Liquiphant M weld-in adapters with related seal kits are available as accessories. .

In the case of weld-in connections, exercise the necessary degree of care when performing the welding work on the process side:

1. Use suitable welding material.
 2. Flush-weld or weld with welding radius ≥ 3.2 mm (0.13 in).
 3. Avoid crevices, folds or gaps.
 4. Ensure the surface is honed and polished, $R_a \leq 0.76$ μm (30 μin).
1. As a general rule, the thermometers should be installed in such a way that does not impact their ability to be cleaned (the requirements of the 3-A Sanitary Standard must be observed).

2. The Varivent® and Liquiphant-M weld-in adapter and Ingold (+ weld-in adapter) connections enable flush-mounted installation.



For the requirements for installation according to the EHEDG and 3-A Sanitary Standard, see the Operating Instructions for the modular hygienic thermometers.

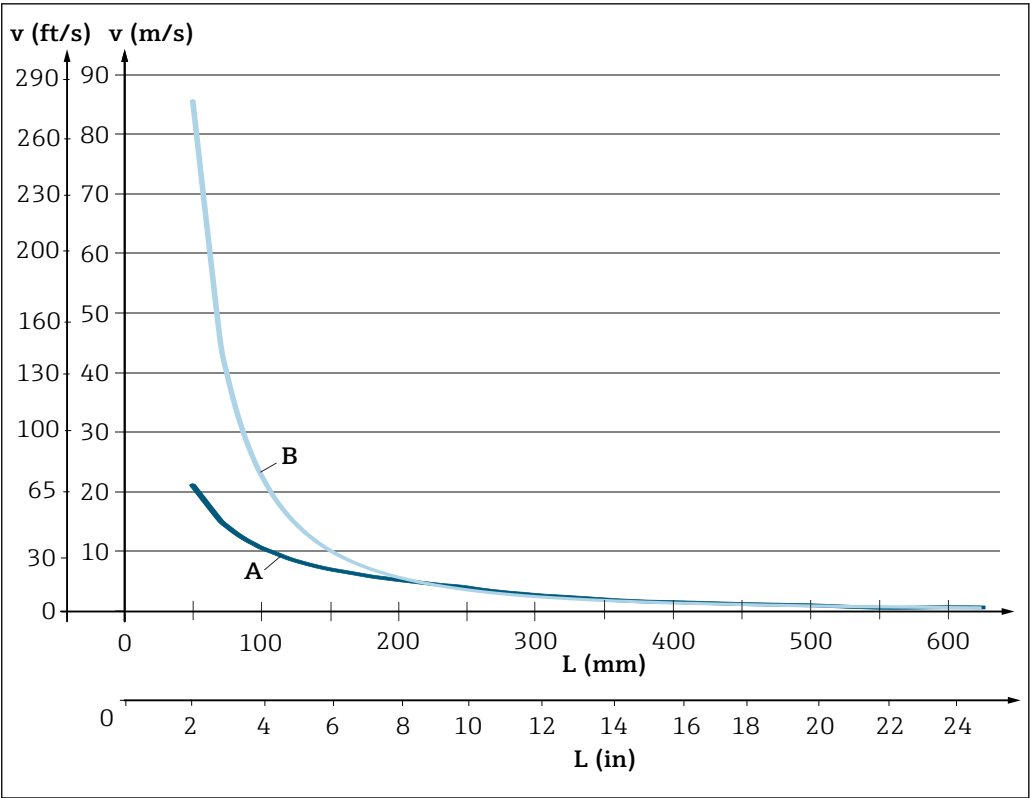
Operating Instructions BA02023T

Process

Process temperature range	Maximum -200 to +650 °C (-328 to +1 202 °F) →  14
Thermal shock	Thermal shock resistance in CIP/SIP process with a temperature increase and decrease from +5 to +130 °C (+41 to +266 °F) within 2 seconds.
Process pressure range	The maximum possible process pressure depends on various influencing factors, such as the design, process connection and process temperature. For information on the maximum possible process pressures for the individual process connections, see the 'Process connection' section. →  14  It is possible to check the mechanical loading capacity depending on the installation and process conditions online using the Sizing Thermowell calculation tool in the Endress+Hauser Applicator software. This is valid for DIN thermowell calculations. https://portal.endress.com/webapp/applicator

Example of the permitted flow velocity depending on the immersion length and process medium

The maximum allowable flow velocity to which the thermowell can be exposed decreases as the immersion length of the measuring insert in the flowing medium increases. In addition, it is dependent on the diameter of the thermowell tip, the medium type, the process temperature and the process pressure. The following figures exemplify the maximum permitted flow velocities in water and superheated steam at a process pressure of 40 bar (580 PSI).



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3 Permitted flow velocities, protection tube diameter 9 mm (0.35 in)

- A Medium water at $T = 50\text{ °C}$ (122 °F)
B Medium superheated steam at $T = 160\text{ °C}$ (320 °F)
L Immersion length exposed to flow
v Flow velocity

Medium - state of aggregation

Gaseous or liquid (also with high viscosity, e.g. yogurt).

Mechanical construction

Design, dimensions

All dimensions in mm (in). The design depends on the thermowell version:

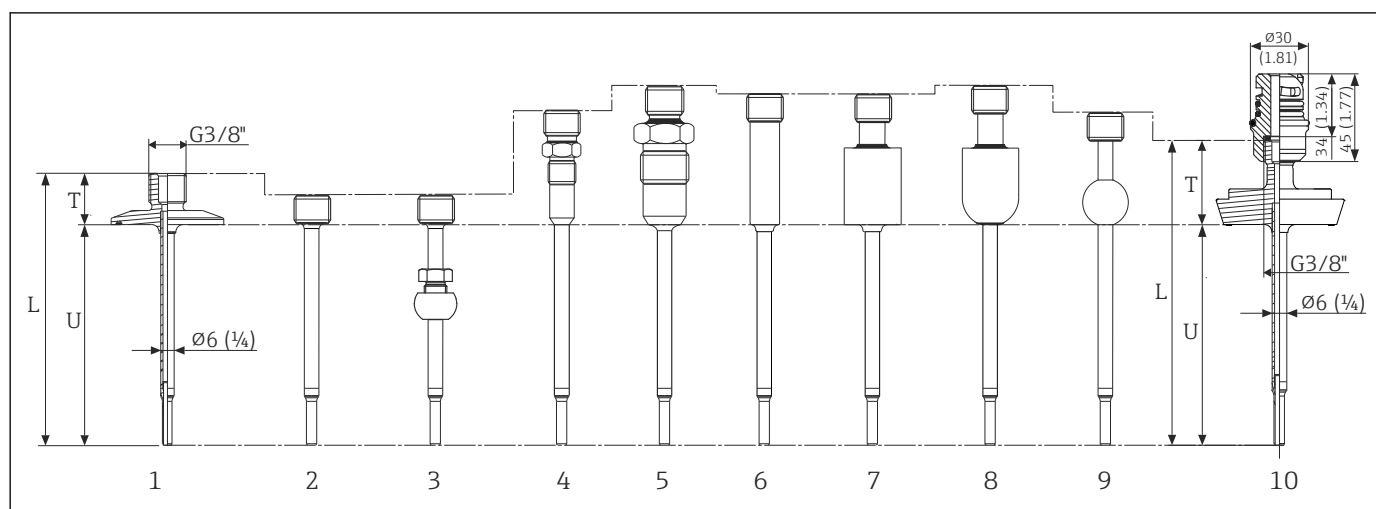
- Diameter 6 mm ($\frac{1}{4}$ in)
- Diameter 9 mm (0.35 in)
- Diameter 12.7 mm ($\frac{1}{2}$ in)
- Thermowell version as Tee thermowell and elbow thermowell as per DIN 11865/ASME BPE for weld-in

i Various dimensions, such as the immersion length U for example, are variable values and are therefore indicated as items in the following dimensional drawings.

Variable dimensions:

Item	Description
L	Thermowell length (U+T)
B	Thermowell bottom thickness: predefined, depends on thermowell version (see also the individual table data)
T	Length of thermowell shaft: variable or predefined, depends on thermowell version (see also the individual table data)
U	Immersion length: variable, depending on the configuration

Thermowell diameter 6 mm (1/4 in)



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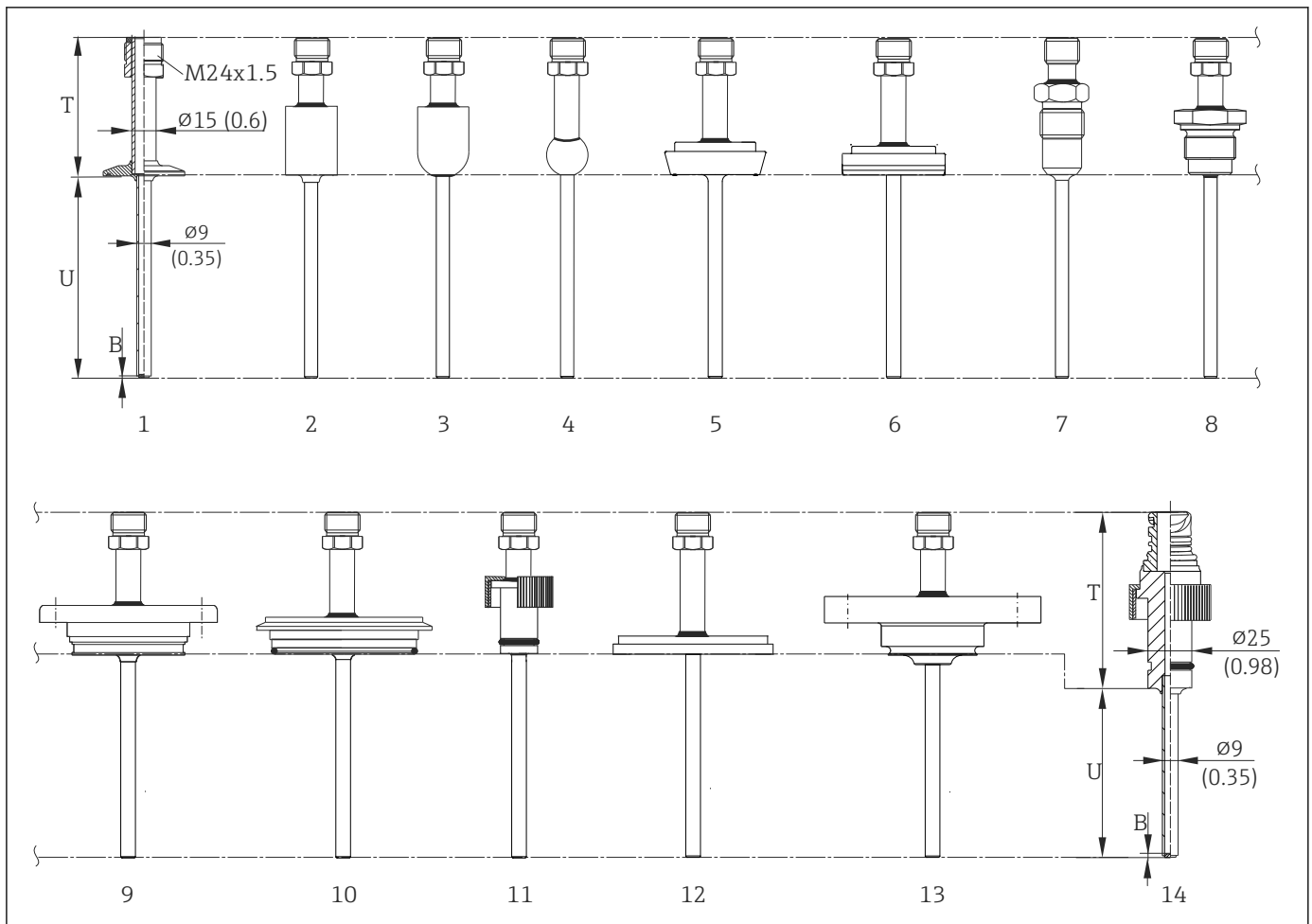
4 Thermowell with extension neck connection G3/8" and various process connection versions:

- 1 Clamp version
- 2 Without process connection
- 3 Spherical compression fitting TK40
- 4 Metal sealing system M12x1
- 5 Metal sealing system G½"
- 6 Cylindrical weld-in adapter Ø12 x 40 mm
- 7 Cylindrical weld-in adapter Ø30 x 40 mm
- 8 Spherical-cylindrical weld-in adapter Ø30 x 40 mm
- 9 Spherical weld-in adapter Ø25 mm
- 10 Sanitary connection according to DIN 11851 with threaded bottom part iTHERM QuickNeck, torque 5 Nm (3.69 lbf ft), glued with loctite® 270.

Item	Type of fitting	Length
Length of thermowell lagging T ¹⁾	Metal sealing system M12x1	46 mm (1.81 in)
	Metal sealing system G½"	60 mm (2.36 in)
	Tri-clamp (0.5"-0.75")	24 mm (0.94 in)
	Microclamp (DN8-18)	23 mm (0.91 in)
	Clamp DN12 according to ISO 2852	24 mm (0.94 in)
	Clamp DN25/DN40 according to ISO 2852	21 mm (0.83 in)
	Sanitary pipe DN25/DN32/DN40 according to DIN 11851	29 mm (1.14 in)
	Spherical-cylindrical weld-in adapter	58 mm (2.28 in)
	Cylindrical weld-in adapter Ø12 mm (0.47 in)	55 mm (2.17 in)
	Without process connection (only G3/8" thread)	11 mm (0.43 in)
	Cylindrical weld-in adapter	55 mm (2.17 in)
	Spherical weld-in adapter	47 mm (1.85 in)
Immersion length U	Independent of the version	Variable, depending on the configuration
Base thickness B	Reduced tip Ø4.3 mm (0.17 in)	3 mm (0.12 in)

1) Depends on the process connection

Thermowell diameter 9 mm (0.35 in)



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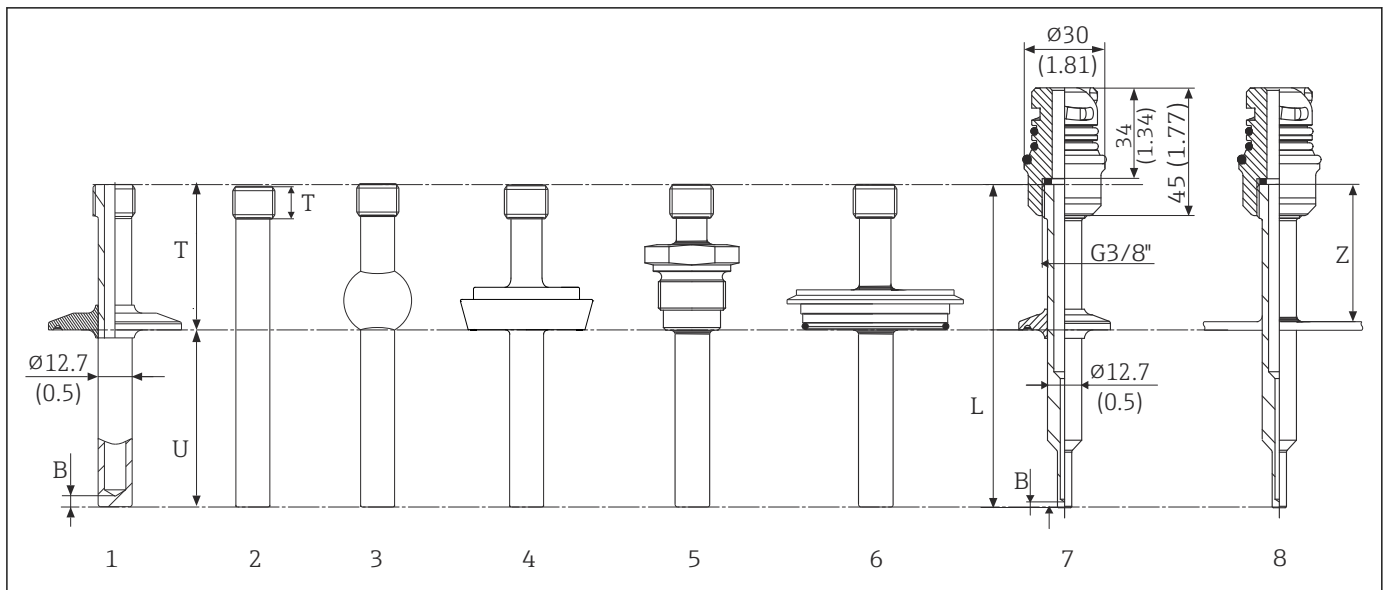
5 Thermowell with M24x1.5 connection thread and the following process connection versions:

- 1 Clamp according to ISO2852
- 2 Cylindrical weld-in adapter $\Phi 30 \times 40$ mm
- 3 Spherical-cylindrical weld-in adapter $\Phi 30 \times 40$ mm
- 4 Spherical weld-in adapter $\Phi 25$ mm
- 5 Sanitary connection according to DIN 11851
- 6 Aseptic pipe union according to DIN 11864-1 Form A
- 7 Metal sealing system $G\frac{1}{2}"$
- 8 Thread according to ISO 228 for Liquiphant weld-in adapter
- 9 APV Inline
- 10 Varivent®
- 11 Ingold connection
- 12 SMS 1147
- 13 Neumo Biocontrol
- 14 Ingold connection, for example with bottom part iTHERM QuickNeck

Item	Type of fitting	Length
Length of thermowell lagging T, without quick-fastening iTHERM QuickNeck		Variable, depending on the configuration
With quick-fastening iTHERM QuickNeck, depending on the process connection	SMS 1147, DN25	40 mm (1.57 in)
	SMS 1147, DN38	41 mm (1.61 in)
	SMS 1147, DN51	42 mm (1.65 in)
	Varivent®, type F, $\Phi D = 50$ mm (1.97 in)	52 mm (2.05 in)
	Varivent®, type N, $\Phi D = 68$ mm (2.67 in)	
	Varivent®, type B, $\Phi D = 31$ mm (1.22 in)	56 mm (2.2 in)

Item	Type of fitting	Length
	G1" thread according to ISO 228 for Liquiphant weld-in adapter	77 mm (3.03 in)
	Spherical-cylindrical weld-in adapter	70 mm (2.76 in)
	Cylindrical weld-in adapter	67 mm (2.64 in)
	Aseptic pipe union according to DIN11864-A, DN25	42 mm (1.65 in)
	Aseptic pipe union according to DIN11864-A, DN40	43 mm (1.7 in)
	Sanitary connection according to DIN 11851, DN32	47 mm (1.85 in)
	Sanitary connection according to DIN 11851, DN40	
	Sanitary connection according to DIN 11851, DN50	48 mm (1.89 in)
	Clamp according to ISO 2852, DN12	
	Clamp according to ISO 2852, DN25	37 mm (1.46 in)
	Clamp according to ISO 2852, DN40	39 mm (1.54 in)
	Clamp according to ISO 2852, DN63.5	
	Clamp according to ISO 2852, DN70	
	Microclamp (DN8-18)	47 mm (1.85 in)
	Tri-clamp (0.5"-0.75")	46 mm (1.81 in)
	Ingold connection $\phi 25$ mm (0.98 in) x 30 mm (1.18 in)	78 mm (3.07 in)
	Ingold connection $\phi 25$ mm (0.98 in) x 46 mm (1.81 in)	94 mm (3.7 in)
	Metal sealing system G $\frac{1}{2}$ "	77 mm (3.03 in)
	APV-Inline, DN50	51 mm (2.01 in)
Immersion length U	Independent of the version	Variable, depending on the configuration
Base thickness B	Reduced tip $\phi 5.3$ mm (0.21 in) x 20 mm (0.79 in)	3 mm (0.12 in)
	Tapered tip $\phi 6.6$ mm (0.26 in) x 60 mm (2.36 in)	2 mm (0.08 in)
	Straight tip	

Thermowell diameter 12.7 mm (½ in)



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6 Thermowell with extension neck connection G3/8" and various process connection versions:

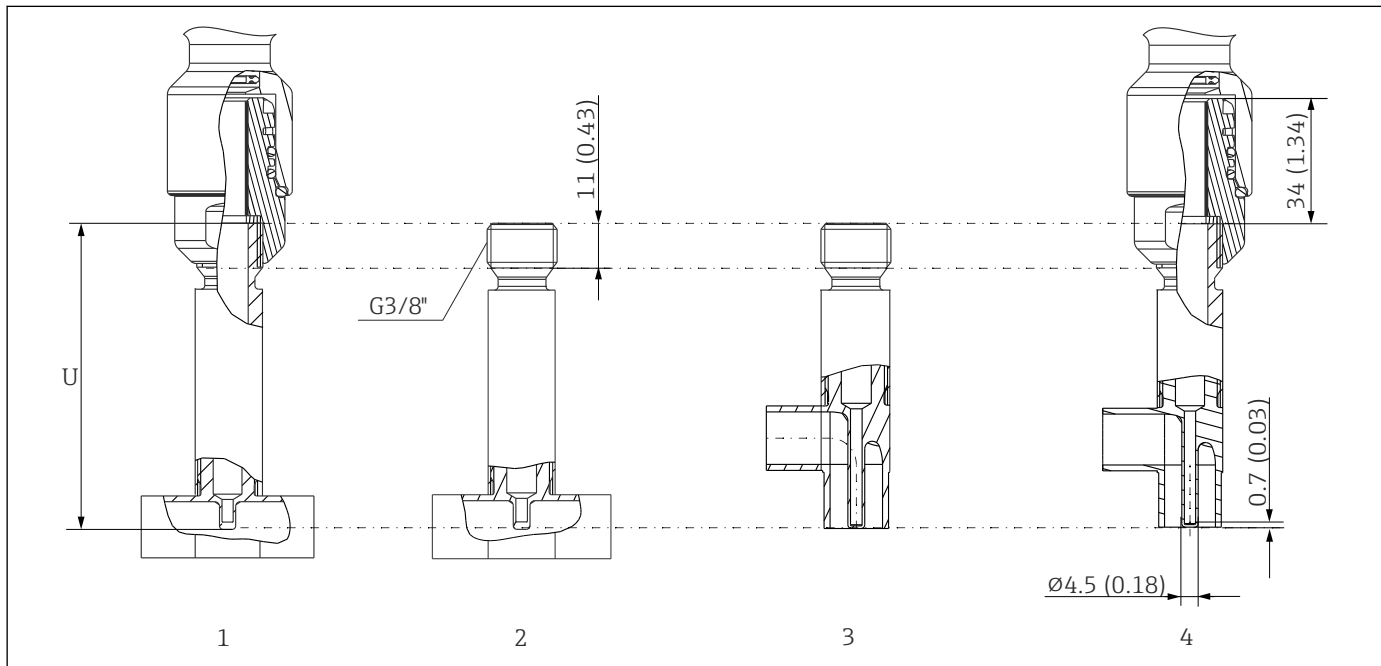
- 1 Clamp version
- 2 Cylindrical weld-in adapter $\phi 12.7$ mm (0.5 in)
- 3 Spherical weld-in adapter $\phi 25$ mm
- 4 Sanitary connection according to DIN 11851
- 5 Thread according to ISO 228 for Liquiphant weld-in adapter
- 6 Varivent®
- 7 Microclamp, threaded with QuickNeck bottom part, torque 5 Nm (3.69 lbf ft), and glued with loctite® 270, and reduced tip
- 8 Cylindrical weld-in adapter with QuickNeck bottom part

Welded thermowell at the tip

Item	Type of fitting	Length
Length of thermowell lagging T	Weld-in adapter, cylindrical, $\phi 12.7$ mm (½ in)	12 mm (0.47 in)
	All other process connections	65 mm (2.56 in)
Immersion length U	Independent of the process connection	Variable, depending on the configuration
Base thickness B	Reduced tip $\phi 5.3$ mm (0.21 in) x 20 mm (0.79 in)	3 mm (0.12 in)
	Reduced tip $\phi 8$ mm (0.31 in) x 32 mm (1.26 in)	4 mm (0.16 in)
	Straight tip	6 mm (0.24 in)
Minimum distance Z	Weld-in adapter, cylindrical, $\phi 12.7$ mm (½ in)	65 mm (2.56 in) With this version, the minimum distance from the welding seam to the QuickNeck bottom part must be observed as otherwise the gluing and sealing function in the QuickNeck cannot be guaranteed.

Thermowell version as tee thermowell or elbow thermowell, optimized

No welds, no dead legs



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 7 Thermowell as per DIN 11865 or ASME BPE

- 1 Tee thermowell with threaded iTHERM QuickNeck bottom part, torque 5 Nm (3.69 lbf ft) and glued with threadlocking adhesive
 - 2 Tee thermowell with extension neck connection G3/8"
 - 3 Elbow thermowell with extension neck connection G3/8"
 - 4 Elbow thermowell threaded iTHERM QuickNeck bottom part, torque 5 Nm (3.69 lbf ft) and glued with threadlocking adhesive
- U Immersion length

- Pipe sizes as per DIN 11865 series A (DIN), B (ISO) and C (ASME BPE) →  19
- 3-A marked for nominal diameters $\geq$ DN25 for 3-A, EHEDG and ASME BPE
- EHEDG certified for nominal diameters $\geq$ DN25 for 3-A, EHEDG and ASME BPE
- ASME BPE-compliant for nominal diameters $\geq$ DN25 for 3-A, EHEDG and ASME BPE
- IP69K protection class
- 1.4435+316L material, delta ferrite content $< 0.5\%$
- Temperature range: -60 to $+200$ °C (-76 to $+392$ °F)
- Pressure range: PN25 as per DIN 11865

 Due to the short immersion length U in the case of small pipe diameters, the use of iTHERM QuickSens inserts is recommended.

As a general rule, the longer the immersion length U the better the measurement accuracy. For small pipe diameters, it is therefore advisable to use elbow thermowells to enable a maximum immersion length U.

Suitable immersion lengths for the following thermometers:

- TMR35: 83 mm (3.27 in)
- iTHERM TM411: 85 mm (3.35 in)
- iTHERM TM311: 85 mm (3.35 in)
- iTHERM TrustSens TM371: 85 mm (3.35 in)

Possible combinations of the thermowell versions with the available process connections

Process connection and size	Thermowell diameter			iTHERM QuickNeck for Ø9 mm (0.35 in) ¹⁾
	6 mm (¼ in)	9 mm (0.35 in)	12.7 mm (½ in)	
Without process connection (for installation with compression fitting)	☑	-	-	-
Weld-in adapter				
Cylindrical Ø12.7 mm (½ in)	-	-	☑	-
Cylindrical Ø30 x 40 mm	☑	☑	-	☑
Cylindrical Ø12 x 40 mm		-	-	-
Spherical-cylindrical Ø30 x 40 mm	☑	☑	-	☑
Spherical Ø25 mm (0.98 in)	☑	☑	☑	-
Clamp according to ISO 2852				
Microclamp/Tri-clamp DN18 (0.75 in)	☑ ²⁾	☑	-	☑
DN12 - 21.3			☑	
DN25 -38 (1 - 1.5 in)	☑	☑	☑	☑
DN40 - 51 (2 in)			☑	
DN63.5 (2.5 in)	-	☑	☑	☑
DN70 - 76.5 (3 in)				
Sanitary connection according to DIN 11851				
DN25	☑	☑	☑	-
DN32, DN40				☑
DN50	-			☑
Aseptic pipe union according to DIN 11864-1 Form A				
DN25, DN40	-	☑	-	☑
Metal sealing system				
M12x1	☑	-	-	-
G½"		☑		☑
Thread according to ISO 228 for Liquiphant weld-in adapter				
G¾" for FTL20, FTL31, FTL33	-	☑	☑	-
G¾" for FTL50				-
G1" for FTL50				☑
APV Inline				
DN50	-	☑	-	☑
Varivent®				
Type B, Ø31 mm; type F, Ø50 mm ; type N, Ø68 mm	-	☑	☑	☑
Ingold connection				
25 x 30 mm or 25 x 46 mm	-	☑	-	☑
SMS 1147				
DN25, DN38, DN51	-	☑	-	☑
Neumo Biocontrol				
D25 PN16, D50 PN16, D65 PN16	-	☑	-	-

1) In the case of 6 mm (¼ in) and 12.7 mm (½ in) diameters, the iTHERM QuickNeck is available for all process connection versions.

2) Microclamp/Tri-clamp DN8 (0.5") only possible in conjunction with a thermowell diameter = 6 mm (¼ in).

Weight 0.5 to 2.5 kg (1 to 5.5 lbs) for standard versions.

Materials

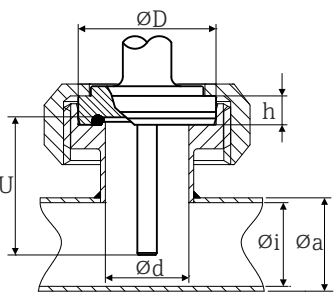
The temperatures for continuous operation specified in the following table are only intended as reference values for use of the various materials in air and without any significant compressive load. The maximum operating temperatures can be reduced considerably in cases where abnormal conditions such as high mechanical load occur or in aggressive media.

Name	Short formula	Recommended max. temperature for continuous use in air	Properties
AISI 316L (corresponds to 1.4404 or 1.4435)	X2CrNiMo17-13-2, X2CrNiMo18-14-3	650 °C (1 202 °F) ¹⁾	■ Austenitic stainless steel ■ High corrosion resistance in general ■ Particularly high corrosion resistance in chlorine-based and acidic, non-oxidizing atmospheres through the addition of molybdenum (e.g. phosphoric and sulfuric acids, acetic and tartaric acids with a low concentration) ■ Increased resistance to intergranular corrosion and pitting ■ The wetted part is a thermowell made of 316L or 1.4435+316L passivated with 3% sulfuric acid.
1.4435+316L, delta ferrite < 1% or < 0.5%	With regard to analytical limits, the specifications of both materials (1.4435 and 316L) are met simultaneously. In addition, the delta ferrite content of the parts in contact with the process is limited to <1% or <0.5%. ≤3% for weld seams (in accordance with Basel Standard II)		

- 1) Can be used to a limited extent up to 800 °C (1472 °F) for low compressive loads and in non-corrosive media. Contact your Endress+Hauser sales team for further information.

Process connections

All dimensions in mm (in).

Model	Type of fitting	Dimensions					Technical properties
		Ød	ØD	Øi	Øa	h	
Aseptic pipe union according to DIN 11864-1, Form A 	DN25	26 mm (1.02 in)	42.9 mm (1.7 in)	26 mm (1.02 in)	29 mm (1.14 in)	9 mm (0.35 in)	■ P_{max.} = 40 bar (580 psi) ■ With 3-A symbol and EHEDG certification ■ ASME BPE compliance
	DN40	38 mm (1.5 in)	54.9 mm (2.16 in)	38 mm (1.5 in)	41 mm (1.61 in)	10 mm (0.39 in)	

Weld-in

Model	Type of fitting	Dimensions	Technical properties
Weld-in adapter 1 2 3 4 5 A0009569	1: Cylindrical ¹⁾	$\phi d = 12.7 \text{ mm } (\frac{1}{2} \text{ in})$, U = immersion length from lower edge of thread, T = 12 mm (0.47 in)	■ $P_{\max.}$ depends on the weld-in process ■ With 3-A symbol and EHEDG certification ■ ASME BPE compliance
	2: Cylindrical ²⁾	$\phi d \times h = 12 \text{ mm } (0.47 \text{ in}) \times 40 \text{ mm } (1.57 \text{ in})$, T = 55 mm (2.17 in)	
	3: Cylindrical	$\phi d \times h = 30 \text{ mm } (1.18 \text{ in}) \times 40 \text{ mm } (1.57 \text{ in})$	
	4: Spherical-cylindrical	$\phi d \times h = 30 \text{ mm } (1.18 \text{ in}) \times 40 \text{ mm } (1.57 \text{ in})$	
	5: Spherical	$\phi d = 25 \text{ mm } (0.98 \text{ in})$ $h = 24 \text{ mm } (0.94 \text{ in})$	

1) For thermowell $\phi 12.7 \text{ mm } (\frac{1}{2} \text{ in})$

2) For thermowell $\phi 6 \text{ mm } (\frac{1}{4} \text{ in})$

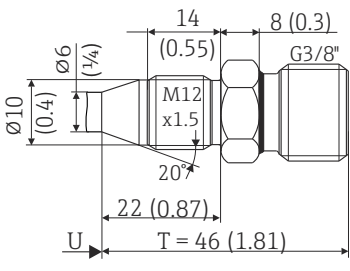
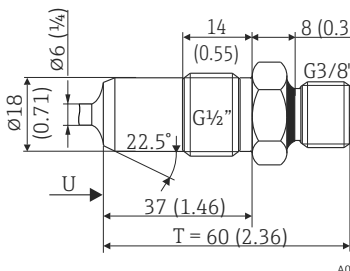
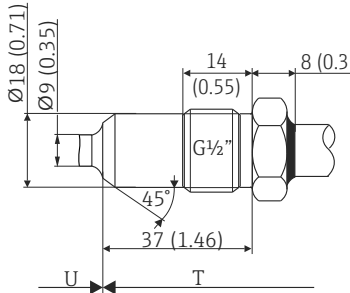
Releasable process connection

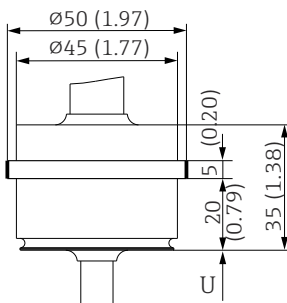
Model	Technical properties					
Sanitary connection according to DIN 11851 1 Centering ring 2 Sealing ring A0009561	■ 3-A marked and EHEDG certified (only with EHEDG-certified and self-centering sealing ring). ■ ASME BPE compliance					
Version ¹⁾	Dimensions	P _{max.}				
	ØD		A	B	Øi	Øa
DN25	44 mm (1.73 in)	30 mm (1.18 in)	10 mm (0.39 in)	26 mm (1.02 in)	29 mm (1.14 in)	40 bar (580 psi)
DN32	50 mm (1.97 in)	36 mm (1.42 in)	10 mm (0.39 in)	32 mm (1.26 in)	35 mm (1.38 in)	40 bar (580 psi)
DN40	56 mm (2.2 in)	42 mm (1.65 in)	10 mm (0.39 in)	38 mm (1.5 in)	41 mm (1.61 in)	40 bar (580 psi)
DN50	68 mm (2.68 in)	54 mm (2.13 in)	11 mm (0.43 in)	50 mm (1.97 in)	53 mm (2.1 in)	25 bar (363 psi)

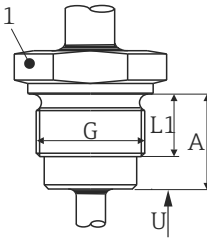
1) Pipes in accordance with DIN 11850

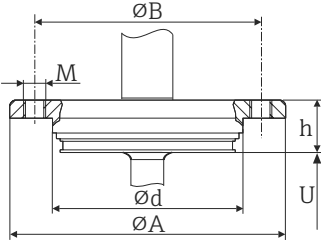
Model	Type of fitting	Dimensions		Technical properties	Conformity
	ϕd ¹⁾	ϕD	ϕa		
Clamp according to ISO 2852 Form A: In compliance with ASME BPE Type A Form B: In compliance with ASME BPE Type B and ISO 2852 A0009566	Microclamp ²⁾ DN8-18 (0.5"-0.75") ³⁾ , Form A	25 mm (0.98 in)	-	■ $P_{max.} = 16$ bar (232 psi), depends on clamp ring and suitable seal ■ With 3-A symbol	-
	Tri-clamp DN8-18 (0.5"-0.75") ³⁾ , Form B		-		Based on ISO 2852 ⁴⁾
	Clamp DN12-21.3, Form B	34 mm (1.34 in)	16 to 25.3 mm (0.63 to 0.99 in)		ISO 2852
	Clamp DN25-38 (1"-1.5"), Form B	50.5 mm (1.99 in)	29 to 42.4 mm (1.14 to 1.67 in)	■ $P_{max.} = 16$ bar (232 psi), depends on clamp ring and suitable seal ■ 3-A marked and EHEDG certified (in connection with Combifit seal) ■ Can be used with 'Novaseptic Connect (NA Connect)' which enables flush-mount installation	ASME BPE Type B; ISO 2852
	Clamp DN40-51 (2"), Form B	64 mm (2.52 in)	44.8 to 55.8 mm (1.76 to 2.2 in)		ASME BPE Type B; ISO 2852
	Clamp DN63.5 (2.5"), Form B	77.5 mm (3.05 in)	68.9 to 75.8 mm (2.71 to 2.98 in)		ASME BPE Type B; ISO 2852
	Clamp DN70-76.5 (3"), Form B	91 mm (3.58 in)	> 75.8 mm (2.98 in)		ASME BPE Type B; ISO 2852

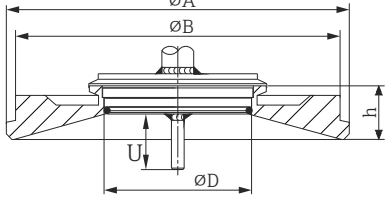
- 1) Pipes in accordance with ISO 2037 and BS 4825 Part 1
- 2) Microclamp (not in ISO 2852); no standard pipes
- 3) DN8 (0.5") only possible with thermowell diameter = 6 mm (¼ in)
- 4) Groove diameter = 20 mm

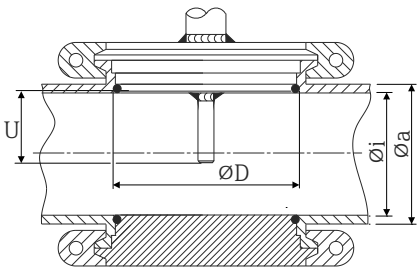
Model	Type of fitting	Technical properties
Metal sealing system		
M12x1.5  A0009574	G½"  A0020856	Thermowell diameter 6 mm (¼ in) P _{max.} = 16 bar (232 psi)  Maximum torque = 10 Nm (7.38 lbf ft)
-	 A0009571	Thermowell diameter 9 mm (0.35 in) P _{max.} = 16 bar (232 psi)  Maximum torque = 10 Nm (7.38 lbf ft)

Model	Type of fitting	Technical properties
Process adapter  A0034881	D45	-

Model	Version G	Dimensions			Technical properties
		L1 thread length	A	1 (SW/AF)	
Thread according to ISO 228 (for Liquiphant weld-in adapter)  A0009572	G¾" for FTL20/31/33 adapter	16 mm (0.63 in)	25.5 mm (1 in)	32	- P_{max.} = 25 bar (362 psi) at max. 150 °C (302 °F) - P_{max.} = 40 bar (580 psi) at max. 100 °C (212 °F) - For information on hygienic compliance in conjunction with the FTL31/33/50 adapter, see TI00426F.
	G¾" for FTL50 adapter				
	G1" for FTL50 adapter	18.6 mm (0.73 in)	29.5 mm (1.16 in)	41	

Model	Type of fitting	Dimensions					Technical properties
		ϕd	ϕA	ϕB	M	h	
APV Inline  A0018435	DN50	69 mm (2.72 in)	99.5 mm (3.92 in)	82 mm (3.23 in)	2xM8	19 mm (0.75 in)	■ $P_{max.} = 25$ bar (362 psi) ■ With 3-A symbol and EHEDG certification ■ ASME BPE compliance

Model	Type of fitting	Dimensions				Technical properties	
		ØD	ØA	ØB	h	P _{max.}	
 A0021307	Type B	31 mm (1.22 in)	105 mm (4.13 in)	-	22 mm (0.87 in)	10 bar (145 psi)	■ With 3-A symbol and EHEDG certification ■ ASME BPE compliance
	Type F	50 mm (1.97 in)	145 mm (5.71 in)	135 mm (5.31 in)	24 mm (0.95 in)		
	Type N	68 mm (2.67 in)	165 mm (6.5 in)	155 mm (6.1 in)	24.5 mm (0.96 in)		
 The VARINLINE® housing connection flange is suitable for welding into the conical or torispherical head in tanks or containers with a small diameter (≤ 1.6 m (5.25 ft)) and up to a wall thickness of 8 mm (0.31 in).							

Model	Technical properties
Varivent® for VARINLINE® housing for installation in pipes  A0009564	■ With 3-A symbol and EHEDG certification ■ ASME BPE compliance

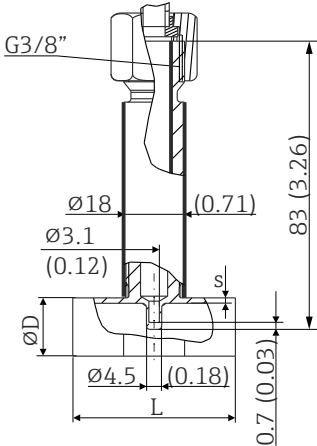
Version	Dimensions			$P_{max.}$
	ϕD	ϕi	ϕa	
Type N, according to DIN 11866, series A	68 mm (2.67 in)	DN40: 38 mm (1.5 in)	DN40: 41 mm (1.61 in)	DN40 to DN65: 16 bar (232 psi)
		DN50: 50 mm (1.97 in)	DN50: 53 mm (2.1 in)	
		DN65: 66 mm (2.6 in)	DN65: 70 mm (2.76 in)	
		DN80: 81 mm (3.2 in)	DN80: 85 mm (3.35 in)	DN80 to DN150: 10 bar (145 psi)
		DN100: 100 mm (3.94 in)	DN100: 104 mm (4.1 in)	
		DN125: 125 mm (4.92 in)	DN125: 129 mm (5.08 in)	
Type N, according to EN ISO 1127, series B	68 mm (2.67 in)	38.4 mm (1.51 in)	42.4 mm (1.67 in)	42.4 mm (1.67 in) to 60.3 mm (2.37 in): 16 bar (232 psi)
		44.3 mm (1.75 in)	48.3 mm (1.9 in)	

Model				Technical properties
		56.3 mm (2.22 in)	60.3 mm (2.37 in)	76.1 mm (3 in) to 114.3 mm (4.5 in): 10 bar (145 psi)
		72.1 mm (2.84 in)	76.1 mm (3 in)	
		82.9 mm (3.26 in)	42.4 mm (3.5 in)	
		108.3 mm (4.26 in)	114.3 mm (4.5 in)	
Type N, according to DIN 11866, series C	68 mm (2.67 in)	OD 1½": 34.9 mm (1.37 in)	OD 1½": 38.1 mm (1.5 in)	OD 1½" to OD 2½": 16 bar (232 psi)
		OD 2": 47.2 mm (1.86 in)	OD 2": 50.8 mm (2 in)	
		OD 2½": 60.2 mm (2.37 in)	OD 2½": 63.5 mm (2.5 in)	
Type N, according to DIN 11866, series C	68 mm (2.67 in)	OD 3": 73 mm (2.87 in)	OD 3": 76.2 mm (3 in)	OD 3" to OD 4": 10 bar (145 psi)
		OD 4": 97.6 mm (3.84 in)	OD 4": 101.6 mm (4 in)	



Due to the short immersion length U, the use of iTHERM QuickSens inserts is recommended.

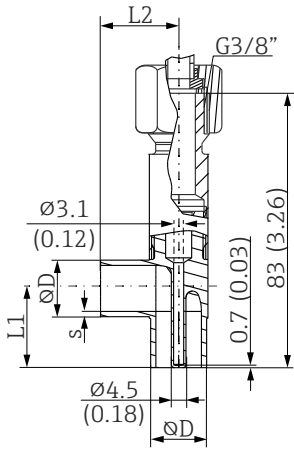
Tee thermowell, optimized (no welding, no dead legs)

Model	Type of fitting		Dimensions in mm (in)			Technical properties
			ØD	L	s ¹⁾	
Tee thermowell for weld-in as per DIN 11865 (series A, B and C)  A0035898	Series A	DN10 PN25	13 mm (0.51 in)	48 mm (1.89 in)	1.5 mm (0.06 in)	■ P_{max.} = 25 bar (362 psi) ■ 3-A marked²⁾ and EHEDG certified²⁾ ■ ASME BPE compliance²⁾
		DN15 PN25	19 mm (0.75 in)			
		DN20 PN25	23 mm (0.91 in)			
		DN25 PN25	29 mm (1.14 in)			
		DN32 PN25	32 mm (1.26 in)			
	Series B	DN13.5 PN25	13.5 mm (0.53 in)		1.6 mm (0.063 in)	
		DN17.2 PN25	17.2 mm (0.68 in)			
		DN21.3 PN25	21.3 mm (0.84 in)			
		DN26.9 PN25	26.9 mm (1.06 in)		2 mm (0.08 in)	
		DN33.7 PN25	33.7 mm (1.33 in)			
	Series C	DN12.7 PN25 (½")	12.7 mm (0.5 in)		1.65 mm (0.065 in)	
		DN19.05 PN25 (¾")	19.05 mm (0.75 in)			
		DN25.4 PN25 (1")	25.4 mm (1 in)			
		DN38.1 PN25 (1½")	38.1 mm (1.5 in)			

1) Wall thickness

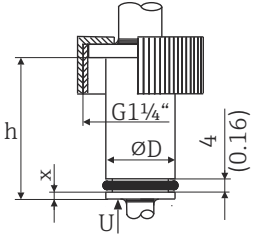
2) Applies to ≥ DN25. The radius ≥ 3.2 mm (⅛ in) cannot be maintained for smaller nominal diameters.

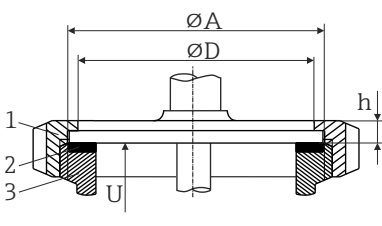
Elbow thermowell, optimized (no welding, no dead legs)

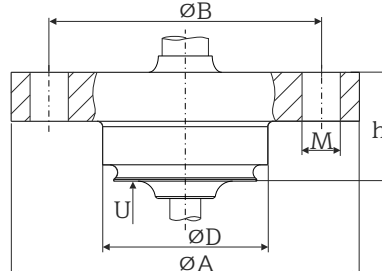
Model	Type of fitting		Dimensions				Technical properties
			ØD	L1	L2	s ¹⁾	
Elbow thermowell for weld-in as per DIN 11865 (series A, B and C)  A0035899	Series A	DN10 PN25	13 mm (0.51 in)	22 mm (0.87 in)	24 mm (0.95 in)	1.5 mm (0.06 in)	■ P_{max.} = 25 bar (362 psi) ■ 3-A marked²⁾ and EHEDG certified²⁾ ■ ASME BPE compliance²⁾
		DN15 PN25	19 mm (0.75 in)	25 mm (0.98 in)			
		DN20 PN25	23 mm (0.91 in)	27 mm (1.06 in)			
		DN25 PN25	29 mm (1.14 in)	30 mm (1.18 in)			
		DN32 PN25	35 mm (1.38 in)	33 mm (1.3 in)			
	Series B	DN13.5 PN25	13.5 mm (0.53 in)	22 mm (0.87 in)	24 mm (0.95 in)	1.6 mm (0.063 in)	
		DN17.2 PN25	17.2 mm (0.68 in)	24 mm (0.95 in)			
		DN21.3 PN25	21.3 mm (0.84 in)	26 mm (1.02 in)			
		DN26.9 PN25	26.9 mm (1.06 in)	29 mm (1.14 in)			
		DN33.7 PN25	33.7 mm (1.33 in)	32 mm (1.26 in)		2.0 mm (0.08 in)	
	Series C	DN12.7 PN25 (½")	12.7 mm (0.5 in)	22 mm (0.87 in)	24 mm (0.95 in)	1.65 mm (0.065 in)	
		DN19.05 PN25 (¾")	19.05 mm (0.75 in)	25 mm (0.98 in)			
		DN25.4 PN25 (1")	25.4 mm (1 in)	28 mm (1.1 in)			
		DN38.1 PN25 (1½")	38.1 mm (1.5 in)	35 mm (1.38 in)			

1) Wall thickness

2) Applies to ≥ DN25. The radius ≥ 3.2 mm (1/8 in) cannot be maintained for smaller nominal diameters.

Model	Version, dimensions ØD x h	Technical properties
Ingold connection  A0009573	Ø25 mm (0.98 in) x 30 mm (1.18 in) x = 1.5 mm (0.06 in)	P _{max.} = 25 bar (362 psi) A seal is included in the scope of delivery. V75SR material: Complies with FDA, 3-A Sanitary Standard 18-03 Class 1 and USP Class VI
	Ø25 mm (0.98 in) x 46 mm (1.81 in) x = 6 mm (0.24 in)	

Model	Type of fitting	Dimensions			Technical properties
		ϕD	ϕA	h	
SMS 1147  1 Cap nut 2 Sealing ring 3 Counterpart connection A0009568	DN25	32 mm (1.26 in)	35.5 mm (1.4 in)	7 mm (0.28 in)	P _{max.} = 6 bar (87 psi)
	DN38	48 mm (1.89 in)	55 mm (2.17 in)	8 mm (0.31 in)	
	DN51	60 mm (2.36 in)	65 mm (2.56 in)	9 mm (0.35 in)	
 The counterpart connection must fit the sealing ring and fix it in place.					

Model	Type of fitting	Dimensions					Technical properties
		ΦA	ΦB	ΦD	Φd	h	
Neumo Biocontrol  A0018497	D25 PN16	64 mm (2.52 in)	50 mm (1.97 in)	30.4 mm (1.2 in)	7 mm (0.28 in)	20 mm (0.79 in)	■ P_{max.} = 16 bar (232 psi) ■ With 3-A symbol
	D50 PN16	90 mm (3.54 in)	70 mm (2.76 in)	49.9 mm (1.97 in)	9 mm (0.35 in)	27 mm (1.06 in)	
	D65 PN25	120 mm (4.72 in)	95 mm (3.74 in)	67.9 mm (2.67 in)	11 mm (0.43 in)		



The 316L compression fittings can only be used once due to deformation. This applies to all the components of the compression fittings! A replacement compression fitting must be secured at another point (grooves in thermowell). PEEK compression fittings must never be used at a temperature that is lower than the temperature present when the compression fitting is secured. This is because the fitting would no longer be leak-tight as a result of heat contraction of the PEEK material.

For higher requirements: SWAGELOCK or similar fittings are urgently recommended.

Surface roughness

Values for process/product contact surfaces:

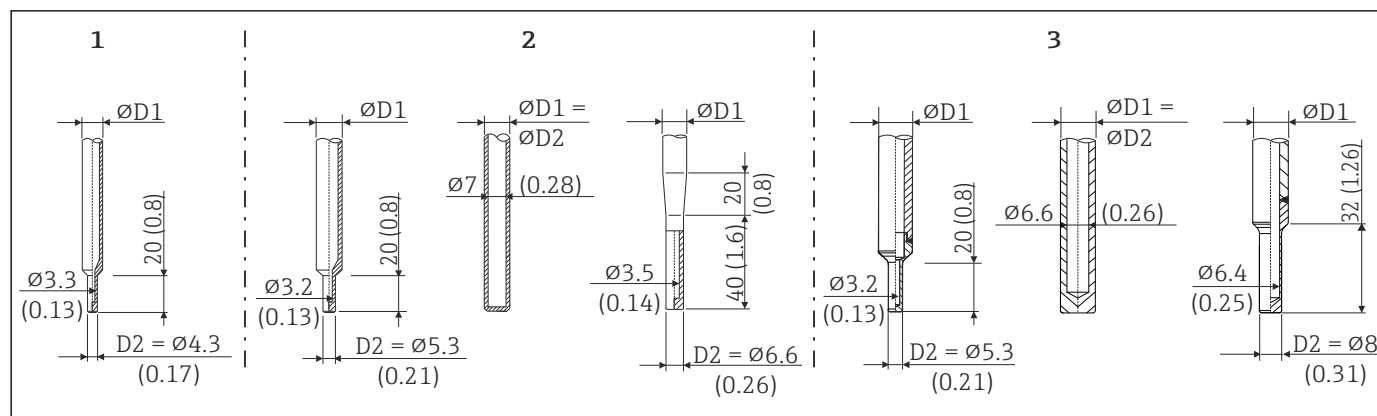
Standard surface, mechanically polished ¹⁾	$R_a \leq 0.76 \mu\text{m (30 } \mu\text{in)}$
Mechanically polished ¹⁾ , buffed ²⁾	$R_a \leq 0.38 \mu\text{m (15 } \mu\text{in)}$
Mechanically polished ¹⁾ , buffed and electropolished	$R_a \leq 0.38 \mu\text{m (15 } \mu\text{in)} + \text{electropolished}$

- 1) Or any other finishing method that meets the $R_a \text{ max}$
- 2) Non-compliant with ASME BPE

Shape of tip

The thermal response time, the reduction of the flow cross-section and the mechanical load that occurs in the process are the criteria that matter when selecting the shape of the tip. Advantages of using reduced or tapered thermometer tips:

- A smaller tip shape has less impact on the flow characteristics of the pipe carrying the medium.
- The flow characteristics are optimized, thereby increasing the stability of the thermowell.
- Endress+Hauser offers users a range of thermowell tips to meet every requirement:
 - Reduced tip with $\varnothing 4.3$ mm (0.17 in) and $\varnothing 5.3$ mm (0.21 in): walls of lower thickness significantly reduce the response times of the overall measuring point.
 - Tapered tip with $\varnothing 6.6$ mm (0.26 in) and reduced tip with $\varnothing 8$ mm (0.31 in): walls of greater thickness are particularly well suited to applications with a higher degree of mechanical load or wear (e.g. pitting, abrasion etc.).



A0017174

8 Thermowell tips available (reduced, straight or tapered)

Item no.	Thermowell ($\varnothing D1$)	Insert ($\varnothing ID$)	
1	$\varnothing 6$ mm ($\frac{1}{4}$ in)	Reduced tip	$\varnothing 3$ mm ($\frac{1}{8}$ in)
2	$\varnothing 9$ mm (0.35 in)	■ Reduced tip with $\varnothing 5.3$ mm (0.21 in) ■ Straight tip ■ Tapered tip with $\varnothing 6.6$ mm (0.26 in)	■ $\varnothing 3$ mm ($\frac{1}{8}$ in) ■ $\varnothing 6$ mm ($\frac{1}{4}$ in) ■ $\varnothing 3$ mm ($\frac{1}{8}$ in)
3	$\varnothing 12.7$ mm ($\frac{1}{2}$ in)	■ Reduced tip with $\varnothing 5.3$ mm (0.21 in) ■ Straight tip ■ Reduced tip with $\varnothing 8$ mm (0.31 in)	■ $\varnothing 3$ mm ($\frac{1}{8}$ in) ■ $\varnothing 6$ mm ($\frac{1}{4}$ in) ■ $\varnothing 6$ mm ($\frac{1}{4}$ in)

i It is possible to check the mechanical loading capacity as a function of the installation and process conditions online using the Sizing Thermowell calculation tool in the Endress+Hauser Applicator software. <https://portal.endress.com/webapp/applicator>

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

Hygiene standard

- ASME BPE (latest edition), certificate of conformity can be ordered for indicated options.
- 3-A Certificate Authorization No. 1144, 3-A Sanitary Standard 74-07. Listed process connections.
- EHEDG certificate, type EL CLASS I. EHEDG-certified/tested process connections.
- FDA-compliant
- All process-wetted parts comply with the requirements of guideline EMA/410/01 Rev.3. Additionally, no grinding or polishing agents derived from animals were used in the manufacturing of the process-wetted parts.

Materials in contact with food/product (FCM)

The process contact parts (FCM) are in conformity with the following European Regulations:

- Regulation (EC) No 1935/2004, on materials and articles intended to come into contact with food, article 3, paragraph 1, article 5 and 17.
- Regulation (EC) No 2023/2006 on good manufacturing practice for materials and articles intended to come into contact with food.
- Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food.

CRN approval

The CRN approval is only available for certain thermowell versions. These versions are identified and displayed accordingly during the configuration of the device.

Detailed ordering information is available for your nearest sales organization www.addresses.endress.com or in the Download Area under www.endress.com :

1. Select the country
2. Select Downloads
3. In the search area: select Approvals/approval type
4. Enter the product code or device
5. Start the search

Surface purity

- Free from oil and grease for O₂ applications, optional
- PWIS-free (PWIS = paint-wetting impairment substances as per DIL0301), optional

Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

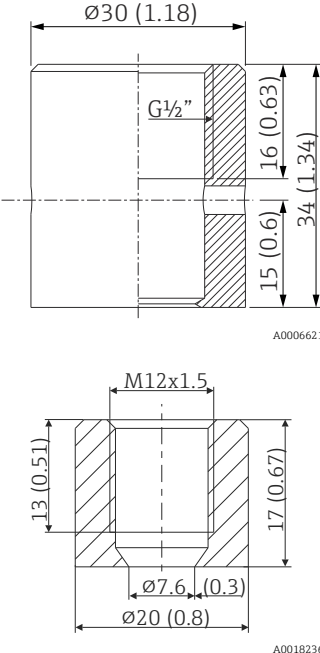
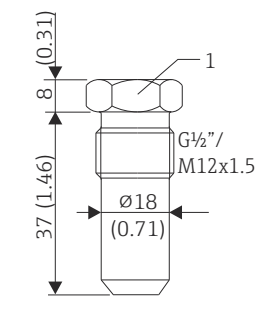
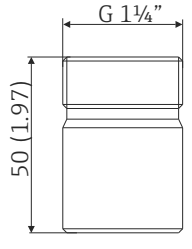
**Product Configurator - the tool for individual product configuration**

- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as the measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Device-specific accessories

Accessories	Description
Welding boss with sealing taper (metal - metal)  A0006621	Welding boss for G$\frac{1}{2}$" and M12x1.5 thread Metal-sealing; conical Material of wetted parts: 316L/1.4435 Max. process pressure 16 bar (232 PSI) Order number: 71424800 (G$\frac{1}{2}$") 71405560 (M12x1.5)
Dummy plug  1 Size across flats SW22 A0045726	Dummy plug for G$\frac{1}{2}$" or M12x1.5 conical metal-sealing welding boss Material: SS 316L/1.4435 Order number: 71424800 (G$\frac{1}{2}$") 71535692 (M12x1.5)
Weld-in adapter for Ingold process connection (OD25 mm (0.98 in)x50 mm (1.97 in))  A0008956	Material of wetted parts: 316L/1.4435 Weight: 0.32 kg (0.7 lb) Adapter for Ingold process connection with 3.1 material certificate, order number: 71531585 Adapter for Ingold process connection, order number: 71531588 O-ring seal set - Silicone O-ring in accordance with FDA CFR 21 - Maximum temperature: 230 °C (446 °F) Order number: 71220351

Weld-in adapter

For more information about order codes and hygienic compliance of the adapters and spare parts, see Technical Information (TI00426F).

Weld-in adapter						
	G 3/4", d=29 for pipe-mounting	G 3/4", d=50 for vessel-mounting	G 3/4", d=55 with flange	G 1", d=53 without flange	G 1", d=60 with flange	G 1" adjustable
Material	316L (1.4435)	316L (1.4435)	316L (1.4435)	316L (1.4435)	316L (1.4435)	316L (1.4435)
Roughness μm (μin) process side	≤ 1.5 (59.1)	≤ 0.8 (31.5)	≤ 0.8 (31.5)	≤ 0.8 (31.5)	≤ 0.8 (31.5)	≤ 0.8 (31.5)



Maximum process pressure for the weld-in adapters:

- 25 bar (362 PSI) at maximum 150 °C (302 °F)
- 40 bar (580 PSI) at maximum 100 °C (212 °F)

Documentation

The following types of documentation are available on the product pages and in the Download Area of the Endress+Hauser website (www.endress.com/downloads) (depending on the selected device version):

Document	Purpose and content of the document
Technical Information (TI)	Planning aid for your device The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Brief Operating Instructions (KA)	Guide that takes you quickly to the 1st measured value The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.
Operating Instructions (BA)	Your reference document These Operating Instructions contain all the information that is required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.
Description of Device Parameters (GP)	Reference for your parameters The document provides a detailed explanation of each individual parameter. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.
Safety Instructions (XA)	Safety Instructions (XA) are supplied with the device, depending on the approval. These are an integral part of the Operating Instructions. The nameplate indicates which Safety Instructions (XA) apply to the device.
Supplementary device-dependent documentation (SD/FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is an integral part of the device documentation.



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