Technical Information
iTHERM TM402

Resistance thermometer for hygienic and aseptic applications

Imperial version with basic technology
for all standard applications, permanent insert

Applications

- Specially designed for use in hygienic and aseptic applications in the Food & Beverages and Life Sciences industries
- Measuring range: −50 to +200 °C (−58 to +392 °F)
- Pressure range up to 40 bar (580 psi)
- Protection class: up to IP69K
- Can be used in non-hazardous areas

Temperature transmitter

All Endress+Hauser transmitters are available with enhanced accuracy and reliability compared to directly wired sensors. Easy customizing by choosing one of the following outputs and communication protocols:

- Analog output 4 to 20 mA, HART®
- Field transmitters with HART® or FOUNDATION Fieldbus™ protocol for highest reliability in harsh industrial environments. Backlit display with large measured value, bargraph and fault condition indication for ease of reading.

Your benefits

- Excellent value for money and fast delivery
- User-friendly and reliable from product selection to maintenance
- International certification: hygiene standards as per 3-A®, EHEDG, ASME BPE, FDA, TSE Certificate of Suitability
- Wide range of process connections

Endress+Hauser

People for Process Automation

Table of contents

Function and system design

iTHERM Hygiene line

This thermometer is part of the product line of modular thermometers for hygienic and aseptic applications.

Differentiating factors when selecting a suitable thermometer

TM4x**1**	TM4x**2**
Metric version	Imperial version
↓	↓

TM4**1**x characterizes the device that uses cutting-edge technology, with features such as a replaceable insert, quick-fastening extension neck (iTHERM QuickNeck), vibration-resistant and fast-response sensor technology (iTHERM StrongSens and QuickSens) and approval for use in hazardous areas

TM411

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TM412

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↓	↓
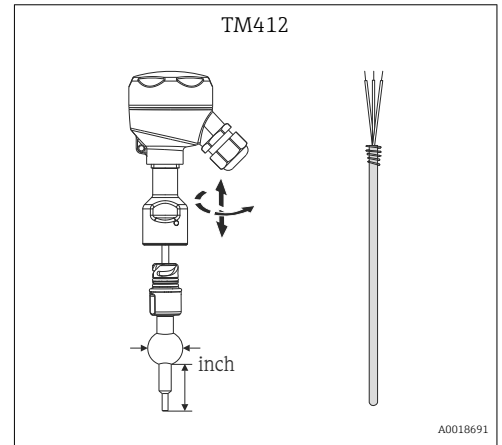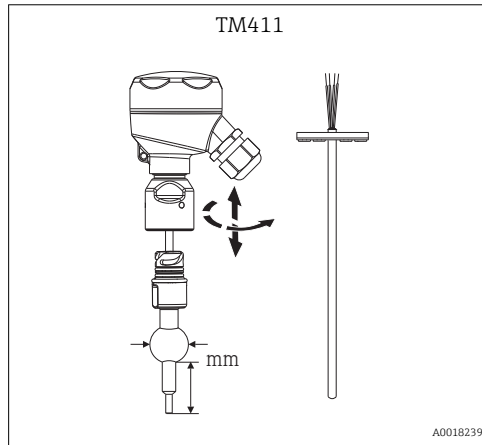
TM4**0**x characterizes the device that uses basic technology, with features such as a fixed, non-replaceable insert, application in non-hazardous areas, standard extension neck, low-cost unit

TM401

A0018692

TM402

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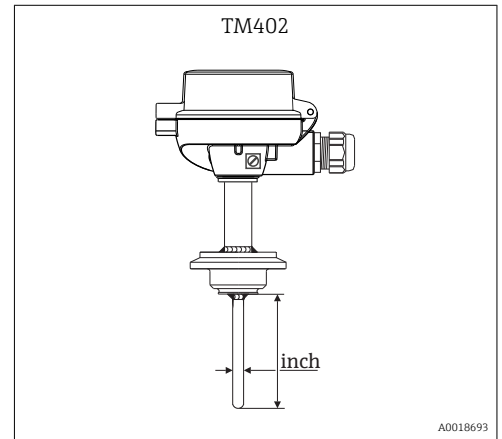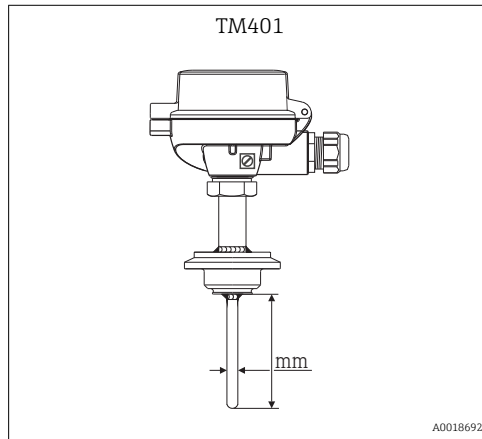
Measuring principle

Measuring system

Endress+Hauser offers a complete portfolio of optimized components for the temperature measuring point – everything you need for the seamless integration of the measuring point into the overall facility. This includes:
- Power supply unit/barrier
- Display units
- Data managers
- Overvoltage protection

For more information, see the brochure 'System Products and Data Managers - Solutions for the loop' (FA00016K)
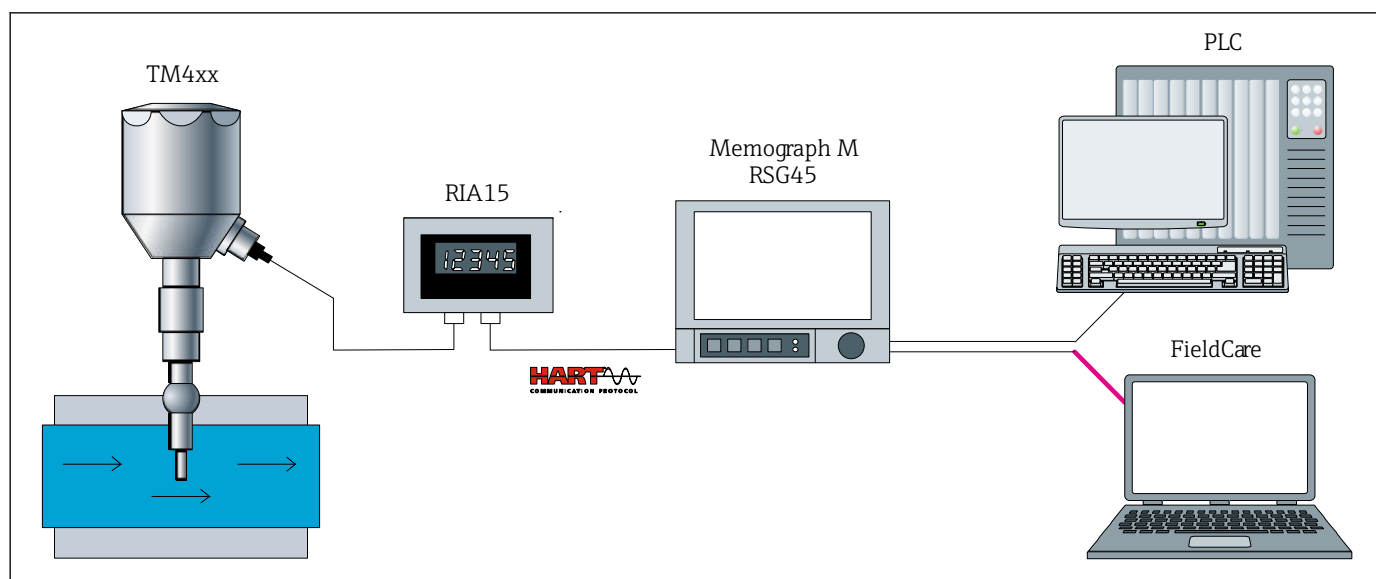
⊡ 1   Example of application, measuring point layout with additional Endress+Hauser components

A0033768

- iTHERM TM4x2: Installed RTD thermometer with integrated HART® head transmitter
- Display unit RIA15:
  - Display of 4 to 20 mA measured values or HART® process variables
  - Loop-powered
  - Voltage drop ≤1 V (HART® ≤1.9 V)
- Data Management Memograph M RSG45:
  - Tamper-proof data storage and access (FDA 21 CFR 11)
  - HART® gateway functionality; Up to 40 HART® devices connected at a time
  - Communication capabilities: Modbus, Profibus DP, PROFINET, EtherNet/IP
- PLC / FieldCare: Field Data Manager Software MS20 - Automatic service for report generation, printing reports, read out of data, storing of data, secure export, pdf generation Read out measured data via online interface or from mass storage Online visualization of instantaneous values ("live data") . More information on this can be found in the Technical Information, see "Documentation".

Input

Measured variable	Temperature (temperature-linear transmission behavior)

Measuring range

Sensor type	Measuring range
Pt100 thin-film	−50 to +200 ℃ (−58 to +392 ℉)

Output

Output signal

Generally, the measured value can be transmitted in one of two ways:

- Directly-wired sensors - sensor measured values forwarded without a transmitter.
- Via all common protocols by selecting an appropriate Endress+Hauser iTEMP temperature transmitter. All the transmitters listed below are mounted directly in the terminal head and wired with the sensory mechanism.

Family of temperature transmitters

Thermometers fitted with iTEMP transmitters are an installation-ready complete solution to improve temperature measurement by significantly increasing accuracy and reliability, when compared to direct wired sensors, as well as reducing both wiring and maintenance costs.

PC programmable head transmitters

They offer a high degree of flexibility, thereby supporting universal application with low inventory storage. The iTEMP transmitters can be configured quickly and easily at a PC. Endress+Hauser offers free configuration software which can be downloaded from the Endress+Hauser Website. More information can be found in the Technical Information. → 🖺 24

HART® programmable head transmitters

The transmitter is a 2-wire device with one or two measuring inputs and one analog output. The device not only transfers converted signals from resistance thermometers and thermocouples, it also transfers resistance and voltage signals using HART® communication. It can be installed as an intrinsically safe apparatus in Zone 1 hazardous areas and is used for instrumentation in the terminal head (flat face) as per DIN EN 50446. Swift and easy operation, visualization and maintenance by using universal device configuration tools like FieldCare, DeviceCare or FieldCommunicator 375/475. For more information, see the Technical Information. → 🖺 24

Advantages of the iTEMP transmitters:
- Dual or single sensor input (optionally for certain transmitters)
- Unsurpassed reliability, accuracy and long-term stability in critical processes
- Mathematical functions
- Monitoring of the thermometer drift, sensor backup functionality, sensor diagnostic functions
- Sensor-transmitter matching for dual sensor input transmitter, based on Callendar/Van Dusen coefficients

Wiring

ℹ️
- According to the 3-A® Standard electrical connecting cables must be smooth, corrosion-resistant and easy to clean.
- Grounding or shield connections are possible via special ground terminals on the terminal head. → 🖺 15

Wiring diagrams for RTD

Type of sensor connection

Head mounted transmitter TMT18x (single input)

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Terminal block mounted

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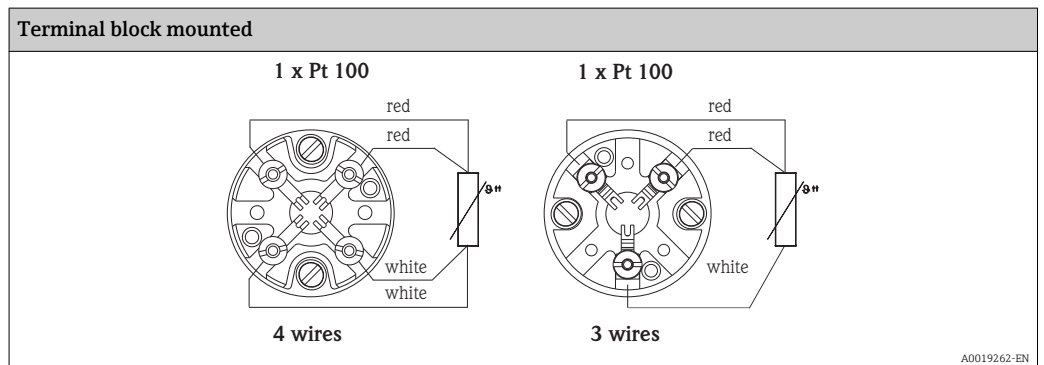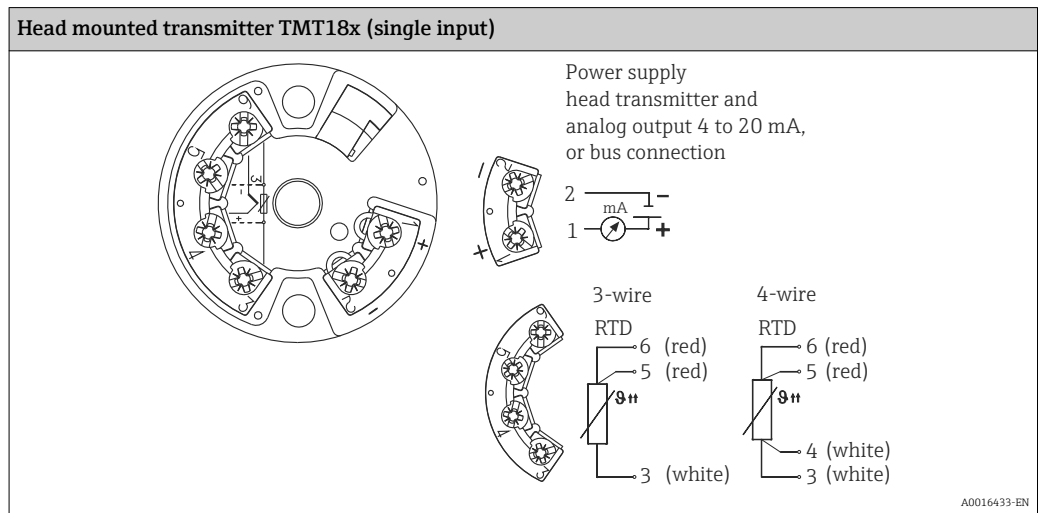
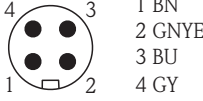| Cable entries	See the 'Terminal head' section → 🖺 15

Connector

PIN assignment of the M12 connectors, connection combinations

Connector	M12 connector 4-pin			
PIN number	1	2	3	4
Electrical connection (terminal head)				
Flying leads	Not connected (not insulated)			
3-wire terminal block (1x Pt100)	RD	RD	WH	
4-wire terminal block (1x Pt100)			WH	WH
1x TMT 4 to 20 mA or HART®	+	i	-	i
PIN position and color code	4 ⌀ 3 ● ● ● ● 1 ⌷ 2	1 BN 2 GNYE 3 BU 4 GY		A0018929

Abbreviations

i	RD	WH	BN	GNYE	BU	GY
Insulated [1]	Red	White	Brown	Green-yellow	Blue	Gray

[1] Wires marked 'i' are not connected and are insulated with heat shrink tubes.

Overvoltage protection

To protect against overvoltage in the power supply and signal/communication cables for the thermometer electronics, Endress+Hauser offers the HAW562 surge arrester for DIN rail mounting and the HAW569 for field housing installation.
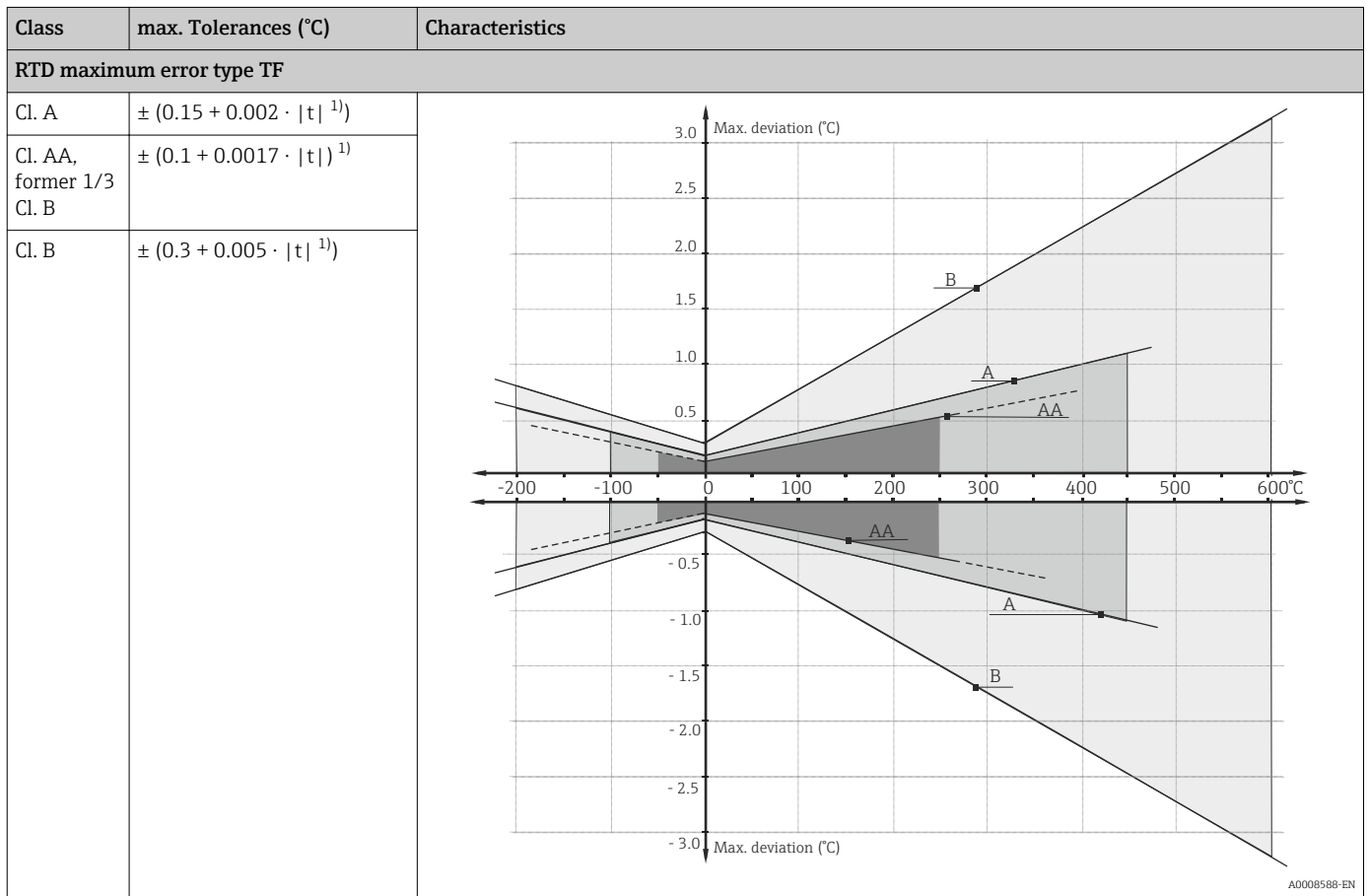
📖 For more information see the Technical Information 'HAW562 Surge arrester' TI01012K and 'HAW569 Surge arrester' TI01013K.

Performance characteristics

Reference conditions

These data are relevant for determining the accuracy of the temperature transmitters used. More information on this can be found in the Technical Information of the iTEMP temperature transmitters.

Maximum measured error   RTD resistance thermometer corresponding to IEC 60751

Class	max. Tolerances (°C)	Characteristics
RTD maximum error type TF		
Cl. A	$\pm (0.15 + 0.002 \cdot |t| ^{1)})$	
Cl. AA, former 1/3 Cl. B	$\pm (0.1 + 0.0017 \cdot |t|) ^{1)}$	
Cl. B	$\pm (0.3 + 0.005 \cdot |t| ^{1)})$	

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1) $|t|$ = absolute value °C

For measurement errors in °F, calculate using equations in °C, then multiply the outcome by 1.8.

Temperature ranges for compliance with the tolerance classes

Sensor type	Operating temperature range	Class B	Class A	Class AA
Pt100 thin film sensor (TF)	−50 to 200 °C (−58 to 392 °F)	-	−30 to 200 °C (−22 to 392 °F)	-

Influence of ambient temperature   Depends on the head transmitter used. For details, see Technical Information. → 🕮 24

Self heating   RTD elements are passive resistances that are measured using an external current. This measurement current causes a self-heating effect in the RTD element itself which in turn creates an additional measurement error. In addition to the measurement current, the size of the measurement error is also affected by the temperature conductivity and flow velocity of the process. This self-heating error is negligible when an Endress+Hauser iTEMP temperature transmitter (very small measurement current) is connected.

Response time

Tests in water at 0.4 m/s (1.3 ft/s), according to IEC 60751; 10 K temperature step change.

Pipe diameter	Shape of tip	1x Pt100 thin-film sensor	
		Response time	
		t_{50}	t_{90}
ϕ6.35 mm ($\frac{1}{4}$ in)	Straight	5 s	11 s
	Reduced 4.76 mm ($\frac{3}{16}$ in) x 19.05 mm (0.75 in)	3.5 s	9 s
ϕ9.53 mm ($\frac{3}{8}$ in)	Reduced 4.76 mm ($\frac{3}{16}$ in) x 19.05 mm (0.75 in)	5 s	10.5 s

Response time without transmitter.

|	
Calibration	**Calibration of thermometers** Calibration involves comparing the measured values of a device under test (DUT) with those of a more precise calibration standard using a defined and reproducible measurement method. The aim is to determine the deviation of the DUT's measured values from the true value of the measured variable. Two different methods are used for thermometers: • Calibration at fixed-point temperatures, e.g. at the freezing point of water at 0 ℃, • Calibration compared against a precise reference thermometer. The thermometer to be calibrated must display the fixed point temperature or the temperature of the reference thermometer as accurately as possible. Temperature-controlled calibration baths with very homogeneous thermal values, or special calibration furnaces into which the DUT and the reference thermometer, where necessary, can project to a sufficient degree, are typically used for thermometer calibrations. The measurement uncertainty can increase due to heat dissipation errors and short immersion lengths. The existing measurement uncertainty is listed on the individual calibration certificate. For accredited calibrations according to ISO17025, the measurement uncertainty shouldn't be twice as high as the accredited measurement uncertainty. If this is exceeded, only a factory calibration can be performed. **Evaluation of thermometers** If a calibration with an acceptable uncertainty of measurement and transferable measurement results is not possible, Endress+Hauser offers customers a thermometer evaluation measurement service, if technically feasible. This is the case when: • The process connections/flanges are too big or the immersion length (IL) is too short to allow the DUT to be immersed sufficiently in the calibration bath or furnace (see the following table), or • Due to heat conduction along the thermometer tube, the resulting sensor temperature generally deviates significantly from the actual bath/furnace temperature. The measured value of the DUT is determined using the maximum possible immersion depth and the specific measuring conditions and measurement results are documented on an evaluation certificate. For the device, Endress+Hauser offers standard calibrations at a reference temperature of −20 to +200 ℃ (−4 to +392 ℉) based on the ITS90 (International Temperature Scale). Calibrations in other temperature ranges are available from your Endress+Hauser sales center on request. Calibrations are traceable to national and international standards. The calibration certificate is referenced to the serial number of the thermometer.
Insulation resistance	Insulation resistance ≥ 100 MΩ at ambient temperature. Insulation resistance between the terminals and the outer jacket is measured with a minimum voltage of 100 V DC.

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
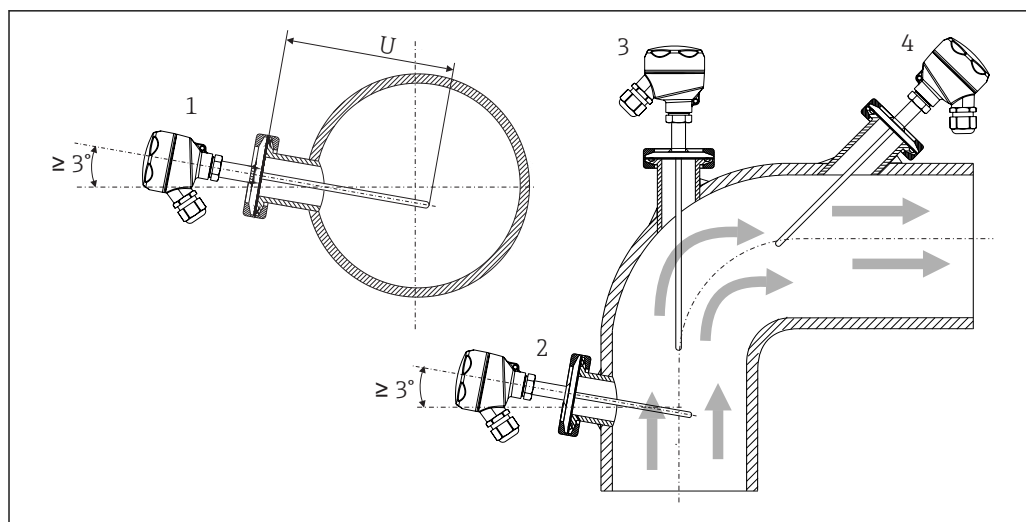
2   Installation examples

1, 2   Perpendicular to 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).
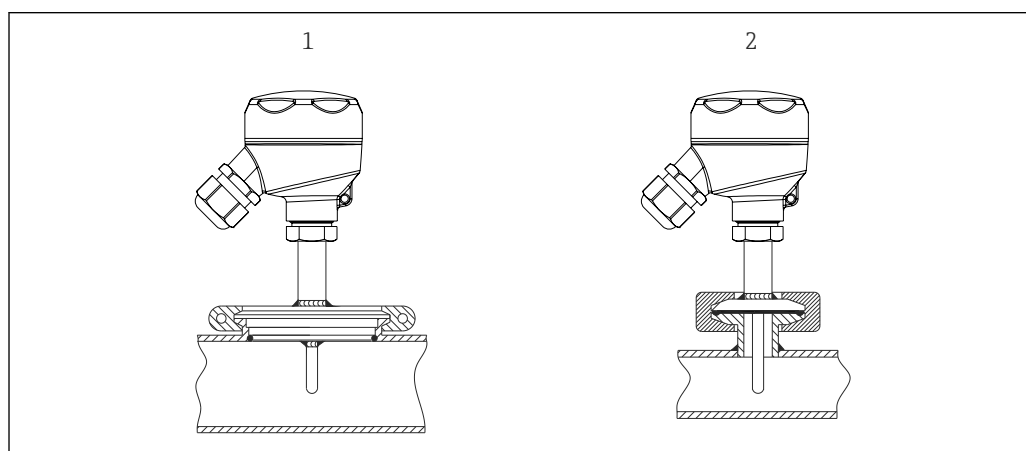
3   Process connections for thermometer installation in pipes with small nominal diameters

1   Varivent® - process connection D = 50 mm for DN25 pipes
2   Clamp or micro-clamp
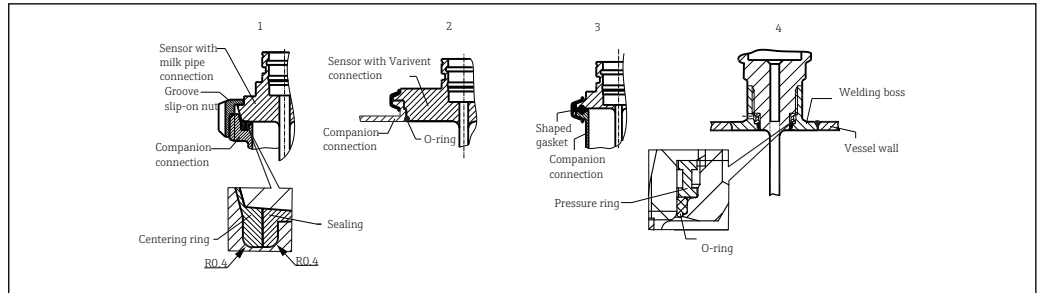
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⚅ 4   *Detailed installation instructions for hygiene-compliant installation*

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, only in connection with seal according to EHEDG position paper*
4   *Liquiphant-M G1" process connection*

> ℹ️ 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.

Procedure in case of seal failure:
- Disassembling of the thermometer, validated cleaning procedure of thread and sealing ring groove
- Replacement of the seal or sealing ring
- CIP after re-assembly

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 (30 µin)

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). The Varivent® and Liquiphant-M weld-in adapter enable flush-mounted installation.

Environment

Ambient temperature range	Terminal head	Temperature in ℃ (℉)
	Without mounted head transmitter	Depends on the terminal head used and the cable gland or fieldbus connector, see 'Terminal heads' section → 🕮 15
	With mounted head transmitter	–40 to 85 ℃ (–40 to 185 ℉)

Storage temperature   For information, see the ambient temperature.

Humidity   Depends on the transmitter used. If Endress+Hauser iTEMP head transmitters are used:
- Condensation permitted as per IEC 60 068-2-33
- Maximum relative humidity: 95% as per IEC 60068-2-30

Climate class   As per EN 60654-1, Class C

Degree of protection   Max. IP69K, depending on the design (terminal head, connector, etc.)

Shock and vibration resistance	The Endress+Hauser inserts meet the requirements of IEC 60751 which specify shock and vibration resistance of 3g in the range from 10 to 500 Hz. The vibration resistance at the measuring point depends on the sensor type and design, see the following table:

Version	Vibration resistance for the sensor tip
Pt100 (TF)	30 m/s² (3g)

Electromagnetic compatibility (EMC)	Depends on the head transmitter used. For details see the Technical Information. → 🖺 24

Process

Process temperature range	Maximum −50 to +200 ℃ (−58 to +392 ℉)

Thermal shock	Thermal shock resistance in CIP/SIP process with a temperature increase from +5 to +130 ℃ (+41 to +266 ℉) 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. → 🖺 16

> ℹ️ 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 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 thermometer diminishes with increasing insert immersion length exposed to the stream of the fluid. In addition it is dependent on the diameter of the thermometer tip, on the kind of measuring medium, on the process temperature and on 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).
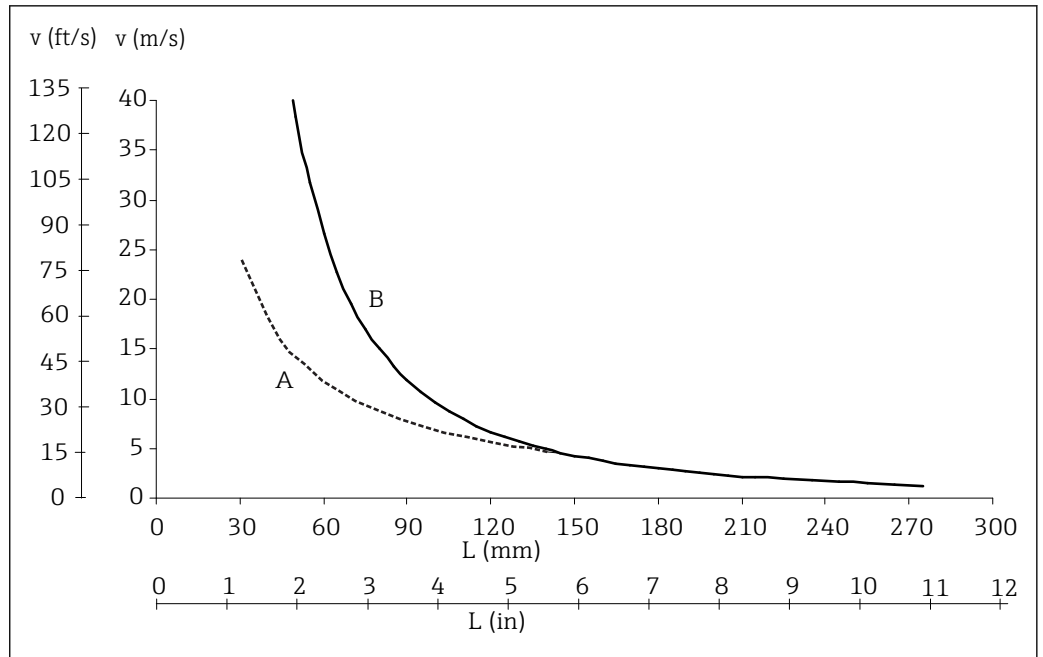
⊞ 5   Permitted flow velocities, thermowell diameter 6.35 mm (¼ in)

A   Medium water at T = 50 ℃ (122 ℉)
B   Medium superheated steam at T = 400 ℃ (752 ℉)
L   Immersion length exposed to flow
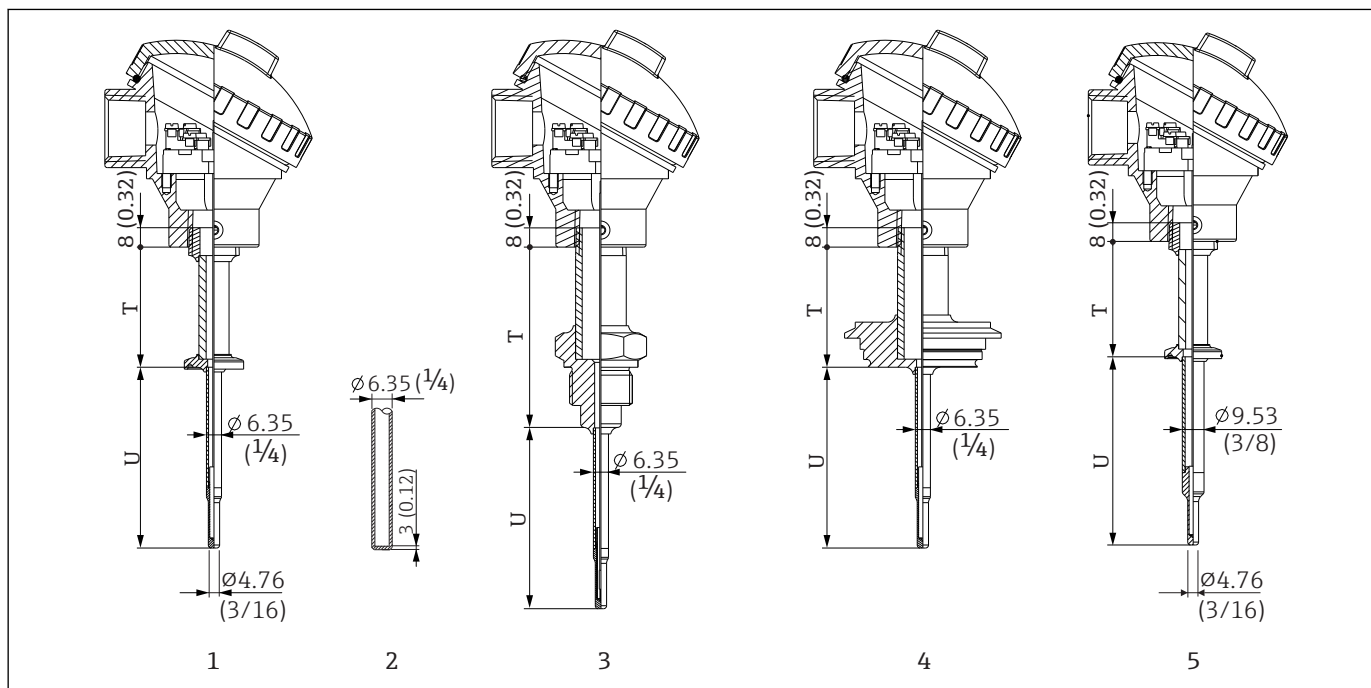*v   Flow velocity*

Medium - state of aggregation

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

Mechanical construction

Design, dimensions   All dimensions in mm (in).

A0034462

1   Thermometer with clamp process connection and Φ6.35 mm (¼ in) thermowell with reduced tip 4.76 mm (³⁄₁₆ in)
2   Optional for all thermometers with Φ6.35 mm (¼ in) thermowell: straight tip shape
3   Thermometer with ISO228 process connection and Φ6.35 mm (¼ in) thermowell with reduced tip Φ4.76 mm (³⁄₁₆ in)
4   Thermometer with Varivent process connection and Φ6.35 mm (¼ in) thermowell with reduced Φ4.76 mm (³⁄₁₆ in)
5   Thermometer with clamp process connection and Φ9.53 mm (³⁄₈ in) thermowell with reduced tip Φ4.76 mm (³⁄₁₆ in)
T   Length of extension neck
U   Immersion length

Weight   Depending on the configuration

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 (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 from a 316L or 1.4435+316L thermowell withstand a passivation process with a 3% sulphuric acid

[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	$R_a \leq 0.76\ \mu m$ (30 µin)
Finely honed surface [1]	$R_a \leq 0.38\ \mu m$ (15 µin)

[1] Not compliant with ASME BPE

Terminal heads

All terminal heads have an internal shape and size in accordance with DIN EN 50446, flat face and a thermometer connection with a ½" NPT or M24x1.5 thread. All dimensions in mm (in). The sample cable glands in the diagrams correspond to M20x1.5 connections with non-Ex polyamide cable glands. Specifications without head transmitter installed. For ambient temperatures with head transmitter installed, see the 'Environment' section. → 🖹 11

As a special feature, Endress+Hauser offers terminal heads with optimized terminal accessibility for easy installation and maintenance.

TA30A	Specification

	• Protection class:
	  – IP66/68 (NEMA Type 4x encl.)
	  – For ATEX: IP66/67
	• Temperature: −50 to +150 °C (−58 to +302 °F) without cable gland
	• Material: aluminum, polyester powder coated Seals: silicone
	• Threaded cable entry: G ½", ½" NPT and M20x1.5;
	• Protection armature connection: ½" NPT, M24x1.5
	• Head color: blue, RAL 5012
	• Cap color: gray, RAL 7035
	• Weight: 330 g (11.64 oz)
	• Ground terminal, internal and external
	• Available in conjunction with 3-A marked sensors

TA30R	Specification
96 (3.8) 64 (2.52) 25 (1) 71 (2.8) 64 (2.52) A0018914	• Degree of protection - standard version: IP69K (NEMA Type 4x encl.) • Temperature: –50 to +130 ℃ (–58 to +266 ℉) without cable gland • Material: stainless steel 316L, abrasive-blasted or hand-polished Seals: EPDM • Cable entry thread ½" NPT and M20x1.5 • Weight: 360 g (12.7 oz) • Protection armature connection: M24x1.5 or ½" NPT • Ground terminal: internal in standard version; external terminal optionally available • Available in conjunction with 3-A marked sensors

TA30S	Specification
81.7 (3.22) 87 (3.43) 50 (1.97) 28 (1.1) 78 (3.1) 122 (4.8) A0017146	• Degree of protection: IP65 (NEMA Type 4x encl.) • Temperature: –40 to +85 ℃ (–40 to +185 ℉) without cable gland • Material: polypropylene (PP), FDA-compliant, seals: O-ring EPDM • Cable entry thread: ¾" NPT (with adapter for ½" NPT), M20x1.5 • Protective assembly connection: ½" NPT • Color: white • Weight: approx. 100 g (3.5 oz) • Ground terminal: only internal via auxiliary terminal • Available in conjunction with 3-A marked sensors
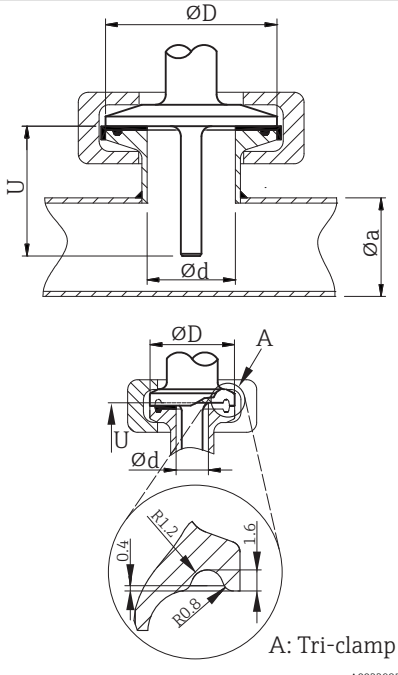
Cable glands and fieldbus connectors

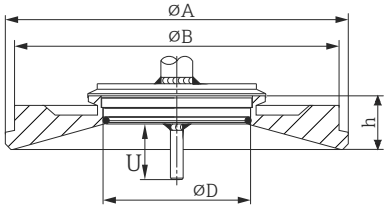| Type	Suitable for cable entry	Degree of protection	Temperature range
Cable gland, polyamide	½" NPT, ¾" NPT, M20x1.5	IP68	–40 to +100 ℃ (–40 to +212 ℉)
	½" NPT, M20x1.5	IP69K	–20 to +95 ℃ (–4 to +203 ℉)
Fieldbus connector (M12, 4-pin)	½" NPT, M20x1.5	IP67, NEMA Type 6	–40 to +105 ℃ (–40 to +221 ℉)
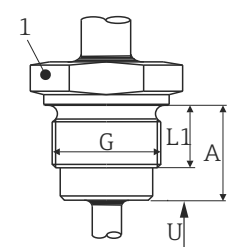
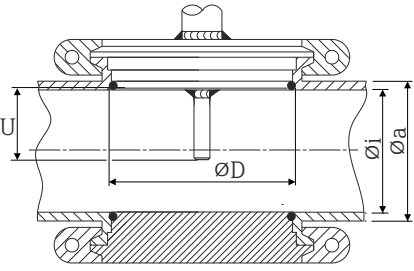**Process connections**   All dimensions in mm (in).

Type	Version	Dimensions		Technical properties
	ϕd: [1]	ϕD	ϕa	
Clamp according to ASME BPE or ISO 2852	Tri-clamp ¾" (DN18)	25 mm (0.98 in)	-	• $P_{max.}$ = 16 bar (232 psi), depends on clamp ring and suitable seal • With 3-A symbol • ASME BPE compliance
	Clamp ISO 2852 ½" (DN12 - 21.3)	34 mm (1.34 in)	16 to 25.3 mm (0.63 to 0.99 in)	

Type	Version	Dimensions		Technical properties
	φd: [1]	φD	φa	
	Tri-clamp 1" - 1½" (DN25 - 38)	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 (sealing according to EHEDG position paper, DN25, DN40, DN63,5) • ASME BPE compliance [2]
	Tri-clamp 2" (DN40 - 51)	64 mm (2.52 in)	44.8 to 55.8 mm (1.76 to 2.2 in)	

A Different seal geometries for Tri-clamp

1) Pipes in accordance with ISO 2037 and BS 4825 Part 1
2) Not for clamp ½"

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) • In connection with FTL31/33/50 adapter 3-A symbol and EHEDG certification • ASME BPE compliance • Minimum extension neck lengths: ≥ 76.2 mm (3 in)
	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	
		ØD	ØA	ØB	h	P_max.	
Varivent®	Type F	50 mm (1.97 in)	145 mm (5.71 in)	135 mm (5.31 in)	24 mm (0.95 in)	10 bar (145 psi)	• With 3-A symbol and EHEDG certification • ASME BPE compliance
	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	• With 3-A symbol and EHEDG certification • ASME BPE compliance

Version	Dimensions			P_max.
	ØD	Øi	Øa	
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)	
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)

Certificates and approvals

CE mark	The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EC directives. The manufacturer confirms successful testing of the product 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 → 🕮 16 • 3-A authorization no. 1144, 3-A sanitary standard 74-06. Permitted process connections in accordance with 3-A, see 'Process connections' section → 🕮 16 • ASME BPE 2009, certificate of conformity can be ordered for indicated options
Other standards and guidelines	• IEC 60529: Degrees of protection provided by enclosures (IP code) • IEC 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use • IEC 60751: Industrial platinum resistance thermometers • ASTM E 1137/E1137M-2008: Standard Specification for Industrial Platinum Resistance Thermometers • EN 50281-1-1: Electrical apparatus protected by enclosures • DIN EN 50446: Terminal heads • IEC 61326-1: Electromagnetic compatibility (electrical equipment for measurement, control and laboratory use - EMC requirements)
Parts in contact with the medium	Parts of the thermometer in contact with the medium comply with the following European regulations: • (EC) No. 1935/2004, Article 3, paragraph 1, Articles 5 and 17 on materials and articles intended to come into contact with food. • (EC) No. 2023/2006 on good manufacturing practice for materials and articles intended to come into contact with food. • (EC) No. 10/2011 on plastic materials and articles intended to come into contact with food. • FDA-compliant • All product contact surfaces are produced without animal derived ingredients (ADI/TSE)
CRN approval	The CRN approval is only available for certain options of protection tubes. These will be marked and shown during the configuration of this device.
Surface purity	Free from oil and grease, optional
Material resistance	Material resistance - including housing - to the following cleaning agents/disinfectants from the company Ecolab: P3-topax 66, P3-topactive 200, P3-topactive 500 and P3-topactive OKTO as well as demineralized water.
Material certification	The material certificate 3.1 (according to standard EN 10204) can be requested separately.
Calibration	The "Factory calibration" is carried out according to an internal procedure in a laboratory of Endress+Hauser accredited by the European Accreditation Organization (EA) to ISO/IEC 17025. A calibration which is performed according to EA guidelines (SIT/Accredia) or (DKD/DAkkS) may be requested separately. The calibration is performed on the replaceable insert of the thermometer. In the case of thermometers without a replaceable insert, the entire thermometer - from the process connection to the tip of the thermometer - is calibrated.

Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> 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.
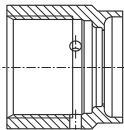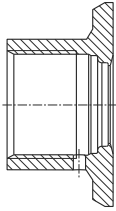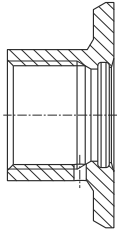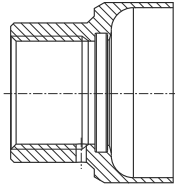- From your Endress+Hauser Sales Center: www.addresses.endress.com
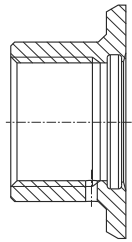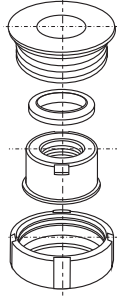
Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation 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

Weld-in adapter	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)
Order number weld-in adapter	71258357	71258355	52001052	71258358	52001051 [1]	52001221 [2]
Order number weld-in adapter with inspection certificate [3] [4]	52028295	52018765	52011897	71093129	52011896 [1]	52011898 [2]
Order number for seal replacement (5 pieces) [5]	Silicone O-ring 52021717	Silicone O-ring 52021717	Silicone O-ring 52014473	Silicone O-ring 52014472	Silicone O-ring 52014472	Silicone profile gasket 52014424
Order number welding dummy [6]	71174959	71174959	71168889	71166879	71166879	71181945
Order number blind plug [6]	71167850	71167850	71177193	71173810	71173810	71166366
Order number blind plug with inspection certificate [4] [6]	-	-	71190074	71167291	71167291	71196853

1) Replace the weld-in adapter with order number 917969-1000.
2) Replace the weld-in adapter with order number 215159-0000.
3) AD2000: The material 316L (in contact with process) corresponds to AD2000 – W0/W2.
4) Inspection certificate EN10204-3.1 material
5) One seal is included in scope of delivery.
6) TSP modification number. Can be ordered only FTSP, PTSP or NTSP.

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

Maximum process pressure for the weld-in adapters:
- 25 bar (362 PSI) at maximum 150 ℃ (302 ℉)
- 40 bar (580 PSI) at maximum 100 ℃ (212 ℉)

Communication-specific accessories	Configuration kit TXU10	Configuration kit for PC-programmable transmitter with setup software and interface cable for PC with USB port Order code: TXU10-xx

Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. ☐ For details, see Technical Information TI00404F
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. ☐ For details, see Technical Information TI00405C
Wireless HART adapter SWA70	Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity. ☐ For details, see Operating Instructions BA00061S
Fieldgate FXA42	Gateway for remote monitoring of connected 4 to 20 mA analog as well as digital field devices. ☐ For details, see Technical Information TI01297S and Brief Operating Instructions KA01246S
Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the **non-Ex area**. ☐ For details, see Operating Instructions BA01202S
Field Xpert SFX370	Field Xpert is an industrial PDA with integrated touchscreen for commissioning and maintaining field devices in explosion hazardous and safe areas. It allows efficient configuration of FOUNDATION fieldbus, HART 5/6/7 and WirelessHART devices via Bluetooth and/or Wifi interfaces. ☐ For details, see Technical Information TI01114S and Operating Instructions BA01202S
Field Xpert SMT70	The Field Xpert SMT70 is an out-of-the box tablet PC for universal device configuration that has pre-installed devices libraries. It supports devices with protocols such as HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, Modbus, and Endress+Hauser service protocols. ☐ For details, see Technical Information TI01342S

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://portal.endress.com/webapp/applicator • On CD-ROM for local PC installation.

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

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.

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

Accessories	Description
Display RIA15	It is integrated in the 4 to 20 mA or HART® loop and transmits the measuring signal or HART® process variables in digital form. The process display unit does not require an external power supply. It is powered directly from the current loop. 📖 For details, see the "Technical Information" document TI01043K
Memograph M, RSG45	Advanced Data Manager with tamper-proof data storage and access (FDA 21 CFR 11) HART® gateway functionality; Up to 40 HART® devices connected at a time Communication capabilities: Modbus, Profibus DP, PROFINET, EtherNet/IP. 📖 For details, see the "Technical Information" document TI01180R
Active barrier RN221N	Active barrier with power supply for safe separation of 4-20 mA standard signal circuits. Offers bidirectional HART transmission. 📖 For details, see "Technical Information" TI00073R and Operating Instructions BA00202R

Power supply RNS221	Supply unit for powering two 2-wire measuring devices solely in the non-Ex area. Bidirectional communication is possible via the HART communication jacks.
	For details, see "Technical Information" TI00081R and Brief Operating Instructions KA00110R

Documentation

Technical information:

Resistance thermometer for hygienic and aseptic applications iTHERM TM402: TI01349T

Modular resistance thermometer for hygienic and aseptic applications iTHERM TM412: TI01348T

Insert for thermometer installation iTHERM TS212: TI01336T

Thermometer protection tube for hygienic and aseptic applications iTHERM TT412: TI01350T

Process Indicator RIA15: TI01043K

Advanced Data Manager Memograph M RSG45: TI01180R

Field Data Manager Software MS20, MS21: TI01022R

iTEMP temperature head transmitter:

TMT80, PC-programmable, single-channel, RTD and TC: TI00153R

TMT180, PC-programmable, single-channel, Pt100: TI00088R

TMT181, PC-programmable, single-channel, RTD, TC, Ω, mV: TI00070R

HART® TMT182, single-channel, RTD, TC, Ω, mV: TI00078R

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