Technical Information
iTHERM TT411

Thermometer protection tube for hygienic and aseptic applications

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: hygiene standards as per 3-A®, EHEDG, ASME BPE, FDA, TSE Certificate of Suitability
- Optional: 1.4435 material, delta ferrite content < 1%
- Fast response time owing to reduced tips with thin walls

Endress+Hauser
People for Process Automation

Installation

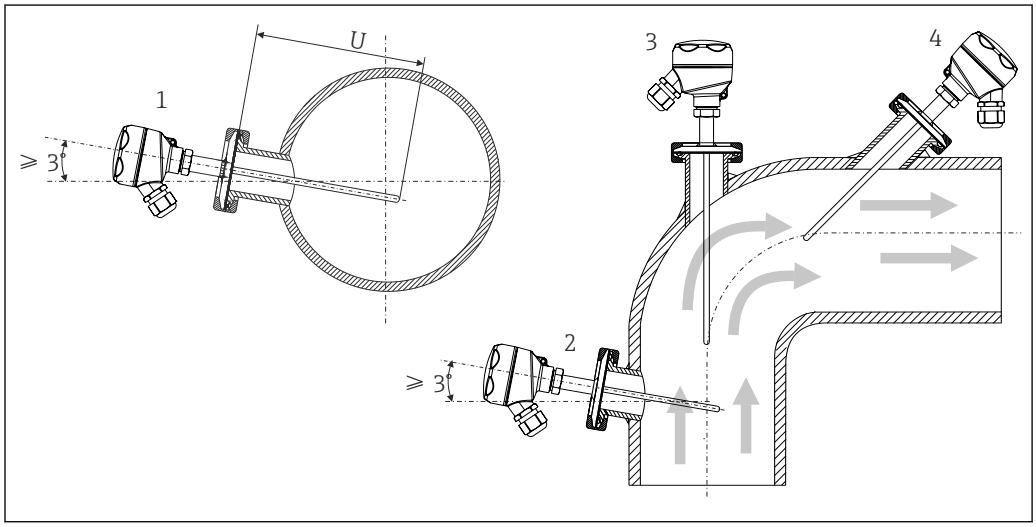
Orientation

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 accuracy. If the immersion length is too small then errors in the measurement are caused by heat conduction via the process connection and the container wall. If installing into a pipe then the immersion length should ideally be half of the pipe diameter.

Installation possibilities: Pipes, tanks or other plant components

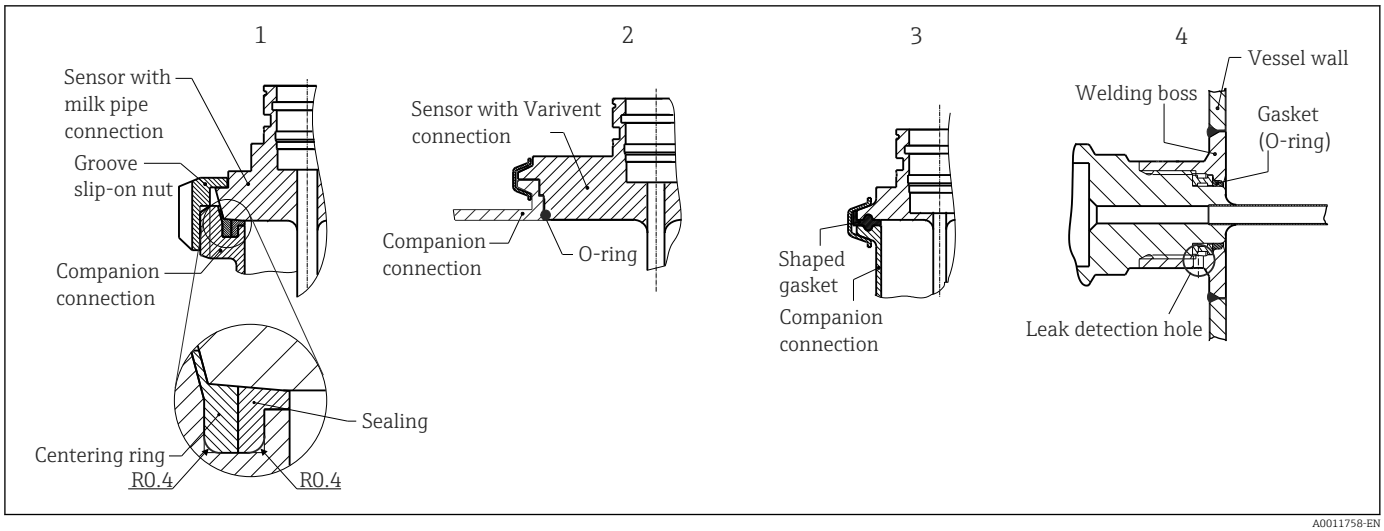


1 *Installation examples*

1, 2 Perpendicular to the flow direction, installed at a minimum angle of 3° to ensure self-draining
3 On elbows
4 Inclined installation in pipes with a small nominal diameter
U Immersion length

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).

The use of iTHERM QuickSens inserts is recommended for immersion lengths U < 70 mm (27.6 in).



2 *Detailed installation instructions for hygiene-compliant installation*

1 *Sanitary connection according to DIN 11851, only in connection with EHEDG-certified and self-centering sealing ring*
2 *Varivent® process connection for VARINLINE® housing*
3 *Clamp according to ISO 2852*
4 *Liquiphant-M G1" process connection, horizontal installation*

The counterpieces for the process connections and the seals or sealing rings are not included in the scope of supply for the thermometer. Liquiphant M weld-in adapters with associated 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:

- Suitable welding material
- Flush-welded or with welding radius > 3.2 mm (0.13 in)
- No recesses, folds or gaps
- Honed and polished surface, Ra ≤ 0.76 µm (0.03 µin)

Process

Process temperature range

Maximum −200 to +650 °C (−328 to +1 202 °F)(→ 12)

Thermal shock

Thermal shock resistance in CIP/SIP process with a temperature increase from +5 to +130 °C (+41 to +266 °F) within 2 seconds.

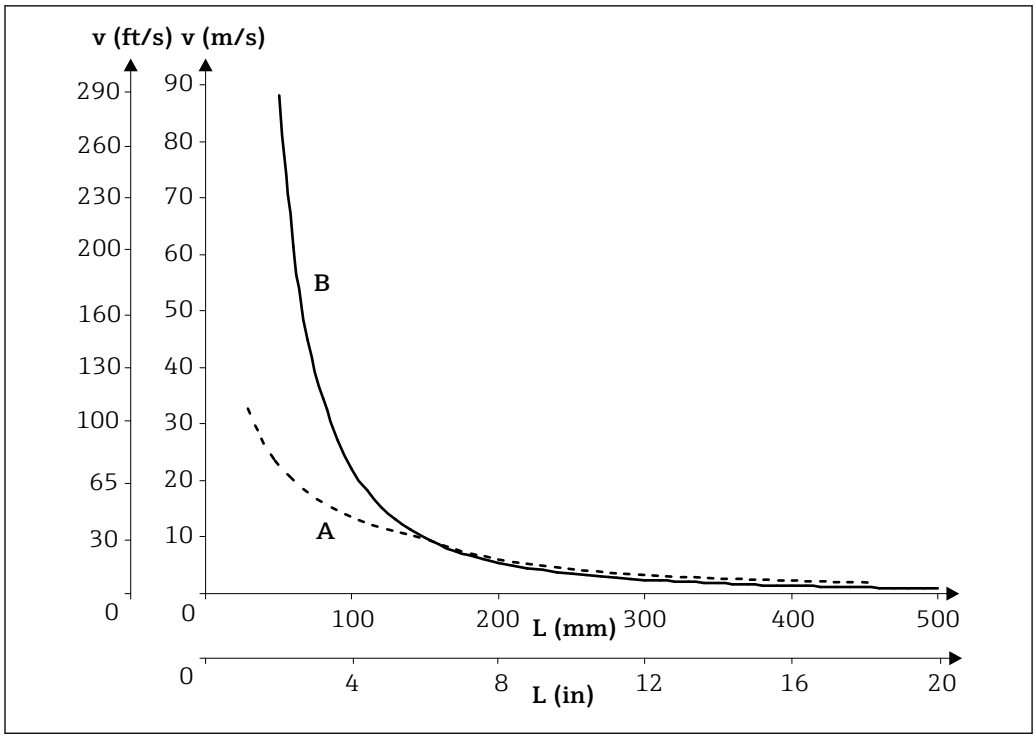
Process pressure range

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. (→ 12)

It is possible to check the mechanical loading capacity as a function of the installation and process conditions online in the TW Sizing Module for protection tubes in the Endress+Hauser Applicator software. See 'Accessories' section.

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

The highest flow velocity tolerated by the protection tube diminishes with increasing insert immersion length exposed to the stream of the fluid. In addition, it is dependent on the diameter of the tip of the protection tube, the medium type, process temperature and 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).



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

A Medium water at T = 50 °C (122 °F)
B Medium superheated steam at T = 400 °C (752 °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

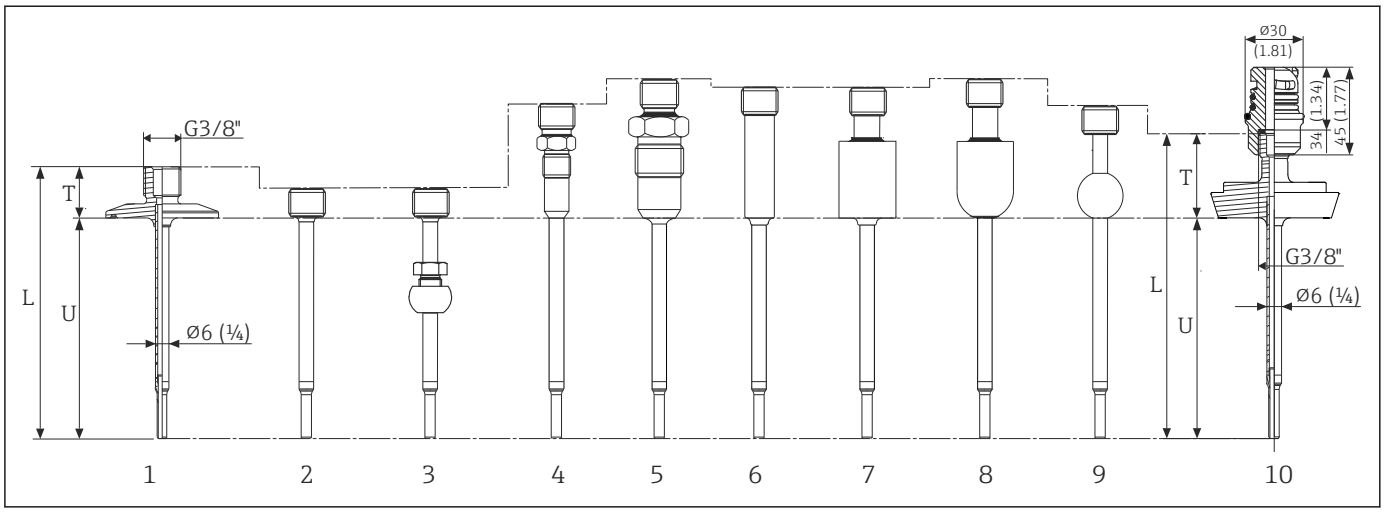
All dimensions in mm (in). The design depends on the protection tube version:
- Diameter 6 mm (¼ in)
- Diameter 9 mm (0.35 in)
- Diameter 12.7 mm (½ in)
- T-piece and corner-piece protection tube version as per DIN 11865 / ASME BPE 2012 for weld-in

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

Variable dimensions:

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

Protection tube diameter 6 mm (¼ in)



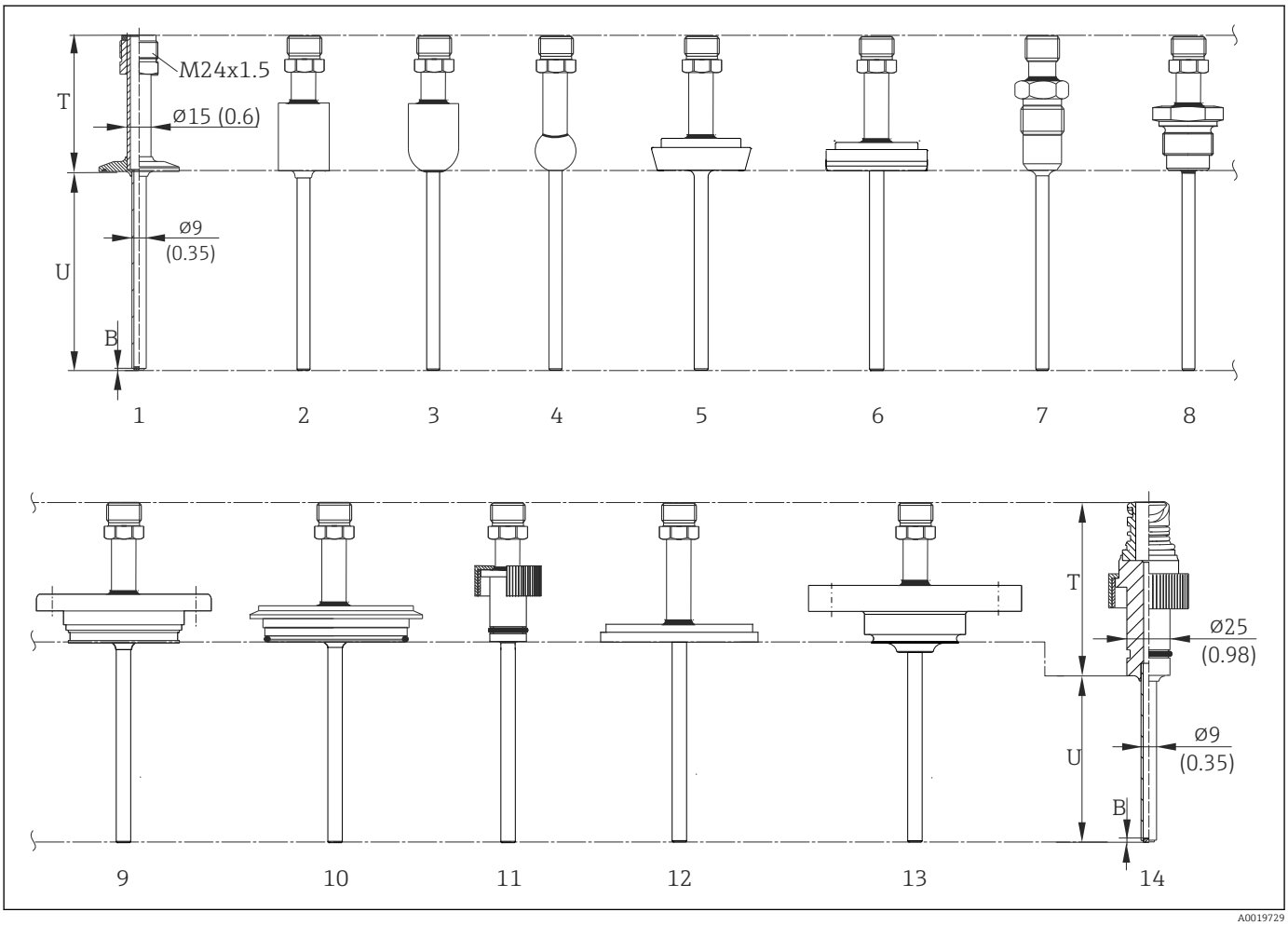
4 *Protection tube with neck connection G3/8" and various process connection versions:*

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 Φ12 x 40 mm
7 Cylindrical weld-in adapter Φ30 x 40 mm
8 Spherical-cylindrical weld-in adapter Φ30 x 40 mm
9 Spherical weld-in adapter Φ25 mm
10 Sanitary connection according to DIN 11851 with threaded base part iTHERM QuickNeck, torque 5 Nm, glued with loctite® 270.

Item	Version	Length
Length of protection tube shaft 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 connection DN25/DN32/DN40 according to DIN 11851	29 mm (1.14 in)
	Spherical-cylindrical weld-in adapter	59 mm (2.32 in)
	Cylindrical weld-in adapter Φ12 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 Φ4.3 mm (0.17 in)	2 mm (0.08 in)

1) Depends on the process connection

Protection tube diameter 9 mm (0.35 in)



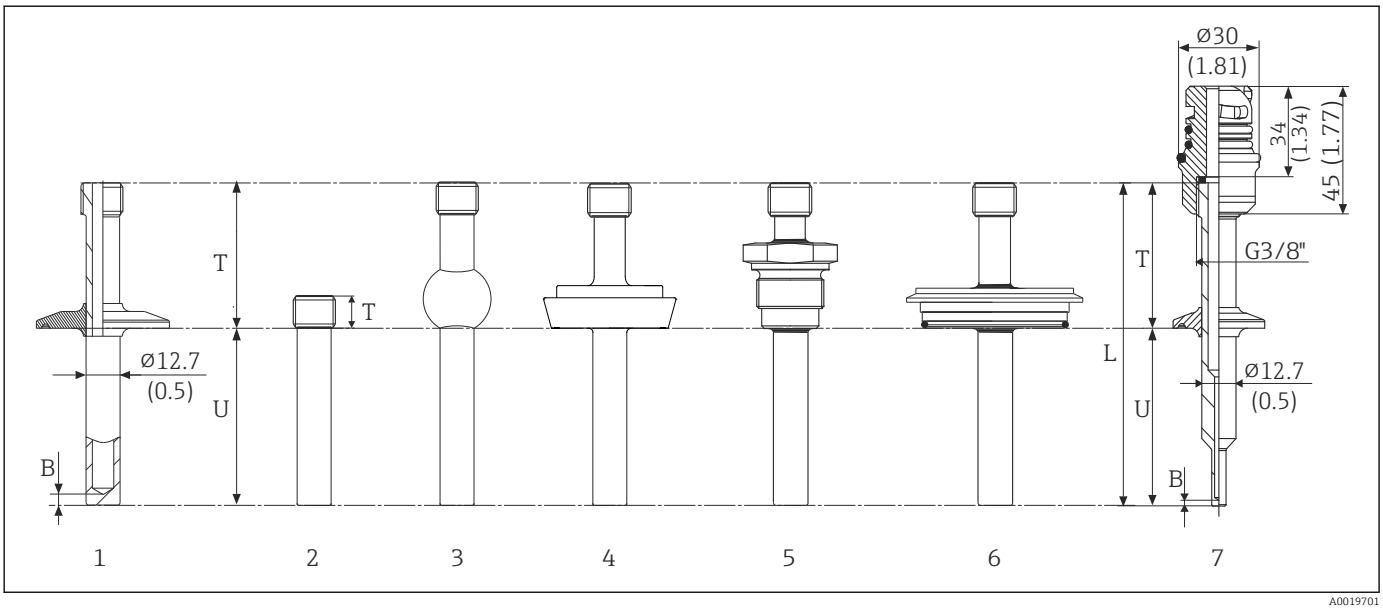
5 Protection tube with connection thread M24x1.5 and the following process connection versions:

1 Clamp according to ISO2852
2 Cylindrical weld-in adapter Φ30 x 40 mm
3 Spherical-cylindrical weld-in adapter Φ30 x 40 mm
4 Spherical weld-in adapter Φ25 mm
5 Sanitary connection according to DIN 11851
6 Aseptic pipe union according to DIN 11864-1 form A
7 Metal sealing system G½"
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 as example with base part of the iTHERM QuickNeck

Item	Version	Length
Length of protection tube shaft 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, ΦD = 50 mm (1.97 in)	52 mm (2.05 in)
	Varivent®, type N, ΦD = 68 mm (2.67 in)	

Item	Version	Length
	Varivent®, type B, ⌀D = 31 mm (1.22 in)	56 mm (2.2 in)
	Thread G1" 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	45 mm (1.77 in)
	Aseptic pipe union according to DIN11864-A, DN40	
	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 ⌀25 mm (0.98 in) x 30 mm (1.18 in)	78 mm (3.07 in)
	Ingold connection ⌀25 mm (0.98 in) x 46 mm (1.81 in)	94 mm (3.7 in)
	Metal sealing system G½"	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 ⌀5.3 mm (0.21 in) x 20 mm (0.79 in)	2 mm (0.08 in)
	Tapered tip ⌀6.6 mm (0.26 in) x 60 mm (2.36 in)	
	Straight tip	

Protection tube diameter 12.7 mm (½ in)



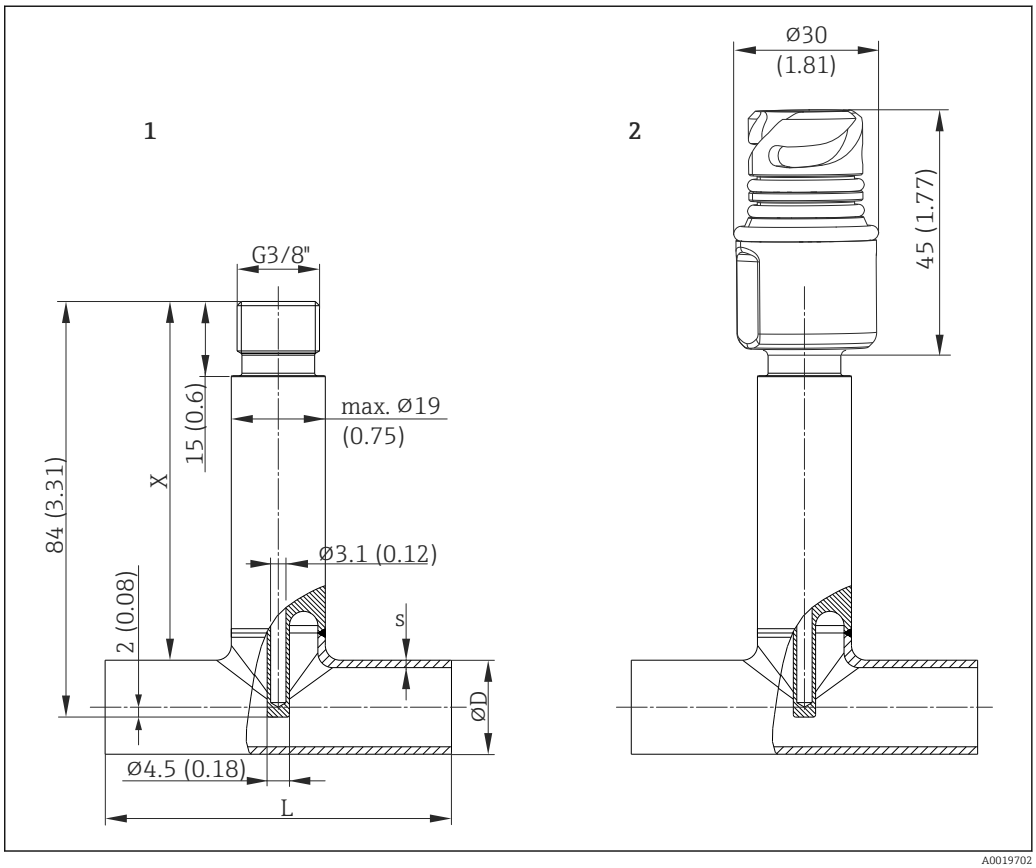
6 Protection tube with connection thread G3/8" and various process connection versions:

1 Clamp version according to ISO2852
2 Cylindrical weld-in adapter Φ12.7 mm (0.5 in)
3 Spherical weld-in adapter Φ25 mm
4 Sanitary connection according to DIN 11851
5 Thread according to ISO 228 for Liquiphant weld-in adapter
6 Varivent®
7 Clamp version with threaded base part iTHERM QuickNeck, torque 5 Nm, glued with loctite® 270 and reduced tip form

- Protection tube made from solid bar stock drilled for L ≤ 200 mm (7.87 in)
- Welded protection tube for L > 200 mm (7.87 in)

Item	Version	Length
Length of protection tube shaft T	Weld-in adapter, cylindrical, Φ12.7 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 Φ5.3 mm (0.21 in) x 20 mm (0.79 in)	2 mm (0.079 in)
	Reduced tip Φ8 mm (0.31 in) x 32 mm (1.26 in)	4 mm (0.16 in)
	Straight tip	6 mm (0.24 in)

T-piece protection tube version



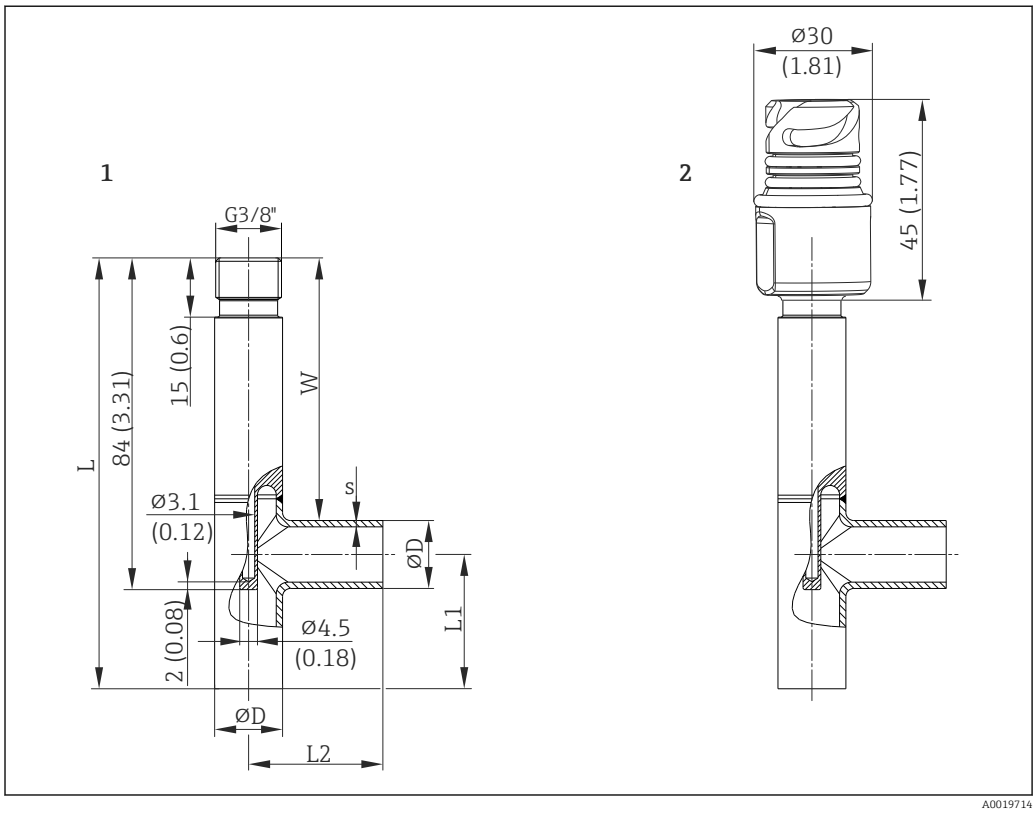
7 *Protection tube as per DIN11865 or ASME BPE 2012*

1 With neck connection thread G3/8"
2 With threaded base part iTHERM QuickNeck, torque 5 Nm, glued with loctite® 270

Dimensions in mm (in):

DIN11865-A					DIN11865-B					DIN11865-C / ASME BPE 2012				
	X	L	ØD	s		X	L	ØD	s		X	L	ØD	s
DN10	76 (3)	70 (2.76)	13 (0.51)	1.5 (0.06)	DN13.5	76 (3)	64 (2.52)	13.5 (0.53)	1.6 (0.063)	DN12.7 (½")	75.6 (2.98)	95.2 (3.75)	12.7 (0.5)	1.65 (0.065)
DN15	73 (2.87)	70 (2.76)	19 (0.75)		DN17.2	73 (2.87)	68 (2.68)	17.2 (0.68)		DN19.05 (¾")	72.5 (2.85)	101.6 (4)	19.05 (0.75)	
DN25	68 (2.68)	100 (3.94)	29 (1.14)		DN21.3	71 (2.8)	72 (2.8)	21.3 (0.84)		DN38.1 (1½")	63 (2.48)	120.6 (4.75)	38.1 (1.5)	

Corner-piece protection tube version



8 Protection tube as per DIN11865 or ASME BPE 2012

1 With neck connection thread G3/8"
2 With threaded base part iTHERM QuickNeck, torque 5 Nm, glued with loctite® 270

Dimensions in mm (in):

DIN11865-A						DIN11865-B					
	W	L1, L2	L	ØD	s		W	L1, L2	L	ØD	s
DN10	75.5 (2.97)	35 (1.38)	117 (4.61)	13 (0.51)	1.5 (0.06)	DN13.5	70 (2.76)	32 (1.26)	108 (4.25)	13.5 (0.53)	1.6 (0.063)
DN15	65 (2.56)	35 (1.38)	109 (4.3)	19 (0.75)		DN17.2	67 (2.64)	34 (1.34)	109 (4.3)	17.2 (0.68)	
DN25	55 (2.17)	50 (1.97)	119 (4.69)	29 (1.14)		DN21.3	63 (2.48)	36 (1.42)	109 (4.3)	21.3 (0.84)	

DIN11865-C / ASME BPE 2012					
	W	L1, L2	L	ØD	s
DN12.7 (½")	75.5 (2.97)	47.6 (1.87)	129.5 (5.08)	129 (0.5)	1.65 (0.065)
DN19.05 (¾")	72.5 (2.86)	50.8 (2)	133 (5.24)	19.05 (0.75)	
DN38.1 (1½")	63 (2.5)	60.3 (2.37)	142 (5.6)	38.1 (1.5)	

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

Possible combinations of the protection tube versions with the available process connections

Process connection and size	Protection tube diameter			iTHERM QuickNeck for ⌀9 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 ⌀12.7 mm (½ in)	-	-	☑	-
Cylindrical ⌀30 x 40 mm	☑	☑	-	☑
Cylindrical ⌀12 x 40 mm		-	-	-
Spherical-cylindrical ⌀30 x 40 mm	☑	☑	-	☑
Spherical ⌀25 mm (0.98 in)	☑	☑	☑	-
Clamp according to ISO 2852				
Microclamp/Tri-clamp DN8 - 18 (0.5 - 0.75 in)	☑	☑	-	☑
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	-	☑	☑	-
G¾" for FTL50				-
G1" for FTL50				☑
APV Inline				
DN50	-	☑	-	☑
Varivent®				
Type B, ⌀31 mm; Type F, ⌀50 mm ; Type N, ⌀68 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.

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

Material

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.

Designation	Short form	Recommended max. temperature for continuous use in air	Properties
AISI 316L (complies with 1.4404 or 1.4435)	X2CrNiMo17-13-2, X2CrNiMo18-14-3	650 °C (1202 °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
1.4435+316L, Delta ferrite < 1%	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 wetted parts is limited to <1% - including the welding seams (following 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.

Surface roughness

Values for wetted surfaces: [1]

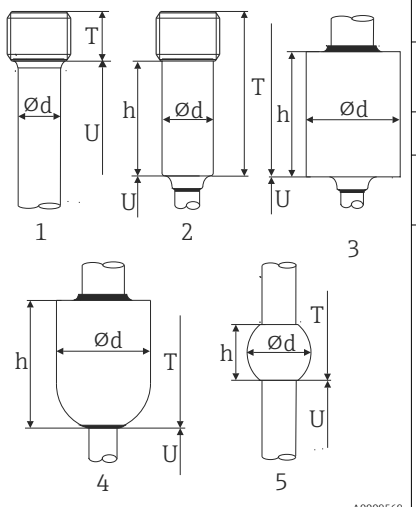
Standard surface	R_a ≤ 0.76 µm (0.03 µin)
Finely honed surface [2]	R_a ≤ 0.38 µm (0.015 µin)
Finely honed surface and electropolished	R_a ≤ 0.38 µm (0.015 µin)+ electropolished

1) Exception: Inside welding seams of the T- and corner pieces
2) Not compliant with ASME BPE

Process connections

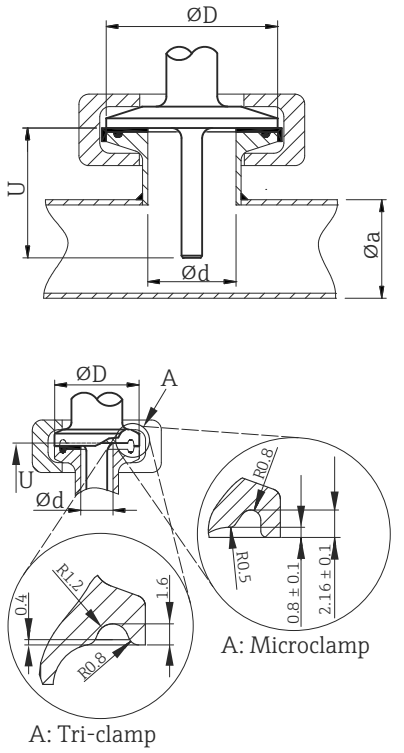
All dimensions in mm (in).

For welding in

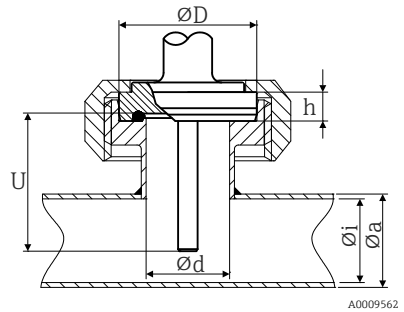
Type	Version	Dimensions	Technical properties
Weld-in adapter 	1: Cylindrical [1]	Φd = 12.7 mm (½ in), U = immersion length from lower edge of thread, T = 12 mm (0.47 in)	▪ $P_{max.}$ depends on the weld-in process ▪ With 3-A® symbol and EHEDG certification ▪ ASME BPE compliance
	2: Cylindrical [2]	Φd x h = 12 mm (0.47 in) x 40 mm (1.57 in), T = 55 mm (2.17 in)	
	3: Cylindrical	Φd x h = 30 mm (1.18 in) x 40 mm (1.57 in)	
	4: Spherical-cylindrical	Φd x h = 30 mm (1.18 in) x 40 mm (1.57 in)	
	5: Spherical	Φd = 25 mm (0.98 in) h = 24 mm (0.94 in)	

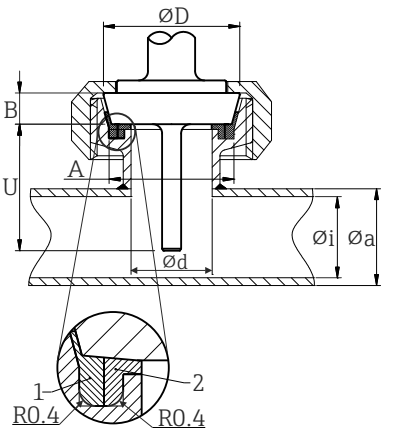
1) For protection tube Φ12.7 mm (½ in)
2) For protection tube Φ6 mm (¼ in)

Releasable process connection

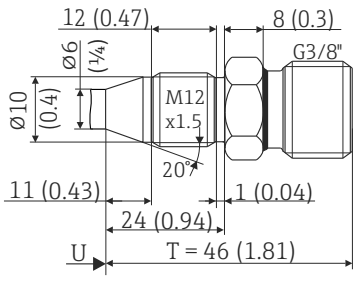
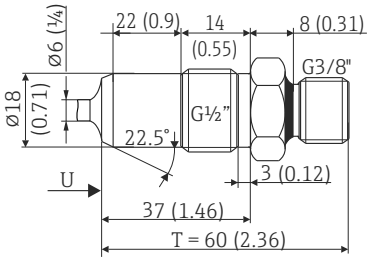
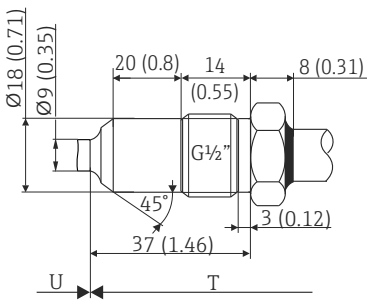
Type	Version	Dimensions		Technical properties
	ϕd [1]	ϕD	ϕa	
Clamp according to ISO 2852  *A Variable sealing geometry for Microclamp and Tri-clamp*	Microclamp [2] DN8-18 (0.5"-0.75")	25 mm (0.98 in)	-	▪ $P_{max.}$ = 16 bar (232 psi), depends on clamp ring and suitable seal ▪ With 3-A® symbol
	Tri-clamp DN8-18 (0.5"-0.75")		-	
	DN12-21.3	34 mm (1.34 in)	16 to 25.3 mm (0.63 to 0.99 in)	▪ $P_{max.}$ = 16 bar (232 psi), depends on clamp ring and suitable seal ▪ With 3-A® symbol and EHEDG certification (combined with Hyjoin PEEK/stainless steel seal or Dupont de Nemours Kalrez/ stainless steel seal) ▪ Compliant with ASME BPE [3]
	DN25-38 (1"-1.5")	50.5 mm (1.99 in)	29 to 42.4 mm (1.14 to 1.67 in)	
	DN40-51 (2")	64 mm (2.52 in)	44.8 to 55.8 mm (1.76 to 2.2 in)	
	DN63.5 (2.5")	77.5 mm (3.05 in)	68.9 to 75.8 mm (2.71 to 2.98 in)	
	DN70-76.5 (3")	91 mm (3.58 in)	> 75.8 mm (2.98 in)	

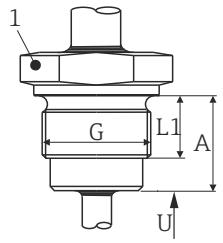
1) Pipes in accordance with ISO 2037 and BS 4825 Part 1
2) Microclamp (not in ISO 2852); no standard pipes
3) Not for DN12-21.3

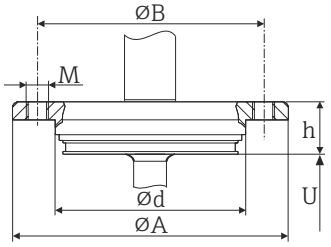
Type	Version	Dimensions					Technical properties
		ϕd	ϕD	ϕi	ϕa	h	
Aseptic pipe union according to DIN 11864-1, Form A 	DN25	26 mm (1.02 in)	42.9 mm (1.7 in)	26 mm (1.02 in)	29 mm (1.14 in)	9 mm (0.35 in)	▪ $P_{max.}$ = 40 bar (580 psi) ▪ With 3-A® symbol and EHEDG certification ▪ ASME BPE compliance
	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)	

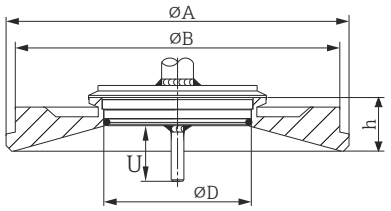
Type	Version [1]	Dimensions					Technical properties	
		ØD	A	B	Øi	Øa	$P_{max.}$	
Sanitary connection according to DIN 11851  *1 Centering ring* *2 Sealing ring*	DN25	44 mm (1.73 in)	30 mm (1.18 in)	10 mm (0.39 in)	26 mm (1.02 in)	29 mm (1.14 in)	40 bar (580 psi)	▪ With 3-A® symbol and EHEDG certification (only with EHEDG-certified and self-centering sealing ring). ▪ ASME BPE compliance
	DN32	50 mm (1.97 in)	36 mm (1.42 in)		32 mm (1.26 in)	35 mm (1.38 in)		
	DN40	56 mm (2.2 in)	42 mm (1.65 in)		38 mm (1.5 in)	41 mm (1.61 in)		
	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

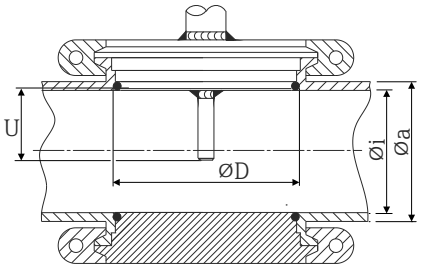
Type		Version	Technical properties
Metal sealing system			
M12x1.5	**G½"**		
 	 	Protection tube diameter 6 mm (¼ in)	▪ $P_{max.}$ = 16 bar (232 psi) ▪ EHEDG certified
-	 	Protection tube diameter 9 mm (0.35 in)	▪ $P_{max.}$ = 16 bar (232 psi) ▪ EHEDG certified

Type	Version G	Dimensions			Technical properties
		L1 thread length	A	1 (SW/AF)	
Thread according to ISO 228 (for Liquiphant weld-in adapter) 	G¾" for FTL20 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) ▪ With 3-A® symbol and EHEDG certification ▪ ASME BPE compliance
	G¾" for FTL50 adapter				
	G1" for FTL50 adapter	18.6 mm (0.73 in)	29.5 mm (1.16 in)	41	

Type	Version	Dimensions					Technical properties
		ϕd	ϕA	ϕB	M	h	
APV Inline 	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

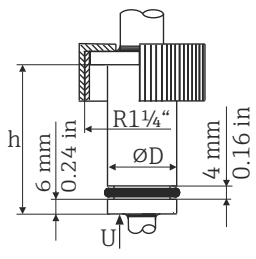
Type	Version	Dimensions				Technical properties	
		ϕD	ϕA	ϕB	h	$P_{max.}$	
Varivent® 	Type B	31 mm (1.22 in)	105 mm (4.13 in)	-	22 mm (0.87 in)	10 bar (145 psi)	▪ With 3-A® symbol and EHEDG certification ▪ ASME BPE compliance
	Type F	50 mm (1.97 in)	145 mm (5.71 in)	135 mm (5.31 in)	24 mm (0.95 in)		
	Type N	68 mm (2.67 in)	165 mm (6.5 in)	155 mm (6.1 in)	24.5 mm (0.96 in)		

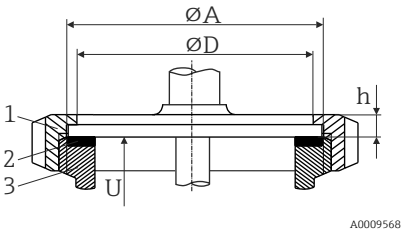
The VARINLINE® housing connection flange is suitable for weld-in into the conical or torispherical head in tanks or containers with a small diameter (≤ 1.6 m (5.25 ft)) and up to a wall thickness of 8 mm (0.31 in).

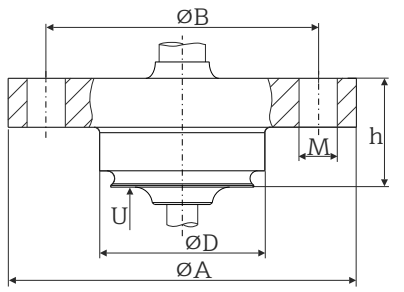
Type	Technical properties
Varivent® for VARINLINE® housing for installation in pipes  A0009564	▪ With 3-A® symbol and EHEDG certification ▪ ASME BPE compliance

Version	Dimensions			$P_{max.}$
	Φ D	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)	
		DN150: 150 mm (5.9 in)	DN150: 154 mm (6.06 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)	
		56.3 mm (2.22 in)	60.3 mm (2.37 in)	
		72.1 mm (2.84 in)	76.1 mm (3 in)	76.1 mm (3 in) to 114.3 mm (4.5 in): 10 bar (145 psi)
		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)	
		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 small immersion length U, the use of iTHERM QuickSens inserts is recommended.

Type	Version, dimensions ΦD x h	Technical properties
Ingold connection  A0009573	Φ25 mm (0.98 in) x 30 mm (1.18 in)	$P_{max.}$ = 25 bar (362 psi)
	Φ25 mm (0.98 in) x 46 mm (1.81 in)	

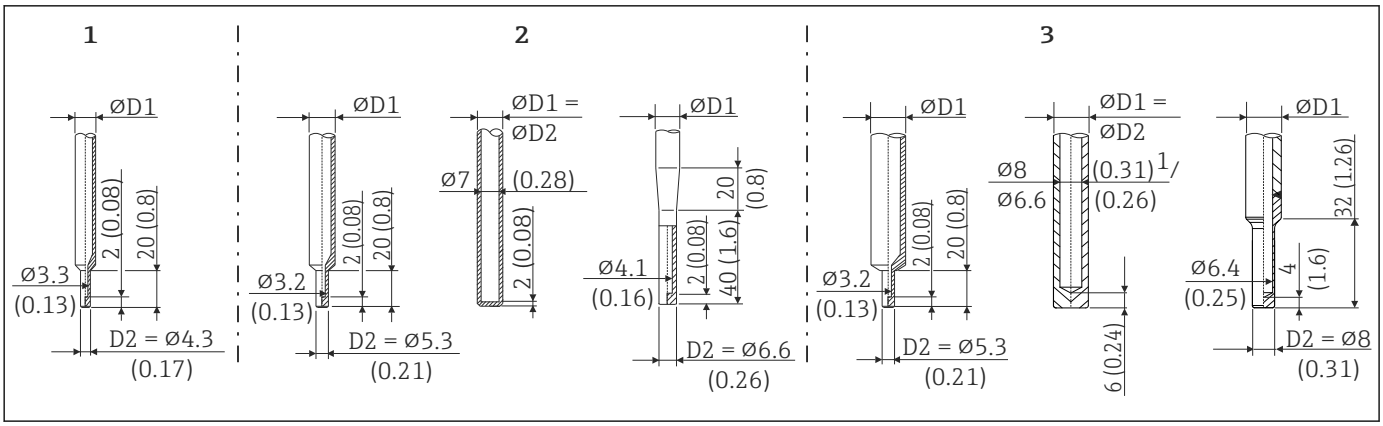
Type	Version	Dimensions			Technical properties
		ΦD	ΦA	h	
SMS 1147  *1 Thread adapter nut* *2 Sealing ring* *3 Counterpart connection*	DN25	32 mm (1.26 in)	35.5 mm (1.4 in)	7 mm (0.28 in)	$P_{max.}$ = 25 bar (362 psi)
	DN38	48 mm (1.89 in)	55 mm (2.17 in)	8 mm (0.31 in)	
	DN51	60 mm (2.36 in)	65 mm (2.56 in)	9 mm (0.35 in)	
The counterpart connection must fit the sealing ring and fix it in place.					

Type	Version	Dimensions					Technical properties
		ΦA	ΦB	ΦD	Φd	h	
Neumo Biocontrol  	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)		

Tip shape

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 protection tube.
- Endress+Hauser offers users a range of protection tube tips to meet every requirement:
  - Reduced tip with Φ4.3 mm (0.17 in) and Φ5.3 mm (0.21 in): walls of lower thickness significantly reduce the response times of the overall measuring point.
  - Tapered tip with Φ6.6 mm (0.26 in) and reduced tip with Φ8 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.).



9 Protection tube tips available (reduced, straight or tapered)

Item No.	Protection tube (ΦD1)		Insert (ΦID)
1	Φ6 mm (¼ in)	Reduced tip	Φ3 mm (⅛ in)
2	Φ9 mm (0.35 in)	▪ Reduced tip with Φ5.3 mm (0.21 in) ▪ Straight tip ▪ Tapered tip with Φ6.6 mm (0.26 in)	▪ Φ3 mm (⅛ in) ▪ Φ6 mm (¼ in) ▪ Φ3 mm (⅛ in)
3	Φ12.7 mm (½ in)	▪ Reduced tip with Φ5.3 mm (0.21 in) ▪ Straight tip [1] ▪ Reduced tip with Φ8 mm (0.31 in)	▪ Φ3 mm (⅛ in) ▪ Φ6 mm (¼ in) ▪ Φ6 mm (¼ in)

1) Internal diameter Φ8 mm (0.31 in) for protection tube made from solid bar stock drilled for total length L ≤ 200 mm (7.87 in). Φ6.6 mm (0.26 in) for welded protection tube with total length L ≥ 200 mm (7.87 in).

It is possible to check the mechanical loading capacity as a function of the installation and process conditions online in the TW Sizing Module for protection tubes in the Endress+Hauser Applicator software. See 'Accessories' section.

Certificates and approvals

CE mark

The measuring system meets the legal requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

Hygiene standard

- EHEDG certification, type EL CLASS I. Permitted process connections in accordance with EHEDG, see 'Process connections' section (→ 12)
- 3-A® authorization no. 1144, 3-A® sanitary standard 74-06. Permitted process connections in accordance with 3-A®, see 'Process connections' section (→ 12)
- ASME BPE, certificate of conformity can be ordered for indicated options
- FDA-compliant
- All product contact surfaces are produced without animal fats (TSE Certificate of Suitability)

Other standards and guidelines

DIN 43772: Protection tubes

Surface roughness

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

Material certification

The material certificate 3.1 (according to standard EN 10204) can be requested separately. The "short form" certificate includes a simplified declaration with no enclosures of documents related to the materials used in the construction of the single sensor and guarantees the traceability of the materials through the identification number of the thermometer. The data related to the origin of the materials can subsequently be requested by the client if necessary.

Protection tube testing and load capacity calculation

- Protection tube pressure tests are carried out in accordance with the specifications in DIN 43772. With regard to protection tubes with tapered or reduced tips that do not comply with this standard, these are tested using the pressure of corresponding straight protection tubes. Tests according to other specifications can be carried out on request. The liquid penetration test verifies that there are no cracks in the welded seams of the protection tube.
- EN1779 helium leak test, PMI test, concentricity test for drilled protection tubes, dye penetration test, TW welding, internal hydrostatic pressure, etc. each with inspection certificate
- Load capacity calculation for the protection tube as per DIN43772

Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser web site: www.endress.com → Choose your country → Products → Select measuring technology, software or components → Select product (picklists: measurement method, product family etc.) → Device support (right-hand column): Configure the selected product → The Product Configurator for the selected product is opened.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

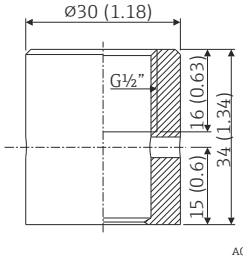
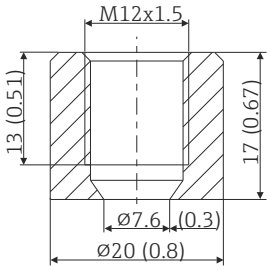
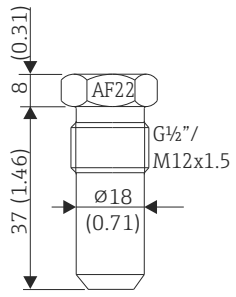
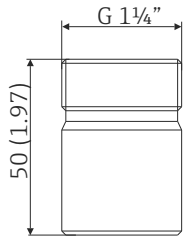
Product Configurator - the tool for individual product configuration

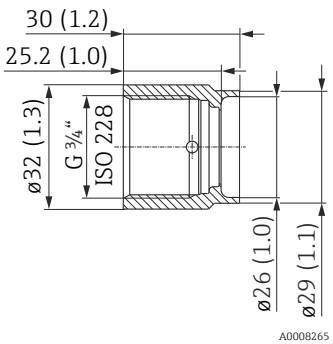
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability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

Accessories

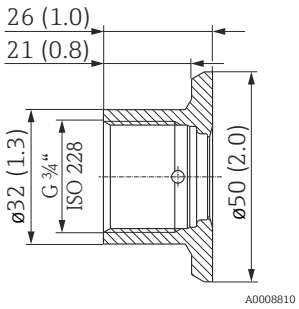
Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Device-specific accessories

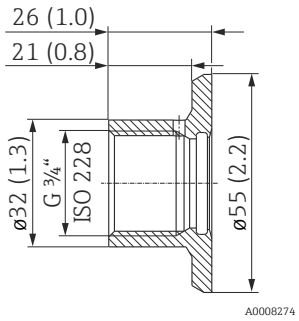
Accessories	Description
Welding boss with sealing taper (metal - metal)  A0006621  A0018236	Welding boss for G½"- and M12x1 thread Metal-sealing; conical Material of wetted parts: 316L/1.4435 Max. process pressure 16 bar (232 PSI) **Order number:** ▪ 60021387 (G½") ▪ 71190468 (M12x1)
Dummy plug  A0009213-EN	Dummy plug for G½" or M12x1 conical metal-sealing welding boss Material: SS 316L/1.4435 **Order number:** ▪ 60022519 (G½") ▪ 60021194 (M12x1)
Weld-in adapter for Ingold process connections  A0008956	Material of wetted parts: 316L/1.4435 Weight: 0.32 kg (0.7 lb) **Order number:** 60017887 O-ring seal set ▪ Silicone O-ring in accordance with FDA CFR 21 ▪ Maximum temperature: 230 °C (446 °F) ▪ **Order number:** 60018911

Weld-in adapter FTL20 	G¾", d=29 mm, without flange Material: 316L Roughness in µm (µin): 1.5 (59.1) **Order number:** 52028295 (with inspection certificate EN10204-3.1 material) **Order number** seal (5-pc. set): silicone O-ring 52021717 [1], FDA-compliant

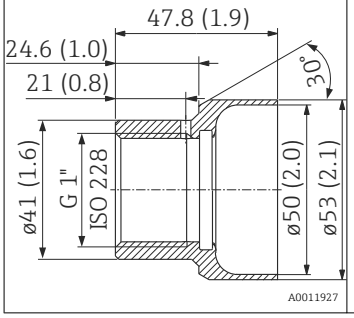
1) A seal is included in the delivery.

Weld-in adapter FTL20 	G¾", d=50 mm, with flange Material: 316L Roughness in µm (µin): 0.8 (31.5) **Order number:** 52018765 (with inspection certificate EN10204-3.1 material) **Order number** seal (5-pc. set): silicone O-ring 52021717 [1], FDA-compliant With EHEDG certification and 3-A® symbol

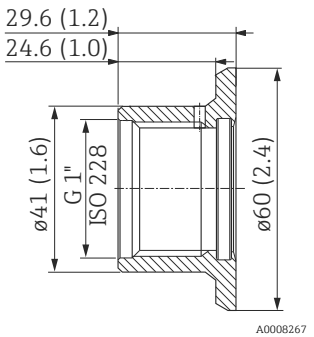
1) A seal is included in the delivery.

Weld-in adapter FTL50 	G¾", d=55 mm, with flange Material: 316L Roughness in µm (µin): 0.8 (31.5) **Order number:** 52001052 (without inspection certificate EN10204-3.1 material) **Order number:** 52011897 (with inspection certificate EN10204-3.1 material) **Order number** seal (5-pc. set): silicone O-ring 52014473 [1], FDA-compliant **Order number** weld-in dummy: MVT2L0692 With EHEDG certification and 3-A® symbol

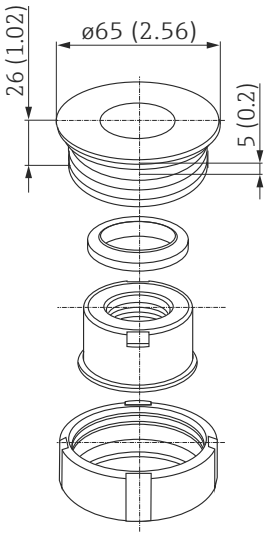
1) A seal is included in the delivery.

Weld-in adapter FTL50 	G1", d=53 mm, without flange Material: 316L Roughness in µm (µin): 0.8 (31.5) **Order number:** 71093129 (with inspection certificate EN10204-3.1 material) **Order number** seal (5-pc. set): silicone O-ring 52014472 [1], FDA-compliant **Order number** weld-in dummy: MVT2L0691

1) A seal is included in the delivery.

Weld-in adapter FTL50  	G1", d=60 mm, with flange Material: 316L Roughness in µm (µin): 0.8 (31.5) **Order number:** 52001051 (without inspection certificate EN10204-3.1 material) **Order number:** 52011896 (with inspection certificate EN10204-3.1 material) **Order number** seal (5-pc. set): silicone O-ring 52014472 [1], FDA-compliant **Order number** weld-in dummy: MVT2L0691 With EHEDG certification and 3-A® symbol

1) A seal is included in the delivery.

Weld-in adapter FTL50  	G1", can be aligned Material: 316L Roughness in µm (µin): 0.8 (31.5) **Order number:** 52001221 (without inspection certificate EN10204-3.1 material) **Order number:** 52011898 (with inspection certificate EN10204-3.1 material) **Order number** seal (5-pc. set): silicone O-ring 52014424 [1], FDA-compliant **Order number** weld-in dummy: M40167

1) A seal is included in the delivery.

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)

For more information on the weld-in adapters FTL20, FTL50, see Technical Information (TI00426F/00).

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ▪ Calculation of all the necessary data for identifying the optimum measuring device: e.g. pressure loss, accuracy or process connections. ▪ Graphic illustration of the calculation results Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: ▪ Via the Internet: https://wapps.endress.com/applicator ▪ On CD-ROM for local PC installation.

Konfigurator$^{+temperature}$	Software for selecting and configuring the product depending on the measuring task, supported by graphics. Includes a comprehensive knowledge database and calculation tools: ▪ For temperature competence ▪ Quick and easy design and sizing of temperature measuring points ▪ Ideal measuring point design and sizing to suit the processes and needs of a wide range of industries The Konfigurator is available: On request from your Endress+Hauser sales office on a CD-ROM for local PC installation.

W@M	Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress +Hauser also takes care of maintaining and updating the data records. W@M is available: ▪ Via the Internet: www.endress.com/lifecyclemanagement ▪ On CD-ROM for local PC installation.

Documentation

Modular resistance thermometer for hygienic and aseptic applications iTHERM TM411: TI01038T/09/EN

Insert iTHERM TS111: TI01014T/09/EN

www.addresses.endress.com

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