TI01350T/09/EN/05.25-00
71718101
2025-08-31

Technical Information
iTHERM ModuLine TT412 Welded thermowell

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

Application

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
- All common hygienic process connections
- International certification: 3-A Sanitary Standard, EHEDG, ASME BPE, FDA, TSE Certificate of Suitability
- Fast response time thanks to reduced tips with thin walls
- Hygienic tee and elbow thermowells; hygienic design with no welds and dead legs

Endress+Hauser
People for Process Automation

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Installation

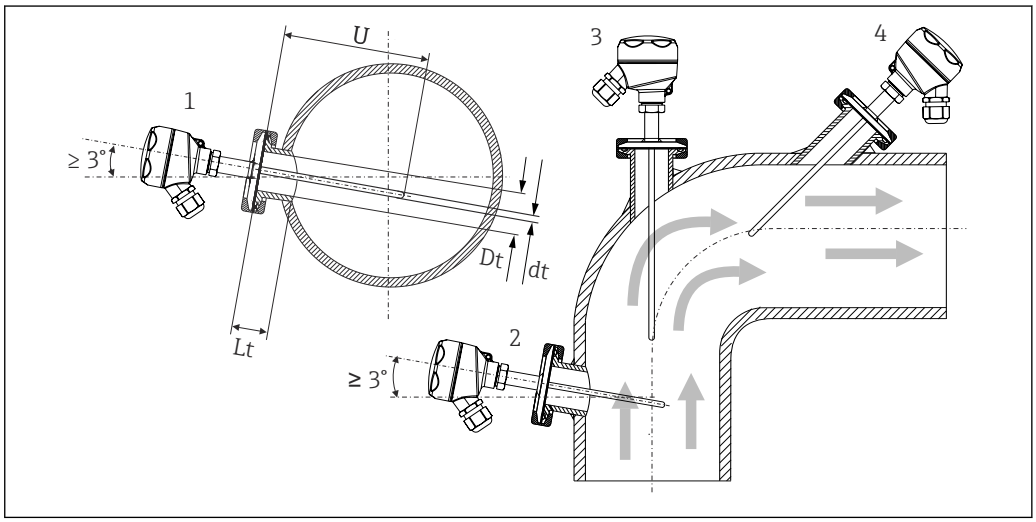
Orientation

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. 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

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

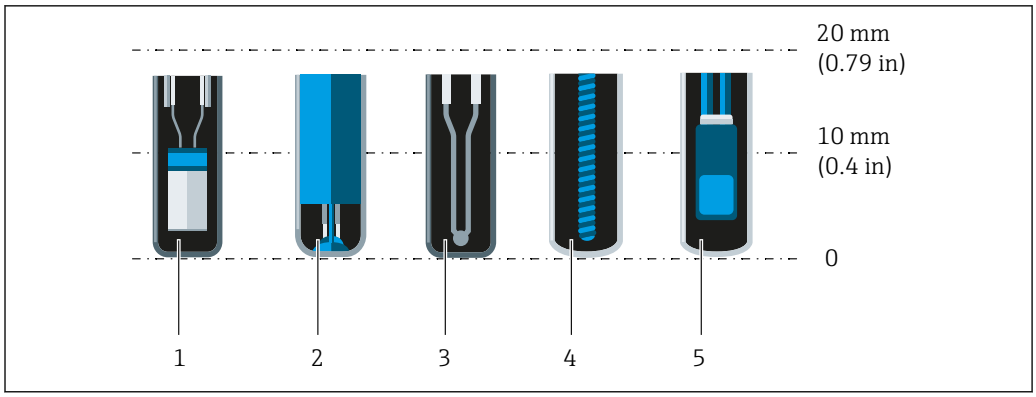
Installation instructions EHEDG/cleanability: Lt ≤ (Dt-dt)

Installation instructions 3-A/cleanability: Lt ≤ 2 (Dt-dt)

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).

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

Available options depend on product and configuration.

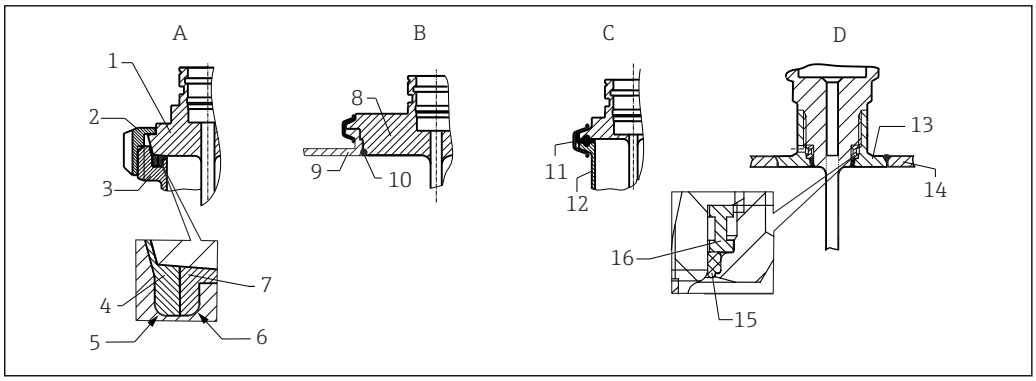


1 *StrongSens or TrustSens for 5 to 7 mm (0.2 to 0.28 in)*
2 *QuickSens for 0.5 to 1.5 mm (0.02 to 0.06 in)*
3 *Thermocouple (not grounded) for 3 to 5 mm (0.12 to 0.2 in)*
4 *Wire wound sensor for 5 to 20 mm (0.2 to 0.79 in)*
5 *Standard thin-film sensor for 5 to 10 mm (0.2 to 0.39 in)*

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
- TrustSens or StrongSens 30 mm (1.18 in)
- 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 T-pieces, 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 pieces with QuickSens sensors.



2 *Detailed installation instructions for hygiene-compliant installation*

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.

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, Ra ≤ 0.76 µm (30 µin).

Pay attention to the following when installing the thermometer to ensure that the cleanability is not affected:

1. The installed sensor is suitable for CIP (cleaning in place). Cleaning is carried out in combination with piping or tank. In the case of internal tank fixtures using process connection nozzles, it is important to ensure that the cleaning assembly directly sprays this area so that it is cleaned properly.
2. The Varivent® connections enable flush-mounted installation.

Process

Process temperature range

Maximum −200 to +650 °C (−328 to +1 202 °F) → 🖹 8

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.

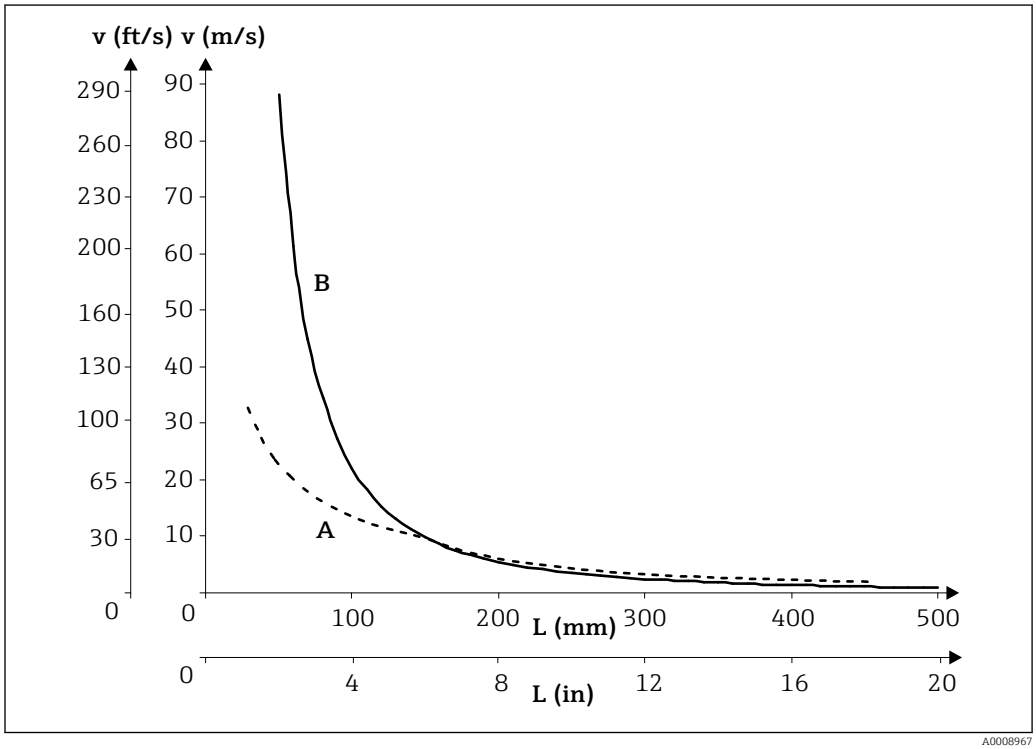
Process pressure range

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. → 🖹 9

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

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 depth of the 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).



🖹 3 *Permitted flow velocities, thermowell diameter 9.53 mm (3/8 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

State of aggregation of the medium

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

Mechanical construction

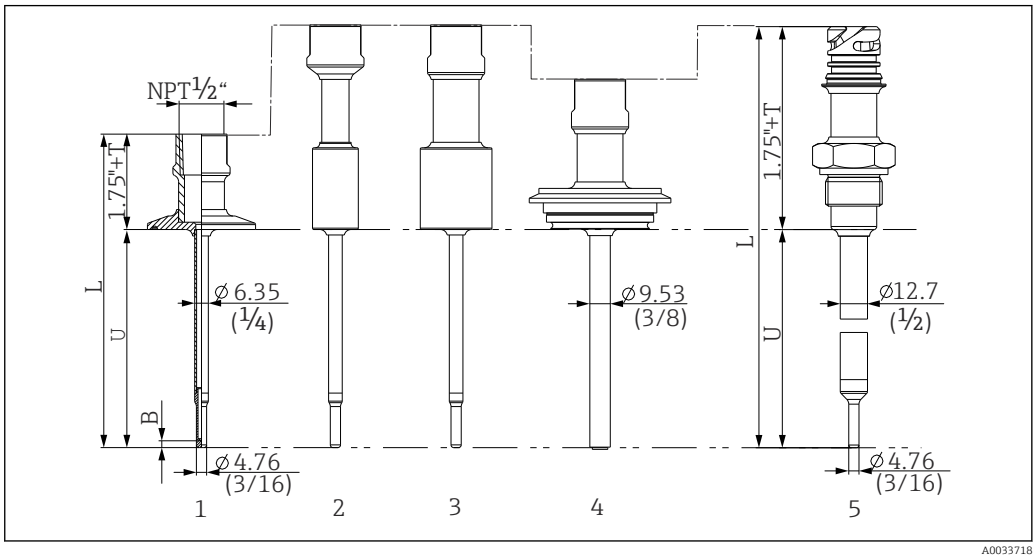
Design, dimensions

All dimensions in mm (in). The design depends on the thermowell version:
- Diameter 6.35 mm (¼ in)
- Diameter 9.53 mm (⅜ in)
- Diameter 12.7 mm (½ in)
- Tee and elbow thermowell version as per DIN 11865/ASME BPE 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	Thermowell length (U+T+1.75 ")
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



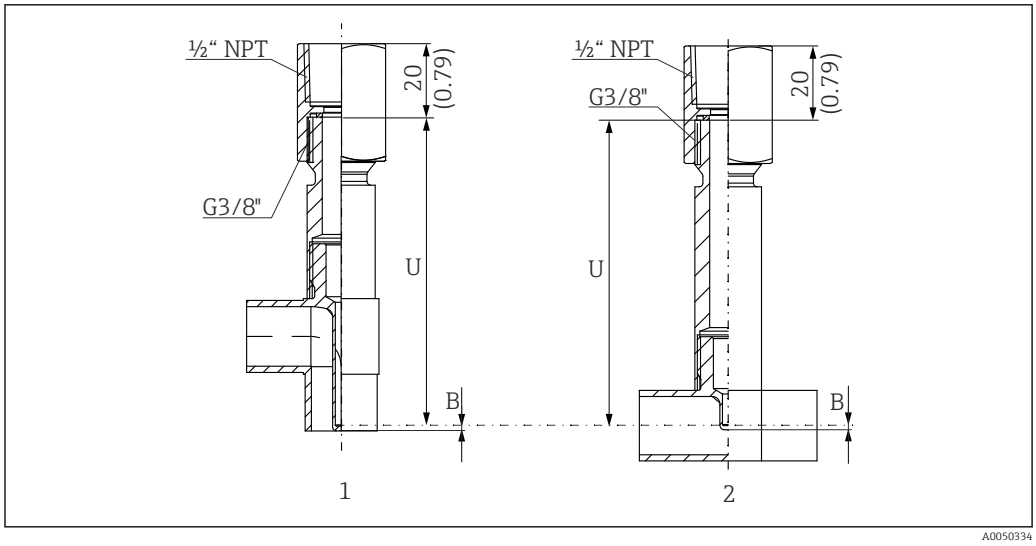
4 *Thermowell with NPT ½" neck connection, diameter ¼", 3/8" and ½" and various process connection versions:*

1 *Tri-clamp*
2 *Cylindrical weld-in adapter ΦD ¾" NPS*
3 *Cylindrical weld-in adapter ΦD 1" NPS*
4 *Varivent®*
5 *Liquiphant adapter with QuickNeck*

Item	Type of fitting	Length
Length of thermowell shaft T [1]	Tri-clamp with NPT Tri-clamp with QuickNeck Varivent® with NPT Varivent® with QuickNeck Liquiphant with NPT Liquiphant with QuickNeck Weld-in with NPT Weld-in with QuickNeck	0-6" 1-6" 1-6" 1.5-6" 2-6" 2-6" 2-6" 2-6"
Immersion length U	Independent of the version	Variable, depending on the configuration

Item	Type of fitting	Length
Bottom thickness B	**6.35 mm (¼ in) Thermowell:** Reduced tip Φ4.76 mm (3/16 in)	3.2 mm (0.125 in)
	9.53 mm (⅜ in) Thermowell: Reduced tip Φ4.76 mm (3/16 in) Straight tip	3.2 mm (0.125 in) 3 mm (0.12 in)
	12.7 mm (½ in) Thermowell: Reduced tip Φ4.76 mm (3/16 in) Straight tip	3.2 mm (0.125 in) 6.3 mm (0.25 in)

1) Depends on the process connection



5 Tee and elbow thermowell version as per DIN 11865/ASME BPE for weld-in

1 Tee thermowell
2 Elbow thermowell

Item	Type of fitting	Length
Immersion length U	Independent of the version	83 mm (3.27 in)
Bottom thickness B		0.7 mm (0.03 in)

All process connections are available for diameters ¼" and 3/8".

Not available for diameter ½": Tri-clamp ¾"

Weight

0.3 to 2.5 kg (0.66 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	Recommended max. temperature for continuous use in air	Properties
AISI 316L	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 ▪ The wetted part from a 316L thermowell withstand a passivation process with a 3% sulphuric acid ▪ Available with 3-A marked sensors

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:

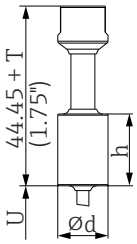
Standard surface, mechanically polished [1]	R_a ≤ 0.76 µm (30 µin)
Mechanically polished [1], buffed [2]	R_a ≤ 0.38 µm (15 µin)
Mechanically polished [1], buffed and electropolished	R_a ≤ 0.38 µm (15 µin)+ electropolished

1) Or equivalent treatment that guarantees R_a max
2) Not compliant with ASME BPE

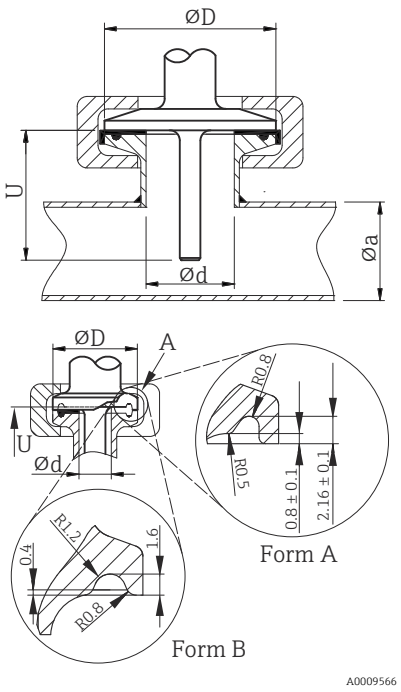
Process connections

All dimensions in mm (in).

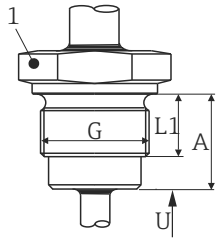
Weld-in

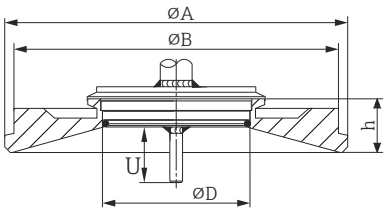
Type	Type of fitting	Dimensions	Technical properties
Weld-in adapter  A0033743	Cylindrical ½" NPS	Ød = ½" NPS, h = 38.1 mm (1.5 in), U = immersion length from lower edge, T = min. 50.8 mm (2 in)	▪ $P_{max.}$ depends on the weld-in process ▪ With 3-A symbol and EHEDG certification ▪ ASME BPE compliance
	Cylindrical ¾" NPS	Ød = ¾" NPS, h = 38.1 mm (1.5 in), U = immersion length from lower edge, T = min. 50.8 mm (2 in)	
	Cylindrical 1" NPS	Ød = 1" NPS, h = 38.1 mm (1.5 in), U = immersion length from lower edge, T = min. 50.8 mm (2 in)	

Detachable process connection

Type	Type of fitting	Dimensions		Technical properties	Conformity
	Ød: [1]	ØD	Øa		
 Form A: In compliance with ASME BPE Type A Form B: In compliance with ASME BPE Type B and ISO 2852	Tri-clamp ¾" (DN18), Form A [2]	25 mm (0.98 in)	-	▪ $P_{max.}$ = 16 bar (232 psi), depends on clamp ring and suitable seal ▪ With 3-A symbol	ASME BPE Type A
	Clamp ISO 2852 ½" (DN12 - 21.3) Form B	34 mm (1.34 in)	16 to 25.3 mm (0.63 to 0. 99 in)		ISO 2852
	Tri-clamp 1" - 1½" (DN25 - 38) 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 ▪ With 3-A symbol and EHEDG certification (combined with Combifit seal) ▪ Can be used with 'Novaseptic Connect (NA Connect)' which enables flush-mount installation	ASME BPE Type B
	Tri-clamp 2" (DN40 - 51) Form B	64 mm (2.52 in)	44.8 to 55. 8 mm (1.76 to 2. 2 in)		
	Tri-clamp 2½" (DN63.5) Form B	77.5 mm (3.05 in)	68.9 to 75. 8 mm (2.71 to 2. 98 in)		
	Tri-clamp 3" (DN70-76. 5) Form B	91 mm (3.58 in)	> 75.8 mm (2.98 in)		

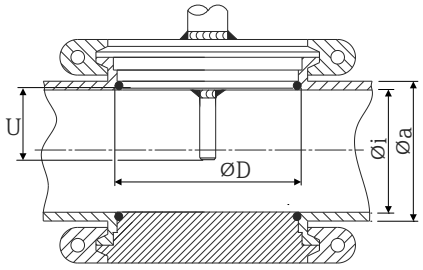
1) Pipes in accordance with ISO 2037 and BS 4825 Part 1
2) Tri-clamp ¾" only possible with thermowell diameter 6.35 mm (¼ in) or 9.53 mm (⅜ in)

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 FTL20/31/33 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 more information about hygienic compliance in conjunction with FTL31/33/50 adapters, see Technical Information TI00426F.
	G¾" for FTL50 adapter				
	G1" for FTL50 adapter	18.6 mm (0.73 in)	29.5 mm (1.16 in)	41	

Type	Type of fitting [1]	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 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).
Varivent® Type F cannot be used for installations in pipes in combination with the VARINLINE® housing connection flange.

1) Options depend on product and configuration

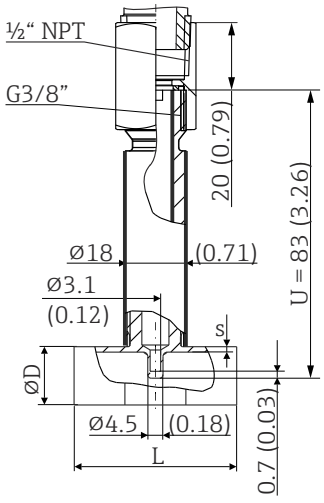
Type	Technical properties
Varivent® for VARINLINE® housing for installation in pipes  	▪ With 3-A symbol and EHEDG certification ▪ ASME BPE compliance

Type of fitting [1]	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)	
		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)	
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)

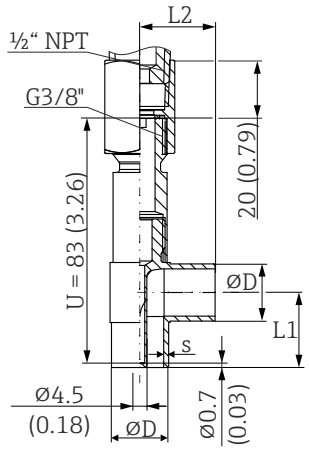
Type				Technical properties
		OD 4": 97.6 mm (3.84 in)	OD 4": 101.6 mm (4 in)	
Type F, according to DIN 11866, series C	50 mm (1.97 in)	OD 1": 22.2 mm (0.87 in)	OD 1": 25.4 mm (1 in)	16 bar (232 psi)

1) Options depend on product and configuration

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

Type	Type of fitting		Dimensions in mm (inch)			Technical properties
			ØD	L	s [1]	
Tee thermowell for weld-in as per DIN 11865 (Part C) 	Part C [2]	DN12.7 PN25 (½")	12.7 mm (0.5 in)	48 mm (1.89 in)	1.65 mm (0.065 in)	▪ $P_{max.}$ = 25 bar (362 psi) ▪ R_a ≤ 0.38 µm (15 µin)+ electropolished [3]
		DN19.05 PN25 (¾")	19.05 mm (0.75 in)			
		DN25.4 PN25 (1")	19.05 mm (0.75 in)			
		DN38.1 PN25 (1½")	38.1 mm (1.5 in)			

1) Wall thickness
2) Dimensions as per ASME BPE
3) Exception: internal welded seams

Type	Type of fitting		Dimensions				Technical properties
			ØD	L1	L2	s [1]	
Elbow thermowell for weld-in as per DIN 11865 (Part C) 	Part C	DN12.7 PN25 (½") [2]	12.7 mm (0.5 in)	22 mm (0.87 in)	24 mm (0.94 in)	1.65 mm (0.065 in)	▪ $P_{max.}$ = 25 bar (362 psi) ▪ R_a ≤ 0.38 µm (15 µin)+ electropolished [3]
		DN19.05 PN25 (¾")	19.05 mm (0.75 in)	25 mm (0.98 in)			

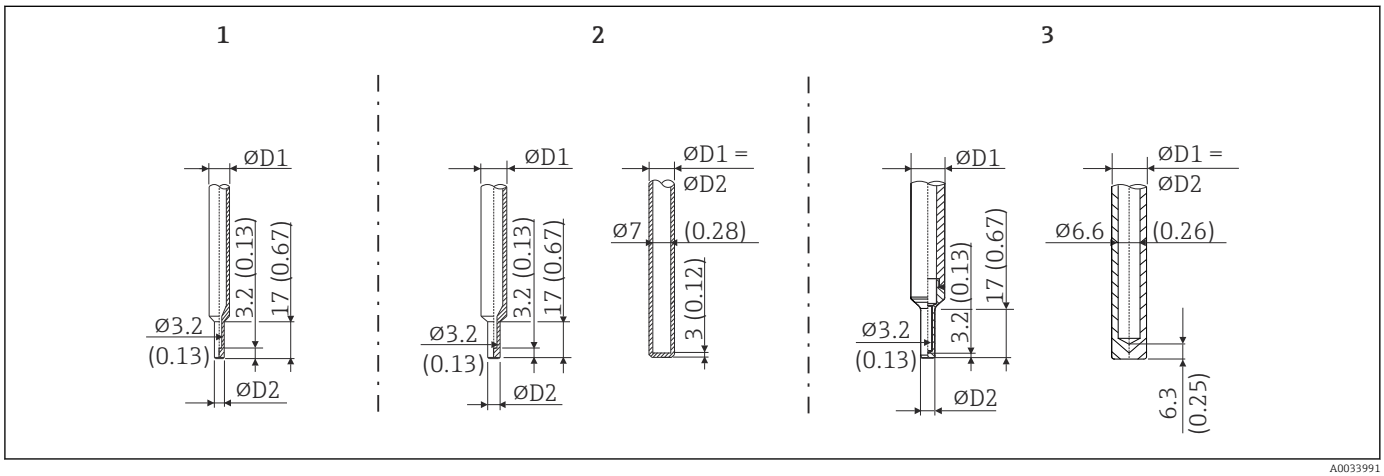
Type	Type of fitting		Dimensions				Technical properties
			ØD	L1	L2	s [1]	
		DN25.4 PN 25 (1")	19.05 mm (0.75 in)	28 mm (1.1 in)			
		DN38.1 PN25 (1½")	38.1 mm (1.5 in)	35 mm (1.38 in)			

1) Wall thickness
2) Dimensions as per ASME BPE
3) Exception: internal welded seams

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

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 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:
  - Straight tip
  - Reduced tip of Φ4.76 mm (3/16 in): walls of lower thickness significantly reduce the response times of the overall measuring point
  - Reduced tip for tee and elbow thermowell with Φ4.5 mm (0.18 in)



6 *Thermowell tips available (reduced or straight)*

Item no.	Thermowell (ΦD1)	Tip (ΦD2)	Insert (ΦID)
1	Φ6.35 mm (¼ in)	Reduced tip of Φ4.76 mm (3⁄16 in)	Φ3 mm (0.12 in)
2	Φ9.53 mm (⅜ in)	▪ Reduced tip of Φ4.76 mm (3⁄16 in) ▪ Straight tip	▪ Φ3 mm (0.12 in) ▪ Φ6.35 mm (¼ in) or 6 mm (0.24 in)
3	Φ12.7 mm (½ in)	▪ Reduced tip of Φ4.76 mm (3⁄16 in) ▪ Straight tip	▪ Φ3 mm (0.12 in) ▪ Φ6.35 mm (¼ in) or 6 mm (0.24 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 thermowells in the Endress+Hauser Applicator software. See 'Accessories' section. → 16

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 revision), Certificate of Conformance can be ordered for designated options.
- 3-A Certificate Authorization number 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 contact parts comply with the requirements of guidance EMA/410/01 Rev.3. Furthermore, no grinding and polishing agents of animal origin have been used during the entire production of the process contact 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.

Material resistance

Material resistance - including resistance of housing - to the following Ecolab cleaning/disinfection agents:
- P3-topax 66
- P3-topactive 200
- P3-topactive 500
- P3-topactive OKTO
- And demineralized water

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, optional.
Thermowell testing and load capacity calculation	▪ Thermowell pressure tests are carried out in accordance with the specifications in DIN 43772. With regard to thermowells with reduced tip that do not comply with this standard, these are tested using the pressure of corresponding straight thermowells. 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 thermowell. ▪ PMI test, dye penetration test, TW welding, internal hydrostatic pressure, etc. each with inspection certificate ▪ Load capacity calculation for the thermowell as per DIN 43772

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

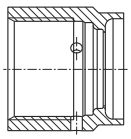
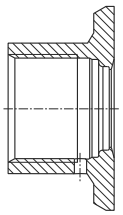
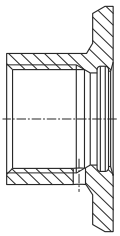
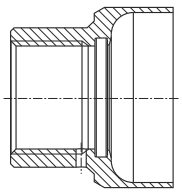
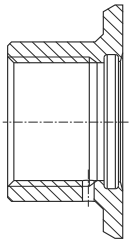
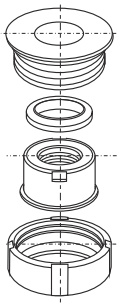
The accessories currently available for the product can be selected at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Spare parts & Accessories**.

Device-specific accessories

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	 A0008246	 A0008251	 A0008256	 A0011924	 A0008248	 A0008253
	G ¾", d=29 for pipe-mounting	**G ¾", d=50 for vessel-mounting**	**G ¾", 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)

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser devices: ▪ Calculation of all the necessary data for identifying the optimum 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://portal.endress.com/webapp/applicator

Accessories	Description
Configurator	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 The Product Configurator is available on the Endress+Hauser website: www.endress.com-> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.

FieldCare SFE500	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. For details, see Operating Instructions BA00027S and BA00065S

DeviceCare SFE100	Configuration tool for devices via fieldbus protocols and Endress+Hauser service protocols. DeviceCare is the tool developed by Endress+Hauser for the configuration of Endress+Hauser devices. All smart devices in a plant can be configured via a point-to-point or point-to-bus connection. The user-friendly menus enable transparent and intuitive access to the field devices. For details, see Operating Instructions BA00027S

System components

Process indicators from the RIA product family

Easily readable process indicators with various functions: loop-powered indicators for displaying 4 to 20 mAvalues, display of up to four HART variables, process indicators with control units, limit value monitoring, sensor power supply, and galvanic isolation.

Universal application thanks to international hazardous area approvals, suitable for panel mounting or field installation..

For more information, please refer to: www.endress.com

RN series active barrier

Single- or two-channel active barrier for safe separation of 0/4 to 20 mA standard signal circuits with bidirectional HART transmission. In the signal duplicator option, the input signal is transmitted to two galvanically isolated outputs. The device has one active and one passive current input; the outputs can be operated actively or passively.

For more information, please refer to: www.endress.com

Data Manager of the RSG product family

Data Managers are flexible and powerful systems to organize process values. Up to 20 universal inputs and up to 14 digital inputs for direct connection of sensors, optionally with HART, are available as an option. The measured process values are clearly presented on the display and logged safely, monitored for limit values and analyzed. The values can be forwarded via common communication protocols to higher-level systems and connected to one another via individual plant modules.

For more information, please refer to: www.endress.com

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.

Document	Purpose and content of the document
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.

www.addresses.endress.com

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