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Technical Information
iTHERM ModuLine TM411

Metric RTD thermometer with or without thermowell for hygienic applications



Easy-to-use metric version with outstanding sensor technology

Applications

- Specially designed for use in hygienic and aseptic applications in the Food & Beverages and Life Sciences industries
- Measuring range: −200 to +600 °C (−328 to +1 112 °F)
- Pressure range up to 50 bar (725 psi)
- Protection class: up to IP69K

Head transmitters

All Endress+Hauser iTEMP transmitters are available with enhanced measurement accuracy and reliability compared to directly wired sensors. Outputs and communication protocol:

- Analog output 4 to 20 mA, HART, HART SIL, optional
- PROFIBUS PA, FOUNDATION Fieldbus
- PROFINET over Ethernet-APL
- IO-Link

Your benefits

- Optimum process control: fast response times with iTHERM QuickSens technology (t90s: 1.5 s)
- Recalibrations up to 75% faster and more reliable with iTHERM QuickNeck. Quick fastener for fast, tool-free removal of the insert
- High sensor availability under harsh conditions: Vibration-resistant RTD technology iTHERM StrongSens (> 60g)
- Easy product selection, configuration and maintenance
- Increase productivity and product safety in hygienic applications with highly accurate and reliable measurement
- Thermowells, hygienic process connections and housing, professionally produced, made of high-quality materials with low surface roughness

Endress+Hauser
People for Process Automation

Table of contents

Function and system design 3
Notes on selecting the right device 3
Measuring principle 4
Measuring system 5
Equipment architecture 6

Input 7
Measured variable 7
Measuring range 7

Output 7
Output signal 7
Family of temperature transmitters 7

Power supply 8
Wiring diagram for RTD 8
Overvoltage protection 15

Performance characteristics 15
Reference operating conditions 15
Maximum measurement error 16
Influence of ambient temperature 16
Self-heating 17
Response time 17
Calibration 18
Insulation resistance 19

Installation 19
Orientation 19
Installation instructions 19

Environment 23
Ambient temperature range 23
Storage temperature 23
Relative humidity 23
Climate class 23
Degree of protection 23
Shock and vibration resistance 23
Electromagnetic compatibility (EMC) 23

Process 23
Process temperature range 23
Thermal shock 23
Process pressure range 23
State of aggregation of the medium 24

Mechanical construction 24
Design, dimensions 24
Insert 36
Weight 36
Materials 36
Surface roughness 37
Terminal heads 37
Extension neck 40
Thermowell 42

Certificates and approvals 52
Materials in contact with food/product (FCM) 52
CRN approval 53
Surface purity 53
Material resistance 53

Ordering information 53

Accessories 53
Device-specific accessories 54
Service-specific accessories 56
Communication-specific accessories 57
Online tools 57
System components 57

Documentation 58
Brief Operating Instructions (KA) 58
Operating Instructions (BA) 58
Safety Instructions (XA) 58
Functional Safety Manual (FY) 58

Function and system design

Notes on selecting the right device

iTHERM ModuLine, hygienic

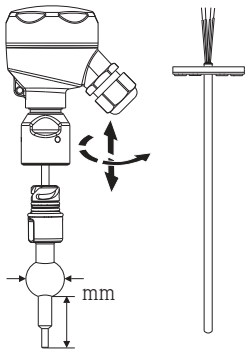
This device is part of the product line of modular thermometers for hygienic and aseptic applications.

Differentiating factors when selecting a suitable thermometer

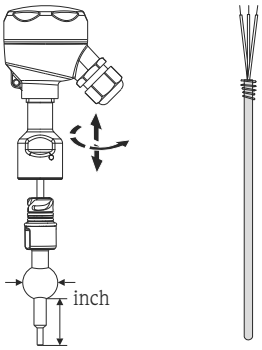
iTHERM ModuLine TM4x**1**	iTHERM ModuLine TM4x**2**
Metric version	Imperial version
↓	↓

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

iTHERM ModuLine TM411



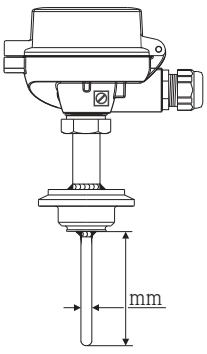
iTHERM ModuLine TM412



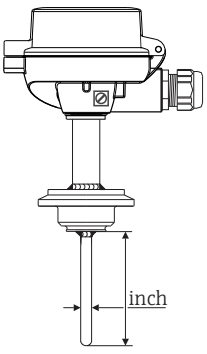
↓ ↓

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

iTHERM ModuLine TM401



iTHERM ModuLine TM402



Measuring principle

Resistance thermometers (RTD)

These resistance thermometers use a Pt100 element as the temperature sensor according to IEC 60751. The temperature sensor is a temperature-sensitive platinum resistor with a resistance of 100 Ω at 0 °C (32 °F) and a temperature coefficient α = 0.003851 $°C^{-1}$.

There are two different versions of platinum resistance thermometers:

- **Wire-wound (WW):WW** In these thermometers, a double coil of fine, high-purity platinum wire is accommodated in a ceramic support. This carrier is then sealed top and bottom with a ceramic protective layer. These resistance thermometers not only facilitate very reproducible measurements but also offer good long-term stability of the resistance/temperature characteristic within temperature ranges up to 600 °C (1 112 °F). This type of sensor is relatively large in size and is comparatively sensitive to vibrations.
- **Thin-film platinum resistance thermometers(TF):** A very thin, ultrapure platinum layer, approx. 1 µm thick, is vaporized in a vacuum on a ceramic substrate and then structured photolithographically. The platinum conductor paths formed in this way create the measuring resistance. Additional covering and passivation layers are applied and reliably protect the thin platinum layer from contamination and oxidation, even at high temperatures.

The primary advantages of thin-film temperature sensors over wire-wound versions are their smaller sizes and better vibration resistance. It should be noted that, due to the operating principle of TF sensors, they frequently exhibit a relatively slight deviation in their resistance/temperature characteristic from the standard characteristic defined in IEC 60751 at higher temperatures. As a result, the tight limit values of tolerance class A as per IEC 60751 can only be observed with TF sensors at temperatures up to approx. 300 °C (572 °F).

Thermocouples (TC)

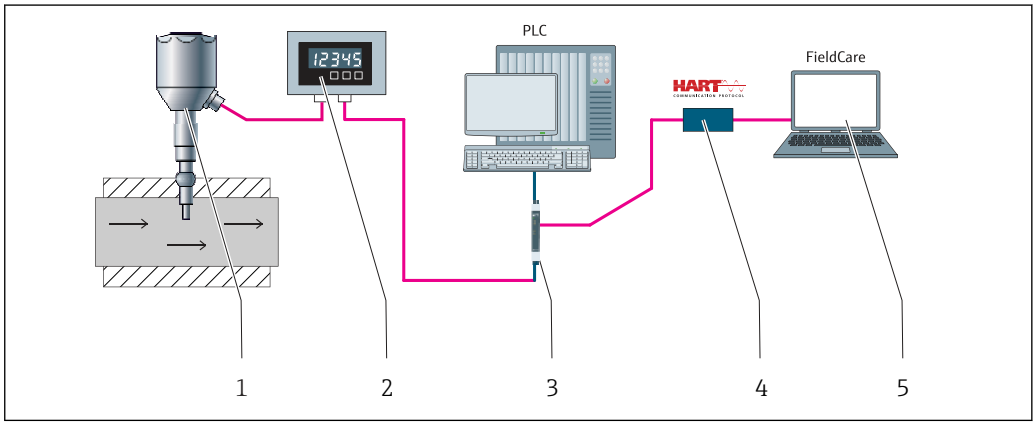
Thermocouples are comparatively simple, robust temperature sensors which use the Seebeck effect for temperature measurement: if two electrical conductors made of different materials are connected at a point, a weak electrical voltage can be measured between the two open conductor ends if the conductors are subjected to a thermal gradient. This voltage is called thermoelectric voltage or electromotive force (emf). Its magnitude depends on the type of conducting materials and the temperature difference between the "measuring point" (the junction of the two conductors) and the "cold junction" (the open conductor ends). Accordingly, thermocouples primarily only measure differences in temperature. The absolute temperature at the measuring point can be determined from these if the associated temperature at the cold junction is known or is measured separately and compensated for. The material combinations and associated thermoelectric voltage/temperature characteristics of the most common types of thermocouple are standardized in the IEC 60584 and ASTM E230/ANSI MC96.1 standards.

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
- Overvoltage protection

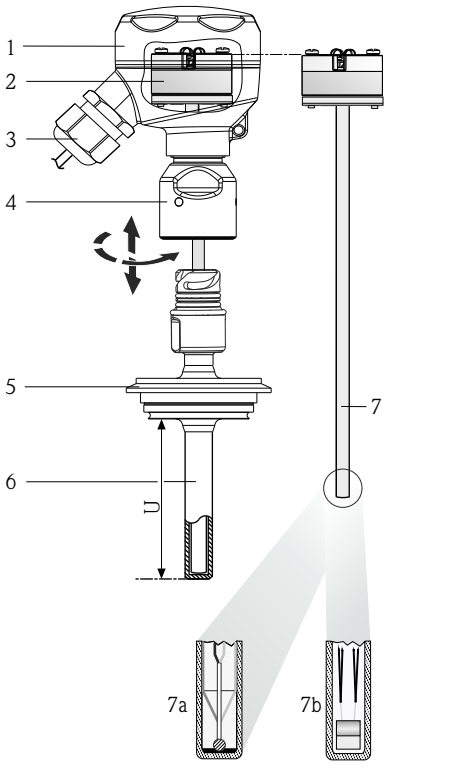
For more information, see the brochure "System Components - Solutions for a Complete Measuring Point" (FA00016K)



1 Example of application, measuring point layout with additional Endress+Hauser components

1 *Installed iTHERM compact thermometer with HART communication protocol*
2 *Process indicator from the RIA product range: The process indicator is looped into the current loop and displays the measuring signal or the HART process variables in digital form. The process indicator does not require an external power supply. It is powered directly from the current loop.*
3 *RN series active barrier - The active barrier (17.5 V_{DC}, 20 mA) has a galvanically isolated output for supplying voltage to 2-wire transmitters. The universal power supply works with an input supply voltage of 24 to 230 V AC/DC, 0/50/60 Hz, which means that it can be used in all international power grids.*
4 *Communication examples: HART Communicator (handheld device), FieldXpert, Commubox FXA195 for intrinsically safe HART communication with FieldCare via a USB port.*
5 *FieldCare is an FDT-based plant asset management tool from Endress+Hauser; for more details, see 'Accessories' section.*

Equipment architecture

Design		Options
	1: Terminal head → 🖹 37	▪ 316L, low head, optionally with display window ▪ Aluminum, high or low head, with or without display window ▪ Polypropylene, low head ▪ Polyamide, high head, without display window **Your benefits:** ▪ Optimum terminal access thanks to low housing edge of bottom section: ▪ Easier to use ▪ Lower installation and maintenance costs ▪ Optional display: local process display for added reliability ▪ IP69K protection: optimum protection even with high-pressure cleaning
	2: Wiring, electrical connection, output signal → 🖹 7	▪ Ceramic terminal block ▪ Flying leads ▪ Head transmitter (4 to 20 mA, HART, PROFIBUS PA, FOUNDATION Fieldbus, IO-Link), single-channel or two-channel, PROFINET over Ethernet-APL ▪ Attachable display (optional)
	3: Plug or cable gland	▪ Polyamide or brass cable glands ▪ M12 plug, 4-pin/8-pin: PROFIBUS PA, Ethernet-APL, IO-Link ▪ 7/8" plug: PROFIBUS PA, FOUNDATION™ Fieldbus
	4: Extension neck → 🖹 40	Welded-in-place or removable either with the quick fastener (iTHERM QuickNeck) or thread adapter nut G3/8" **Your benefits at a glance:** ▪ **iTHERM QuickNeck:** tool-free removal of the insert: ▪ Saves time/costs on frequently calibrated measuring points ▪ Wiring mistakes avoided ▪ IP69K protection: safety under extreme process conditions
	5: Process connection → 🖹 42	More than 50 different versions.
	6: Thermowell → 🖹 42	▪ Versions with and without thermowell (insert in direct contact with process). ▪ Various diameters ▪ Various tip shapes (straight or reduced)
	7: Insert → 🖹 36 with: 7a: iTHERM QuickSens 7b: iTHERM StrongSens	Sensor models: wire wound (WW) or thin-film sensor (TF). **Your benefits at a glance:** ▪ **iTHERM QuickSens** - insert with the world's fastest response time: ▪ Insert: Ø3 mm (⅛ in) or Ø6 mm (¼ in) ▪ Fast, highly accurate measurements, delivering maximum process safety and control ▪ Quality and cost optimization ▪ Minimization of necessary immersion length: better product protection thanks to improved process flow ▪ **iTHERM StrongSens** - insert with unbeatable durability: ▪ Vibration resistance > 60g: lower life cycle costs thanks to longer operating life and high plant availability ▪ Automated, traceable production: top quality and maximum process safety ▪ High long-term stability: reliable measured values and high level of system safety

Input

Measured variable

Temperature (temperature-linear transmission behavior)

Measuring range

Depends on the type of sensor used

Sensor type	Measuring range
Pt100 thin-film	−50 to +400 °C (−58 to +752 °F)
Pt100 thin-film, iTHERM StrongSens, vibration-resistant > 60g	−50 to +500 °C (−58 to +932 °F)
Pt100 thin-film, iTHERM QuickSens, fast-response	−50 to +200 °C (−58 to +392 °F)
Pt100 wire wound, extended measuring range	−200 to +600 °C (−328 to +1 112 °F)

Output

Output signal

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

- Directly-wired sensors - sensor measured values forwarded without 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 measurement accuracy and reliability, when compared to direct wired sensors, as well as reducing both wiring and maintenance costs.

4-20 mA head transmitter
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.

HART head transmitter
The iTEMP 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. Swift and easy operation, visualization and maintenance using universal configuration software like FieldCare, DeviceCare or FieldCommunicator 375/475. Integrated Bluetooth® interface for the wireless display of measured values and configuration via Endress +Hauser SmartBlue app, optional.

PROFIBUS PA head transmitter
Universally programmable iTEMP head transmitter with PROFIBUS PA communication. Conversion of various input signals into digital output signals. High measurement accuracy over the complete operating temperature range. PROFIBUS PA functions and device-specific parameters are configured via fieldbus communication.

FOUNDATION Fieldbus™ head transmitters
Universally programmable iTEMP head transmitter with FOUNDATION Fieldbus™ communication. Conversion of various input signals into digital output signals. High measurement accuracy over the complete operating temperature range. All iTEMP transmitters are approved for use in all the main process control systems. The integration tests are performed in Endress+Hauser's 'System World'.

Head transmitter with PROFINET and Ethernet-APL™
The iTEMP transmitter is a 2-wire device with two measuring inputs. The device not only transfers converted signals from resistance thermometers and thermocouples, it also transfers resistance and voltage signals using the PROFINET protocol. Power is supplied via the 2-wire Ethernet connection according to IEEE 802.3cg 10Base-T1. The iTEMP transmitter can be installed as an intrinsically safe electrical apparatus in Zone 1 hazardous areas. The device can be used for instrumentation purposes in the terminal head form B (flat face) according to DIN EN 50446.

Head transmitter with IO-Link
The iTEMP transmitter is an IO-Link device with a measurement input and an IO-Link interface. It offers a configurable, simple and cost-effective solution thanks to digital communication via IO-Link. The device is mounted in a terminal head form B (flat face) as per DIN EN 5044.

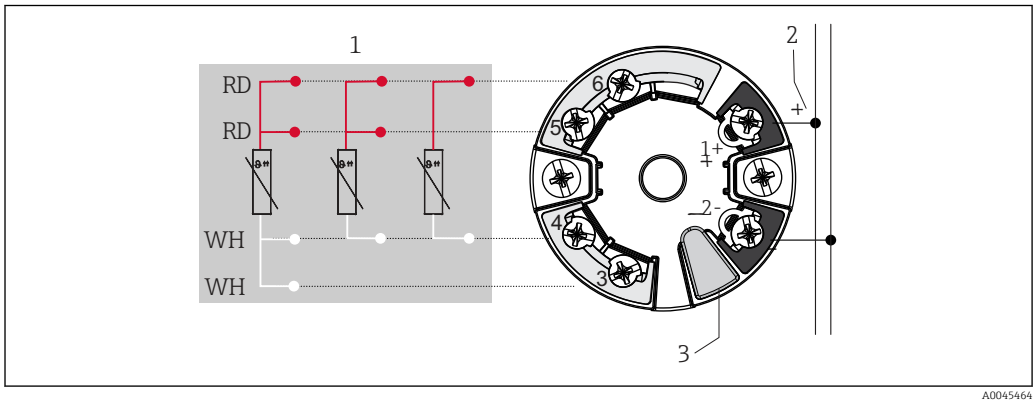
Advantages of the iTEMP transmitters:
- Dual or single sensor input (optionally for certain transmitters)
- Attachable display (optionally for certain transmitters)
- Unsurpassed reliability, accuracy and long-term stability in critical processes
- Mathematical functions
- Monitoring of the thermometer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

Power supply

- According to the 3-A Sanitary Standard and EHEDG, 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. → 37

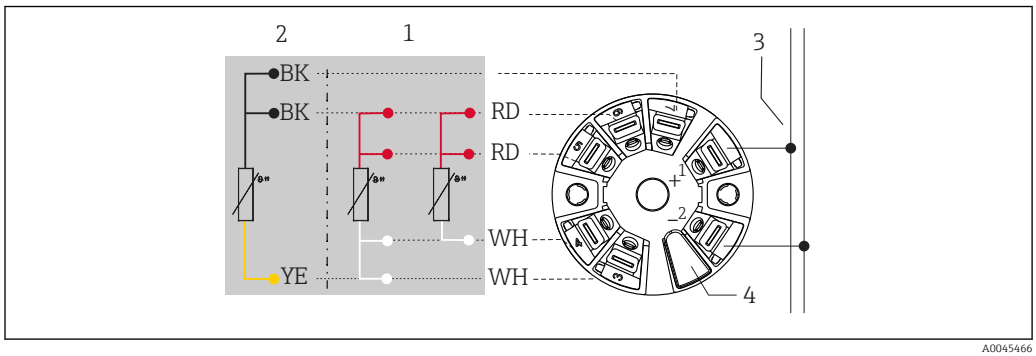
Wiring diagram for RTD

Type of sensor connection



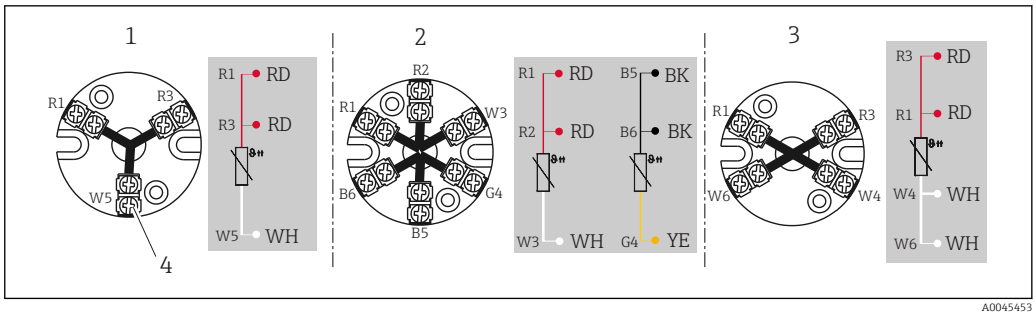
2 *Head-mounted iTEMP TMT7x transmitter or TMT31 (single sensor input)*

1 *Sensor input, RTD and Ω: 4-, 3- and 2-wire*
2 *Power supply or fieldbus connection*
3 *Display connection/CDI interface*



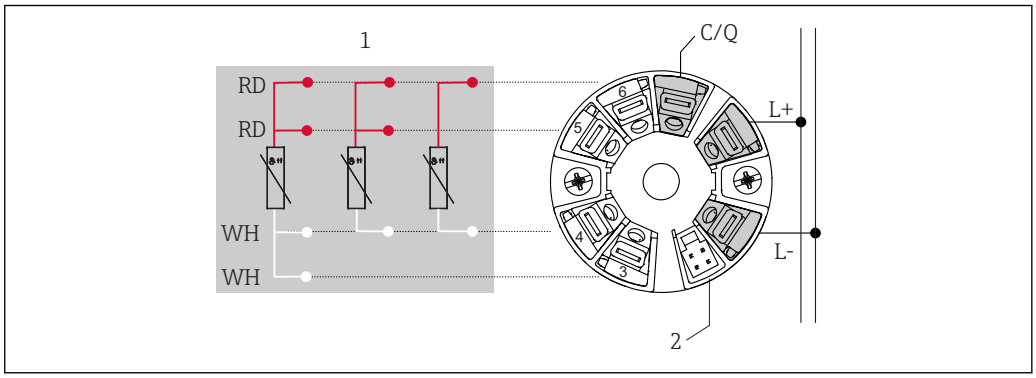
3 *Head-mounted iTEMP TMT8x transmitter (dual sensor input)*

1 *Sensor input 1, RTD: 4- and 3-wire*
2 *Sensor input 2, RTD: 3-wire*
3 *Power supply or fieldbus connection*
4 *Display connection*



4 *Terminal block mounted*

1 3-wire single
2 2 x 3-wire single
3 4-wire single
4 Outside screw



5 *Head-mounted iTEMP TMT36 transmitter (single sensor input)*

1 RTD sensor input: 4-, 3- and 2-wire
2 Display connection
L+ 18 to 30 V_{DC} power supply
L- 0 V_{DC} power supply
C/Q IO-Link or switch output

Terminals

iTEMP head transmitters fitted with push-in terminals unless screw terminals are explicitly selected or a double sensor is installed.

Cable entries

The cable entries must be selected during configuration of the device. Different terminal heads offer different options in terms of the thread and number of available cable entries.

Device plugs

The manufacturer offers a wide variety of device plugs for the simple and fast integration of the thermometer into a process control system. The following tables show the PIN assignments of the various plug connector combinations.

The manufacturer advises against connecting thermocouples directly to connectors. The direct connection to the pins of the plug might generate a new "thermocouple" which influences the accuracy of the measurement. The thermocouples are connected in combination with a iTEMP transmitter.

Abbreviations

#1	Order: first transmitter/insert	#2	Order: second transmitter/insert
i	Insulated. Wires marked 'i' are not connected and are insulated with heat shrink tubes.	YE	Yellow

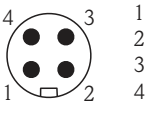
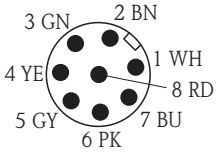
GND	Grounded. Wires marked 'GND' are connected to the internal grounding screw in the terminal head.	RD	Red
BN	Brown	WH	White
GNYE	Green-yellow	PK	Pink
BU	Blue	GN	Green
GY	Gray	BK	Black

Terminal head with a cable entry [1)]

Plug	**1x PROFIBUS PA**								**1x FOUNDATION™ Fieldbus (FF)**				**1x PROFINET and Ethernet-APL™**			
Plug thread	M12				7/8"				7/8"				M12			
PIN number	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Electrical connection (terminal head)																
Flying leads and TC	Not connected (not insulated)															
3-wire terminal block (1x Pt100)	RD	RD	WH		RD	RD	WH		RD	RD	WH		Cannot be combined		Cannot be combined	
4-wire terminal block (1x Pt100)			WH	WH			WH	WH			WH	WH				
6-wire terminal block (2x Pt100)	RD (#1) [2)]	RD (#1)	WH (#1)		RD (#1)	RD (#1)	WH (#1)		RD (#1)	RD (#1)	WH (#1)					
1x TMT 4 to 20 mA or HART®	+	i	-	i	+	i	-	i	+	i	-	i	Cannot be combined			
2x TMT 4 to 20 mA or HART® in the terminal head with a high cover	+(#1)	+(#2)	-(#1)	-(#2)	+(#1)	+(#2)	-(#1)	-(#2)	+(#1)	+(#2)	-(#1)	-(#2)				
1x TMT PROFIBUS® PA	+	i	-	GND [3)]	+	i	-	GND [3)]	Cannot be combined							
2x TMT PROFIBUS® PA	+(#1)		-(#1)		+		-									
1x TMT FF	Cannot be combined				Cannot be combined				-	+	GND	i	Cannot be combined			
2x TMT FF									-(#1)	+(#1)						
1x TMT PROFINET®									Cannot be combined				Ethernet-APL signal -	Ethernet-APL signal +	GND	-
2x TMT PROFINET®													Ethernet-APL signal - (#1)	Ethernet-APL signal + (#1)		
PIN position and color code	 1 BN 2 GNYE 3 BU 4 GY A0018929				 1 BN 2 GNYE 3 BU 4 GY A0018930				 1 BU 2 BN 3 GY 4 GNYE A0018931				 1 RD 2 GN A0052119			

1) Options depend on product and configuration
2) Second Pt100 is not connected
3) If a head is used without grounding screw, e.g. plastic housing TA30S or TA30P, insulated 'i' instead of grounded GND

Terminal head with a cable entry [1)]

Plug	4-pin/8-pin							
Plug thread	M12							
PIN number	1	2	3	4	5	6	7	8
Electrical connection (terminal head)								
Flying leads and TC	Not connected (not insulated)							
3-wire terminal block (1x Pt100)	RD	RD	WH		i			
4-wire terminal block (1x Pt100)			WH	WH				
6-wire terminal block (2x Pt100)			WH		BK	BK	YE	
1x TMT 4 to 20 mA or HART®	+(#1)	i	-(#1)	i	i			
2x TMT 4 to 20 mA or HART® in the terminal head with a high cover					+(#2)	i	-(#2)	i
1x TMT PROFIBUS® PA	Cannot be combined							
2x TMT PROFIBUS® PA								
1x TMT FF	Cannot be combined							
2x TMT FF								
1x TMT PROFINET®	Cannot be combined							
2x TMT PROFINET®	Cannot be combined							
PIN position and color code								

1) Options depend on product and configuration

Terminal head with one cable entry

Plug	1x IO-Link, 4-pin			
Plug thread	M12			
PIN number	1	2	3	4
Electrical connection (terminal head)				
Flying leads	Not connected (not insulated)			
3-wire terminal block (1x Pt100)	RD	i	RD	WH
4-wire terminal block (1x Pt100)	Cannot be combined			
6-wire terminal block (2x Pt100)				
1x TMT 4 to 20 mA or HART	Cannot be combined			
2x TMT 4 to 20 mA or HART in the terminal head with a high cover				
1x TMT PROFIBUS PA	Cannot be combined			
2x TMT PROFIBUS PA				
1x TMT FF	Cannot be combined			
2x TMT FF				
1x TMT PROFINET	Cannot be combined			
2x TMT PROFINET				
1x TMT IO-Link	L+	-	L-	C/Q

Plug	1x IO-Link, 4-pin			
2x TMT IO-Link	L+ (#1)	-	L- (#1)	C/Q
PIN position and color code	 1 BN 3 BU 4 BK A0055383			

Terminal head with two cable entries [1)]

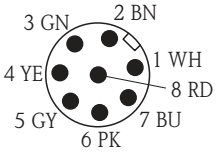
Plug	2x PROFIBUS PA								2x FOUNDATION™ Fieldbus (FF)				2x PROFINET and Ethernet-APL™			
Plug thread  A0021706	M12(#1) / M12(#2)				7/8"(#1)/7/8"(#2)				7/8"(#1)/7/8"(#2)				M12 (#1)/M12 (#2)			
PIN number	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Electrical connection (terminal head)																
Flying leads and TC	Not connected (not insulated)															
3-wire terminal block (1x Pt100)	RD/i	RD/i	WH/i		RD/i	RD/i	WH/i		RD/i	RD/i	WH/i		Cannot be combined		WH/i	
4-wire terminal block (1x Pt100)			WH/i	WH/i			WH/i	WH/i			WH/i	WH/i				
6-wire terminal block (2x Pt100)	RD/BK	RD/BK	WH/YE		RD/BK	RD/BK	WH/YE		RD/BK	RD/BK	WH/YE					
1x TMT 4 to 20 mA or HART®	+/i	i/i	-/i	i/i	+/i	i/i	-/i	i/i	+/i	i/i	-/i	i/i	+/i	i/i	-/i	i/i
2x TMT 4 to 20 mA or HART® in the terminal head with a high cover	+ (#1)/ + (#2)		- (#1)/ -(#2)		+ (#1)/ + (#2)		- (#1)/ -(#2)		+ (#1)/ + (#2)		- (#1)/ -(#2)		+ (#1)/ +(#2)		- (#1)/ -(#2)	
1x TMT PROFIBUS® PA	+/i		-/i	GND/ GND	+/i		-/i	GND/ GND	Cannot be combined							
2x TMT PROFIBUS® PA	+ (#1)/ + (#2)		- (#1)/ -(#2)		+ (#1)/ + (#2)		- (#1)/ -(#2)									
1x TMT FF	Cannot be combined				Cannot be combined				-/i	+/i	i/i	GND/ GND	Cannot be combined			
2x TMT FF									- (#1)/ -(#2)	+ (#1)/ + (#2)						
1x TMT PROFINET®	Cannot be combined				Cannot be combined				Cannot be combined				Ethernet-APL signal -	Ethernet-APL signal +	GND	i

Plug	2x PROFIBUS PA		2x FOUNDATION™ Fieldbus (FF)	2x PROFINET and Ethernet-APL™			
2x TMT PROFINET®	Cannot be combined	Cannot be combined	Cannot be combined	Ethernet-APL signal - (#1) and (#2)	Ethernet-APL signal + (#1) and (#2)		
PIN position and color code	 1 BN 2 GNYE 3 BU 4 GY A0018929	 1 BN 2 GNYE 3 BU 4 GY A0018930	 1 BU 2 BN 3 GY 4 GNYE A0018931	 1 RD 2 GN A0052119			

1) Options depend on product and configuration

Terminal head with two cable entries [1)]

Plug	4-pin/8-pin							
Plug thread  A0021706	M12 (#1)/M12 (#2)							
PIN number	1	2	3	4	5	6	7	8

Electrical connection (terminal head)					
Flying leads and TC	Not connected (not insulated)				
3-wire terminal block (1x Pt100)	RD/i	RD/i	WH/i		i/i
4-wire terminal block (1x Pt100)			WH/i	WH/i	
6-wire terminal block (2x Pt100)	RD/BK	RD/BK	WH/YE		
1x TMT 4 to 20 mA or HART®	+/i	i/i	-/i	i/i	
2x TMT 4 to 20 mA or HART® in the terminal head with a high cover	+(#1)/ +(#2)		-(#1)/-(#2)		
1x TMT PROFIBUS® PA	Cannot be combined				
2x TMT PROFIBUS® PA					
1x TMT FF	Cannot be combined				
2x TMT FF					
1x TMT PROFINET®	Cannot be combined				
2x TMT PROFINET®	Cannot be combined				
PIN position and color code	 1 BN 2 GNYE 3 BU 4 GY A0018929				 A0018927

1) Options depend on product and configuration

Terminal head with two cable entries

Plug	2x IO-Link, 4-pin			
Plug thread	M12(#1)/M12 (#2)			
PIN number	1	2	3	4
Electrical connection (terminal head)				
Flying leads	Not connected (not insulated)			
3-wire terminal block (1x Pt100)	RD	i	RD	WH
4-wire terminal block (1x Pt100)	Cannot be combined			
6-wire terminal block (2x Pt100)	RD/BK	i	RD/BK	WH/YE
1x TMT 4 to 20 mA or HART	Cannot be combined			
2x TMT 4 to 20 mA or HART in the terminal head with a high cover				
1x TMT PROFIBUS PA	Cannot be combined			
2x TMT PROFIBUS PA				
1x TMT FF	Cannot be combined			
2x TMT FF				
1x TMT PROFINET	Cannot be combined			
2x TMT PROFINET				
1x TMT IO-Link	L+	-	L-	C/Q
2x TMT IO-Link	L+ (#1) and (#2)	-	L- (#1) and (#2)	C/Q
PIN position and color code	 1 BN 3 BU 4 BK A0055383			

Connection combination: insert - transmitter [1)]

Insert	Transmitter connection [2)]			
	iTEMP TMT31/iTEMP TMT7x		iTEMP TMT8x	
	1x 1-channel	2x 1-channel	1x 2-channel	2x 2-channel
1x sensor (Pt100 or TC), flying leads	Sensor (#1) : transmitter (#1)	Sensor (#1) : transmitter (#1) (Transmitter (#2) not connected)	Sensor (#1) : transmitter (#1)	Sensor (#1) : transmitter (#1) Transmitter (#2) not connected
2x sensor (2x Pt100 or 2x TC), flying leads	Sensor (#1) : transmitter (#1) Sensor (#2) insulated	Sensor (#1) : transmitter (#1) Sensor (#2): transmitter (#2)	Sensor (#1) : transmitter (#1) Sensor (#2): transmitter (#1)	Sensor (#1) : transmitter (#1) Sensor (#2): transmitter (#1) (Transmitter (#2) not connected)
1x sensor (Pt100 or TC),with terminal block [3)]	Sensor (#1) : transmitter in cover	Cannot be combined	Sensor (#1) : transmitter in cover	Cannot be combined

Insert	Transmitter connection [2]			
	iTEMP TMT31/iTEMP TMT7x		iTEMP TMT8x	
	1x 1-channel	2x 1-channel	1x 2-channel	2x 2-channel
2x sensor (2x Pt100 or 2x TC) with terminal block	Sensor (#1) : transmitter in cover Sensor (#2) not connected		Sensor (#1) : transmitter in cover Sensor (#2): transmitter in cover	
2x sensors (2x Pt100 or 2x TC) in conjunction with feature 600, option MG [4]	Cannot be combined	Sensor (#1) : transmitter (#1) Sensor (#2): transmitter (#2)	Cannot be combined	Sensor (#1): transmitter (#1) - channel 1 Sensor (#2): transmitter (#2) - channel 1

1) Options depend on product and configuration
2) If 2 transmitters are selected in a terminal head, transmitter (#1) is installed directly on the insert. Transmitter (#2) is installed in the high cover. A TAG cannot be ordered for the second transmitter as standard. The bus address is set to the default value and, if necessary, must be changed manually before commissioning.
3) Only in the terminal head with a high cover, only 1 transmitter possible. A ceramic terminal block is automatically fitted on the insert.
4) Individual sensors each connected to channel 1 of a transmitter

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.

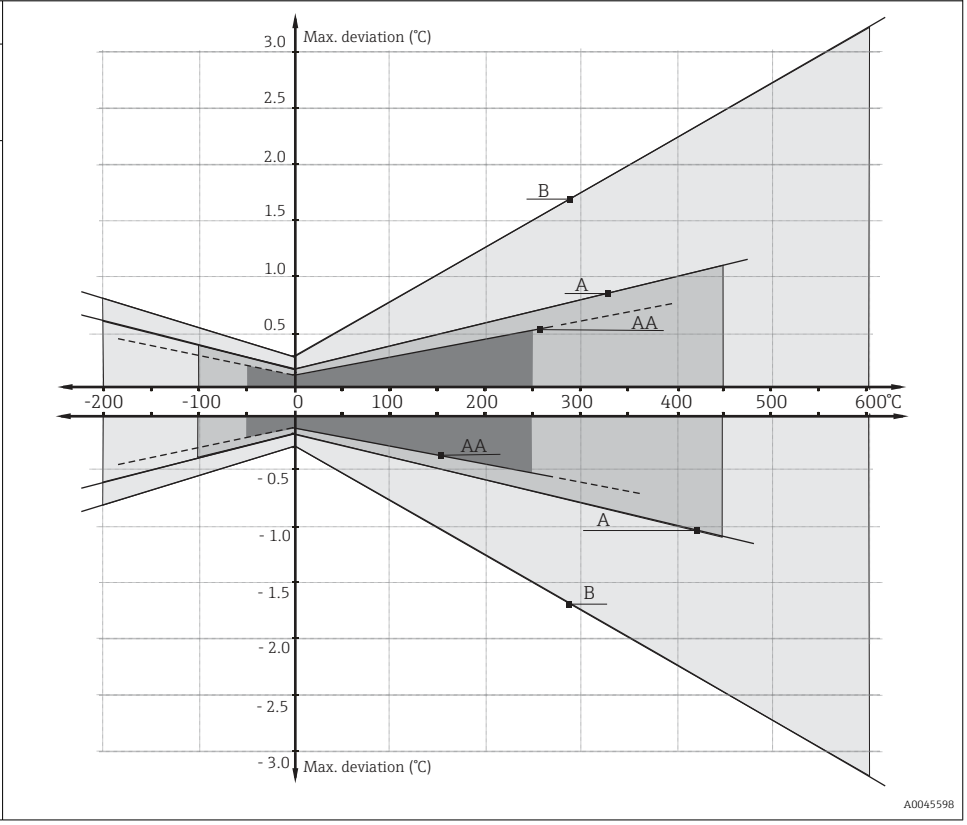
Performance characteristics

Reference operating conditions

This data is relevant for determining the measurement accuracy of the iTEMP transmitters used. See technical documentation of the specific iTEMP transmitter.

Maximum measurement error

RTD resistance thermometer according to IEC 60751

Class	Max. tolerances (°C)	Characteristics
RTD maximum sensor error		
Cl. A	± (0.15 + 0.002 · |t| [1])	
Cl. AA, previously 1/3 Cl. B	± (0.1 + 0.0017 · |t|) [1]	
Cl. B	± (0.3 + 0.005 · |t| [1])	

1) |t| = Temperature absolute value in °C

To obtain the maximum tolerances in °F, multiply the results in °C by a factor of 1.8.

Temperature ranges

Sensor type [1]	Operating temperature range	Class B	Class A	Class AA
Pt100 (WW)	−200 to +600 °C (−328 to +1 112 °F)	−200 to +600 °C (−328 to +1 112 °F)	−100 to +450 °C (−148 to +842 °F)	−50 to +250 °C (−58 to +482 °F)
Pt100 (TF) Basic	−50 to +200 °C (−58 to +392 °F)	−50 to +200 °C (−58 to +392 °F)	−30 to +200 °C (−22 to +392 °F)	-
Pt100 (TF) Standard	−50 to +400 °C (−58 to +752 °F)	−50 to +400 °C (−58 to +752 °F)	−30 to +250 °C (−22 to +482 °F)	0 to +150 °C (+32 to +302 °F)
Pt100 (TF) iTHERM QuickSens	−50 to +200 °C (−58 to +392 °F)	−50 to +200 °C (−58 to +392 °F)	−30 to +200 °C (−22 to +392 °F)	0 to +150 °C (+32 to +302 °F)
Pt100 (TF) iTHERM StrongSens	−50 to +500 °C (−58 to +932 °F)	−50 to +500 °C (−58 to +932 °F)	−30 to +300 °C (−22 to +572 °F)	0 to +150 °C (+32 to +302 °F)

1) Options depend on product and configuration

Influence of ambient temperature

Depends on the head transmitter used. For details, see the Technical Information.

Self-heating

RTD elements are passive resistors 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 if an Endress+Hauser iTEMP temperature transmitter (very small measurement current) is connected.

Response time

Tests have been performed in water at 0.4 m/s (according to IEC 60751) and with a 10 K temperature change.

Response time with heat transfer paste [1)]

Thermowell	Shape of tip	Insert	1x Pt100 iTHERM QuickSens, TF		1x Pt100 iTHERM StrongSens, TF		1x Pt100 wire wound WW		2x Pt100 wire wound WW		1x Pt100 standard thin-film TF	
			t_{50}	t_{90}	t_{50}	t_{90}	t_{50}	t_{90}	t_{50}	t_{90}	t_{50}	t_{90}
Ø6 mm (¼ in)	Reduced 4.3 mm (0.17 in) x 20 mm (0.79 in)	Ø3 mm (⅛ in)	1 s	2.5 s	-		8.5 s	26 s	5.5 s	18 s	8 s	23 s
Ø9 mm (0.35 in)	Straight	Ø6 mm (¼ in)	2 s	9 s	8 s	27 s	15 s	45 s	15 s	45 s	9.5 s	27 s
	Reduced 5.3 mm (0.21 in) x 20 mm (0.79 in)	Ø3 mm (⅛ in)	1.25 s	4 s	-		7 s	20 s	7 s	20 s	7 s	23 s
	Tapered 6.6 mm (0.26 in) x 60 mm (2.36 in)	Ø3 mm (⅛ in)	2.5 s	12 s	-		14 s	49 s	12 s	40 s	15 s	51 s
Ø12.7 mm (½ in)	Straight	Ø6 mm (¼ in)	4 s	26 s	12 s	54 s	23 s	81 s	23 s	81 s	31 s	100 s
	Reduced 5.3 mm (0.21 in) x 20 mm (0.79 in)	Ø3 mm (⅛ in)	1.5 s	5.5 s	-		9 s	27 s	9 s	27 s	6.5 s	21 s
	Reduced 8 mm (0.31 in) x 32 mm (1.26 in)	Ø6 mm (¼ in)	6 s	36 s	11 s	44 s	22 s	69 s	22 s	69 s	26 s	90 s

1) If using a thermowell.

Response time without heat transfer paste [1)]

Thermowell	Shape of tip	Insert	1x Pt100 iTHERM QuickSens, TF		1x Pt100 iTHERM StrongSens, TF		1x Pt100 wire wound WW		2x Pt100 wire wound WW		1x Pt100 standard thin-film TF	
			t_{50}	t_{90}	t_{50}	t_{90}	t_{50}	t_{90}	t_{50}	t_{90}	t_{50}	t_{90}
Without thermowell	-	Ø3 mm (⅛ in)	0.5 s	0.75 s	-		1.75 s	5 s	2 s	6 s	2.5 s	5.5 s
		Ø6 mm (¼ in)		1.5 s	2.5 s	16 s	4 s	10.5 s	4.5 s	12 s	4.75 s	13 s
Ø6 mm (¼ in)	Reduced 4.3 mm (0.17 in) x 20 mm (0.79 in)	Ø3 mm (⅛ in)	1 s	3 s	-		9 s	27 s	7.5 s	24 s	8.5 s	28 s
Ø9 mm (0.35 in)	Straight	Ø6 mm (¼ in)	2 s	9 s	8 s	29 s	19 s	62 s	19 s	62 s	13.5 s	42 s
	Reduced 5.3 mm (0.21 in) x 20 mm (0.79 in)	Ø3 mm (⅛ in)	1.5 s	5 s	-		7 s	21 s	7 s	21 s	8 s	22 s
	Tapered 6.6 mm (0.26 in) x 60 mm (2.36 in)	Ø3 mm (⅛ in)	5 s	23 s	-		13 s	45 s	13 s	45 s	15.5 s	60 s
Ø12.7 mm (½ in)	Straight	Ø6 mm (¼ in)	5.5 s	41 s	12 s	54 s	23 s	82 s	23 s	82 s	32 s	105 s

Thermowell	Shape of tip	Insert	1x Pt100 iTHERM QuickSens, TF		1x Pt100 iTHERM StrongSens, TF		1x Pt100 wire wound WW		2x Pt100 wire wound WW		1x Pt100 standard thin-film TF	
			t_{50}	t_{90}	t_{50}	t_{90}	t_{50}	t_{90}	t_{50}	t_{90}	t_{50}	t_{90}
	Reduced 5.3 mm (0.21 in) x 20 mm (0.79 in)	Ø3 mm (⅛ in)	2 s	6 s	-		10 s	30 s	10 s	30 s	8 s	30 s
	Reduced 8 mm (0.31 in) x 32 mm (1.26 in)	Ø6 mm (¼ in)	14.5 s	65 s	16 s	53 s	26 s	85 s	26 s	85 s	32 s	108 s

1) If using a thermowell.

Response time for directly wired insert without transmitter.

Calibration

Calibration of thermometers

Calibration refers to the comparison between the display of a piece of measuring equipment and the true value of a variable provided by the calibration standard under defined conditions. The aim is to determine the deviation or measurement errors of the UUT from the true value of the measured variable. For thermometers, calibration is usually only performed on the inserts. This checks only the deviation of the sensor element caused by the insert design. However, in most applications, the deviations caused by the design of the measuring point, integration into the process, the influence of ambient conditions, and other factors are significantly greater than the deviations related to the insert. Calibration of inserts is generally carried out using two methods:

- Calibration at fixed points, e.g. at the freezing point of water at 0 °C,
- Calibration compared against a precise reference thermometer.

The thermometer to be calibrated must display either 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 are typically used for thermometer calibrations. The measurement uncertainty may increase due to heat conduction errors and short immersion lengths. The existing measurement uncertainty is recorded on the individual calibration certificate. For accredited calibrations in accordance with ISO 17025, a measurement uncertainty that is twice as high as the accredited measurement uncertainty is not permitted. If this limit is exceeded, only a factory calibration is possible.

Sensor-transmitter-matching

The resistance/temperature curve of platinum resistance thermometers is standardized but in practice it is rarely possible to keep to the values precisely over the entire operating temperature range. For this reason, platinum resistance sensors are divided into tolerance classes, such as Class A, AA or B as per IEC 60751. These tolerance classes describe the maximum permissible deviation of the specific sensor characteristic curve from the standard curve, i.e. the maximum temperature-dependent characteristic error that is permitted. The conversion of measured sensor resistance values to temperatures in temperature transmitters or other meter electronics is often susceptible to considerable errors as the conversion is generally based on the standard characteristic curve.

When Endress+Hauser iTEMP temperature transmitters are used, this conversion error can be reduced significantly by sensor-transmitter-matching:

- Calibration at three temperatures at least and determination of the actual temperature sensor characteristic curve,
- Adjustment of the sensor-specific polynomial function using Calendar-van Dusen (CvD) coefficients
- Configuration of the temperature transmitter with the sensor-specific CvD coefficients for resistance/temperature conversion, and
- another calibration of the reconfigured temperature transmitter with connected resistance thermometer.

Endress+Hauser offers its customers this kind of sensor-transmitter matching as a separate service. Furthermore, the sensor-specific polynomial coefficients of platinum resistance thermometers are always provided on every Endress+Hauser calibration certificate where possible, e.g. at least three calibration points, so that users themselves can also appropriately configure suitable temperature transmitters.

For the device, Endress+Hauser offers standard calibrations at a reference temperature of −80 to +600 °C (−112 to +1 112 °F) based on the ITS90 (International Temperature Scale). Calibrations in other temperature ranges are available from an 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 device. Only the insert is calibrated.

Minimum immersion length (IL) for inserts required to perform a correct calibration

Due to the limitations of furnace geometries, the minimum immersion lengths must be observed at high temperatures to enable a calibration to be performed with an acceptable degree of measurement uncertainty. The same applies when using a head transmitter. Due to heat conduction, minimum lengths must be observed in order to guarantee the functionality of the transmitter −40 to +85 °C (−40 to +185 °F).

Calibration temperature	Minimum immersion length IL in mm without head transmitter
−196 °C (−320.8 °F)	120 mm (4.72 in) [1]
−80 to +250 °C (−112 to +482 °F)	No minimum immersion length required [2]
+251 to +550 °C (+483.8 to +1 022 °F)	300 mm (11.81 in)
+551 to +600 °C (+1 023.8 to +1 112 °F)	400 mm (15.75 in)

1) With iTEMP head transmitter min. 150 mm (5.91 in) is required
2) at a temperature of +80 to +250 °C (+176 to +482 °F), the iTEMP head transmitter requires min. 50 mm (1.97 in)

Insulation resistance

Insulation resistance ≥ 100 MΩ at ambient temperature, measured between the terminals and the outer jacket with a minimum voltage of 100 V_{DC}.

Installation

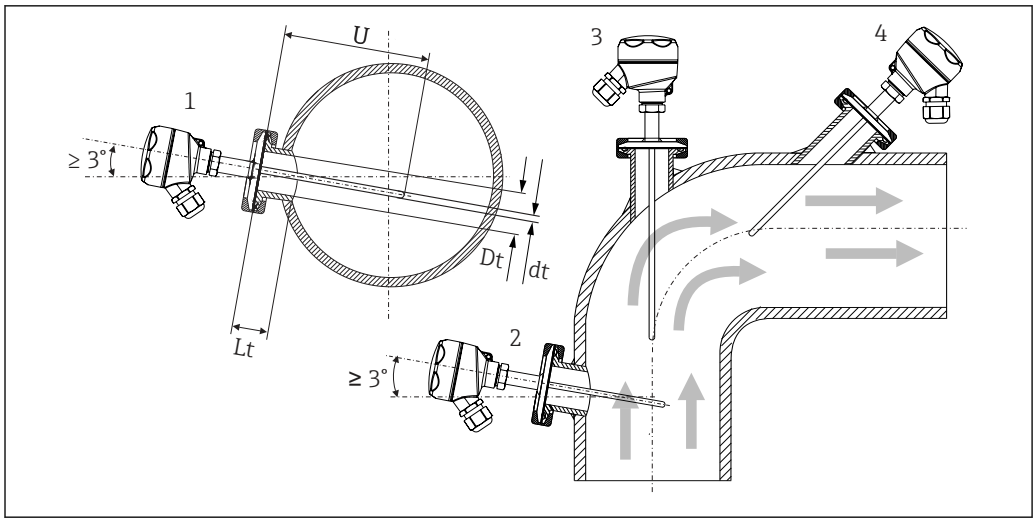
Orientation

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

Installation instructions

The immersion length of the thermometer can influence the measurement accuracy. If the immersion length is too small, then measurement errors are caused by heat conduction via the process connection and the container wall. For installation in a pipe, an immersion length is therefore recommended that ideally corresponds to half the pipe diameter.

- Installation options: Pipes, tanks or other plant components
- To minimize the heat conduction error, a minimum immersion length is recommended depending on the type of sensor used and the design of the insert. This immersion length corresponds to the minimum insertion length for the calibration.
- ATEX certification: Observe the installation instructions in the Ex documentation.



6 *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

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 (2 and 3).

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).

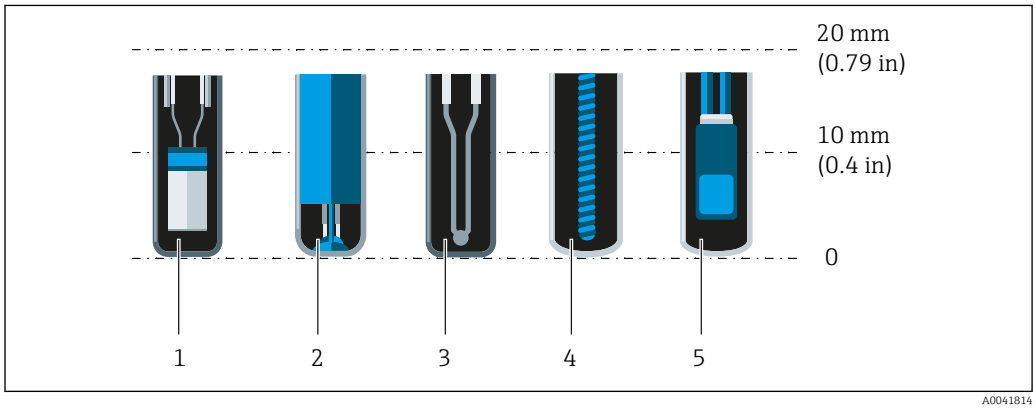
The requirements of the EHEDG and the 3-A Sanitary Standard must be adhered to.

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

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

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

Available options depend on product and configuration.

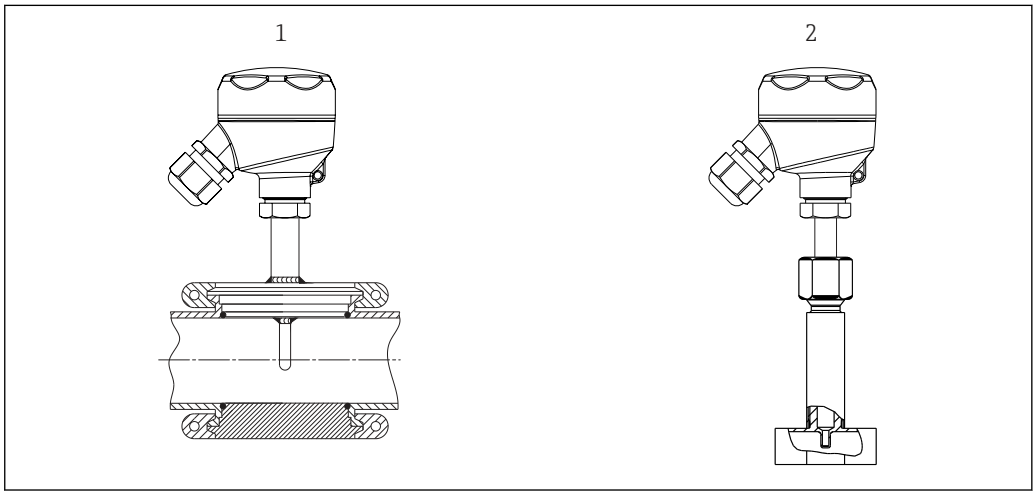


1 iTHERM StrongSens or iTHERM TrustSens for 5 to 7 mm (0.2 to 0.28 in)
2 iTHERM QuickSens for 0.5 to 1.5 mm (0.02 to 0.06 in)
3 Thermocouple (not grounded) for 3 to 5 mm (0.12 to 0.2 in)
4 Wire-wound sensor for 5 to 20 mm (0.2 to 0.79 in)
5 Standard thin-film sensor for 5 to 10 mm (0.2 to 0.39 in)

To minimize the heat dissipation, 20 to 25 mm of the sensor should extend into the medium beyond the sensor element.

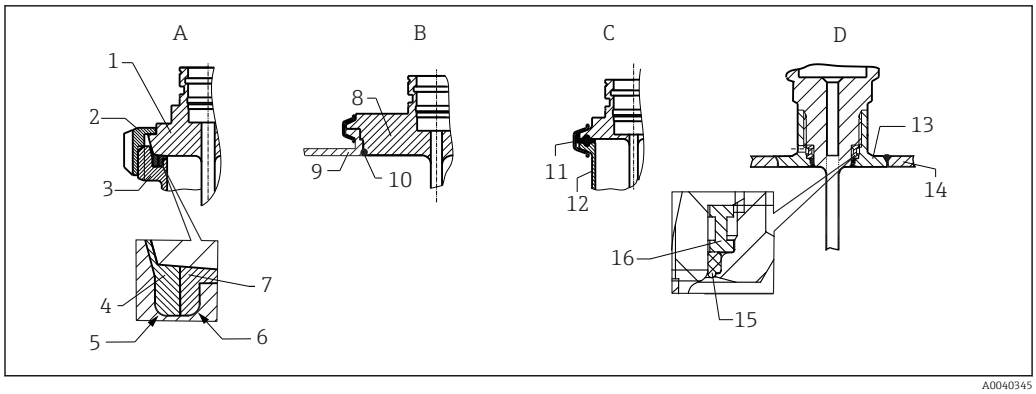
This results in the following recommended minimum immersion lengths:
- iTHERM TrustSens or iTHERM StrongSens 30 mm (1.18 in)
- iTHERM QuickSens 25 mm (0.98 in)
- Wire wound sensor 45 mm (1.77 in)
- Standard thin-film sensor 35 mm (1.38 in)

Special consideration should be given to tee thermowells, as the immersion length is very short on account of their design, and the measurement error is higher as a result. It is therefore recommended to use elbow thermowells with iTHERM QuickSens sensors.



7 Process connections for thermometer installation in pipes with small nominal diameters

1 Varivent process connection type N for DN40
2 Tee or elbow thermowell (illustrated) for weld-in as per DIN 11865/ASME BPE



8 Versions for hygiene-compliant installation (depends on the version ordered)

A Dairy fitting according to DIN 11851, only in connection with EHEDG-certified and self-centering sealing ring
1 Sensor with dairy fitting
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 DIN 32676
11 Molded seal
12 Counterpart connection
D Liquiphant M G1" process connection, horizontal installation
13 Weld-in adapter
14 Vessel wall
15 O-ring
16 Thrust collar

NOTICE

The following action must be taken if a sealing ring or O-ring fails:

- ▶ Remove the thermometer.
- ▶ Clean the thread and the O-ring joint or sealing surface.
- ▶ Replace the O-ring or sealing ring.
- ▶ Perform CIP after installation.

The counterpieces for the process connections and the seals or sealing rings are not supplied with the thermometer. Liquiphant M weld-in adapters with associated seal kits are available as accessories. → 53.

In the case of weld-in connections, exercise 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).

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 connections, Liquiphant M weld-in adapters and Ingold connections with weld-in adapters enable flush-mounted installation.

For the requirements for installation according to the EHEDG and 3-A Sanitary Standard, see the Operating Instructions for the modular hygienic thermometers (BA02023T).

Environment

Ambient temperature range

Terminal head	Temperature in °C (°F)
Without mounted head transmitter	Depends on the terminal head used and the cable gland or fieldbus connector; see "Terminal heads" section. → 🖹 37
With mounted iTEMP head transmitter	−40 to +85 °C (−40 to +185 °F)
With mounted iTEMP head transmitter and display	−30 to +85 °C (−22 to 185 °F)

Extension neck	Temperature in °C (°F)
Quick-fastening iTHERM QuickNeck	−50 to +140 °C (−58 to +284 °F)

Storage temperature

For information, see the ambient temperature.

Relative humidity

Depends on the transmitter used. If Endress+Hauser iTEMP head transmitters are used:
- Condensation permitted as per IEC 60 068-2-33
- Max. rel. 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 (WW or TF)	30 m/s² (3g) [1]
iTHERM StrongSens Pt100 (TF) iTHERM QuickSens Pt100 (TF), version: Ø6 mm (0.24 in)	> 600 m/s² (60g)

1) Vibration resistance also applies to quick-fastening iTHERM QuickNeck.

Electromagnetic compatibility (EMC)

Depends on the head transmitter used. For details, see the Technical Information.

Process

Process temperature range

Depends on the type of sensor used, maximum −200 to +600 °C (−328 to +1 112 °F)

Thermal shock

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

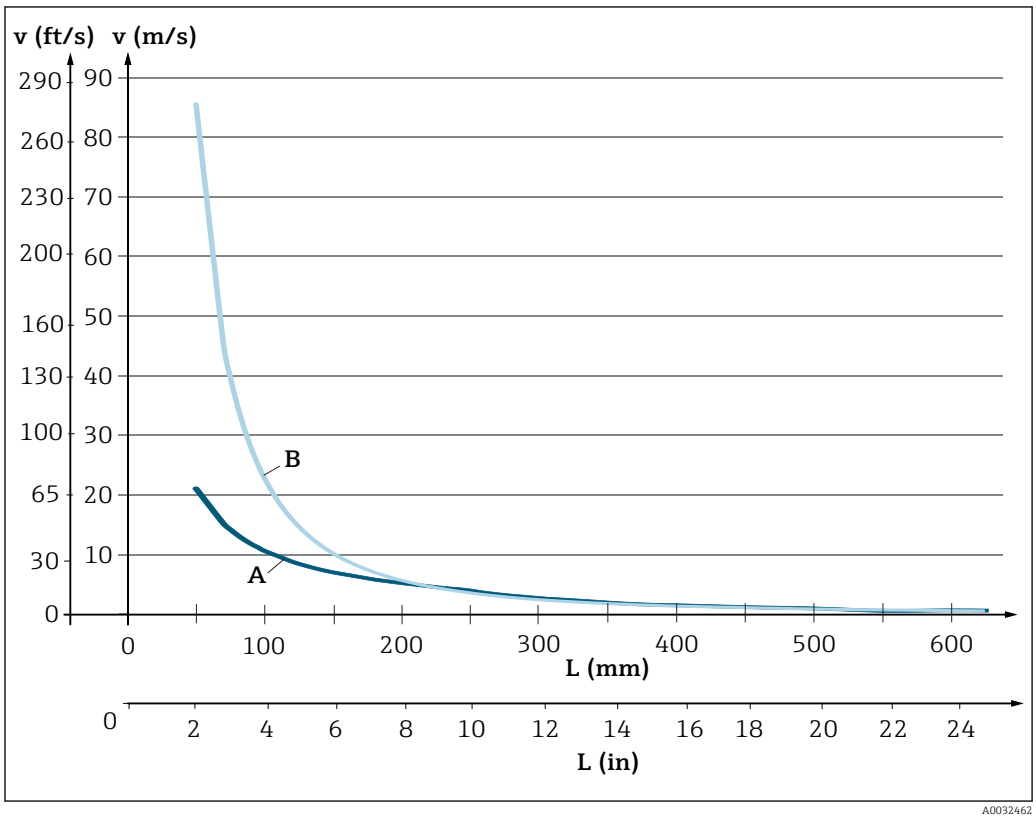
Process pressure range

The maximum possible process pressure depends on various influencing factors, such as the design, process connection and process temperature. For information on the maximum possible process pressures for the individual process connections, see the 'Process connection' section. → 🖹 42

It is possible to verify the mechanical loading capacity depending on the installation and process conditions using the online TW Sizing Module for thermowells in the Endress+Hauser Applicator software. This is valid for DIN thermowell calculations. 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 thermometer 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 thermometer 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).



9 *Permitted flow velocity, thermowell diameter 9 mm (0.35 in)*

A Medium water at T = 50 °C (122 °F)
B Medium superheated steam at T = 160 °C (320 °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).

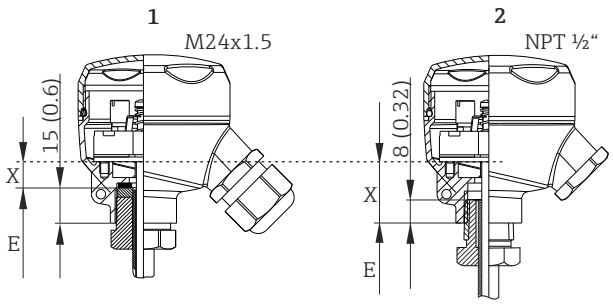
Mechanical construction

Design, dimensions

All dimensions in mm (in). The design of the thermometer depends on the thermowell version used:
- Thermometer without a thermowell
- Diameter 6 mm (¼ in)
- Diameter 9 mm (0.35 in)
- Diameter 12.7 mm (½ in)
- Thermowell version as tee thermowell and elbow thermowell as per DIN 11865/ASME BPE for welding in

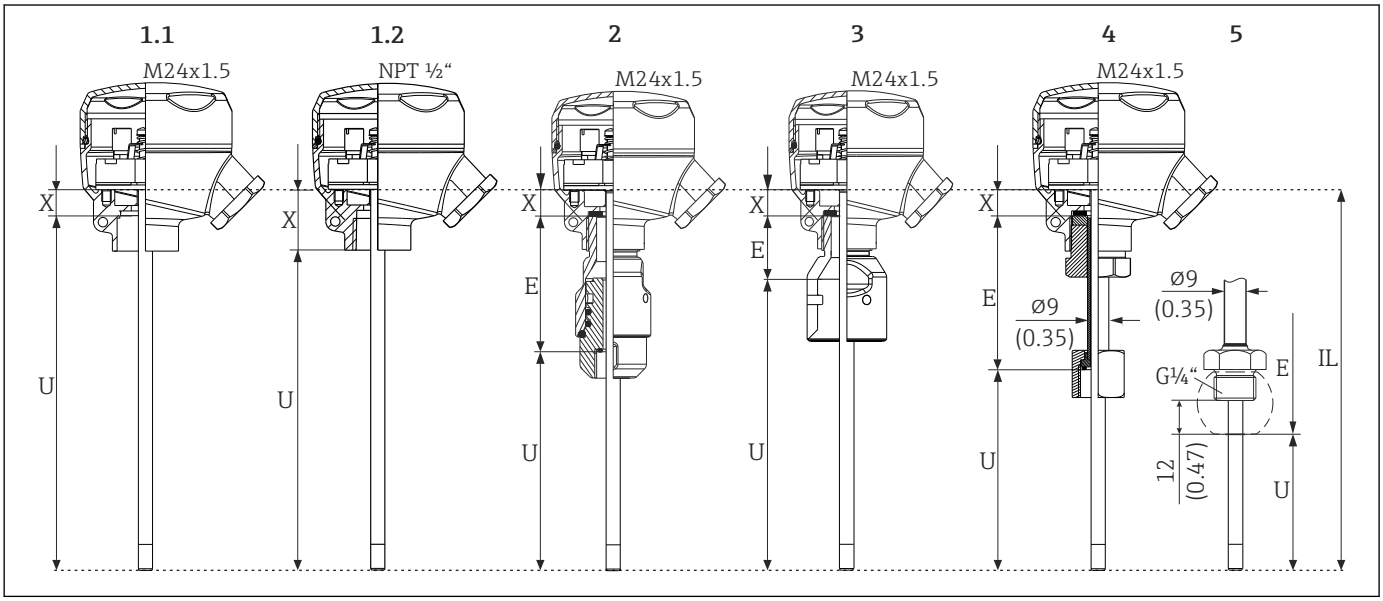
Various dimensions, such as the immersion length U for example, are variable values and are therefore indicated as items in the following dimensional drawings.

Variable dimensions:

Item	Description
E	Extension neck length, variable depending on configuration or optionally predefined for version with iTHERM QuickNeck
IL	Insertion length of insert
L	Thermowell length (U+T)
B	Thermowell base thickness: predefined, depends on thermowell version (see also the individual table data)
T	Length of thermowell lagging: variable or predefined, depends on thermowell version (see also the individual table data)
U	Immersion length: variable, depending on the configuration
X	Variable for calculating the insertion length of the insert, depends on different screw-in lengths in the terminal head thread M24x1.5 or NPT ½", see insert length calculation (IL) → 🖹 36  🖻 *10 Different screw-in lengths in terminal head thread for M24x1.5 and ½" NPT* *1 Thread M24x1.5: X = 11 mm (0.43 in), mat.: 1.4305 (coupling)* *2 Thread NPT ½": X = 26 mm (1.02 in) or with terminal head TA30S = 31 mm (1.22 in), mat.: 1.4305 (coupling)*
ØID	Insert diameter 6 mm (¼ in) or 3 mm (⅛ in)

Without thermowell

For installation in an existing thermowell



1.1 Thermometer without extension neck, insert surface not specified, product structure: feature 80, option A0; X = 11 mm (0.43 in) for connection thread M24x1.5
1.2 Thermometer without extension neck, insert surface not specified, product structure: feature 80, option A0; X = 26 mm (1.02 in) for connection thread NPT ½"; X = 31 mm (1.22 in) for connection thread NPT ½" and terminal head TA30S
2 Thermometer with quick-fastening iTHERM QuickNeck, top and bottom part, G3/8" internal thread for thermowell connection
3 Thermometer with quick-fastening iTHERM QuickNeck, top part
4 Thermometer with replaceable extension neck TE411, G3/8" union nut for thermowell connection
5 Thermometer with replaceable extension neck TE411, external thread G¼" for compression fitting TK40

Can be selected for all versions: thread M24x1.5 or ½" NPT to terminal head

Pay attention to the following equations when calculating the immersion length U for immersion into an existing thermowell TT411:

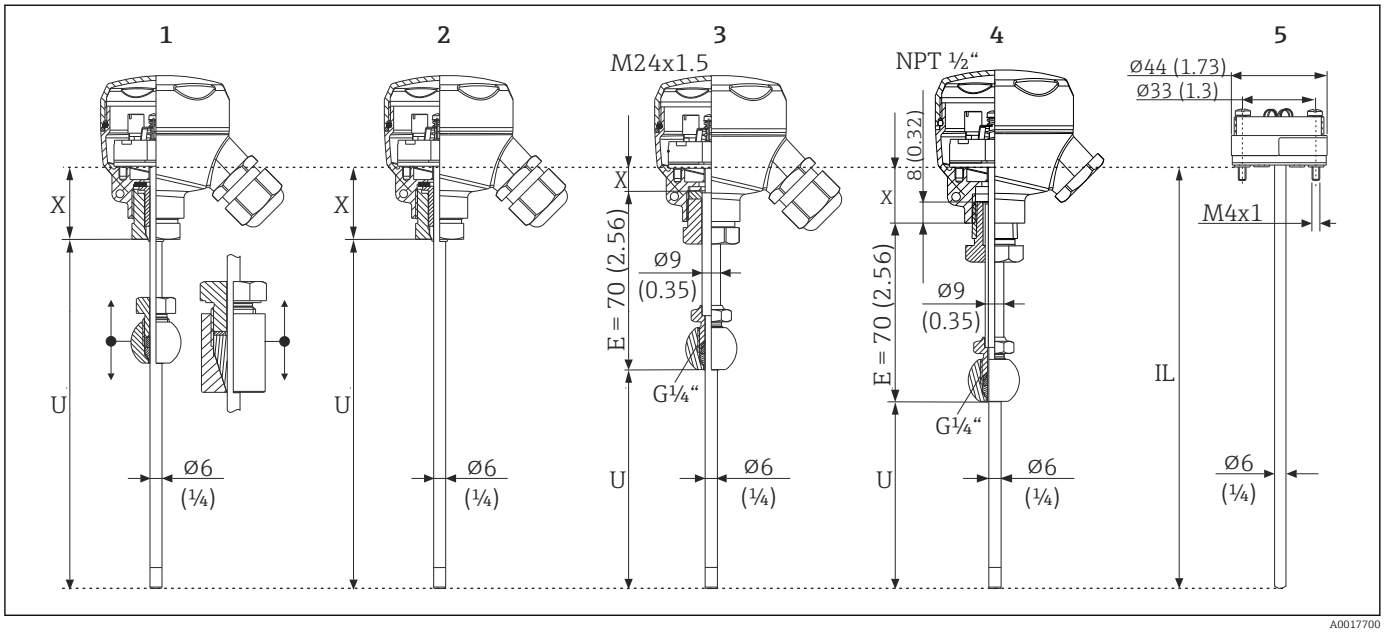
Version 1	U = L [1] + E [2] + 4 mm (0.16 in) - B
Version 2 and 4	U = L [1] + 4 mm (0.16 in) - B
Version 3, thermowell diameter 9 mm (0.35 in)	U = L [1] + 4 mm (0.16 in)(for spring travel) - B
Version 3, thermowell diameter 6 mm (¼ in)/ 12.7 mm (½ in)	U = L [1] + 36 mm (1.42 in)+ 4 mm (0.16 in)(for spring travel) - B
Version 5	$U = U_{(incl.\ TK40)}$

1) L = total length of the thermowell available onsite = $U_{thermowell} + T_{thermowell}$
2) E = length of the extension neck provided onsite (if available)

Item (see drawing above)	Version	Length
Extension neck length E	**Version 1:** Without extension neck	E = 0
	Version 2: iTHERM QuickNeck with thread M24x1.5 to terminal head ▪ A0: E not required ▪ X1: E= variable length	▪ 62 mm (2.44 in) ▪ Variable, depending on the configuration
	iTHERM QuickNeck with thread NPT ½" to terminal head ▪ A0: E not required ▪ X1: E= variable length	▪ 54 mm (2.13 in) ▪ Variable, depending on the configuration

Item (see drawing above)	Version	Length
	Version 3: iTHERM QuickNeck top part with thread M24x1.5 to terminal head ▪ A0: E not required ▪ X1: E= variable length	▪ 30 mm (1.18 in) ▪ Variable, depending on the configuration
	iTHERM QuickNeck top part with thread NPT ½" to terminal head ▪ A0: E not required ▪ X1: E= variable length	▪ 22 mm (0.87 in) ▪ Variable, depending on the configuration
	Version 4: With replaceable extension neck, G3/8" union nut for thermowell connection	Variable, depending on the configuration
	Version 5: With replaceable extension neck and external thread G¼" for compression fitting TK40, with thread M24x1.5 or ½" NPT to terminal head	70 mm (2.76 in)
Immersion length U	Independent of the version	Variable, depending on the configuration
Variable length X	▪ Connection thread M24x1.5 ▪ Connection thread ½" NPT IL = U+E+X ▪ Connection thread ½" NPT and terminal head TA30S	11 mm (0.43 in) 28 mm (1.1 in) 31 mm (1.22 in)

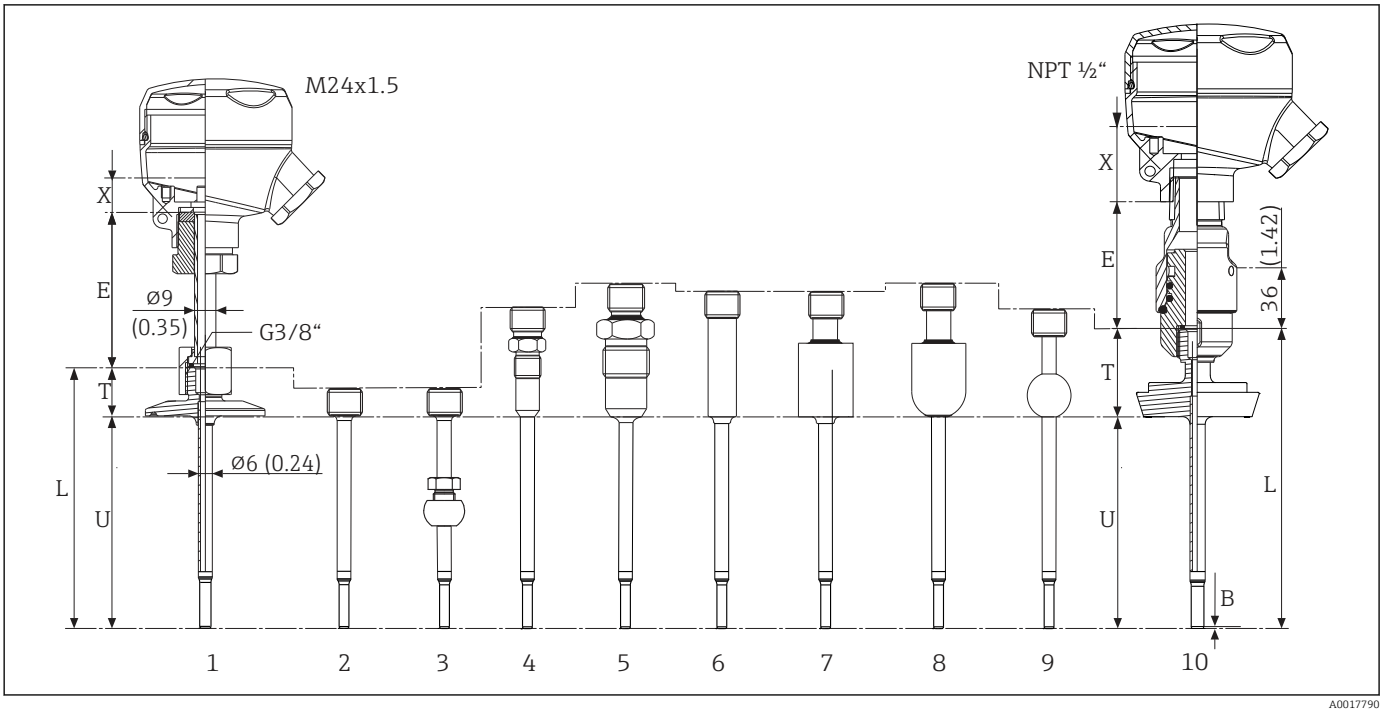
With compression fitting TK40 as process connection, insert in direct contact with the process



1 *Movable compression fitting TK40 - variably fixable immersion length U, only connection thread M24x1.5*
2 *Without compression fitting for use if compression fitting is available at point of installation, insert with polished surface - product structure: feature 80, option A1 or A3 - only connection thread M24x1.5*
3 *Compression fitting TK40 fixed by extension neck - fixed immersion length U, connection thread M24x1.5*
4 *Compression fitting TK40 fixed by extension neck - fixed immersion length U, connection thread ½" NPT*
5 *Insert, for example with mounted head transmitter*

Item	Version	Length
Extension neck length E	Extension neck Ø9 mm (0.35 in)	70 mm (2.76 in)
Immersion length U	Independent of the version	Variable, depending on the configuration
Variable length X	▪ **Versions 1 and 2:** Without extension neck, connection thread M24x1.5 IL = U+X ▪ **Version 3:** With extension neck, connection thread M24x1.5 IL = U+E+X ▪ **Version 4:** With extension neck, connection thread ½" NPT IL = U+E+X ▪ With extension neck and TA30S terminal head IL = U+E+X	39 mm (1.54 in) 11 mm (0.43 in) 26 mm (1.02 in) 31 mm (1.22 in)

With thermowell diameter 6 mm (¼ in)



1 Thermometer with replaceable extension neck TE411 and process connection as clamp version
2 Without process connection
3 Process connection version as spherical compression fitting TK40
4 Process connection version as metal sealing system M12x1.5
5 Process connection version as metal sealing system G½"
6 Process connection version as cylindrical weld-in adapter Ø12 x 40 mm
7 Process connection version as cylindrical weld-in adapter Ø30 x 40 mm
8 Process connection version as spherical-cylindrical weld-in adapter Ø30 x 40 mm
9 Process connection version as spherical weld-in adapter Ø25 mm
10 Thermometer with quick-fastening iTHERM QuickNeck and process connection as sanitary connection according to DIN 11851

- Replaceable extension neck or quick-fastening iTHERM QuickNeck
- Thread M24x1.5 or ½" NPT to terminal head
- G3/8" thread for thermowell connection

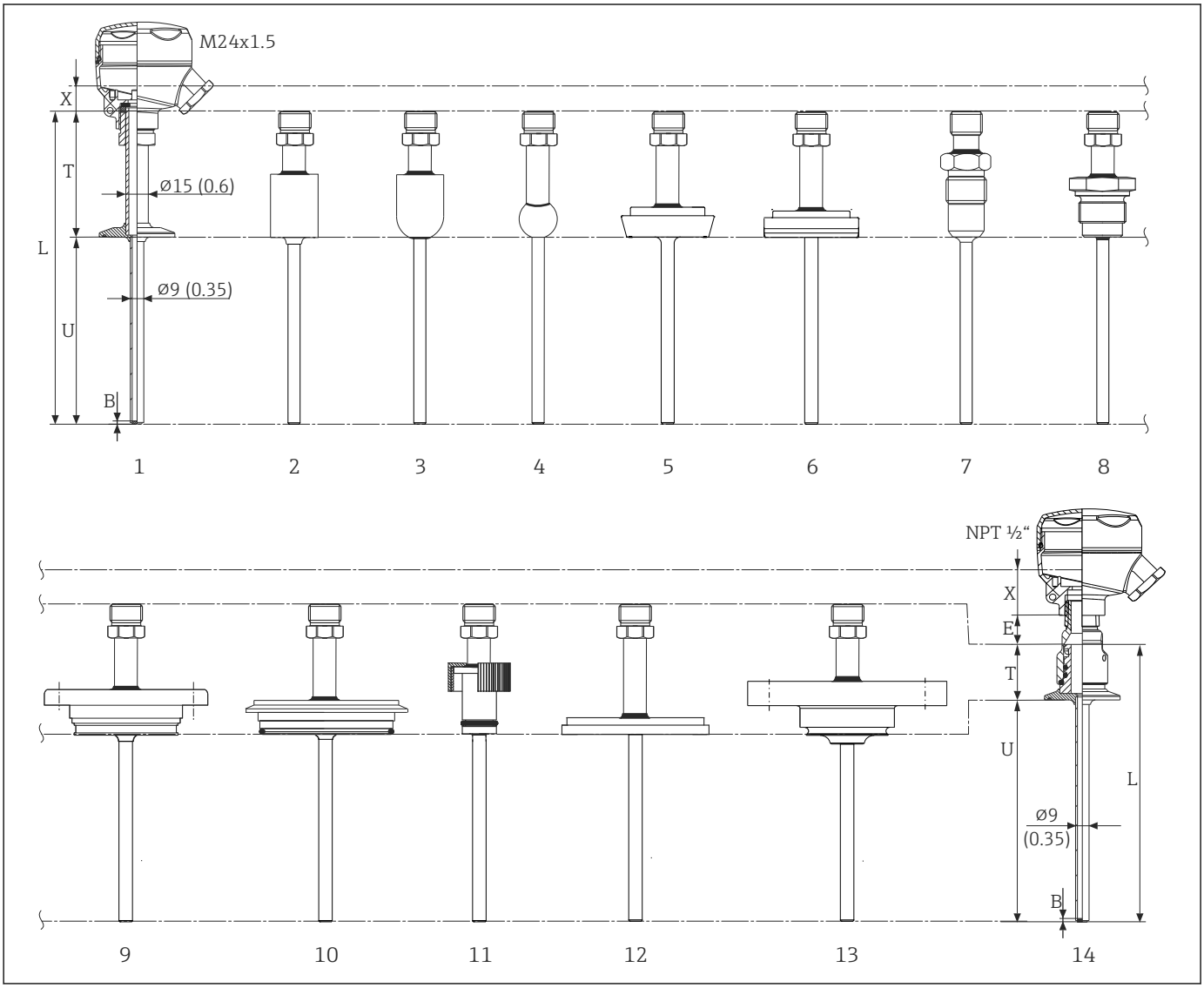
Item	Version	Length
Extension neck length E	Replaceable extension neck Ø9 mm (0.35 in)	Variable, depending on the configuration
	iTHERM QuickNeck with thread M24x1.5 to terminal head, with option: ▪ A0: E not required ▪ X1: E= variable length	▪ 62 mm (2.44 in) ▪ Variable, depending on the configuration
	iTHERM QuickNeck with thread NPT ½" to terminal head, with option: ▪ A0: E not required ▪ X1: E= variable length	▪ 54 mm (2.13 in) ▪ Variable, depending on the configuration
Length of thermowell lagging T [1)]	Metal sealing system M12x1.5	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)	23 mm (0.91 in)
	Clamp DN12 according to DIN 32676	24 mm (0.94 in)
	Clamp DN25/DN40 according to DIN 32676	21 mm (0.83 in)

Item	Version	Length
	Dairy fitting DN25/DN32/DN40 according to DIN 11851	29 mm (1.14 in)
	Spherical-cylindrical weld-in adapter	58 mm (2.28 in)
	Cylindrical weld-in adapter Ø12 mm (0.47 in)	55 mm (2.17 in)
	Without process connection (only G3/8" thread), where necessary with compression fitting TK40	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
Variable length X	▪ With connection thread M24x1.5 ▪ With connection thread ½" NPT ▪ With terminal head TA30S Calculation of IL for the insert: IL = U+T+E-B+X	15 mm (0.6 in) 30 mm (1.18 in) 35 mm (1.38 in)
Base thickness B	Reduced tip Ø4.3 mm (0.17 in)	3 mm (0.12 in)

1) Depends on the process connection

With thermowell diameter 9 mm (0.35 in)

Extension neck not replaceable, but can be separated with the option of the quick-fastening iTHERM QuickNeck.

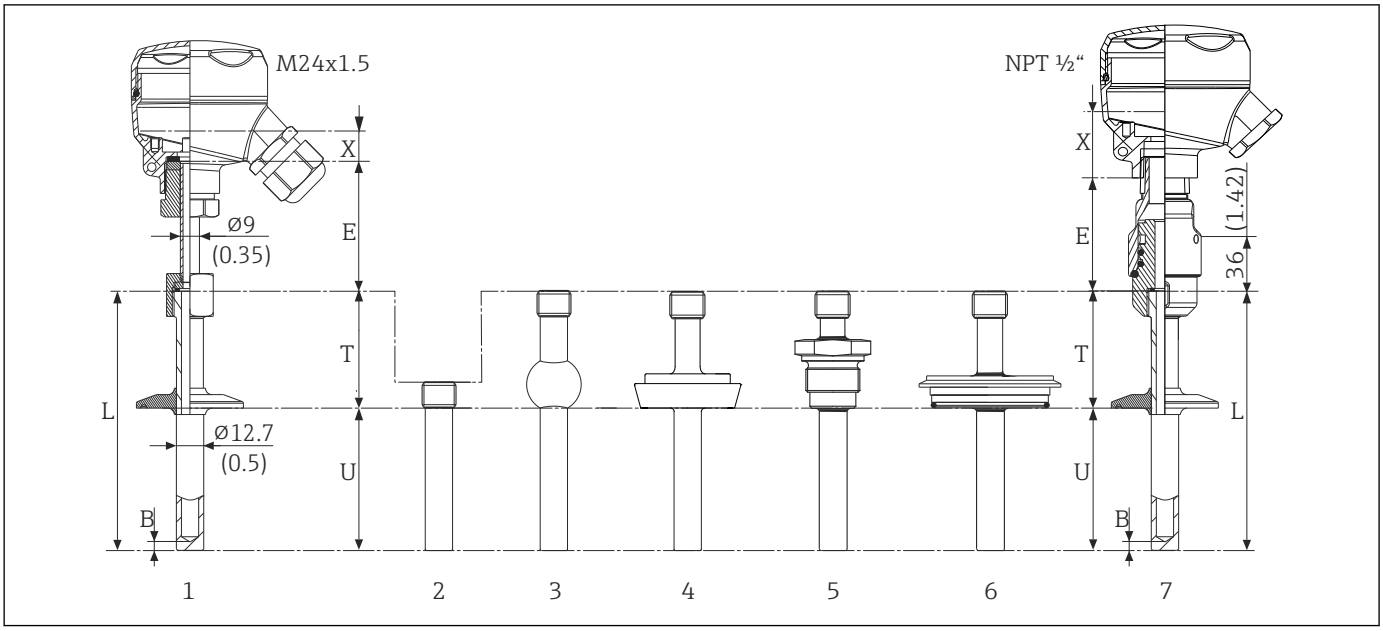


1 *Thermometer without replaceable extension neck, connection thread M24x1.5, process connection as clamp version*
2 *Process connection version as cylindrical weld-in adapter Ø30 x 40 mm*
3 *Process connection version as spherical-cylindrical weld-in adapter Ø30 x 40 mm*
4 *Process connection version as spherical weld-in adapter Ø25 mm*
5 *Process connection version as dairy fitting according to DIN 11851*
6 *Process connection version as aseptic pipe union according to DIN 11864-1 Form A*
7 *Process connection version as metal sealing system G½"*
8 *Process connection thread as per ISO 228 for Liquiphant weld-in adapter*
9 *Process connection version APV Inline*
10 *Process connection version Varivent*
11 *Process connection version Ingold connection*
12 *Process connection SMS 1147*
13 *Process connection version Neumo Biocontrol*
14 *Thermometer with quick-fastening iTHERM QuickNeck and process connection, as clamp version for example*

Item	Version	Length
Extension neck length E	Without iTHERM QuickNeck	0
	With iTHERM QuickNeck With thread M24x1.5 to terminal head ▪ A0: E not required ▪ X1: E= variable length	▪ 30 mm (1.18 in) ▪ Variable, depending on the configuration

Item	Version	Length
	With thread ½" NPT to terminal head ▪ A0: E not required ▪ X1: E= variable length	▪ 22 mm (0.9 in) ▪ Variable, depending on the configuration
Length of thermowell lagging T	Without iTHERM QuickNeck	Variable, depending on the configuration
	With 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, D = 50 mm (1.97 in) Varivent, type N, D = 68 mm (2.67 in)	52 mm (2.05 in)
	Varivent, type B, D = 31 mm (1.22 in)	56 mm (2.2 in)
	G1" thread according to ISO 228 for Liquiphant weld-in adapter	77 mm (3.03 in)
	Spherical-cylindrical weld-in adapter	70 mm (2.76 in)
	Cylindrical weld-in adapter	67 mm (2.64 in)
	Aseptic pipe union according to DIN11864-A, DN25	42 mm (1.65 in)
	Aseptic pipe union according to DIN11864-A, DN40	43 mm (1.69 in)
	Dairy fitting according to DIN 11851, DN32	47 mm (1.85 in)
	Dairy fitting according to DIN 11851, DN40	
	Dairy fitting according to DIN 11851, DN50	48 mm (1.89 in)
	Clamp according to DIN 32676, DN12	
	Clamp according to DIN 32676, DN25	37 mm (1.46 in)
	Clamp according to DIN 32676, DN40	39 mm (1.54 in)
	Clamp according to DIN 32676, DN63.5	
	Clamp according to DIN 32676, DN70	
	Microclamp (DN18)	47 mm (1.85 in)
	Tri-clamp (0.75")	46 mm (1.81 in)
	Ingold connection Ø25 mm (0.98 in) x 30 mm (1.18 in)	78 mm (3.07 in)
	Ingold connection Ø25 mm (0.98 in) x 46 mm (1.81 in)	94 mm (3.7 in)
	Metal sealing system G½"	74 mm (2.91 in)
	APV Inline, DN50	51 mm (2.01 in)
Immersion length U	Independent of the version	Variable, depending on the configuration
Variable length X	▪ Without iTHERM QuickNeck, connection thread M24x1.5 ▪ With iTHERM QuickNeck, connection thread M24x1.5 ▪ With iTHERM QuickNeck, connection thread NPT ½" ▪ With iTHERM QuickNeck, terminal head TA30S	IL = U+T-B+X IL = U+E+T-B+X IL = U+E+T-B+X IL = U+E+T-B+X 15 mm (0.6 in) 15 mm (0.6 in) 30 mm (1.18 in) 35 mm (1.38 in)
Base thickness B	Reduced tip Ø3 mm (0.12 in) x 20 mm (0.79 in)	3 mm (0.12 in)
	Tapered tip Ø 6.6 mm (0.26 in) x 60 mm (2.36 in)	
	Straight tip	

With thermowell diameter 12.7 mm (½ in)



1 Thermometer with replaceable extension neck TE411 and process connection as clamp version
2 Process connection version as cylindrical weld-in adapter Ø12.7 mm (0.5 in)
3 Process connection version as spherical weld-in adapter Ø25 mm
4 Process connection version as dairy fitting according to DIN 11851
5 Thread according to ISO 228 for Liquiphant weld-in adapter
6 Process connection version Varivent
7 Thermometer with quick-fastening iTHERM QuickNeck and process connection, as clamp version for example

- Replaceable extension neck or quick-fastening iTHERM QuickNeck
- G3/8" thread for thermowell connection
- Thermowell welded at the tip

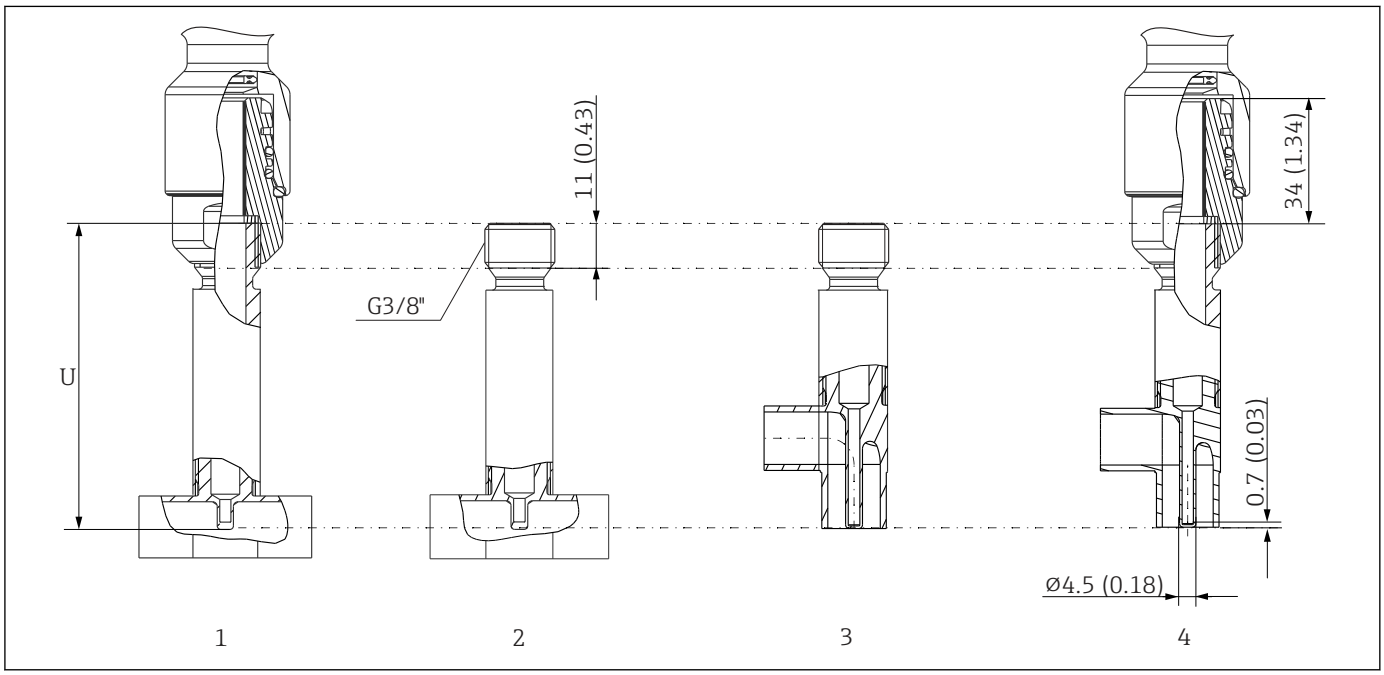
Item	Version	Length
Extension neck length E	Replaceable extension neck, Ø9 mm (0.35 in)	Variable, depending on the configuration
	iTHERM QuickNeck with thread M24x1.5 to terminal head, with option: ▪ A0: E not required ▪ X1: E= variable length	▪ 62 mm (2.44 in) ▪ Variable, depending on the configuration
	iTHERM QuickNeck with thread NPT ½" to terminal head, with option: A0: E not required	54 mm (2.13 in)
Length of thermowell lagging T	Weld-in adapter, cylindrical, Ø12.7 mm (0.5 in) [1)]	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
Variable length X	▪ With connection thread M24x1.5 ▪ With connection thread ½" NPT ▪ With terminal head TA30S Calculation of IL for the insert: IL = U+T+E-B+X	15 mm (0.6 in) 30 mm (1.18 in) 35 mm (1.38 in)
Base thickness B	Reduced tip Ø5.3 mm (0.21 in) x 20 mm (0.79 in)	3 mm (0.12 in)

Item	Version	Length
	Reduced tip Ø8 mm (0.31 in) x 32 mm (1.26 in)	4 mm (0.16 in)
	Straight tip	6 mm (0.24 in)

1) See Fig. Version 2

Thermowell version as tee thermowell or elbow thermowell, optimized

No welds, no dead legs



11 Thermowell as per DIN 11865 or ASME BPE

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

- Pipe sizes as per DIN 11865 series A (DIN), B (ISO) and C (ASME BPE)
- 3-A marked for nominal diameters ≥ DN25
- EHEDG certified for nominal diameters ≥ DN25
- ASME BPE compliance for nominal diameters ≥ DN25
- IP69K protection class
- 1.4435+316L material, delta ferrite content < 0.5%
- Temperature range: −60 to +200 °C (−76 to +392 °F)
- Pressure range: PN25 as per DIN11865

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

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

Suitable immersion lengths for the following thermometers with G3/8" extension neck connection:
- iTHERM CompactLine TMR35: 83 mm (3.27 in)
- iTHERM TM411: 85 mm (3.35 in)
- iTHERM TM311: 85 mm (3.35 in)
- iTHERM TrustSens TM371: 85 mm (3.35 in)

Suitable immersion lengths for the following thermometers with QuickNeck connection:
- iTHERM TM411: 119 mm (4.7 in)
- iTHERM TrustSens TM371: 119 mm (4.7 in)

Possible combinations of the thermowell versions with the available process connections and quick-fastening iTHERM QuickNeck

Process connection and size	Thermowell diameter			iTHERM QuickNeck for Ø9 mm (0.35 in) [1]
	6 mm (¼ in)	9 mm (0.35 in)	12.7 mm (½ in)	
Without process connection (for installation with compression fitting)	☑	-	-	-
Weld-in adapter				
Cylindrical Ø12.7 mm (0.5 in)	-	-	☑	-
Cylindrical Ø30 x 40 mm	☑	☑	-	☑
Cylindrical Ø12 x 40 mm		-	-	-
Spherical-cylindrical Ø30 x 40 mm	☑	☑	-	☑
Spherical Ø25 mm (0.98 in)	☑	☑	☑	-
Clamp according to DIN 32676				
DN10 - 20	☑	☑	-	☑
			☑	
DN25 - 40 (1 - 1.5 in)	☑	☑	☑	☑
DN50 (2 in)				
DN63.5 (2.5 in)	-	☑	☑	☑
DN70 - 76.5 (3 in)				
Dairy fitting according to DIN 11851				
DN25	☑	☑	☑	-
DN32, DN40				☑
DN50	-			
Aseptic pipe union according to DIN 11864-1 Form A				
DN25, DN40	-	☑	-	☑
Metal sealing system				
M12x1.5	☑	-	-	-
G½"		☑		☑
Thread according to ISO 228 for Liquiphant weld-in adapter				
G¾" for FTL20, FTL31, FTL33	-	☑	☑	-
G¾" for FTL50				-
G1" for FTL50				☑
APV Inline				
DN50	-	☑	-	☑
Varivent				
Type B, Ø31 mm; Type F, Ø50 mm ; Type N, Ø68 mm	-	☑	☑	☑
Ingold connection				
25 x 30 mm or 25 x 46 mm	-	☑	-	☑
SMS 1147				
DN25, DN38, DN51	-	☑	-	☑
Neumo Biocontrol				
D25 PN16, D50 PN16, D65 PN16	-	☑	-	-

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

Insert

Depending on the application, iTHERM TS111 inserts with different RTD sensors are available for the thermometer:

Sensor	Standard thin-film	iTHERM StrongSens	iTHERM QuickSens [1]	Wire wound	
Sensor design; connection method	1x Pt100, 3- or 4-wire, mineral insulated	1x Pt100, 3- or 4-wire, mineral insulated	1x Pt100, 3- or 4-wire ▪ Ø6 mm (¼ in), mineral insulated ▪ Ø3 mm (⅛ in), Teflon insulated	1x Pt100, 3- or 4-wire, mineral insulated	2x Pt100, 3-wire, mineral insulated
Vibration resistance of the insert tip	Up to 3g	Enhanced vibration resistance > 60g	▪ Ø3 mm (⅛ in) up to 3g ▪ Ø6 mm (¼ in) > 60g	Up to 3g	
Measuring range; accuracy class	−50 to +400 °C (−58 to +752 °F), Class A or AA	−50 to +500 °C (−58 to +932 °F), Class A or AA	−50 to +200 °C (−58 to +392 °F), Class A or AA	−200 to +600 °C (−328 to +1 112 °F), Class A or AA	
Diameter	3 mm (⅛ in), 6 mm (¼ in)	6 mm (¼ in)	3 mm (⅛ in), 6 mm (¼ in)		

1) Recommended for immersion lengths U < 70 mm (2.76 in)

The iTHERM TS111 insert is available as a spare part. The insertion length (IL) depends on the immersion length of the thermowell (U), the length of the extension neck (E), the thickness of the base (B), the length of the thermowell lagging (L) and the variable length (X). The insertion length (IL) must be taken into consideration when replacing the unit. Formulas for calculating IL → 24.

For more information on the deployed iTHERM TS111 insert with enhanced vibration resistance and fast-response sensor, see the Technical Information (TI01014T/09/).

Spare parts currently available for your product can be found online at: https://www.endress.com/en/instrumentation-services, product root: TM411. Always quote the serial number of the device when ordering spare parts! The insertion length IL is automatically calculated using the serial number.

Weight

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

Materials

Extension neck and thermowell, insert, process connection.

The temperatures for continuous operation specified in the following table are only intended as reference values for use of the various materials in air and without any significant compressive load.

The maximum operating temperatures can be reduced considerably in cases where abnormal conditions such as high mechanical load occur or in aggressive media.

Name	Short formula	Recommended max. temperature for continuous use in air	Properties
AISI 316L (corresponds to 1.4404 or 1.4435)	X2CrNiMo17-13-2, X2CrNiMo18-14-3	650 °C (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 is a thermowell made of 316L or 1.4435+316L passivated with 3% sulfuric acid.
1.4435+316L, delta ferrite < 1% or < 0.5%	With regard to analytical limits, the specifications of both materials (1.4435 and 316L) are met simultaneously. In addition, the delta ferrite content of the parts in contact with the process is limited to <1% or <0.5%. ≤3% for weld seams (in accordance with Basel Standard II)		

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

Surface roughness

Values for process/product contact surfaces:

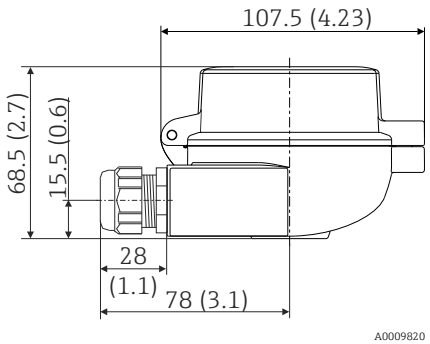
Standard surface, mechanically polished [1]	R_a ≤ 0.76 µm (30 µin)
Mechanically polished [1], buffed [2]	R_a ≤ 0.38 µm (15 µin)
Mechanically polished [1], buffed and electropolished	R_a ≤ 0.38 µm (15 µin)+ electropolished

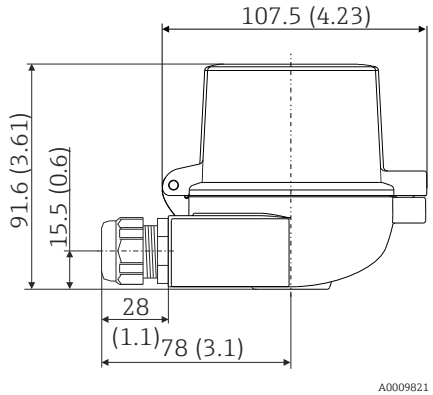
1) Or any other finishing method that meets the R_a max
2) Not compliant with ASME BPE

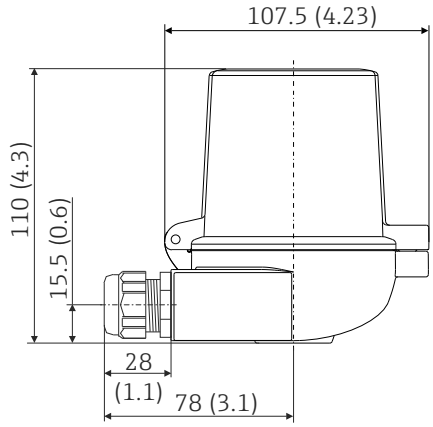
Terminal heads

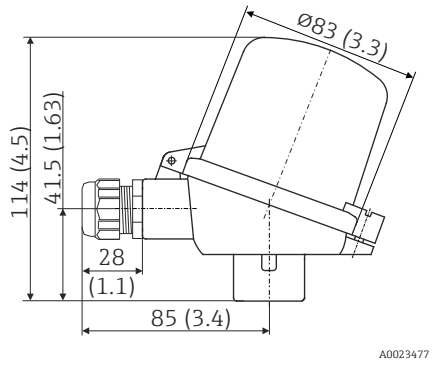
All terminal heads have an internal shape and size in accordance with DIN EN 50446, flat face, and a thermometer connection with a M24x1.5 or ½" NPT thread. All dimensions in mm (in). The sample cable glands in the diagrams correspond to M20x1.5 connections with non-Ex polyamide cable glands. Specifications without head transmitter installed. For ambient temperatures with head transmitter installed, see the 'Environment' section. → 🖹 23

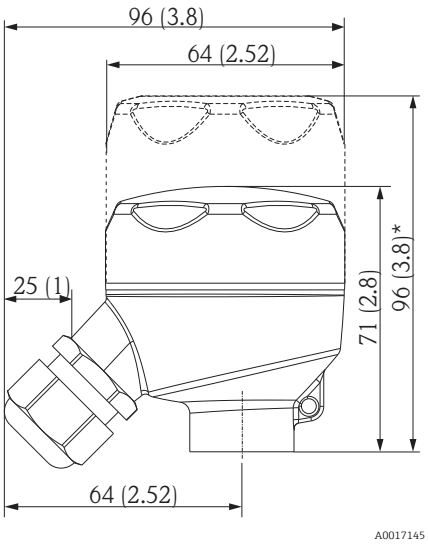
As a special feature, Endress+Hauser offers terminal heads with optimized terminal accessibility for easy installation and maintenance.

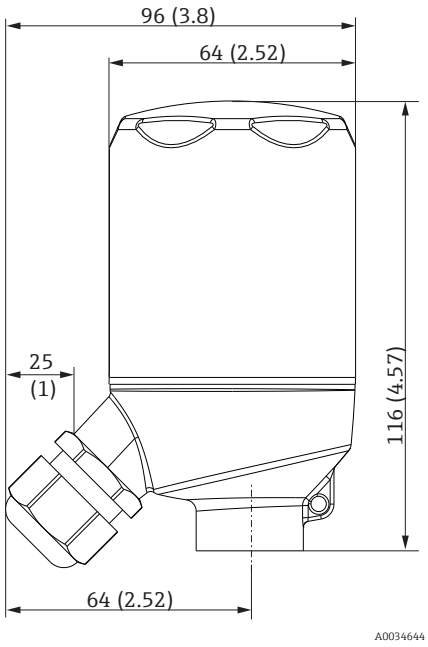
TA30A	Specification
	▪ Protection degree: ▪ IP66/68 (NEMA Type 4x encl.) ▪ For ATEX: IP66/67 ▪ Temperature: −50 to +150 °C (−58 to +302 °F) without cable gland ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Threaded cable entry: G ½", NPT ½" and M20x1.5; ▪ Head color: blue, RAL 5012 ▪ Cap color: gray, RAL 7035 ▪ Weight: 330 g (11.64 oz) ▪ Ground terminal, internal and external ▪ Available with sensors with 3-A® symbol

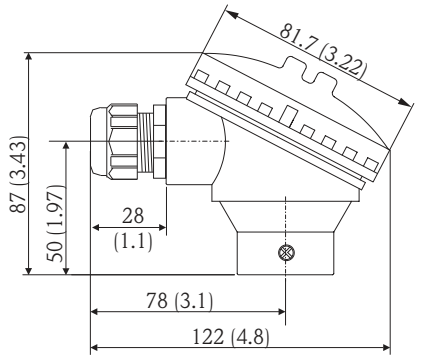
TA30A with display window in cover	Specification
	▪ Protection degree: ▪ IP66/68 (NEMA Type 4x encl.) ▪ For ATEX: IP66/67 ▪ Temperature: −50 to +150 °C (−58 to +302 °F) without cable gland ▪ Material: aluminum, polyester powder coated Seals: silicone ▪ Threaded cable entry: G ½", NPT ½" and M20x1.5 ▪ Head color: blue, RAL 5012 Cap color: gray, RAL 7035 ▪ Weight: 420 g (14.81 oz) ▪ Display window: single-pane safety glass according to DIN 8902 ▪ Display window in cover for head transmitter with TID10 display ▪ Ground terminal, internal and external ▪ Available with sensors with 3-A® symbol

TA30D	Specification
	▪ Protection degree: ▪ 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", NPT ½" and M20x1.5 ▪ Two head transmitters can be mounted. In the standard configuration one transmitter is mounted in the terminal head cover and an additional terminal block is installed directly on the insert. ▪ Head color: blue, RAL 5012 ▪ Cap color: gray, RAL 7035 ▪ Weight: 390 g (13.75 oz) ▪ Ground terminal, internal and external ▪ Available with sensors with 3-A® symbol

TA30P	Specification
	▪ Degree of protection: IP65 ▪ Max. temperature: −40 to +120 °C (−40 to +248 °F) ▪ Material: polyamide (PA12), antistatic Seals: silicone ▪ Threaded cable entry: M20x1.5 ▪ Two head transmitters can be mounted. In the standard version, one transmitter is mounted in the terminal head cover and an additional terminal block is installed directly on the insert. ▪ Head and cap color: black ▪ Weight: 135 g (4.8 oz) ▪ Type of protection: intrinsic safety (G Ex ia) ▪ Ground terminal: only internal via auxiliary clamp ▪ Available with sensors with 3-A® symbol

TA30R (optionally with display window in cover)	Specification
 * Dimensions of version with display window in cover	▪ Degree of protection - standard version: IP69K (NEMA Type 4x encl.) Degree of protection - version with display window: IP66/68 (NEMA Type 4x encl.) ▪ Temperature: −50 to +130 °C (−58 to +266 °F) without cable gland ▪ Material: stainless steel 316L, abrasive-blasted or polished Seals: silicone, optional EPDM for applications free from paint-wetting impairment substances Display window: polycarbonate (PC) ▪ Cable entry thread NPT ½" and M20x1.5 ▪ Weight ▪ Standard version: 360 g (12.7 oz) ▪ Version with display window: 460 g (16.23 oz) ▪ Display window in cover optionally for head transmitter with display TID10 ▪ Ground terminal: internal as standard ▪ Available with sensors with 3-A® symbol ▪ Not allowed for Class II and III applications

TA30R (high version for two transmitters)	Specification
	▪ Degree of protection: IP69K (NEMA Type 4x encl.) ▪ Temperature: −50 to +130 °C (−58 to +266 °F) without cable gland ▪ Material: stainless steel 316L, abrasive-blasted or polished Seals: EPDM ▪ Cable entry thread NPT ½" and M20x1.5 ▪ Weight: 460 g (16.23 oz) ▪ For two head transmitters ▪ Ground terminal: internal as standard ▪ Not allowed for Class II and III applications ▪ Available with 3-A marked sensors

TA30S	Specification
	▪ Degree of protection: IP65 (NEMA Type 4x encl.) ▪ Temperature: −40 to +85 °C (−40 to +185 °F) 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 ▪ Not allowed for Class II and III applications ▪ Available with 3-A marked sensors

Cable glands and connectors [1)]

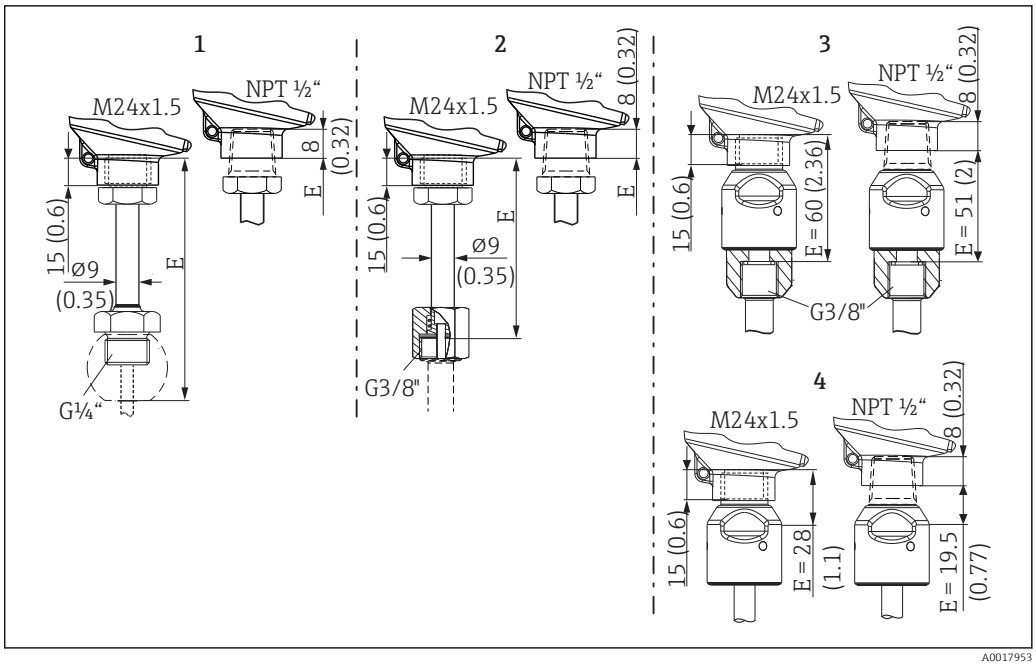
Type	Suitable for cable entry	Degree of protection	Temperature range	Suitable cable diameter
Cable gland, polyamide blue (indication of Ex-i circuit)	½" NPT	IP68	−30 to +95 °C (−22 to +203 °F)	7 to 12 mm (0.27 to 0.47 in)
Cable gland, polyamide	½" NPT, ¾" NPT, M20x1.5 (optionally 2x cable entry)	IP68	−40 to +100 °C (−40 to +212 °F)	5 to 9 mm (0.19 to 0.35 in)
	½" NPT, M20x1.5 (optionally 2x cable entry)	IP69K	−20 to +95 °C (−4 to +203 °F)	
Cable gland for dust ignition-proof area, polyamide	½" NPT, M20x1.5	IP68	−20 to +95 °C (−4 to +203 °F)	
Cable gland for dust ignition-proof area, nickel-plated brass	M20x1.5	IP68 (NEMA Type 4x)	−20 to +130 °C (−4 to +266 °F)	
M12 plug, 4-pin, 316 (PROFIBUS® PA, Ethernet-APL™, IO-Link®)	½" NPT, M20x1.5	IP67	−40 to +105 °C (−40 to +221 °F)	-
M12 plug, 8-pin, 316	M20x1.5	IP67	−30 to +90 °C (−22 to +194 °F)	-
7/8" plug, 4-pin, 316 (FOUNDATION ™ Fieldbus, PROFIBUS® PA)	½" NPT, M20x1.5	IP67	−40 to +105 °C (−40 to +221 °F)	-

1) Depending on product and configuration

Cable glands are not available for encapsulated, flameproof thermometers.

Extension neck

Extension neck in standard version or with optional quick-fastening iTHERM QuickNeck.
- Tool-free removal of the insert:
  - Saves time/costs on frequently calibrated measuring points
  - Wiring mistakes avoided
- IP69K protection class

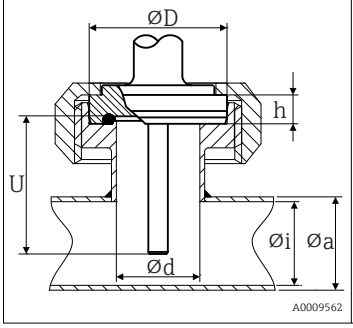


12 *Dimensions of extension neck type TE411, different versions, each with M24x1.5 or NPT ½" thread to the terminal head*

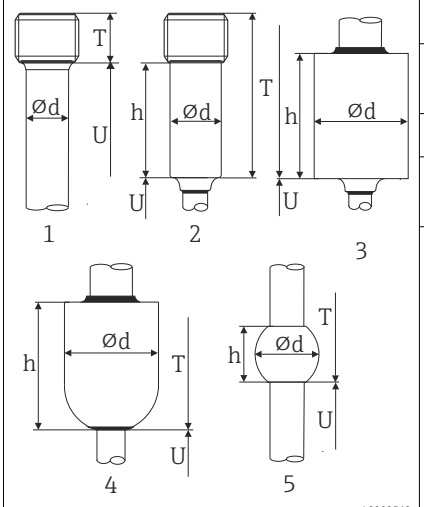
1 *With G¼" external thread for compression fitting TK40, 3-A marked*
2 *With G3/8" union nut for thermowell version: Ø6 mm (¼ in), Ø12.7 mm (0.5 in) and tee thermowell and elbow thermowell versions*
3 *Quick-fastening iTHERM QuickNeck for thermowell version: Ø6 mm (¼ in), Ø12.7 mm (0.5 in) and tee thermowell or elbow thermowell versions*
4 *Quick-fastening iTHERM QuickNeck - top part, for installation in an existing thermowell with iTHERM QuickNeck*

Thermowell **Process connections**

All dimensions in mm (in).

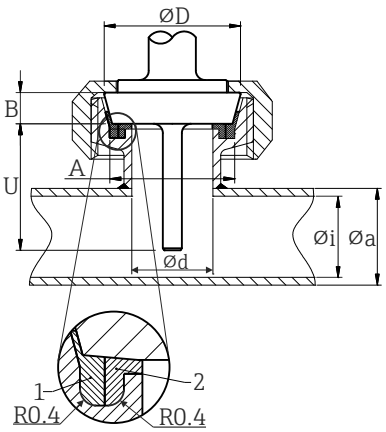
Type	Version	Dimensions					Technical properties
		Φd	ΦD	Φi	Φa	h	
Aseptic pipe union according to DIN 11864-1, Form A 	DN25	26 mm (1.02 in)	42.9 mm (1.7 in)	26 mm (1.02 in)	29 mm (1.14 in)	9 mm (0.35 in)	▪ $P_{max.}$ = 40 bar (580 psi) ▪ 3-A marked and EHEDG certified ▪ ASME BPE compliance
	DN40	38 mm (1.5 in)	54.9 mm (2.16 in)	38 mm (1.5 in)	41 mm (1.61 in)	10 mm (0.39 in)	

Weld-in

Model	Type of fitting [1]	Dimensions	Technical properties
Weld-in adapter 	1: Cylindrical [2]	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 [3]	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)	

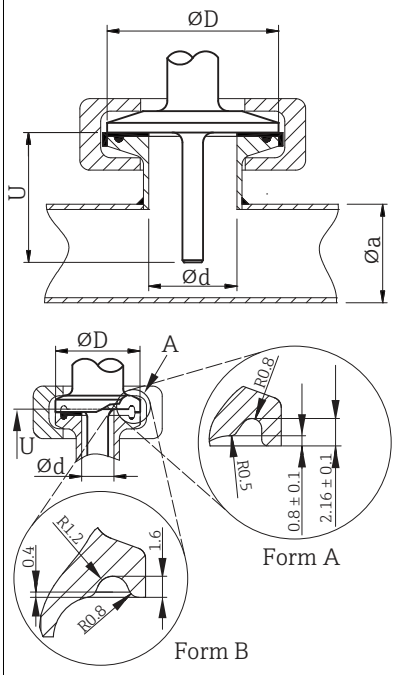
1) Options depend on product and configuration
2) For thermowell Φ12.7 mm (½ in)
3) For thermowell Φ6 mm (¼ in)

Releasable process connection

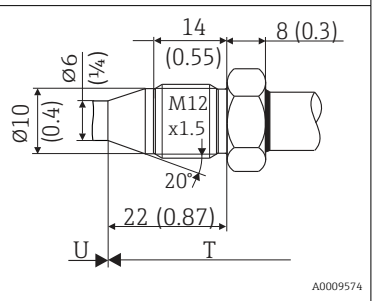
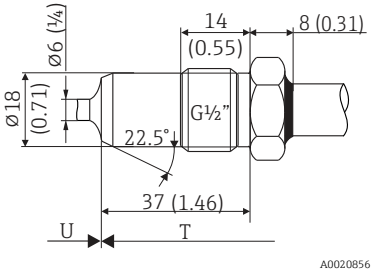
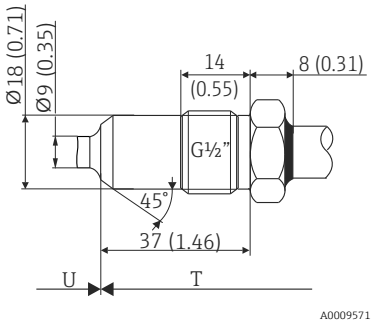
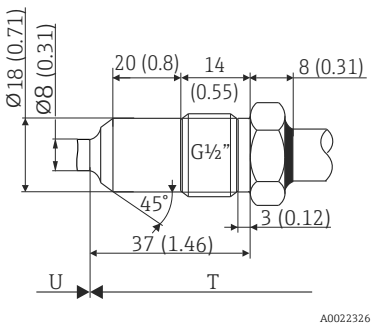
Type	Technical properties
Sanitary connection according to DIN 11851  A0009561 *1 Centering ring* *2 Sealing ring*	▪ 3-A marked and EHEDG certified (only with EHEDG-certified and self-centering sealing ring). ▪ ASME BPE compliance

Version [1]	Dimensions					$P_{max.}$
	ΦD	A	B	Φi	Φa	
DN25	44 mm (1.73 in)	30 mm (1.18 in)	10 mm (0.39 in)	26 mm (1.02 in)	29 mm (1.14 in)	40 bar (580 psi)
DN32	50 mm (1.97 in)	36 mm (1.42 in)	10 mm (0.39 in)	32 mm (1.26 in)	35 mm (1.38 in)	40 bar (580 psi)
DN40	56 mm (2.2 in)	42 mm (1.65 in)	10 mm (0.39 in)	38 mm (1.5 in)	41 mm (1.61 in)	40 bar (580 psi)
DN50	68 mm (2.68 in)	54 mm (2.13 in)	11 mm (0.43 in)	50 mm (1.97 in)	53 mm (2.1 in)	25 bar (363 psi)

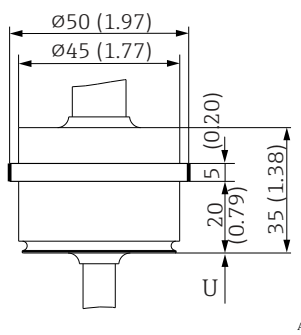
1) Pipes in accordance with DIN 11850

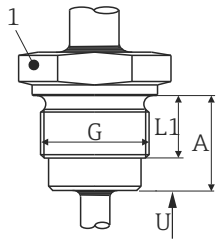
Type	Version [1]	Dimensions		Technical properties	Conformity
	ϕd [2]	ϕD	ϕa		
Clamp according to DIN 32676 [3]  Form A: In compliance with ASME BPE Type A Form B: In compliance with ASME BPE Type B and DIN 32676	Microclamp [4] DN8 (0.5"), Form A	25 mm (0.98 in)	-	▪ $P_{max.}$ = 16 bar (232 psi), depends on clamp ring and suitable seal ▪ With 3-A symbol	-
	Tri-clamp DN8 (0.5"), Form B		-		DIN 32676 [5]
	Clamp DN10-20, Form B	34 mm (1.34 in)	16 to 25.3 mm (0.63 to 0.99 in)		DIN 32676
	Clamp DN25-40 (1"-1.5"), Form B	50.5 mm (1.99 in)	29 to 42.4 mm (1.14 to 1.67 in)	▪ $P_{max.}$ = 16 bar (232 psi), depends on clamp ring and suitable seal ▪ 3-A marked and EHEDG certified (in connection with Combifit seal) ▪ Can be used with 'Novaseptic Connect (NA Connect)' which enables flush-mount installation	ASME BPE Type B; DIN 32676
	Clamp DN50 (2"), Form B	64 mm (2.52 in)	44.8 to 55.8 mm (1.76 to 2.2 in)		ASME BPE Type B; DIN 32676
	Clamp DN63.5 (2.5"), Form B	77.5 mm (3.05 in)	68.9 to 75.8 mm (2.71 to 2.98 in)		ASME BPE Type B; DIN 32676
	Clamp DN70-76.5 (3"), Form B	91 mm (3.58 in)	> 75.8 mm (2.98 in)		ASME BPE Type B; DIN 32676

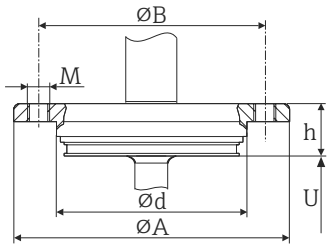
1) Options depend on product and configuration
2) Pipes in accordance with ISO 2037 and BS 4825 Part 1
3) replaces ISO 2852
4) Microclamp (not contained in DIN 32676); no standard pipes
5) Groove diameter = 20 mm

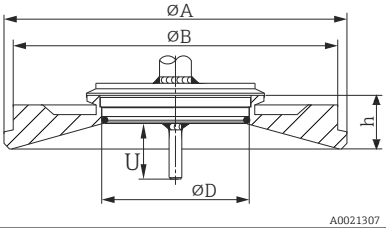
Type	Version [1]	Technical properties
Metal sealing system  *13 M12x1.5*  *14 G½"*	Thermowell diameter 6 mm (¼ in)	$P_{max.}$ = 16 bar (232 psi) Maximum torque = 10 Nm (7.38 lbf ft)
 	Thermowell diameter 9 mm (0.35 in)	$P_{max.}$ = 16 bar (232 psi) Maximum torque = 10 Nm (7.38 lbf ft)
 	Thermowell diameter 8 mm (0.31 in)	$P_{max.}$ = 16 bar (232 psi) Maximum torque = 10 Nm (7.38 lbf ft)

1) Options depend on product and configuration

Type	Version	Technical properties
Process adapter  *Unit of measurement mm (in)*	D45	

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	

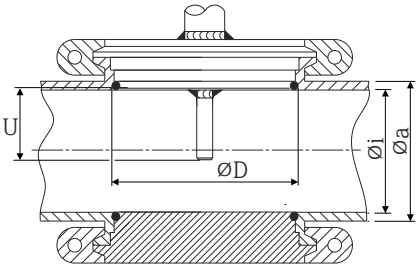
Type	Version	Dimensions					Technical properties
		Ød	ØA	ØB	M	h	
APV Inline  	DN50	69 mm (2.72 in)	99.5 mm (3.92 in)	82 mm (3.23 in)	2xM8	19 mm (0.75 in)	• $P_{max.}$ = 25 bar (362 psi) • 3-A marked and EHEDG certified • ASME BPE compliance

Type	Version [1]	Dimensions				Technical properties	
		ØD	ØA	ØB	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	Version [1]	Dimensions				Technical properties	
		ΦD	ΦA	ΦB	h	$P_{max.}$	
	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  A0009564	▪ With 3-A symbol and EHEDG certification ▪ ASME BPE compliance

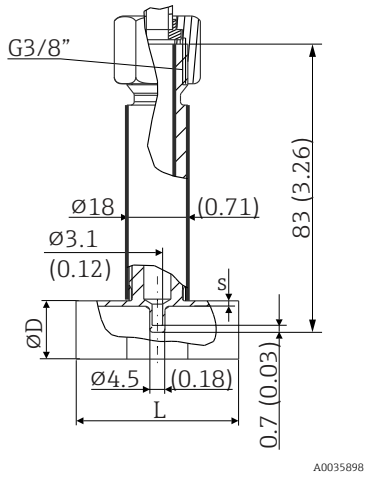
Version [1]	Dimensions			$P_{max.}$
	ΦD	Φi	Φa	
Type N, according to DIN 11866, series A	68 mm (2.67 in)	DN40: 38 mm (1.5 in)	DN40: 41 mm (1.61 in)	DN40 to DN65: 16 bar (232 psi)
		DN50: 50 mm (1.97 in)	DN50: 53 mm (2.1 in)	
		DN65: 66 mm (2.6 in)	DN65: 70 mm (2.76 in)	
		DN80: 81 mm (3.2 in)	DN80: 85 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

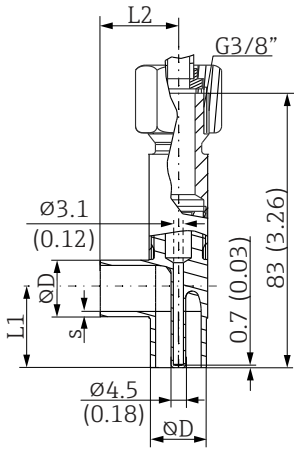
Due to the small immersion length U, the use of iTHERM QuickSens inserts is recommended.

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

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

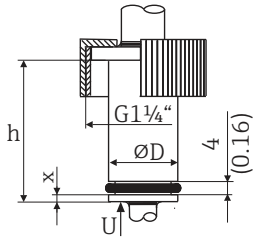
1) Options depend on product and configuration
2) Wall thickness
3) Applies to ≥ DN25. The radius ≥ 3.2 mm (⅛ in) cannot be maintained for smaller nominal diameters.

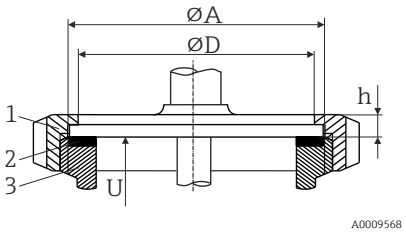
Elbow thermowell, optimized (no welding, no dead legs)

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

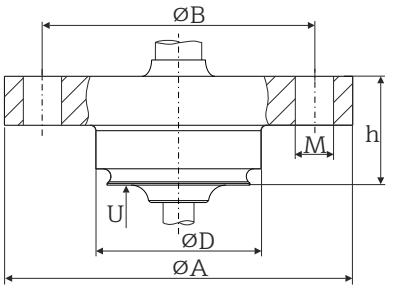
1) Options depend on product and configuration
2) Wall thickness
3) Applies to ≥ DN25. The radius ≥ 3.2 mm (⅛ in) cannot be maintained for smaller nominal diameters.

Due to the short immersion length U, the use of iTHERM QuickSens inserts is generally recommended for T-piece/elbow piece process connections according to DIN 11865.

Type	Version, dimensions ΦD x h	Technical properties
Ingold connection  	Φ25 mm (0.98 in) x 30 mm (1.18 in) x = 1.5 mm (0.06 in)	$P_{max.}$ = 25 bar (362 psi) A seal is included in the scope of delivery. V75SR material: Complies with FDA, 3-A Sanitary Standard 18-03 Class 1 and USP Class VI
	Φ25 mm (0.98 in) x 46 mm (1.81 in) x = 6 mm (0.24 in)	

Model	Type of fitting	Dimensions			Technical properties
		ΦD	ΦA	h	
SMS 1147  *1 Cap nut* *2 Sealing ring* *3 Counterpart connection*	DN25	32 mm (1.26 in)	35.5 mm (1.4 in)	7 mm (0.28 in)	$P_{max.}$ = 6 bar (87 psi)
	DN38	48 mm (1.89 in)	55 mm (2.17 in)	8 mm (0.31 in)	
	DN51	60 mm (2.36 in)	65 mm (2.56 in)	9 mm (0.35 in)	

The counterpart connection must fit the sealing ring and fix it in place.

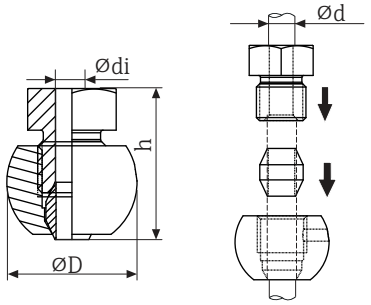
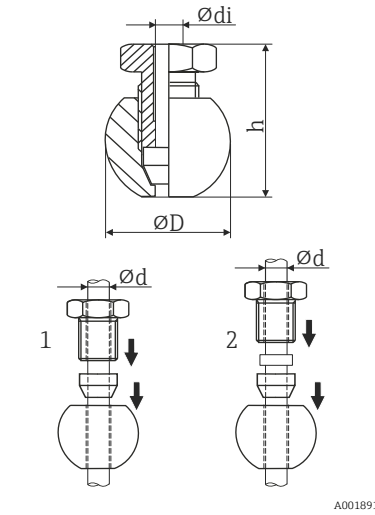
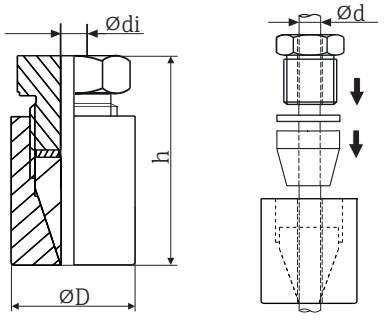
Type	Version	Dimensions					Technical properties
		ΦA	ΦB	ΦD	Φd	h	
NEUMO BioControl  	D25 PN16	64 mm (2.52 in)	50 mm (1.97 in)	30.4 mm (1.2 in)	7 mm (0.28 in)	20 mm (0.79 in)	▪ $P_{max.}$ = 16 bar (232 psi) ▪ With 3-A symbol
	D50 PN16	90 mm (3.54 in)	70 mm (2.76 in)	49.9 mm (1.97 in)	9 mm (0.35 in)	27 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)		

The 316L compression fittings can only be used once due to deformation. This applies to all the compression fitting components. A replacement compression fitting must be secured at another point (grooves in thermowell).

PEEK compression fittings must never be used at a temperature that is lower than the temperature present when the compression fitting is secured. This is because the fitting would no longer be leak-tight as a result of heat contraction of the PEEK material.

SWAGELOK or similar fittings are strongly recommended for higher requirements.

Compression fitting

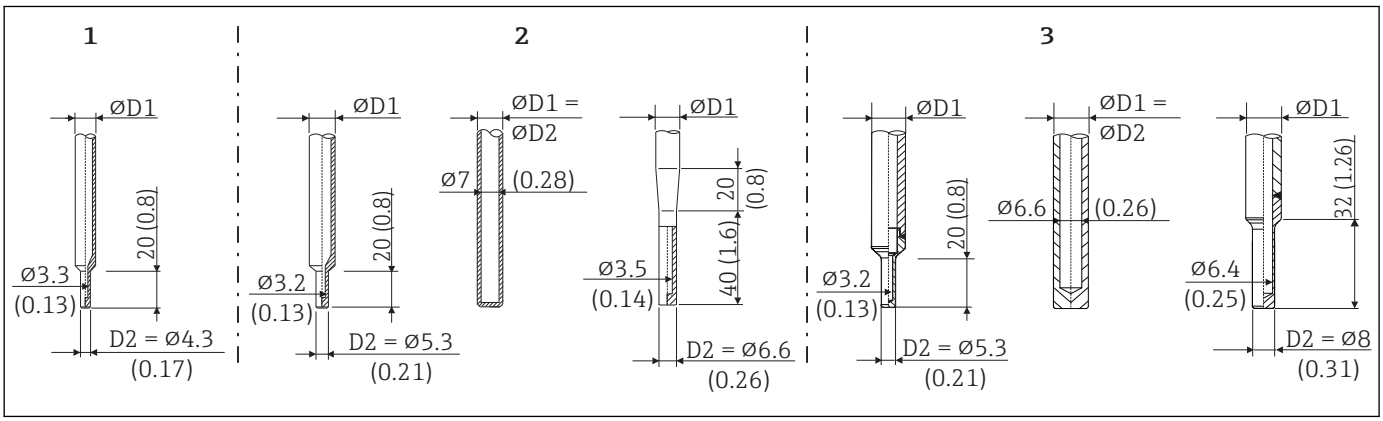
Model	Type of fitting [1]	Dimensions			Technical properties [2]
	Spherical or cylindrical	Ød*i*	Ø*D*	*h*	
	Spherical Sealing taper material 316L	6.3 mm (0.25 in) [3]	25 mm (0.98 in)	33 mm (1.3 in)	▪ $P_{max.}$ = 50 bar (725 psi) ▪ $T_{max.}$ for 316L sealing taper = +200 °C (+392 °F), tightening torque = 40 Nm
Compression fitting TK40 for weld-in  *1 Movable* *2 Fixed*	Spherical Sealing taper material PEEK Thread G¼"	6.3 mm (0.25 in) [3]	25 mm (0.98 in)	33 mm (1.3 in)	▪ $P_{max.}$ = 10 bar (145 psi) ▪ $T_{max.}$ for PEEK sealing taper = +200 °C (+392 °F), tightening torque = 10 Nm ▪ The TK40 PEEK sealing taper is EHEDG tested and 3-A marked
	Cylindrical Material of sealing taper ELASTOSIL® Thread G½"	6.2 mm (0.24 in) [3] 9.2 mm (0.36 in)	30 mm (1.18 in)	57 mm (2.24 in)	▪ $P_{max.}$ = 10 bar (145 psi) ▪ $T_{max.}$ for ELASTOSIL® sealing taper = +200 °C (+392 °F), tightening torque = 5 Nm ▪ The Elastosil® compression fitting is EHEDG tested and 3-A marked

1) Options depend on product and configuration
2) All the pressure specifications apply for cyclic temperature load
3) For insert or thermowell diameter Ød = 6 mm (0.236 in).

Shape of tip

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

- A smaller tip shape has less impact on the flow characteristics of the pipe carrying the medium.
- The flow characteristics are optimized, thereby increasing the stability of the thermowell.
- Endress+Hauser offers users a range of thermowell tips to meet every requirement:
  - Reduced tip with Ø4.3 mm (0.17 in) and Ø5.3 mm (0.21 in): walls of lower thickness significantly reduce the response times of the overall measuring point.
  - Tapered tip with Ø6.6 mm (0.26 in) and reduced tip with Ø8 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.).



15 Thermowell tips available (reduced, straight or tapered)

Item no.	Thermowell (ØD1)		Insert (ØID)
1	Ø6 mm (¼ in)	Reduced tip	Ø3 mm (⅛ in)
2	Ø9 mm (0.35 in)	▪ Reduced tip with Ø5.3 mm (0.21 in) ▪ Straight tip ▪ Tapered tip with Ø6.6 mm (0.26 in)	▪ Ø3 mm (⅛ in) ▪ Ø6 mm (¼ in) ▪ Ø3 mm (⅛ in)
3	Ø12.7 mm (½ in)	▪ Reduced tip with Ø5.3 mm (0.21 in) ▪ Straight tip ▪ Reduced tip with Ø8 mm (0.31 in)	▪ Ø3 mm (⅛ in) ▪ Ø6 mm (¼ in) ▪ Ø6 mm (¼ in)

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

Certificates and approvals

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

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

Materials in contact with food/product (FCM)

The materials of the thermometer in contact with food/product (FCM) 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.
- (EU) No. 10/2011 on plastic materials and articles intended to come into contact with food.

- EHEDG certification, type EL CLASS I. EHEDG-certified/tested process connections. → 42
- 3-A authorization no. 1144, 3-A Sanitary Standard 74-07. Listed process connections. → 42
- ASME BPE (latest edition), certificate of conformity can be ordered for indicated options.
- FDA-compliant
- All surfaces in contact with the medium are free of animal derived ingredients (ADI/TSE) and do not contain any materials derived from bovine or animal sources.

CRN approval

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

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

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

Surface purity

- Free from oil and grease for O_2 applications, optional
- PWIS-free (PWIS = paint-wetting impairment substances as per DIL0301), optional

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

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**.

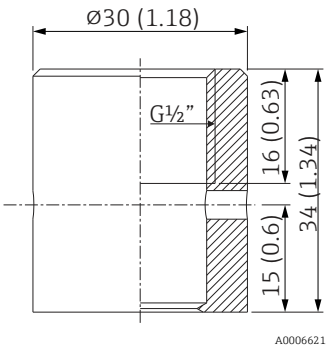
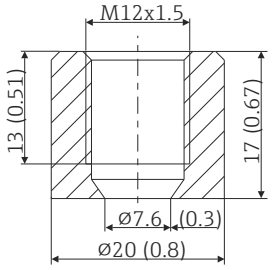
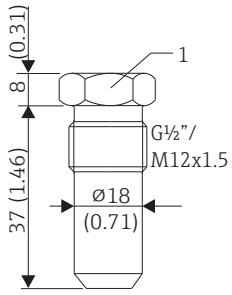
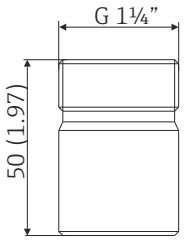
Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as the measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic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

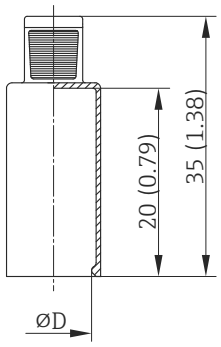
Accessories

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**.

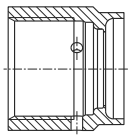
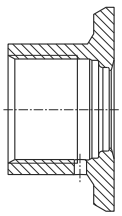
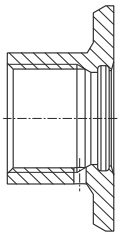
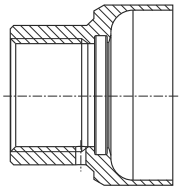
Device-specific accessories

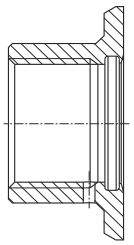
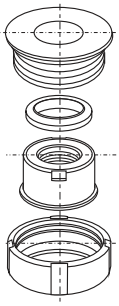
Accessory	Description
Welding boss with sealing taper (metal - metal)  	Welding boss for G½" and M12x1.5 thread Metal-sealing; conical Material of wetted parts: 316L/1.4435 Max. process pressure 16 bar (232 PSI) **Order number:** ▪ 71424800 (G½") ▪ 71405560 (M12x1.5)
Dummy plug  *1 Size across flats AF22*	Dummy plug for G½" or M12x1.5 conical metal-sealing welding boss Material: SS 316L/1.4435 **Order number:** ▪ 71424800 (G½") ▪ 71535692 (M12x1.5)
Weld-in adapter for Ingold process connection (OD25 mm (0.98 in)x50 mm (1.97 in) 	Material of wetted parts: 316L/1.4435 Weight: 0.32 kg (0.7 lb) Adapter for Ingold process connection with 3.1 material certificate, **order number:** 71531585 Adapter for Ingold process connection, **order number:** 71531588 O-ring seal set ▪ Silicone O-ring in accordance with FDA CFR 21 ▪ Maximum temperature: 230 °C (446 °F) ▪ **Order number:** 71220351

Flexible handle cap to cover the QuickNeck bottom part  A0027201	Diameter ØD: 24 to 26 mm (0.94 to 1.02 in) Material: Thermoplastic polyolefin - elastomer (TPE), free from plasticizers Maximum temperature: +150 °C (+302 °F) **Order number:** 71275424

Weld-in adapter

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

Weld-in adapter	Material	Roughness µm (µin) process side
 A0008246 **G ¾, d=29 pipe-mounting**	316L (1.4435)	≤1.5 (59.1)
 A0008251 **G ¾, d=50 vessel-mounting**	316L (1.4435)	≤0.8 (31.5)
 A0008256 **G ¾", d=55, with flange**	316L (1.4435)	≤0.8 (31.5)
 A0011924 **G 1", d=53, without flange**	316L (1.4435)	≤0.8 (31.5)

 A0008248 **G 1", d=60, with flange**	316L (1.4435)	≤0.8 (31.5)
 A0008253 **G 1" adjustable**	316L (1.4435)	≤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

Modems/Edge devices

Commubox FXA195 USB/HART modem
Connects intrinsically safe 'smart transmitters' with a HART protocol to the USB interface of a laptop/PC. This enables the remote operation of the transmitters with FieldCare.

Technical Information TI00404F

www.endress.com/fxa195

Software

DeviceCare SFE100
DeviceCare is an Endress+Hauser configuration tool for field devices using the following communication protocols: HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, IO/Link, Modbus, CDI and Endress+Hauser Common Data Interfaces.

Technical Information TI01134S

www.endress.com/sfe100

FieldCare SFE500
FieldCare is a configuration tool for Endress+Hauser and third-party field devices based on DTM technology.
The following communication protocols are supported: HART, WirelessHART, PROFIBUS, FOUNDATION Fieldbus, Modbus, IO-Link, EtherNet/IP, PROFINET and PROFINET APL.

Technical Information TI00028S

www.endress.com/sfe500

Netilion
With the Netilion IIoT ecosystem, Endress+Hauser enables the optimization of plant performance, digitization of workflows, sharing of knowledge and improved collaboration. Drawing upon decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem designed to effortlessly extract insights from data. These insights allow process optimization, leading to increased plant availability, efficiency, reliability and ultimately a more profitable plant.

www.netilion.endress.com

Field Xpert SMT50
Universal, high-performance tablet PC for device configuration.

Technical Information TI01555S

www.endress.com/smt50

Field Xpert SMT77 via WLAN
Universal, high-performance tablet PC for device configuration in Ex Zone 1 areas.

Technical Information TI01418S

www.endress.com/smt77

SmartBlue app
SmartBlue from Endress+Hauser allows easy wireless field device configuration via Bluetooth® or WLAN. By providing mobile access to diagnostic and process information, SmartBlue saves time, even in hazardous and difficult-to-access environments.



A0033202

16 *QR code for free Endress+Hauser SmartBlue app*

Communication-specific accessories

Configuration kit TXU10

Configuration kit for PC-programmable transmitter - FDT/DTM-based plant asset management tool, FieldCare/DeviceCare, and interface cable (4-pin connector) for PC with USB port.

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

Online tools

Product information about the entire life cycle of the device is available at:
www.endress.com/onlinetools

System components

Process indicators from the RIA product family

Easily readable process indicators with various functions: loop-powered indicators for displaying 4-20mA values, 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 document types are available in the Downloads area of the Endress+Hauser website (www.endress.com/downloads):

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

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)	**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 installation, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.
Safety Instructions (XA)	Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions. The nameplate indicates the Safety Instructions (XA) that are relevant to the device.
Functional Safety Manual (FY)	Depending on the SIL approval, the Functional Safety Manual (FY) is an integral part of the Operating Instructions and applies in addition to the Operating Instructions, Technical Information and ATEX Safety Instructions. The different requirements that apply for the protective function are described in the Functional Safety Manual (FY).



www.addresses.endress.com

Endress+Hauser

People for Process Automation