

# Technical Information

## T13, T14 and T15

Explosion proof RTD assemblies in thermowells with spring loaded insert and enclosure for process industry



### Application

- Heavy duty applications
- The sensor assemblies can be used in process industries such as:
  - Chemicals
  - Petrochemical
  - Refineries
  - Offshore platforms
- Measuring range: -200 to 600 °C (-328 to 1 112 °F)
- Protection class: IP66/67

### Head transmitter

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

- Analog output 4 to 20 mA
- HART®
- PROFIBUS® PA
- FOUNDATION Fieldbus™
- Bluetooth® connectivity (optional)

### Field transmitter

Temperature field transmitters with HART® or FOUNDATION Fieldbus™ protocol for highest reliability in harsh industrial environments. Backlit display with large measured value, bargraph and fault condition indication for ease of reading.

### Your benefits

- CSA C/US XP and FM/CSA XP Class I, Div. 1 approved temperature assemblies for maximum safety
- One source shopping for temperature measurement solutions. World class transmitter with integrated sensor offering for heavy process industry applications
- Remove and install straight out of the box
- Improved galvanic isolation on most devices (2 kV)

*[Continued from front page]*

- Simplified model structure: Competitively priced, offers great value. Easy to order and reorder. A single model number includes sensor, thermowell and transmitter assembly for a complete point solution
- All iTEMP transmitters provide long-term stability  $\leq 0.05\%$  per year
- iTHERM StrongSens: unsurpassed vibration resistance ( $> 60g$ ) for ultimate plant safety

## Function and system design

### Measuring principle

#### Resistance thermometer (RTD)

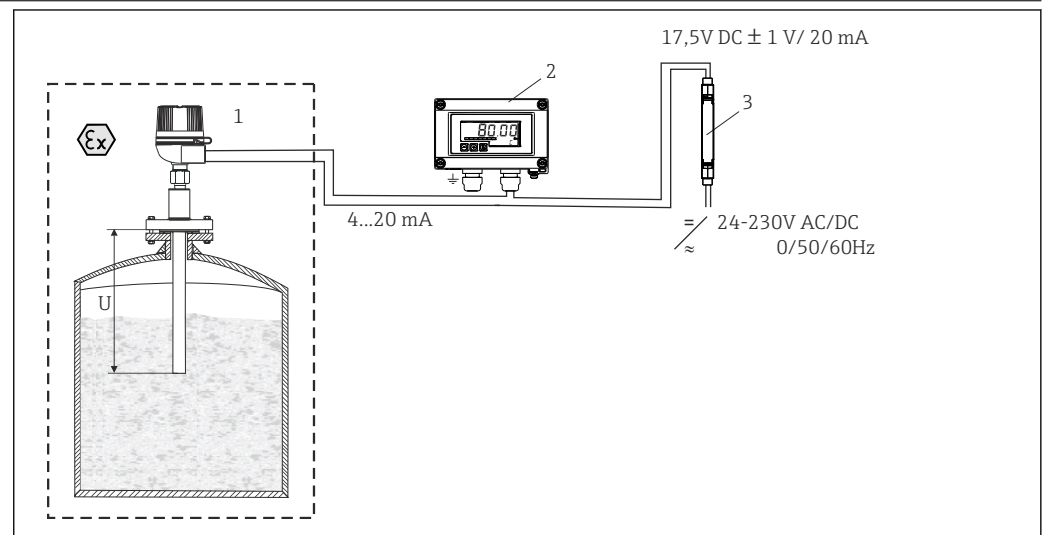
These resistance thermometers use a Pt100 temperature sensor according to IEC 60751. The temperature sensor is a temperature-sensitive platinum resistor with a resistance of 100  $\Omega$  at 0 °C (32 °F) and a temperature coefficient  $\alpha = 0.003851 \text{ }^{\circ}\text{C}^{-1}$ .

**There are generally two different kinds of platinum resistance thermometers:**

- **Wire wound (WW):** Here, a double coil of fine, high-purity platinum wire is located in a ceramic support. This is then sealed top and bottom with a ceramic protective layer. Such 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 it is comparatively sensitive to vibrations.
- **Thin film platinum resistance thermometers (TF):** A very thin, ultrapure platinum layer, approx. 1  $\mu\text{m}$  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. A relatively low principle-based deviation of the resistance/temperature characteristic from the standard characteristic of IEC 60751 can frequently be observed among TF sensors at high temperatures. As a result, the tight limit values of tolerance category A as per IEC 60751 can only be observed with TF sensors at temperatures up to 200 °C (392 °F).

### Measuring system



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#### 1 Application example

- 1 Mounted thermometer with head transmitter installed.
- 2 RIA15 process display - The display unit records the analog measuring signal from the head transmitter and shows this on the display. The LC display shows the current measured value in digital form and as a bar graph indicating a limit value violation. The process display unit is integrated in the 4 to 20 mA or HART® loop and is powered directly from the current loop. Optionally up to four of a sensor's HART® process variables can be displayed. More information on this can be found in the Technical Information, see "Documentation".
- 3 Active barrier RN42 - The RN42 (17.5 V<sub>DC</sub>, 20 mA) active barrier has a galvanic isolated output for supplying voltage to loop powered 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. More information on this can be found in the Technical Information, see "Documentation".

## Input

Measurement range	Construction	Model code (class and type of sensor)	Max. measurement range
Low temperature range		T13-_____ (A/C/E/G/J/L) _____	-50 to 200 °C (-58 to 392 °F)
		T14-_____ (A/C/E/G/J/L) _____	
		T15-____ (A/C/E/G/J/L) _____	
High temperature range		T13-_____ (B/D/F/H/K/M) _____	-200 to 600 °C (-328 to 1 112 °F)
		T14-_____ (B/D/F/H/K/M) _____	
		T15-____ (B/D/F/H/K/M) _____	
Pt100 thin-film, iTHERM StrongSens, vibration- resistant > 60g		T13-_____ (S/T/U/V) _____	-50 to +500 °C (-58 to +932 °F)
		T14-_____ (S/T/U/V) _____	
		T15-____ (S/T/U/V) _____	



Options J, K, L, M are duplex platinum elements of two sensors inside the same sheath.

## Output

Output signal	<p>Generally, the measured value can be transmitted in one of two ways:</p> <ul style="list-style-type: none"> <li>▪ Directly-wired sensors - sensor measured values forwarded without a transmitter.</li> <li>▪ 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 or as field transmitter and wired with the sensory mechanism.</li> </ul>
Family of temperature transmitters	<p>Thermometers fitted with iTEMP transmitters are an installation-ready complete solution to improve temperature measurement by significantly increasing accuracy and reliability, when compared to direct wired sensors, as well as reducing both wiring and maintenance costs.</p> <p><b>4 to 20 mA head transmitters</b></p> <p>They offer a high degree of flexibility, thereby supporting universal application with low inventory storage. The iTEMP transmitters can be configured quickly and easily at a PC. Endress+Hauser offers free configuration software which can be downloaded from the Endress+Hauser Website. More information can be found in the Technical Information.</p> <p><b>HART® head transmitters</b></p> <p>The transmitter is a 2-wire device with one or two measuring inputs and one analog output. The device not only transfers converted signals from resistance thermometers and thermocouples, it also transfers resistance and voltage signals using HART® communication. Swift and easy operation, visualization and maintenance using universal device configuration tools like FieldCare, DeviceCare or FieldCommunicator 375/475. Integrated Bluetooth® interface for the wireless display of measured values and configuration via E+H SmartBlue (app), optional. For more information, see the Technical Information.</p> <p><b>PROFIBUS® PA head transmitters</b></p> <p>Universally programmable head transmitter with PROFIBUS® PA communication. Conversion of various input signals into digital output signals. High accuracy over the complete ambient temperature range. The configuration of PROFIBUS PA functions and of device-specific parameters is performed via fieldbus communication. For more information, see the Technical Information.</p> <p><b>FOUNDATION Fieldbus™ head transmitters</b></p> <p>Universally programmable head transmitter with FOUNDATION Fieldbus™ communication. Conversion of various input signals into digital output signals. High accuracy over the complete ambient temperature range. All transmitters are released for use in all important process control systems. The integration tests are performed in Endress+Hauser's "System World". For more information, see the Technical Information.</p>

Advantages of the iTEMP transmitters:

- Dual or single sensor input (optionally for certain transmitters)
- Pluggable 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 for dual sensor input transmitters, based on Callendar-Van-Dusen-coefficients (CvD).

**Field transmitter**

Field transmitter with HART®, FOUNDATION Fieldbus™ or PROFIBUS® PA communication and backlit display. Can be read easily from a distance, in sunlight and at night. Large measurement value, bargraph and fault indication displayed. Benefits are: dual sensor input, highest reliability in harsh industrial environments, mathematic functions, thermometer drift monitoring and sensor back-up functionality, corrosion detection.

**Galvanic isolation**

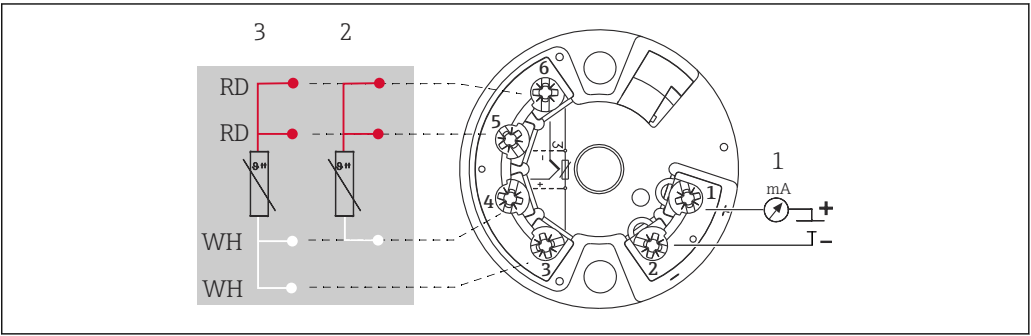
Galvanic isolation of Endress+Hauser iTEMP transmitters

Transmitter type	Sensor
TMT181 PCP	$\hat{U} = 3.75 \text{ kV AC}$
TMT182 HART®	$U = 2 \text{ kV AC}$
TMT162 HART® Field transmitter	
TMT71	
TMT72 HART®	
TMT82 HART®	
TMT84 PA	
TMT85 FF	
TMT142B	

**Power supply**

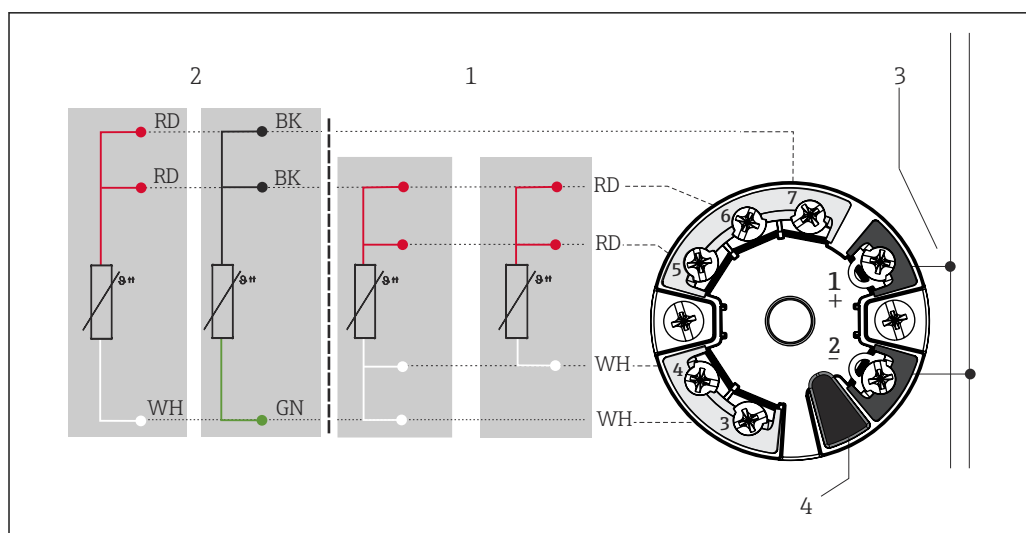
**Terminal assignment**

Type of sensor connection



**2** Head mounted transmitter TMT18x (single input)

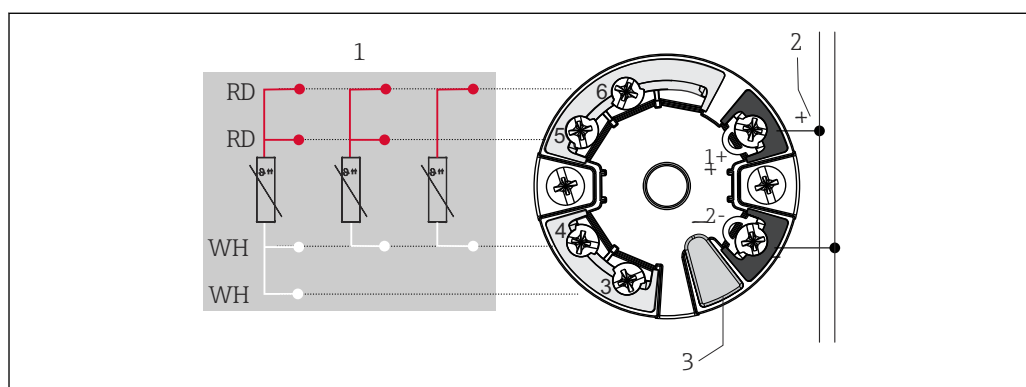
- 1 Power supply head transmitter and analog output 4 to 20 mA or bus connection
- 2 3-wire
- 3 4-wire



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3 Head mounted transmitter TMT8x (dual input)

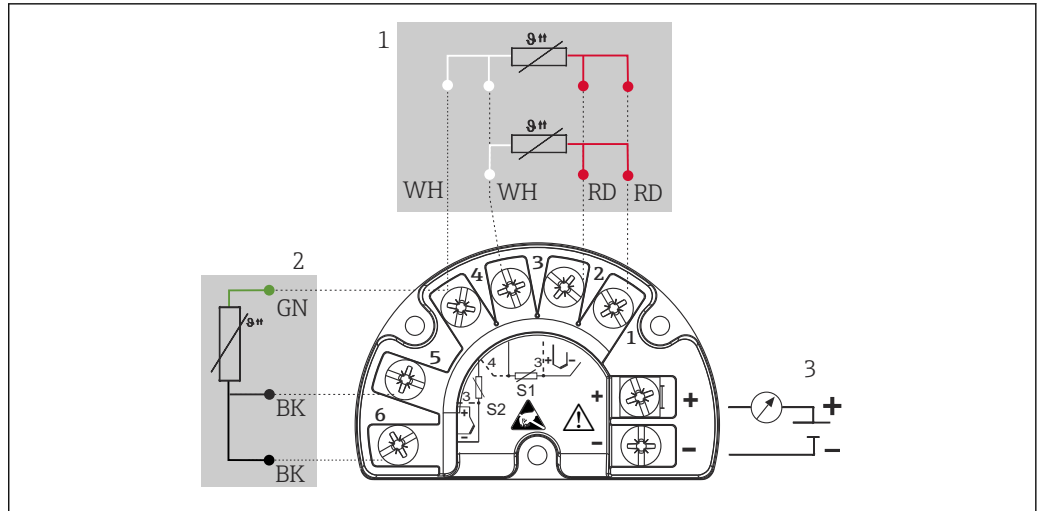
- 1 Sensor input 1, RTD, 4- and 3-wire
- 2 Sensor input 2, RTD, 3-wire
- 3 Bus connection and supply voltage
- 4 Display connection



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4 Head mounted transmitter TMT7x (single input)

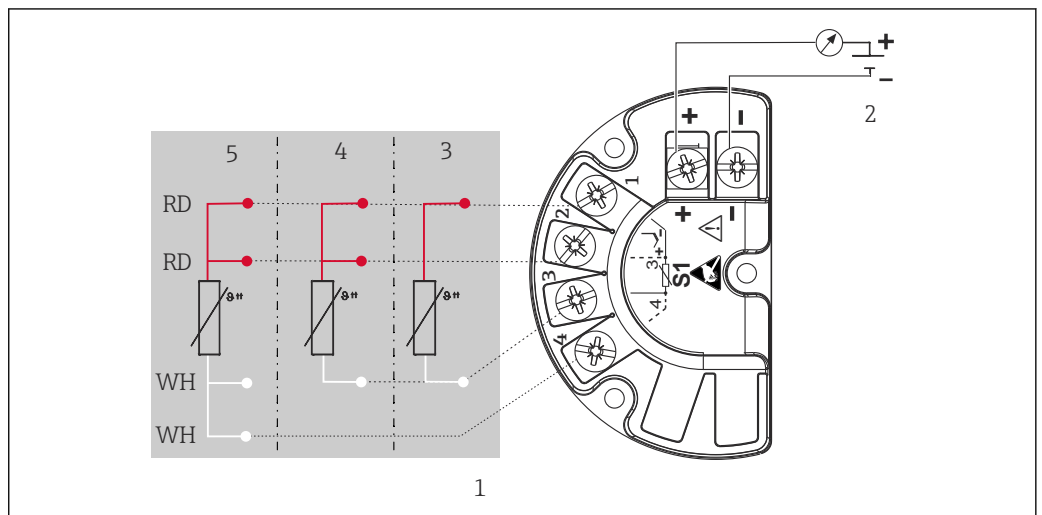
- 1 Sensor Input
- 2 Bus connection and supply voltage
- 3 Display connection



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5 Field mounted transmitter TMT162 (dual input)

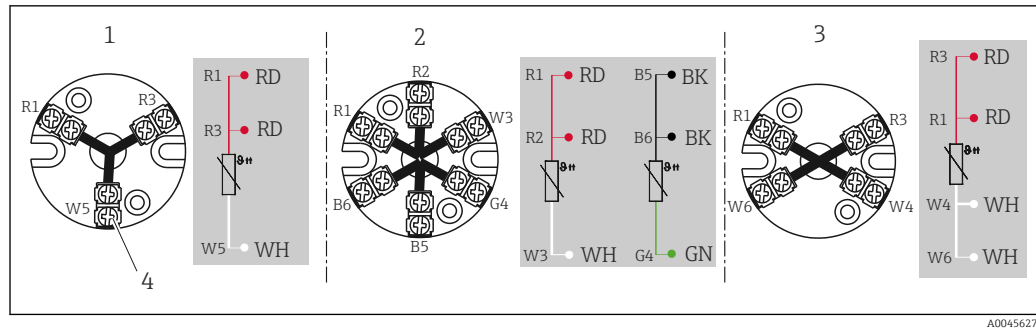
- 1 Sensor 1
- 2 Sensor 2 (not TMT142B)
- 3 Power supply field transmitter and analog output 4 to 20 mA or bus connection



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6 Field mounted transmitter TMT142B (single Input)

- 1 Sensor input RTD
- 2 Power supply field transmitter and analog output 4 to 20 mA, HART®-Signal
- 3 2-wire
- 4 3-wire
- 5 4-wire



**7** Terminal block mounted

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

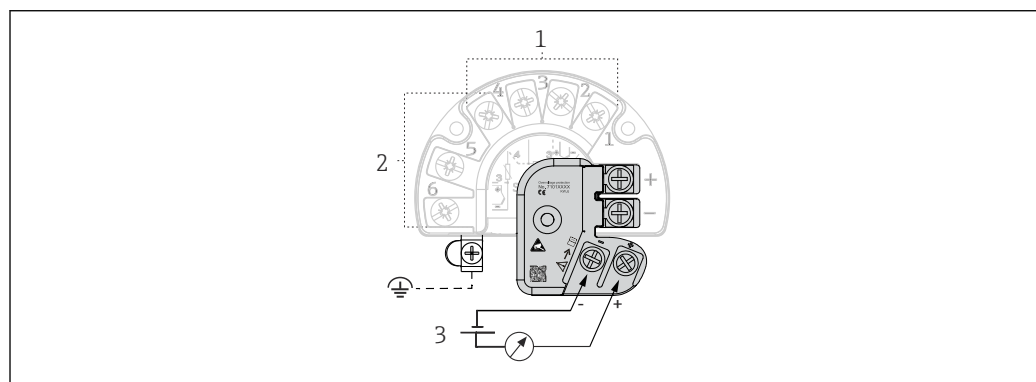
**i** The blocks and transmitters are shown as they sit inside the heads in reference to the conduit opening.

### Integrated overvoltage protection

The integrated overvoltage protection module can be ordered as an optional extra<sup>1)</sup>. The module protects the electronics from damage from overvoltage. Overvoltage occurring in signal cables (e.g. 4 to 20 mA, communication lines (fieldbus systems) and power supply is diverted to ground. The functionality of the transmitter is not affected as no problematic voltage drop occurs.

#### Connection data:

Maximum continuous voltage (rated voltage)	$U_C = 42 \text{ V}_{DC}$
Nominal current	$I = 0.5 \text{ A}$ at $T_{amb.} = 80^\circ \text{C}$ ( $176^\circ \text{F}$ )
Surge current resistance <ul style="list-style-type: none"> <li>Lightning surge current D1 (10/350 <math>\mu\text{s}</math>)</li> <li>Nominal discharge current C1/C2 (8/20 <math>\mu\text{s}</math>)</li> </ul>	<ul style="list-style-type: none"> <li><math>I_{imp} = 1 \text{ kA}</math> (per wire)</li> <li><math>I_n = 5 \text{ kA}</math> (per wire)</li> <li><math>I_n = 10 \text{ kA}</math> (total)</li> </ul>
Temperature range	$-40$ to $+80^\circ \text{C}$ ( $-40$ to $+176^\circ \text{F}$ )
Series resistance per wire	$1.8 \Omega$ , tolerance $\pm 5 \%$



**8** Electrical connection of the overvoltage protection

- 1 Sensor 1
- 2 Sensor 2
- 3 Bus connection and supply voltage

1) Available for the field transmitter with HART® 7 specification



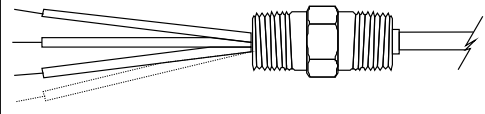
Grounding

The device must be connected to the potential equalization. The connection between the housing and the local ground must have a minimum cross-section of 4 mm<sup>2</sup> (13 AWG) . All ground connections must be secured tightly.

Wire specifications

24 AWG, 19 strand silver plated copper with 0.025 mm (0.010 in) PTFE extruded outer.

Electrical connection
Flying leads, standard 3" for wiring in terminal head, head mounted transmitter or terminal block mounted
Flying leads, 5½" for wiring with TMT162 or TMT142 assemblies

Design of leads
Flying leads 3" or 5½" with brass crimped sleeves


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Performance characteristics

Reference conditions

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

Response time

63% response time per ASTM E644

RTD assembly T15 without thermowell

Construction	
High temperature range	3 s
Low temperature range	9 s

 Response time for the sensor assembly without transmitter.

Response time examples for RTD assemblies with thermowell T13 and T14

Construction	Stepped thermowell	Tapered thermowell	Straight thermowell (¾")
High temperature range	20 s	25 s	30 s
Low temperature range	25 s	30 s	35 s

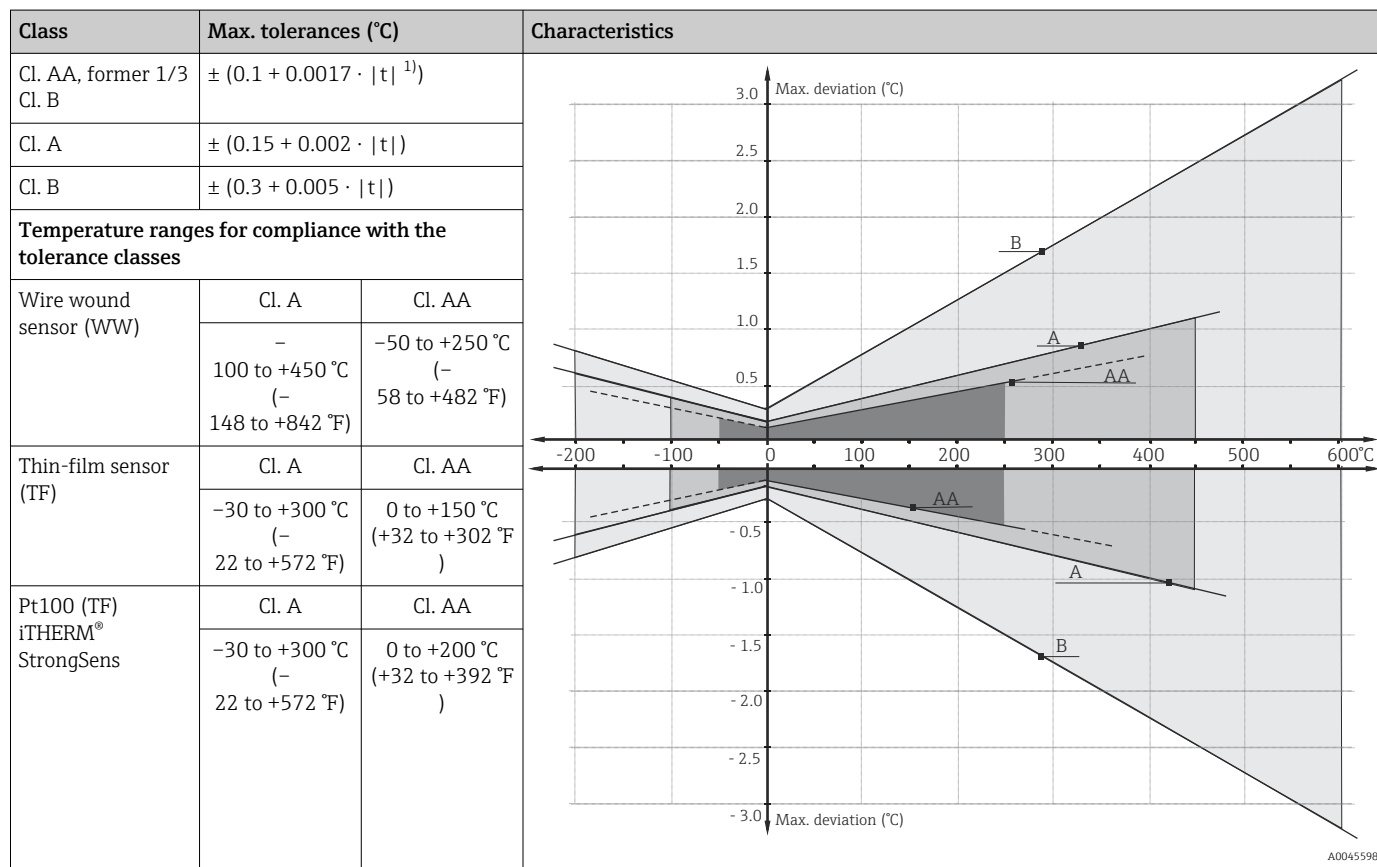
 Response times for RTD assemblies with thermowell are provided for general design guidance without transmitter.

When the temperature of a process media changes, the output signal of a RTD assembly follows this change after a certain time delay. The physical cause is the time related to heat transfer from the process media through the thermowell and the insert to the sensor element (RTD). The manner in which the reading follows the change in temperature of the assembly over time is referred to as the response time. Variables that influence or impact the response time are:

- Wall thickness of thermowell
- Spacing between RTD insert and thermowell
- Sensor packaging
- Process parameters such as media, flow velocity, etc.

**Reference operating conditions****Accuracy**

RTD resistance thermometer as per IEC 60751

1)  $|t|$  = absolute value °C

In order to obtain the maximum tolerances in °F, the results in °C must be multiplied by a factor of 1.8.

**Transmitter long-term stability** $\leq 0.1\text{ °C (0.18 °F) / year}$  or  $\leq 0.05\text{ % / year}$ 

Data under reference conditions; % relates to the set span. The larger value applies.

**Dielectric strength**The units are factory tested with 500 V<sub>AC</sub> for one minute between live parts (terminals) and exposed non-current-carrying metal parts (e.g. probe sheath).**Self heating**

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

**Calibration specifications**


The manufacturer provides comparison temperature calibrations from -20 to +300 °C (-4 to +573 °F) on the ITS-90 (International Temperature Scale). Calibrations are traceable to standards maintained by the National Institute of Standards and Technology (NIST). Calibration services are in conformance with ASTM E220. The report of calibration is referenced to the serial number of the RTD assembly.

Three point calibrations are provided, given that the specified temperatures are within the recommended range and the minimum length requirements are met as specified. The minimum length is based on overall length 'x' of the spring loaded insert.

# Installation

Orientation	No restrictions.
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Installation instructions


-  9    *Installation examples*
- A-C    *In pipes with a small cross section the thermowell tip should reach or extend slightly past the center line of the pipe (= U)*
- B    *Threaded, angled installation of T13 assembly*
- C    *Flange installation of T14 assembly*

The immersion length of the thermometer influences the accuracy. If the immersion length is too small then errors in the measurement are caused by heat conduction via the process connection and the container wall. If installing into a pipe then the immersion length should be at least half of the pipe diameter. A further solution could be an angled (tilted) installation (see C). When determining the immersion length all thermometer parameters and the process to be measured must be taken into account (e.g. flow velocity, process pressure).

- Installation possibilities: Pipes, tanks or other plant components
- Minimum immersion length per ASTM E644,  $\Delta T \leq 0.05\text{ }^{\circ}\text{C}$  (0.09 °F):

For temperature assemblies with themowell (T13 and T14) the minimum immersion is the depth to which the thermowell is immersed in the medium, measured from the tip. To minimize errors from ambient temperature the following minimum immersion lengths are recommended:

Construction	Minimum immersion
Stepped thermowell	63.5 mm (2.5 in)
Tapered thermowell	114.3 mm (4.5 in)
¾" straight thermowell	101.6 mm (4 in)
Weld-in thermowell	114.3 mm (4.5 in)

 T15 assemblies can only be used in existing thermowells.

# 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
	With mounted head transmitter	–40 to 85 °C (–40 to 185 °F) SIL mode (HART 7 transmitter): –40 to 70 °C (–40 to 158 °F)

Terminal head	Temperature in °C (°F)
With mounted head transmitter and display	-20 to 70 °C (-4 to 158 °F)
With mounted field transmitter	<ul style="list-style-type: none"> <li>■ Without display: -40 to 85 °C (-40 to 185 °F)</li> <li>■ With display and/or integrated overvoltage protection module: -40 to +80 °C (-40 to +176 °F)</li> <li>■ SIL mode: -40 to +75 °C (-40 to +167 °F)</li> </ul>

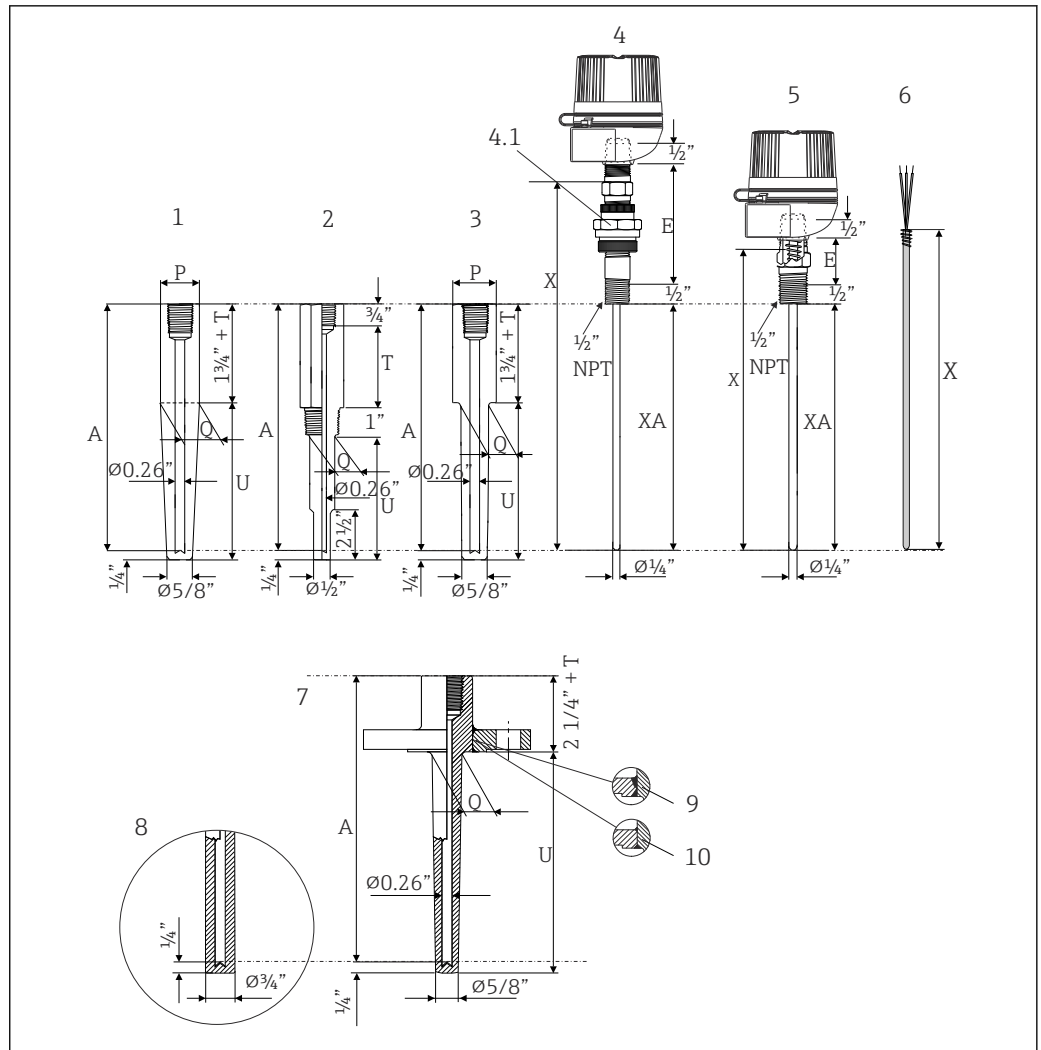
**Shock and vibration resistance**

Sensor type	Vibration resistance for the sensor tip
iTHERM StrongSens Pt100 (TF)	> 600 m/s <sup>2</sup> (60g)
Thin-film (TF) and Wire wound (WW) standard sensors	30 m/s <sup>2</sup> (3g)

## Mechanical construction

**Design, dimensions**

All dimensions in inch. For values related to the graphics please refer to the tables and equations below.



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10 Dimensions of the sensor assemblies.

- 1 T13 weld-in thermowell (tapered)
- 2 T13 threaded thermowell (stepped)
- 3 T13 socket weld thermowell (tapered)
- 4 T13/T14 extension, nipple-XP-union-nipple (NUN), without thermowell
- 4.1 XP certified union
- 5 T13/T14 extension hex nipple without thermowell
- 6 Spring loaded insert (TU111 or TS212)
- 7 T14 flange thermowell (tapered)
- 8 Straight thermowell tip
- 9 Full penetration weld thermowell
- 10 Standard weld thermowell
- E Extension length
- P Pipe size
- Q Thermowell root diameter
- T Lag dimension
- U Thermowell immersion length
- XA Immersion length RTD sensor
- A Drill depth of thermowell
- X Overall insert length

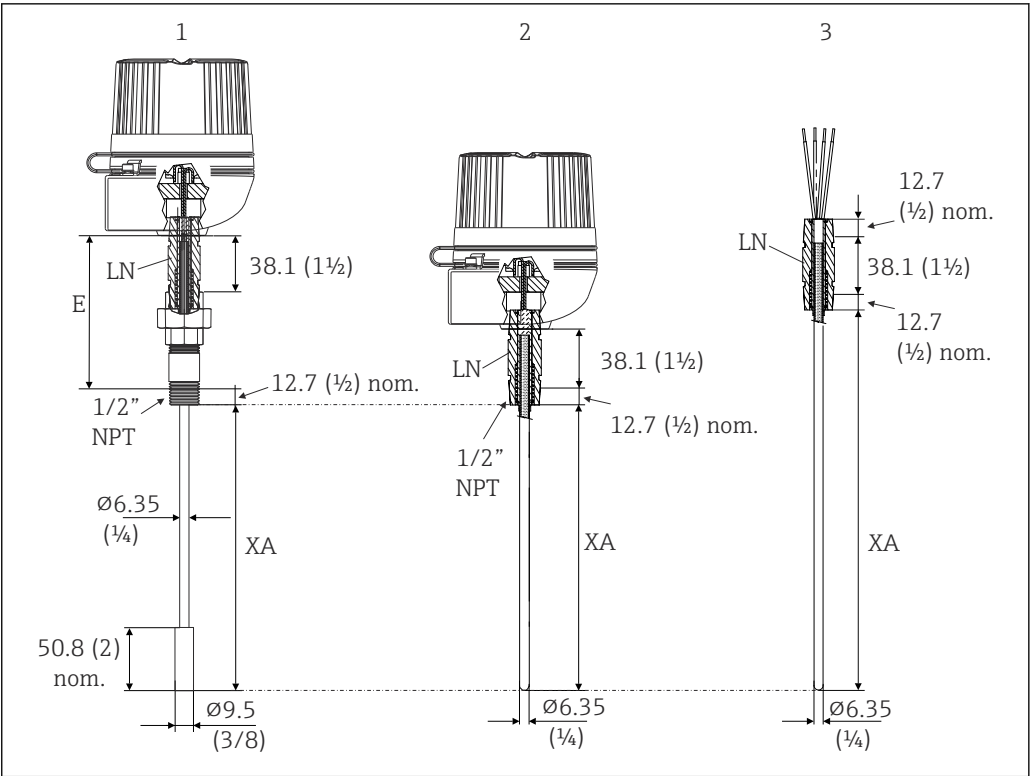
**i** The spring travel of the insert is 1/2".

**i** Tolerance of XA length = +/- 1/4".

All thermowells are marked with a material ID, CRN (Canadian Registration Number) and heat number.

Dimensions of T13						
U	E (nominal dimension)	T	Process connection	Shape of Thermowell	Ø Q1	Ø Q2
63.5 mm (2.5 in)	Material: Steel or 316	76.2 mm (3 in) or specified length 25.4 to 152.4 mm (1 to 6 in) in ½" increments	½" NPT	Stepped	16 mm (⅝ in)	12.7 mm (½ in)
				Tapered	16 mm (⅝ in)	16 mm (⅝ in)
114.3 mm (4.5 in)	Hex nipple = 25.4 mm (1 in)		¾" NPT	Stepped	19.05 mm (¾ in)	12.7 mm (½ in)
				Tapered	22.3 mm (⅞ in)	16 mm (⅝ in)
190.5 mm (7.5 in)	Nipple Union Nipple (NUN) = 101.6 mm (4 in) 177.8 mm (7 in)		1" NPT	Stepped	22.3 mm (⅞ in)	12.7 mm (½ in)
				Tapered	26.9 mm (1 ⅛ in)	16 mm (⅝ in)
266.7 mm (10.5 in)			¾" socket weld	Stepped	19.05 mm (¾ in)	12.7 mm (½ in)
				Tapered	22.3 mm (⅞ in)	16 mm (⅝ in)
342.9 mm (13.5 in)			1" socket weld	Stepped	22.3 mm (⅞ in)	12.7 mm (½ in)
				Tapered	25.4 mm (1 in)	16 mm (⅝ in)
419.1 mm (16.5 in)			¾" weld in	Tapered	26.6 mm (1.050 in)	16 mm (⅝ in)
571.5 mm (22.5 in)			1" weld in	Tapered	33.4 mm (1.315 in)	16 mm (⅝ in)
specified length 50.8 to 609.6 mm (2 to 24 in) in ½" increments						
Immersion length RTD sensor = Thermowell drilled length XA = A = U + 38.1 mm (1.5 in) + T Insert overall length X = A + E						
P = Pipe size <ul style="list-style-type: none"> <li>Nom. ¾"; Dia. = 1.050"</li> <li>Nom. 1"; Dia. = 1.315"</li> </ul>						

Dimensions of T14 Flange rating: ASME B16.5						
U	E	T	Flange size	Shape of thermowell	Ø Q1	Ø Q2
50.8 mm (2 in)	Material: Steel or 316SS	specified length 25.4 to 254 mm (1 to 10 in) ½" increments	1"	Straight	19.05 mm (¾ in)	19.05 mm (¾ in)
101.6 mm (4 in)				Tapered	22.3 mm (⅞ in)	16 mm (⅝ in)
177.8 mm (7 in)	1 ½" and larger		Straight	19.05 mm (¾ in)	19.05 mm (¾ in)	
254 mm (10 in)			Tapered	26.9 mm (1⅛ in)	16 mm (⅝ in)	
330.2 mm (13 in)			Nipple Union Nipple (NUN) = 101.6 mm (4 in) 177.8 mm (7 in)			
406.4 mm (16 in)						
558.8 mm (22 in)						
specified length 50.8 to 609.6 mm (2 to 24 in) in ½" increments						
Immersion length RTD sensor - Thermowell drilled length XA = A = U + 50.8 mm (2 in) + T Insert overall length X = A + E						



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11 Design and dimensions of T15 (without thermowell), all dimensions in mm (in)

- 1 T15 extension, lamination nipple union nipple
- 2 T15 extension, lamination nipple
- 3 Spring loaded insert (TU211 )
- E Extension length (nominal dimension)
- LN Lamination nipple (flamepath nipple)
- XA Insert immersion length

**i** The spring travel of the insert is 1/2".

**i** When ordering a sensor with a 3/8" diameter, only the bottom 2" will have an outer diameter of 3/8".

Dimensions of T15 (without thermowell)		Extension E
Immersion length	Thermocouple sensor XA	Lamination Nipple Union Nipple (LUN) = 101.6 mm (4 in) or 177.8 mm (7 in)
	specified length 101.6 to 2 540 mm (4 to 100 in) in 1/2" increments	
	Thermocouple sensor XA for spring loaded insert TU221 as spare part insert for Lamination Nipple Union Nipple (LUN) version	
	Spring travel of the insert = 1/2"	

**Weight** 1 to 30 lbs

**Material** Process connection and thermowell

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 operation temperatures are reduced considerably in some cases where abnormal conditions such as high mechanical load occur or in aggressive media.

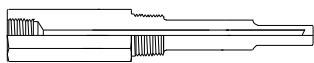


Material name	Short form	Recommended max. temperature for continuous use in air	Properties
AISI 316/ 1.4401	X5CrNiMo17-12-2	650 °C (1202 °F) <sup>1)</sup>	<ul style="list-style-type: none"> <li>■ Austenitic, stainless steel</li> <li>■ High corrosion resistance in general</li> <li>■ Particularly high 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)</li> </ul>
AISI 316L/ 1.4404 1.4435	X2CrNiMo17-12-2 X2CrNiMo18-14-3	650 °C (1202 °F) <sup>1)</sup>	<ul style="list-style-type: none"> <li>■ Austenitic, stainless steel</li> <li>■ High corrosion resistance in general</li> <li>■ 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)</li> <li>■ Increased resistance to intergranular corrosion and pitting</li> <li>■ Compared to 1.4404, 1.4435 has even higher corrosion resistance and a lower delta ferrite content</li> </ul>
AISI A105/1.0460	C22.8	450 °C (842 °F)	<ul style="list-style-type: none"> <li>■ Heat-resistant steel</li> <li>■ Resistant in nitrogen-containing atmospheres an atmospheres that are low in oxygen; not suitable for acids or other aggressive media</li> <li>■ Often used in steam generators, water and steam pipes, pressure vessels</li> </ul>

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

## Process connection

The process connection is the means of connecting the thermometer to the process. The following process connections are available:

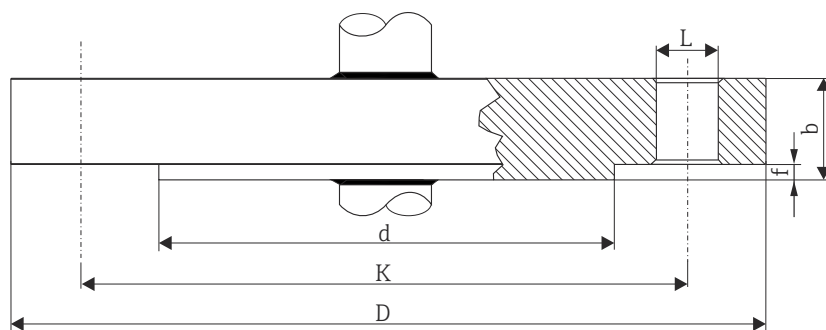
### T13

Thread	Version	
 A0026110	NPT thread	NPT 1/2"
		NPT 3/4"
		NPT 1"
 A0026111	NPS for socket weld	NPS 3/4"
		NPS 1"
 A0026108	NPS for weld-in	NPS 3/4"
		NPS 1"



## T14

## Flange

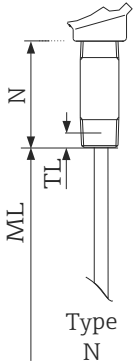
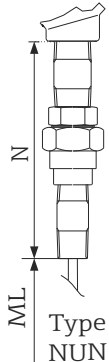


A0010471

For detailed information on the flange dimensions refer to the following flange standard:  
ANSI/ASME B16.5

The flange material must be the same as of the stem of the thermowell.

*T15*

Type	Thermowell connection	Extension neck lengths in mm (in)
 <p>Diagram of Type N thermowell. Dimensions shown: N (total height), TL (thread length), and ML (mounting length). The thermowell has a single threaded section at the top.</p>	Type N	1/2" NPT external thread 25.4 mm (1 in)
 <p>Diagram of Type NUN thermowell. Dimensions shown: N (total height) and ML (mounting length). The thermowell has multiple threaded sections along its length.</p>	Type NUN	1/2" NPT external thread 101.6 mm (4 in) 177.8 mm (7 in)

## Housing

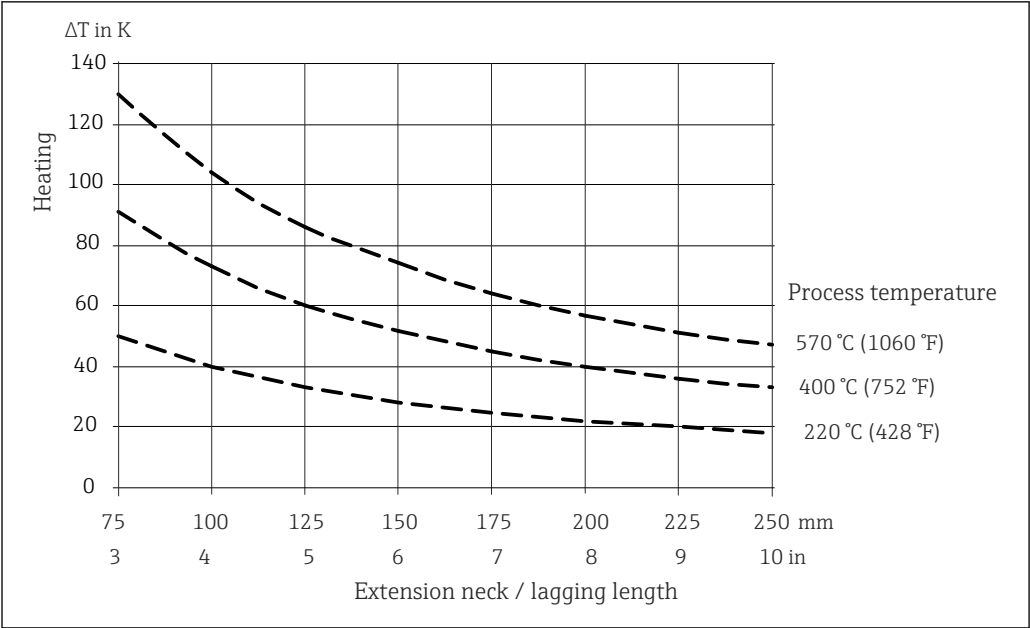
## Terminal heads

All terminal heads have an internal shape and size in accordance with DIN EN 50446, flat face and a thermometer connection with a ½" NPT thread. All dimensions in mm (in). Specifications without head transmitter installed. For ambient temperatures with head transmitter installed, see the 'Environment' section.

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

 Some of the specifications listed below may not be available on this product line.

As illustrated in the following diagram, the length of the extension neck can influence the temperature in the terminal head. This temperature must remain within the limit values defined in the "Operating conditions" section.

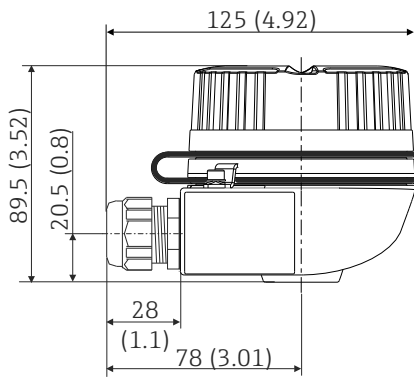


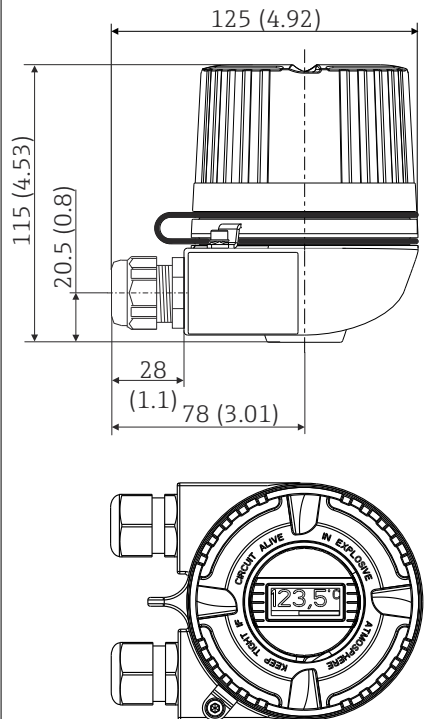
12 Heating of the terminal head as a function of the process temperature. Temperature in terminal head = ambient temperature 20 °C (68 °F) + ΔT

The diagram can be used to calculate the transmitter temperature.

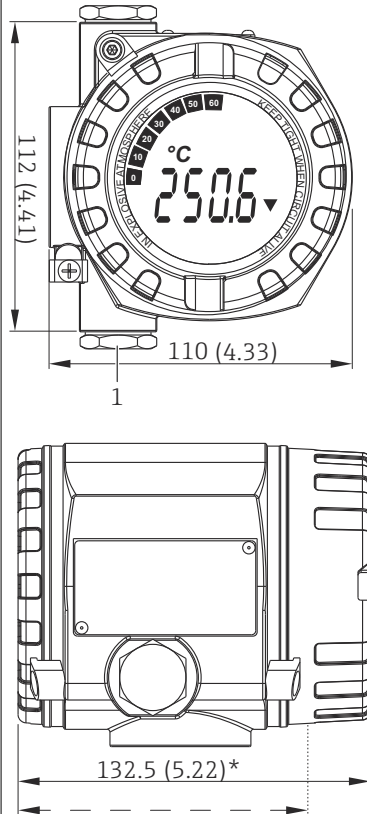
**Example:** At a process temperature of 220 °C (428 °F) and with a lagging length of 100 mm (3.94 in), the heat conduction is 40 K (72 °F). The transmitter temperature is therefore 40 K (72 °F) plus the ambient temperature, e.g. 25 °C (77 °F): 40 K (72 °F) + 25 °C (77 °F) = 65 °C (149 °F).

Result: The temperature of the transmitter is o.k., the length of the lagging is sufficient.

TA30H	Specification
	<ul style="list-style-type: none"><li>■ Flameproof (XP) version, explosion-protected, captive screw cap, available with one or two cable entries</li><li>■ Degree of protection: IP 66/68, NEMA Type 4x Encl. Ex-version: IP 66/67</li><li>■ Temperature: -50 to +150 °C (-58 to +302 °F) for rubber seal without cable gland (observe max. permitted temperature of cable gland!)</li><li>■ Material:<ul style="list-style-type: none"><li>■ Aluminum; polyester powder coated</li><li>■ Stainless steel 316L without coating</li></ul></li><li>■ Thread: ½" NPT, ¾" NPT, M20x1.5, G½"</li><li>■ Extension neck/thermowell connection: ½" NPT</li><li>■ Color of aluminum head: blue, RAL 5012</li><li>■ Color of aluminum cap: gray, RAL 7035</li><li>■ Weight:<ul style="list-style-type: none"><li>■ Aluminum: approx. 640 g (22.6 oz)</li><li>■ Stainless steel: approx. 2 400 g (84.7 oz)</li></ul></li></ul>

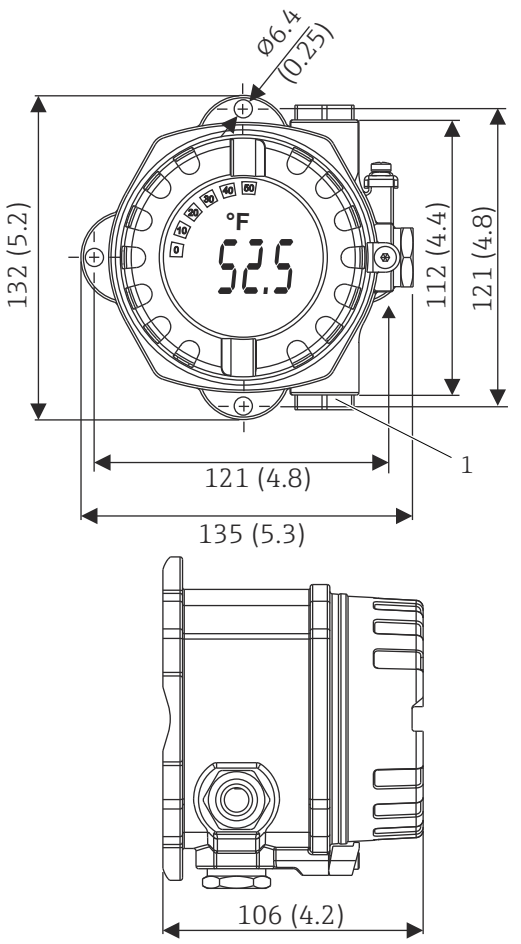
TA30H with display window in cover	Specification
 <p>Technical drawing of the TA30H transmitter. The top view shows a cylindrical body with a diameter of 125 (4.92) mm. The side view shows a total height of 115 (4.53) mm, with a mounting flange height of 20.5 (0.8) mm and a base diameter of 78 (3.01) mm. A cable entry is shown on the side with a diameter of 28 (1.1) mm. The bottom view shows a circular display window with a diameter of 78 (3.01) mm, displaying the number 123.5. The drawing is labeled A0009831.</p>	<ul style="list-style-type: none"><li>Flameproof (XP) version, explosion-protected, captive screw cap, available with one or two cable entries</li><li>Degree of protection: IP 66/68, NEMA Type 4x Encl. Ex-version: IP 66/67</li><li>Temperature: -50 to +150 °C (-58 to +302 °F) for rubber seal without cable gland (observe max. permitted temperature of cable gland!)</li><li>Material:<ul style="list-style-type: none"><li>Aluminum; polyester powder coated</li><li>Stainless steel 316L without coating</li></ul></li><li>Thread: ½" NPT, ¾" NPT, M20x1.5, G½"</li><li>Extension neck/thermowell connection: ½" NPT</li><li>Color of aluminum head: blue, RAL 5012</li><li>Color of aluminum cap: gray, RAL 7035</li><li>Weight:<ul style="list-style-type: none"><li>Aluminum approx. 860 g (30.33 oz)</li><li>Stainless steel approx. 2 900 g (102.3 oz)</li></ul></li><li>Head transmitter optionally available with TID10 display</li></ul>

Field transmitter

Temperature field transmitter iTEMP TMT162	Specification
 <p>Technical drawing of the iTEMP TMT162 transmitter. The top view shows a circular body with a diameter of 110 (4.33) mm. The side view shows a total height of 112 (4.41) mm. A cable entry is shown on the side with a diameter of 1 mm. The bottom view shows a rectangular body with a width of 132.5 (5.22)* mm. The drawing is labeled A0047364.</p>	<ul style="list-style-type: none"><li>Separate electronics compartment and connection compartment</li><li>Protection class: IP67, NEMA type 4x</li><li>Material: Die-cast aluminum housing AlSi10Mg with powder coating on polyester base or stainless steel 316L</li><li>Display rotatable in 90° increments</li><li>Cable entry: 2x ½" NPT</li><li>Brilliant backlit display with ease of visibility in bright sunshine or pitch darkness</li><li>Gold plated terminals to avoid corrosion and additional measurement errors</li><li>SIL certification as per IEC 61508:2010 (HART-protocol)</li></ul>

1 Instrument connection for direct mounting assembly

\* Dimensions without display = 112 mm (4.41 in)

Temperature field transmitter iTEMP TMT142B	Specification
 <p>1 Instrument connection for direct mounting assembly</p> <p>A0047368</p>	<ul style="list-style-type: none"><li>■ Protection class: IP66/67, NEMA type 4x</li><li>■ Material: Die-cast aluminum housing AlSi10Mg with powder coating on polyester base or stainless steel 316L</li><li>■ Display rotatable in 90° increments</li><li>■ Integrated Bluetooth® interface for wireless measured value display and parameter configuration, optional</li><li>■ Brilliant backlit display with ease of visibility in bright sunshine or pitch darkness</li><li>■ Gold plated terminals to avoid corrosion and additional measurement errors</li></ul>

## Certificates and approvals

Current certificates and approvals for the product are available via the Product Configurator at [www.endress.com](http://www.endress.com).

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

The **Configuration** button opens the Product Configurator.

## Ordering information

Detailed ordering information is available for your nearest sales organization [www.addresses.endress.com](http://www.addresses.endress.com) or in the Product Configurator under [www.endress.com](http://www.endress.com) :

1. Click Corporate
2. Select the country
3. Click Products
4. Select the product using the filters and search field
5. Open the product page

The Configuration button to the right of the product image opens the Product Configurator.



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



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

## Accessories




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

Device-specific accessories	Mounting bracket	SS316L, for tube 1.5...3" Order code: 51007995
	Adapter	M20x1.5 - 1/2" NPT cable entry Order code: 51004387
	Cable gland	1/2" NPT, D4.5-8.5, IP 68 Order code: 51006845
	Integrated overvoltage protection module	The module protects the electronics from overvoltage. Available for TMT162 housing.
Communication-specific accessories	Configuration kit TXU10	Configuration kit for PC-programmable transmitter with setup software and interface cable for PC with USB port Order code: TXU10-xx
	Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. For details, see "Technical Information" TI00404F
	Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. For details, see "Technical Information" TI00405C
	Wireless HART adapter SWA70	Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity. For details, see Operating Instructions BA061S
	Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the <b>non-Ex area</b> . For details, see Operating Instructions BA01202S
	Field Xpert SFX370	Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the <b>non-Ex area and the Ex area</b> . For details, see Operating Instructions BA01202S

## Service-specific accessories

Accessories	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> <li>■ Calculation of all the necessary data for identifying the optimum measuring device: e.g. pressure loss, accuracy or process connections.</li> <li>■ Graphic illustration of the calculation results</li> </ul> <p>Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.</p> <p>Applicator is available:</p> <ul style="list-style-type: none"> <li>■ Via the Internet: <a href="https://portal.endress.com/webapp/applicator">https://portal.endress.com/webapp/applicator</a></li> <li>■ On CD-ROM for local PC installation.</li> </ul>
Configurator	<p>Product Configurator - the tool for individual product configuration</p> <ul style="list-style-type: none"> <li>■ Up-to-the-minute configuration data</li> <li>■ Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language</li> <li>■ Automatic verification of exclusion criteria</li> <li>■ Automatic creation of the order code and its breakdown in PDF or Excel output format</li> <li>■ Ability to order directly in the Endress+Hauser Online Shop</li> </ul> <p>The Configurator is available on the Endress+Hauser website: <a href="http://www.endress.com">www.endress.com</a> -&gt; Click "Corporate" -&gt; Select country -&gt; Click "Products" -&gt; Select the product using the filters and search field -&gt; Open product page -&gt; The "Configure" button to the right of the product image opens the Product Configurator.</p>
W@M	<p>Life cycle management for your plant</p> <p>W@M supports with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle.</p> <p>The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records.</p> <p>W@M is available:</p> <ul style="list-style-type: none"> <li>■ Via the Internet: <a href="http://www.endress.com/lifecyclemanagement">www.endress.com/lifecyclemanagement</a></li> <li>■ On CD-ROM for local PC installation.</li> </ul>
FieldCare SFE500	<p>FDT-based plant asset management tool from Endress+Hauser.</p> <p>It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.</p> <p> For details, see Operating Instructions BA00027S and BA00065S</p>
DeviceCare SFE100	<p>Configuration tool for devices via fieldbus protocols and Endress+Hauser service protocols.</p> <p>DeviceCare is the tool developed by Endress+Hauser for the configuration of Endress+Hauser devices. All smart devices in a plant can be configured via a point-to-point or point-to-bus connection. The user-friendly menus enable transparent and intuitive access to the field devices.</p> <p> For details, see Operating Instructions BA00027S</p>

## System components

Accessories	Description
Field display unit RIA16	<p>The display unit records the analog measuring signal from the head transmitter and shows this on the display. The LC display shows the current measured value in digital form and as a bar graph indicating a limit value violation. The display unit is looped into the 4 to 20 mA circuit and gets the required energy from there.</p> <p> For details, see the "Technical Information" document TI00144R</p>
Process display RIA15	<p>Process display, digital loop-powered display for 4 to 20 mA circuit, panel mounting, with optional HART® communication. Displays 4 to 20 mA or up to 4 HART® process variables</p> <p> For details, see "Technical Information", TI01043K</p>
Active barrier RN221N	<p>Active barrier with power supply for safe separation of 4 to 20 mA standard signal circuits. Has bidirectional HART® transmission and optional HART® diagnostics if transmitters are connected with monitoring of 4 to 20 mA signal or HART® status byte analysis and an E+H-specific diagnostic command.</p> <p> For details, see "Technical Information", TI00073R</p>

## Documentation

### Brief operating instructions - explosion proof RTD assemblies

- T13 with thermowell, (KA00236R)
- T14 with flanged thermowell, (KA00237R)
- T15 spring loaded insert, (KA00238R)

### Technical Information - Temperature transmitter iTEMP

- TMT71, PC-programmable, single-channel, RTD, TC, Ω, mV, (TI01393T)
- HART® TMT72, PC-programmable, single-channel, RTD, TC, Ω, mV, (TI01392T)
- HART® TMT82, (TI01010T)
- PROFIBUS® PA TMT84, two-channel, RTD, TC, Ω, mV, (TI00138R)
- FOUNDATION Fieldbus™ TMT85, (TI00134R)
- Pt TMT180, (TI00088R)
- PCP TMT181, (TI00070R)
- HART® TMT182, (TI00078R)
- Field transmitter:
  - TMT162 HART® 7 and SIL certification, (TI01344T)
  - TMT142B HART® 7, (TI00107R)

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