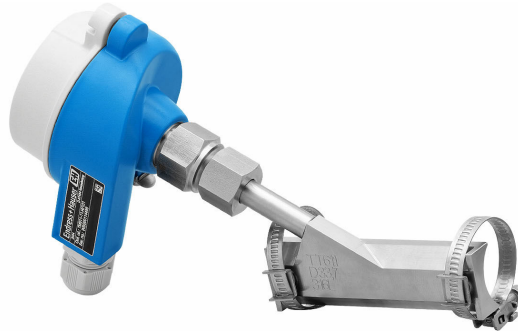


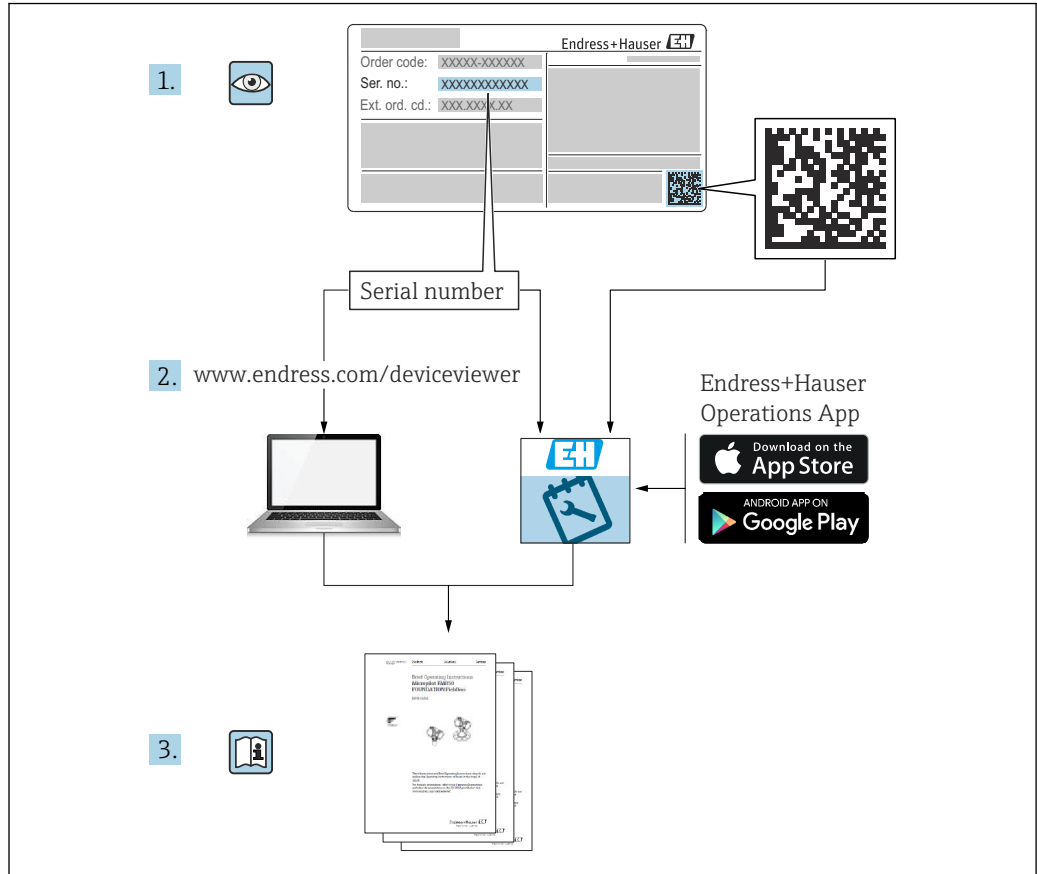
# Operating Instructions

## **iTHERM SurfaceLine TM611**

Surface thermometer

Non-invasive RTD/TC thermometer with high measurement performance for demanding applications





A0023555

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# 1 About this document

## 1.1 Document function

These Operating Instructions contain all the information 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.

## 1.2 Symbols

### 1.2.1 Safety symbols

#### **DANGER**

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

#### **WARNING**

This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in serious or fatal injury.






#### **CAUTION**

This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in minor or medium injury.




#### **NOTICE**










This symbol alerts you to a potentially harmful situation. Failure to avoid this situation can result in damage to the product or something in its vicinity.

### 1.2.2 Electrical symbols




Symbol	Meaning
	Direct current
	Alternating current
	Direct and alternating current
	<b>Ground connection</b> A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	<b>Protective earth (PE)</b> Ground terminals that must be connected to ground prior to establishing any other connections.  The ground terminals are located on the interior and exterior of the device: <ul style="list-style-type: none"> <li>▪ Interior ground terminal: protective earth is connected to the mains supply.</li> <li>▪ Exterior ground terminal: device is connected to the plant grounding system.</li> </ul>

### 1.2.3 Symbols for certain types of information


Symbol	Meaning
	<b>Permitted</b> Procedures, processes or actions that are permitted.
	<b>Preferred</b> Procedures, processes or actions that are preferred.
	<b>Forbidden</b> Procedures, processes or actions that are forbidden.

Symbol	Meaning
	<b>Tip</b> Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Notice or individual step to be observed
	Series of steps
	Result of a step
	Help in the event of a problem
	Visual inspection

### 1.2.4 Symbols in graphics

Symbol	Meaning	Symbol	Meaning
1, 2, 3,...	Item numbers		Series of steps
A, B, C, ...	Views	A-A, B-B, C-C, ...	Sections
	Hazardous area		Safe area (non-hazardous area)


## 1.3 Documentation

 For an overview of the scope of the associated Technical Documentation, refer to the following:

- *Device Viewer* ([www.endress.com/deviceviewer](http://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.

The following documentation may be available depending on the device version ordered:

Document type	Purpose and content of the document
Technical Information (TI)	<b>Planning aid for your device</b> The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Brief Operating Instructions (KA)	<b>Guide that takes you quickly to the 1st measured value</b> The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.
Operating Instructions (BA)	<b>Your reference document</b> These Operating Instructions contain all the information that is required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.
Description of Device Parameters (GP)	<b>Reference for your parameters</b> The document provides a detailed explanation of each individual parameter. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

Document type	Purpose and content of the document
Safety Instructions (XA)	Depending on the approval, safety instructions for electrical equipment in hazardous areas are also supplied with the device. The Safety Instructions are a constituent part of the Operating Instructions.  Information on the Safety Instructions (XA) that are relevant for the device is provided on the nameplate.
Supplementary device-dependent documentation (SD/FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is a constituent part of the device documentation.

## 1.4 Registered trademarks

### **IO-Link®**

Is a registered trademark. It may only be used in conjunction with products and services by members of the IO-Link Community or by non-members who hold an appropriate license. For more detailed information on the use of IO-Link, please refer to the rules of the IO-Link Community at: [www.io.link.com](http://www.io.link.com).

### **Bluetooth®**

The Bluetooth® wordmark and logos are registered trademarks of Bluetooth SIG, Inc. and any use of these trademarks by Endress+Hauser is licensed. Other trademarks and trade names are those of their respective owners.

### **FOUNDATION™ Fieldbus**

Registration-pending trademark of the FieldComm Group, Austin, Texas, USA

### **ethernet-apl™**

- Ethernet-APL ADVANCED PHYSICAL LAYER
- Registered trademark of the PROFIBUS Nutzerorganisation e.V. (Profibus User Organization), Karlsruhe - Germany

### **HART®**

Registered trademark of the FieldComm Group, Austin, Texas, USA

### **PROFIBUS®**

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

### **PROFINET®**

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

## 2 Safety instructions

### 2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- ▶ Trained, qualified specialists must have a relevant qualification for this specific function and task.
- ▶ Are authorized by the plant owner/operator.
- ▶ Are familiar with federal/national regulations.
- ▶ Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- ▶ Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:

- ▶ Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- ▶ Follow the instructions in this manual.

### 2.2 Intended use

The device described in this document is intended for non-invasive temperature measurement in industrial applications. Depending on the version, it can be configured as an industrial thermometer or cable thermometer and can be attached to the process by means of a coupling element. It is the responsibility of the operator to select the appropriate thermometer (RTD and TC) to ensure safe operation of the measuring point.

#### Incorrect use

The manufacturer is not liable for damage caused by improper or non-designated use. Use the device for non-invasive temperature measurement only.

### 2.3 Workplace safety

#### **⚠ CAUTION**

**Extreme temperatures (hot and cold) can occur at the thermometer and in the terminal head. There is a risk of burning and damage to property.**

- ▶ Wear appropriate protective equipment.

#### **⚠ CAUTION**

**There is an the increased risk of electric shock if working on and with the device with wet hands:**

- ▶ Wear appropriate protective equipment.

### 2.4 Operational safety

Damage to the device!

- ▶ Operate the device only if it is in proper technical condition, free from errors and faults.
- ▶ The operator is responsible for ensuring that the device is in good working order.

**Hazardous area**

To avoid danger to individuals or the facility when the device is used in the approval-related area (e.g. explosion protection or safety instrumented systems):

- ▶ Based on the technical data on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area. The nameplate can be found on the side of the device.
- ▶ Observe the specifications in the separate supplementary documentation included as an integral part of these instructions.

**Modifications to the device**

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers!

- ▶ If modifications are nevertheless required, consult with the manufacturer.

**Temperature****NOTICE**

**During operation, heat conduction or heat radiation may cause the temperature in the terminal head to rise.**

- ▶ Exceeding the operating temperature of the transmitter or housing must be prevented using appropriate heat insulation or a suitably long extension neck.

## 2.5 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EU directives listed in the device-specific EU Declaration of Conformity. The manufacturer confirms this by affixing the CE mark to the device.



### 3 Product description

Design	
Options	
1: Terminal head → 44	Terminal heads made of aluminum, polyamide or stainless steel
2: Wiring, electrical connection, output signal → 29	<ul style="list-style-type: none"> <li>■ Ceramic terminal block</li> <li>■ Flying leads</li> <li>■ iTEMP head transmitter (4 to 20 mA, HART®, PROFINET® with Ethernet-APL™, PROFIBUS® PA, FOUNDATION™ Fieldbus), single channel or dual channel</li> <li>■ Plug-in display</li> <li>■ IO-Link®</li> </ul>
3: Plug or cable gland	<ul style="list-style-type: none"> <li>■ M12 plug, PROFIBUS® PA/FOUNDATION™ Fieldbus/PROFINET®, 4-pin</li> <li>■ Cable glands of polyamide or nickel-plated brass</li> </ul>
4: Extension neck	Extension piece to guide the connection to the thermometer through a pipe insulation to restrict the temperature in the terminal head if necessary.
5: Coupling element	Shape and size adapted to pipe diameter for optimized heat transfer from the pipe surface to the sensor element.
6: Insert with sensor element → 44	Sensor models: RTD - wire wound (WW), thin-film sensor (TF) or thermocouples (TC) type J or K. Insert diameter Ø3 mm (0.12 in).
7: Cable thermometer	Thermometer with variable connecting cable without terminal head. Lightweight and flexible version, e.g. for use with remotely mounted field transmitter or DIN rail transmitter in cabinet.
8: Hose clips	Made from stainless steel for reliable mounting on the pipe.

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## 4 Incoming acceptance and product identification

### 4.1 Incoming acceptance

On receipt of the delivery:

1. Check the packaging for damage.
  - ↳ Report all damage immediately to the manufacturer.  
Do not install damaged components.
2. Check the scope of delivery using the delivery note.
3. Compare the data on the nameplate with the order specifications on the delivery note.
4. Check the technical documentation and all other necessary documents, e.g. certificates, to ensure they are complete.



If one of the conditions is not satisfied, contact the manufacturer.

### 4.2 Product identification

The following options are available for identification of the measuring device:

- The device label
- Order code with breakdown of the device features on the delivery note
- Enter the serial number on the device label in *W@M Device Viewer* ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)): all the information about the measuring device is displayed.
- Enter the serial number on the device label into the *Endress+Hauser Operations App* or scan the 2-D matrix code (QR code) on the measuring device with the *Endress+Hauser Operations App*: all the information about the measuring device is displayed.

#### 4.2.1 Nameplate

**Do you have the correct device?**

The nameplate provides you with the following information on the device:

- Manufacturer identification, device designation
- Order code
- Extended order code
- Serial number
- Tag name (TAG) (optional)
- Technical values, e.g. supply voltage, current consumption, ambient temperature, communication-specific data (optional)
- Degree of protection
- Approvals with symbols
- Reference to Safety Instructions (XA) (optional)

- ▶ Compare the information on the nameplate with the order.

#### 4.2.2 Name and address of manufacturer

<b>Name of manufacturer:</b>	Endress+Hauser Wetzler GmbH + Co. KG
<b>Address of manufacturer:</b>	Obere Wank 1, D-87484 Nesselwang or <a href="http://www.endress.com">www.endress.com</a>


### 4.3 Storage and transport

Storage temperature: -40 to +85 °C (-40 to +185 °F).

Avoid the following environmental influences during storage:

- Direct sunlight
- Proximity to hot objects
- Mechanical vibration
- Aggressive media

Maximum relative humidity: < 95%

-  Pack the device for storage and transportation in such a way that it is reliably protected against impact and external influences. The original packaging provides the best protection.

## 5 Mounting

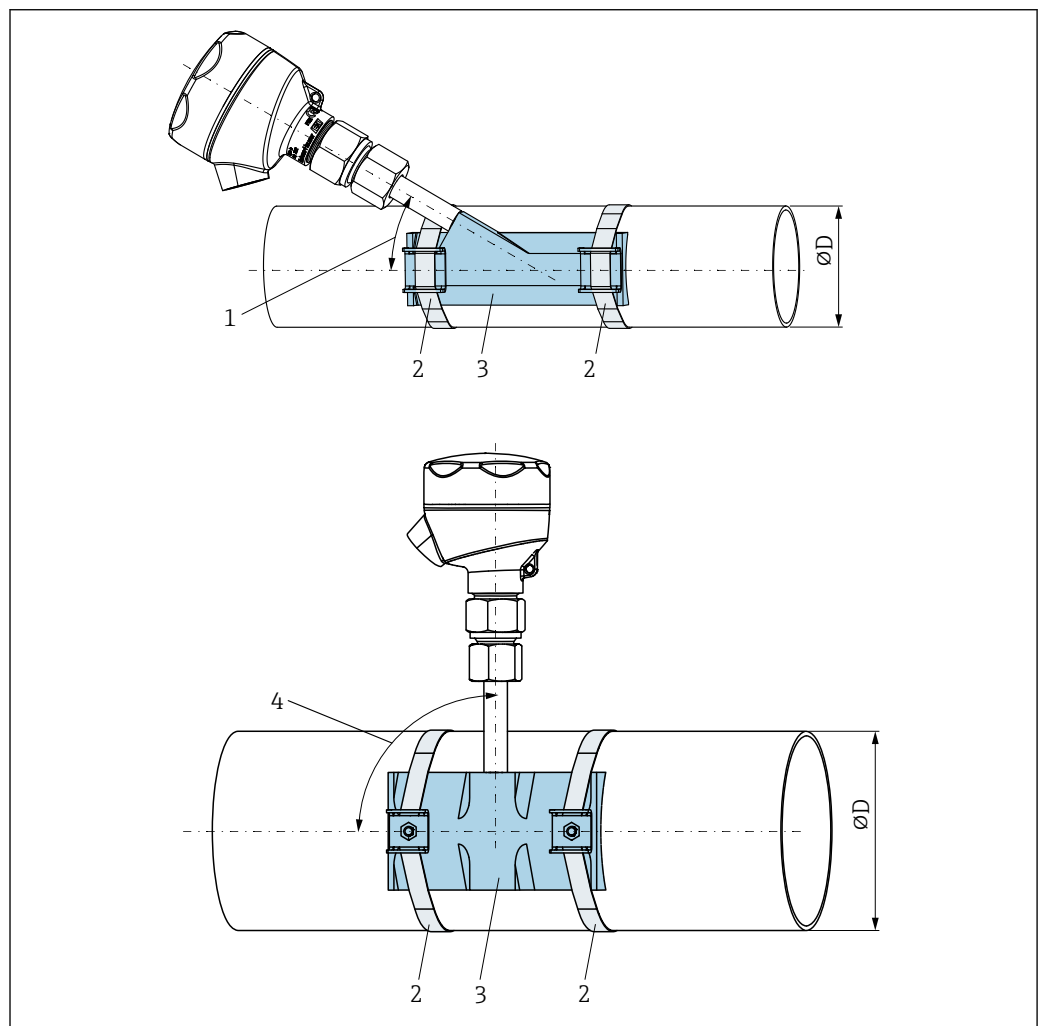
### 5.1 Mounting requirements

Depending on the nominal width, the device is attached either at an angle or perpendicularly to the process:

- At an angle for pipe outer diameters  $\varnothing D < DN100$ , see "Installation examples" graphic.
- Perpendicularly for pipe outer diameters  $\varnothing D \geq DN100$ , see "Installation examples" graphic.





**i** Because of the coupling element, the device is not installed directly in the process so there is no leakage risk.

**i** A coupling foil is attached to the inside of the coupling element for heat transfer. Do not remove the coupling foil from the coupling element.



**1** Installation examples

- 1 Inclined connection angle 20°, 30° or 40° for pipe outer diameters  $\varnothing D < DN100$   
 2 Hose clips  
 3 Coupling element  
 4 Vertical connection angle 90° for pipe outer diameters  $\varnothing D \geq DN100$

-  The extension neck length influences the heating of the head transmitter: The greater the distance between the outer pipe wall and terminal head, the lower the heating.
-  The following installation option achieves the highest measurement accuracy:
  - Thermometer installed at an angle against the direction of flow of the medium
  - Thermometer installed vertically above the pipe
- Installation options: pipes or other plant components
- ATEX certification: Observe the installation instructions in the Ex documentation!
-  If the device is used in the hazardous area, refer to the separate Ex documentation for all the information on explosion protection. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.
-  The mounting location must be smooth and clean.

#### CAUTION

**A pipe outer wall that is too hot can lead to injuries during installation of the device.**

- ▶ Ensure appropriate surface temperature.
- ▶ Wear appropriate safety equipment during mounting.

#### CAUTION

**There is a risk of injury from the hose clips when mounting the device.**

- ▶ Be aware of the sharp edges of the hose clips.
- ▶ Wear appropriate safety equipment during mounting.

#### **Before mounting the device:**


1. Ensure that the nominal diameter engraved on the coupling element matches the pipe diameter.
2. Clean the mounting location before installing the device.
3. Prepare the necessary tools for mounting.

#### **Tool:**

- Clamp
- Hexagon wrench AF = 7 mm
- Hexagon wrench AF = 27 mm
- Phillips screwdriver
- Flat-blade screwdriver

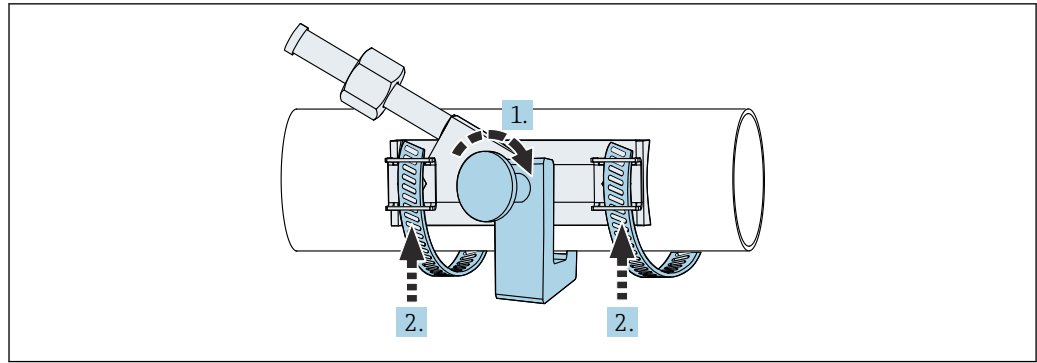
The coupling element is fixed to the outside of the pipe using the clamp. The hose clips are included with the packaging. They feature a combination screw head, which means that both the hexagon wrench AF = 7 mm and the Phillips or flat-blade screwdriver can be used for assembly. The thermometer is connected to the coupling element with a union nut, which is tightened with the hexagon wrench AF = 27 mm.

## **5.2 Mounting the measuring instrument**

-  If the device is supplied with the iTHERM thermometer screwed to the coupling element, the iTHERM thermometer can be removed at the union nut to make it easier to fit the coupling element.

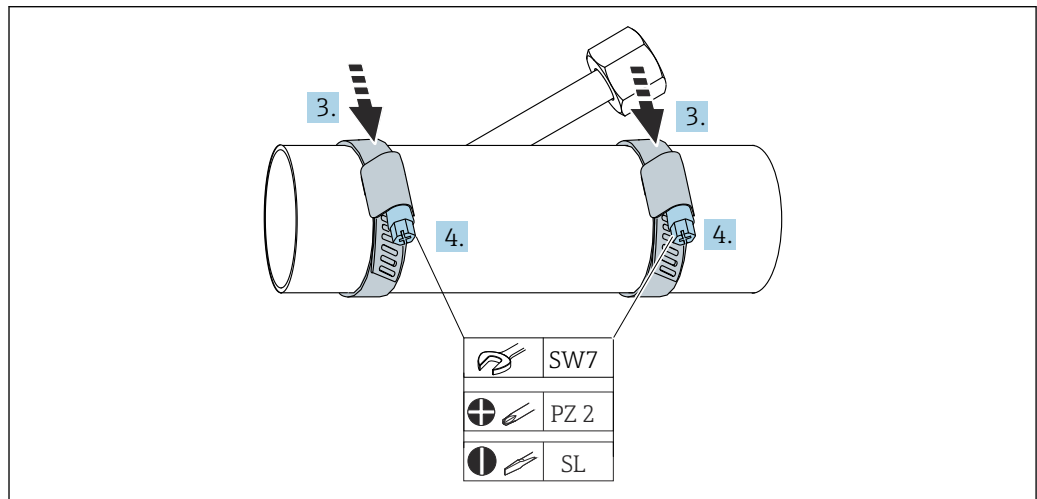
#### Mounting the coupling element

1. Place the coupling element on the pipe and secure with a clamp.
2. Guide the two supplied hose clips with the open ends on the left and right of the coupling element through the holder.



A0056412

3. On the opposite side of the pipe, insert the open ends of each of the hose clips into the screw head.
4. Tighten and secure each of the hose clips to the screw head with a maximum torque of 5 Nm. Secure the screw head with the hexagon wrench AF = 7 mm, Phillips screwdriver (PZ 2) or flat-blade screwdriver (SL). On the opposite side of the pipe, insert the open ends of each of the hose clips into the screw head.

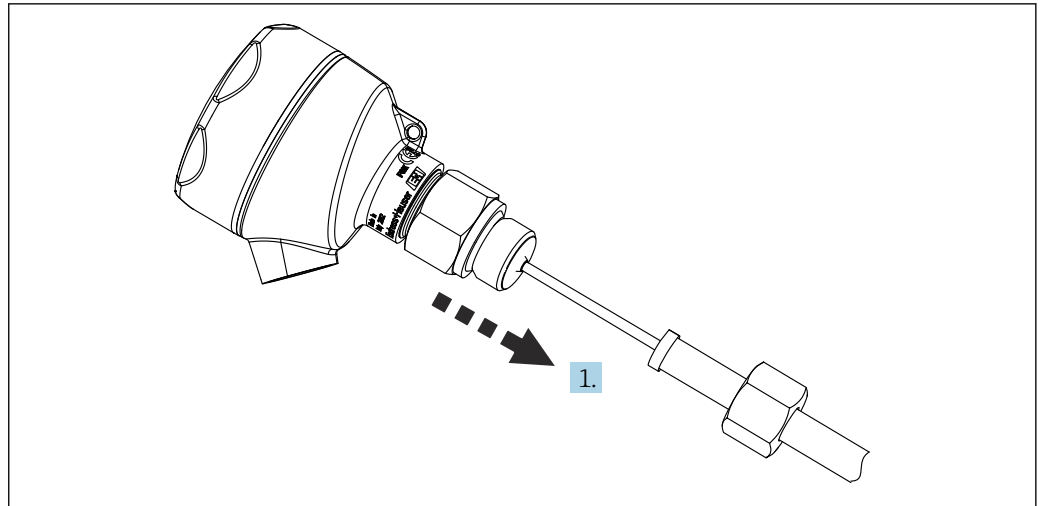


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The coupling element is mounted on the pipe. Release and remove the clamp.

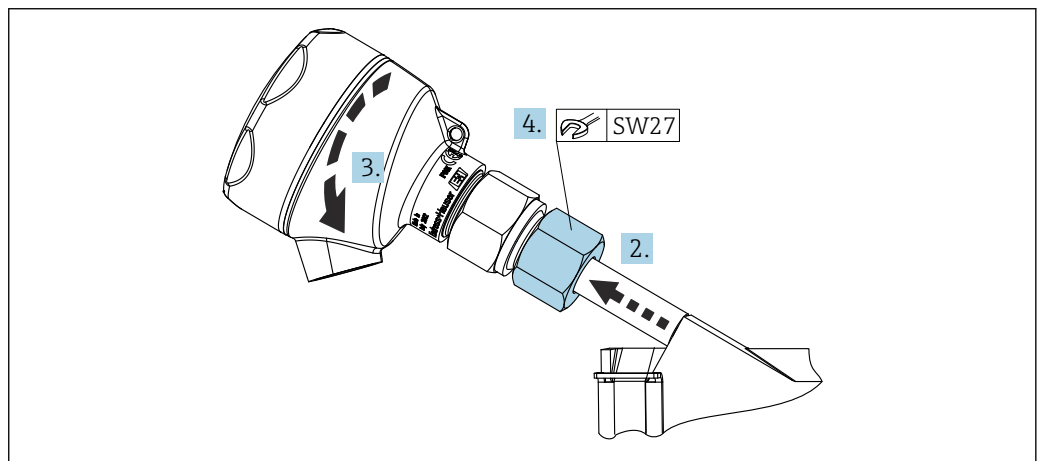
#### Mounting the thermometer

1. Insert the thermometer as far as it will go into the extension neck of the coupling element.



A0056399

2. Push the union nut upwards to the extension neck of the thermometer.
3. Turn the terminal head so that no moisture can accumulate in the cable entry.
4. Tighten the union nut on the extension neck of the thermometer with a max. torque of 20 Nm.

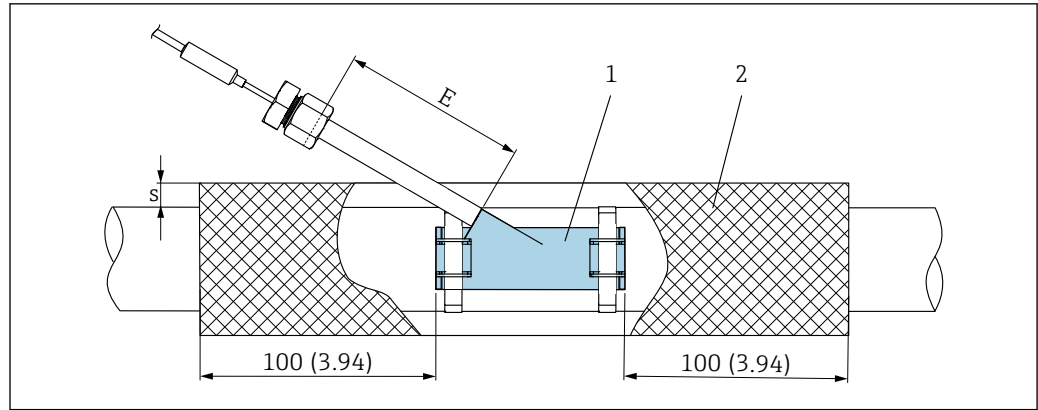


A0056405

Union nut is tightened. The thermometer is securely positioned in the coupling element.

### 5.3 Insulation of the measuring point

To ensure a high level of measurement accuracy, the manufacturer recommends heat insulation of the coupling element against the environment over a length of 100 mm (3.94 in) on both sides of the coupling.



A0055913

- 1 Coupling element  
 2 Heat insulation  
 E Extension neck length  
 s Insulation thickness

**i** The maximum permissible thickness of the insulation depends on extension neck length E and can be calculated using the following formula:

Connection angle	Formula
90°	0.85 x extension neck length E
20°	0.33 x extension neck length E
30°	0.46 x extension neck length E
40°	0.54 x extension neck length E

## 5.4 Post-mounting check

<input type="checkbox"/>	Is the device undamaged (visual inspection)?
<input type="checkbox"/>	Is the device correctly secured?
<input type="checkbox"/>	Does the device correspond to the specifications at the measuring point, e.g. Ambient temperature, measuring range?

## 6 Electrical connection

### NOTICE

**Risk of short-circuit - can cause the device to malfunction.**

- ▶ Check for damage to cables, wires and to connection points.

### NOTICE

- ▶ ⚠ ESD - Electrostatic discharge. Protect the terminals from electrostatic discharge. Failure to observe this may result in the destruction or malfunction of parts of the electronics.

**i** For information on the electrical connection, see the technical documentation of the specific iTEMP transmitter.

### 6.1 Connecting requirements

A Phillips screwdriver, Pozidriv Z1 for example, is required to wire the iTEMP head transmitter with screw terminals. The push-in terminals can be wired without any tools.



The RTD or TC cable thermometers can be wired, e.g. to a separate DIN rail transmitter in the cabinet, without any tools.

**CAUTION**

**Risk associated with the uncontrolled activation of processes! Risk of short-circuit and injury!**

- Switch off the supply voltage before connecting the device.

**CAUTION**

**An incorrect connection compromises electrical safety! Risk of short-circuit and injury!**

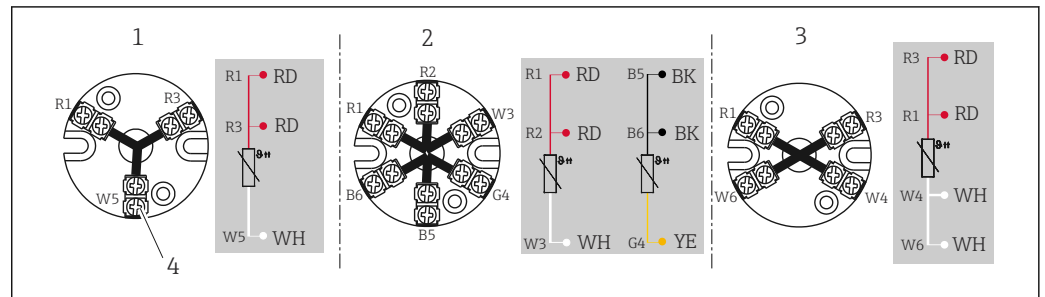
- Switch off the supply voltage before connecting the device.

**i** If the device is used in the hazardous area, refer to the separate Ex documentation for all the information on explosion protection. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.

## 6.2 Terminal assignment

**i** The sensor connection cables of the industrial thermometer are fitted with terminal lugs. The nominal diameter of the cable lugs is  $\varnothing 1.3$  mm (0.05 in).

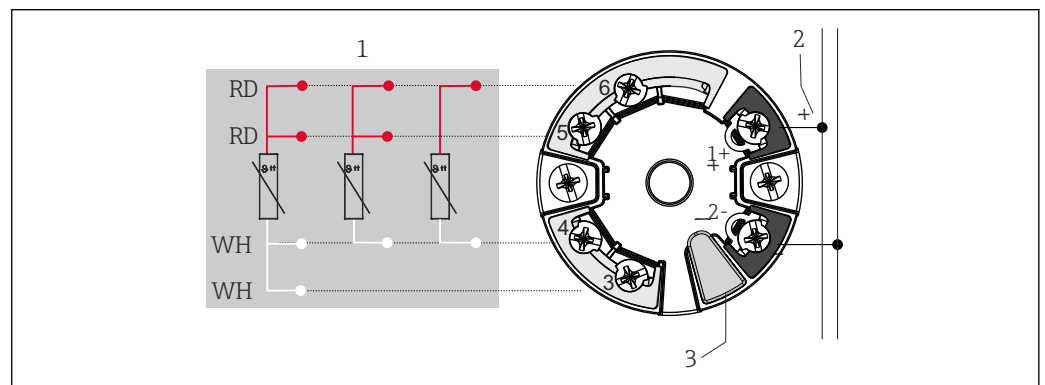
### 6.2.1 Sensor connection type: RTD industrial thermometer



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**2** Mounted ceramic terminal block

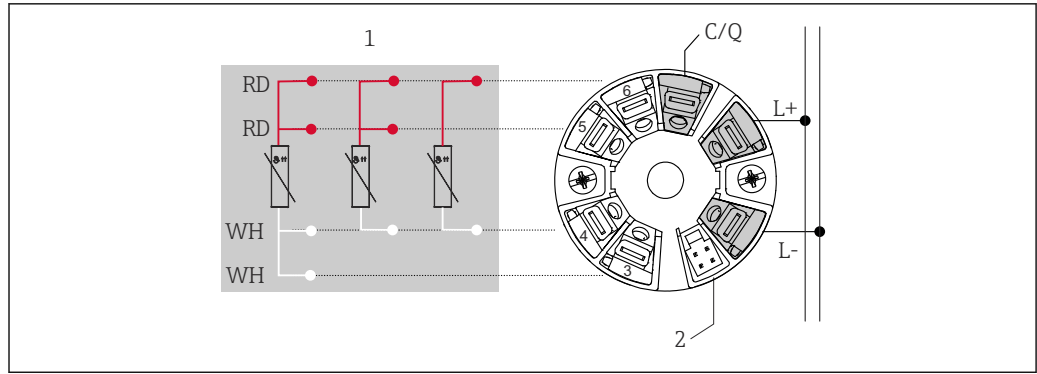
- 1 3-wire
- 2 2x3-wire
- 3 4-wire
- 4 Outside screw



A0045464

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

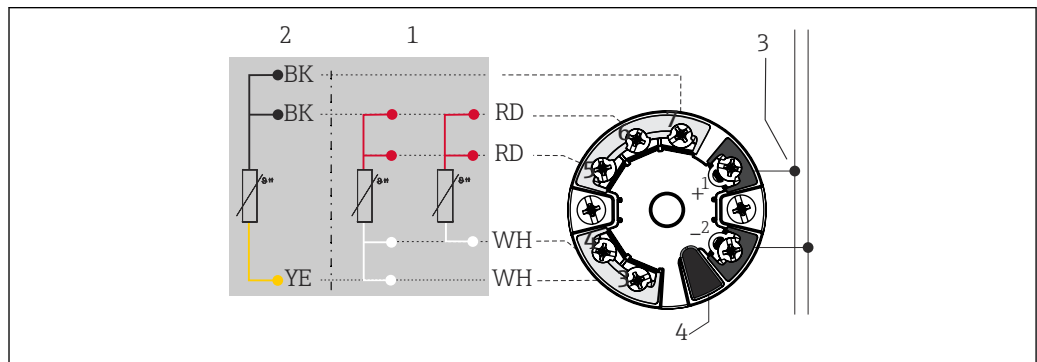
- 1 Sensor input, RTD, 4-, 3- and 2-wire
- 2 Power supply/bus connection
- 3 Display connection/CDI interface



A0052495

4 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<sub>DC</sub> power supply
- L- 0 V<sub>DC</sub> power supply
- C/Q IO-Link or switch output

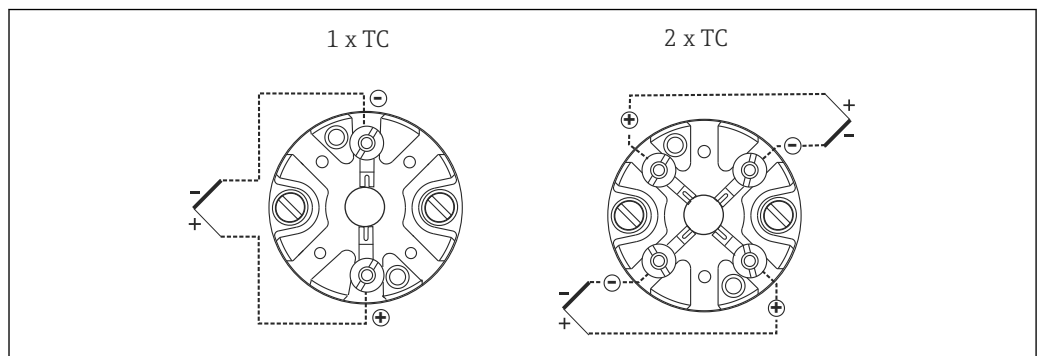


A0045466

5 Head-mounted iTEMP TMT8x transmitter (dual sensor input)

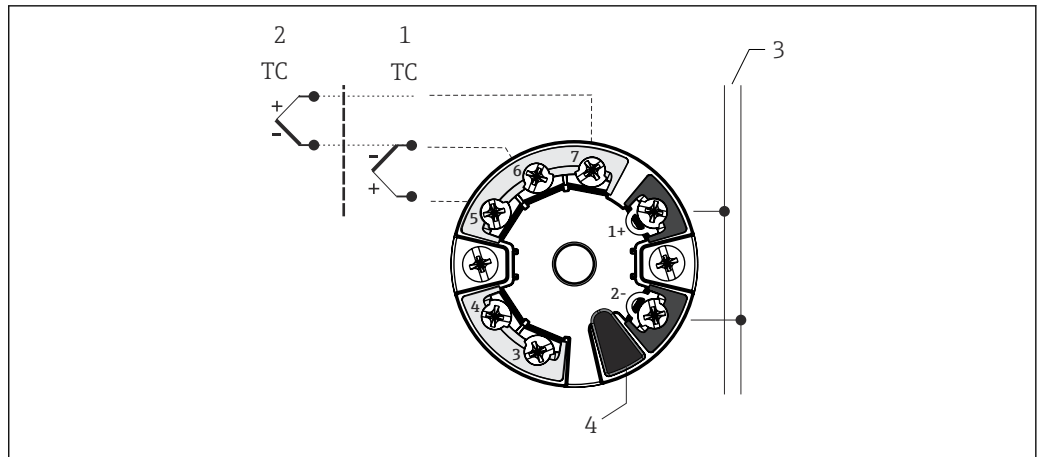
- 1 Sensor input 1, RTD, 4- and 3-wire
- 2 Sensor input 2, RTD, 3-wire
- 3 Fieldbus connection and power supply
- 4 Display connection

### 6.2.2 Sensor connection type: Industrial thermometer (TC)



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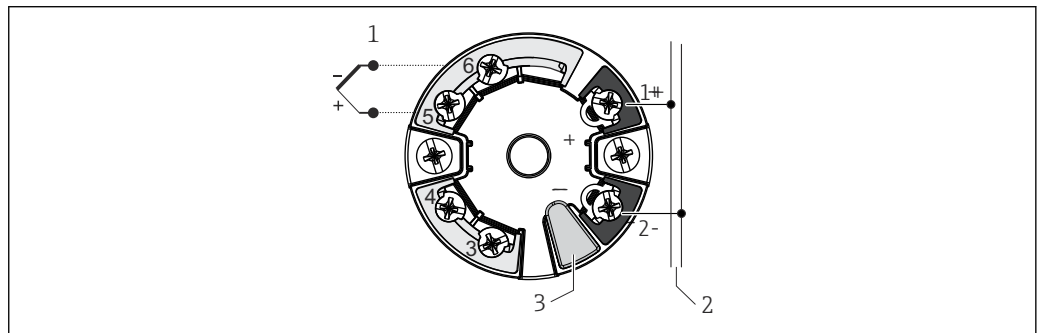
6 Mounted ceramic terminal block



A0045474

7 Head-mounted iTEMP TMT8x transmitter (dual sensor input)

- 1 Sensor input 1
- 2 Sensor input 2
- 3 Fieldbus connection and power supply
- 4 Display connection



A0045353

8 Head-mounted iTEMP TMT7x transmitter (single sensor input)

- 1 Sensor input
- 2 Power supply and bus connection
- 3 Display connection and CDI interface

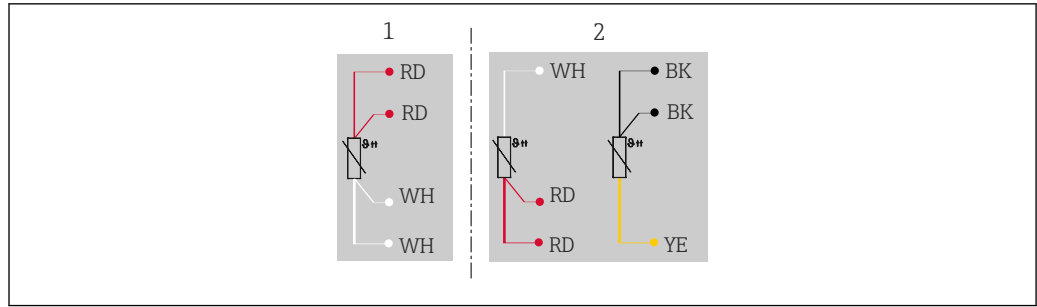
### 6.2.3 Sensor connection type: RTD cable thermometer

**i** The sensor connection cables of the cable thermometer are fitted with ferrules. The nominal diameter of the ferrules is  $\varnothing$  1 mm (0.03 in).

#### Wiring diagram

The cable thermometer is wired to the flying leads of the connection cable. The cable thermometer can be connected to a separate iTEMP temperature transmitter, for example.

Wire cross-section:  $\leq 0.382 \text{ mm}^2$  (AWG 22) with ferrules, length = 5 mm (0.2 in).



A0056032

9 Wiring diagram for RTD cable thermometer

- 1 1x Pt100, 4-wire
- 2 2x Pt100, 3-wire

**i** For the highest accuracy, a 4-wire connection is recommended or use of a transmitter.

### 6.2.4 Sensor connection type: Cable thermometer (TC)

#### Wiring diagram

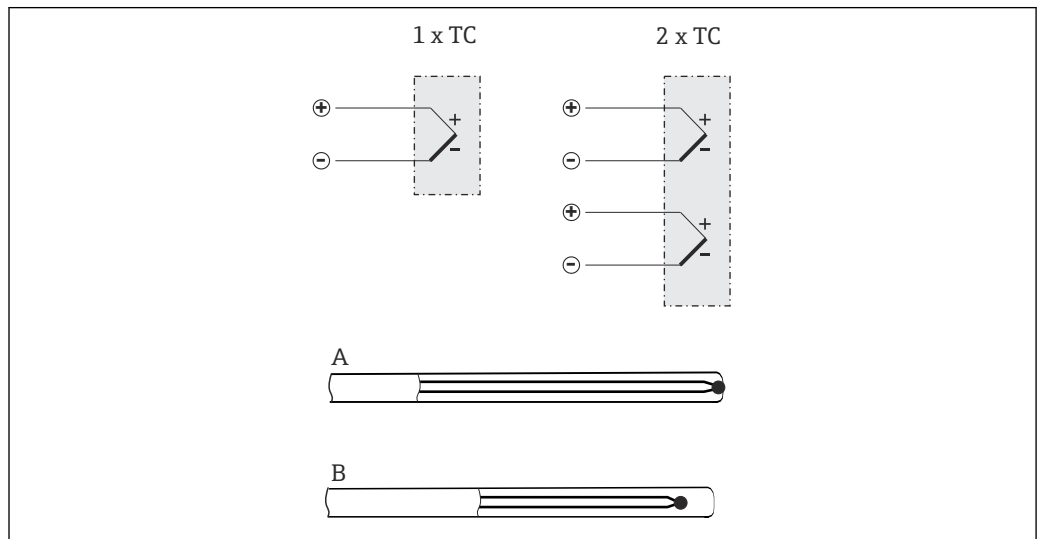
The cable thermometer is wired to the flying leads of the connection cable. The cable thermometer can be connected to a separate iTEMP temperature transmitter, for example.

Wire cross-section:

- ≤ 0.205 mm<sup>2</sup> (AWG 24) for 4-wire connection
- ≤ 0.518 mm<sup>2</sup> (AWG 20) for 2-wire connection

Thermocouple wire colors

As per IEC 60584	As per ASTM E230/ANSI MC96.1
<ul style="list-style-type: none"> <li>■ Type J: black (+), white (-)</li> <li>■ Type K: green (+), white (-)</li> </ul>	<ul style="list-style-type: none"> <li>■ Type J: white (+), red (-)</li> <li>■ Type K: yellow (+), red (-)</li> </ul>



A0014393

10 Wiring diagram


- A Grounded connection
- B Ungrounded connection

## 6.3 Connecting the measuring instrument

Proceed as follows to wire a mounted iTEMP head transmitter:

1. Open the cable gland and the housing cover at the terminal head or the field housing.
2. Feed the cables through the opening in the cable gland.
3. Connect the cables in accordance with the electrical connection of the specific head transmitter. If the head transmitter is fitted with push-in terminals, pay particular attention to the information in the "Connecting to push-in terminals" section.
4. Tighten the cable gland again and close the housing cover.

Proceed as follows to wire the cable thermometer:

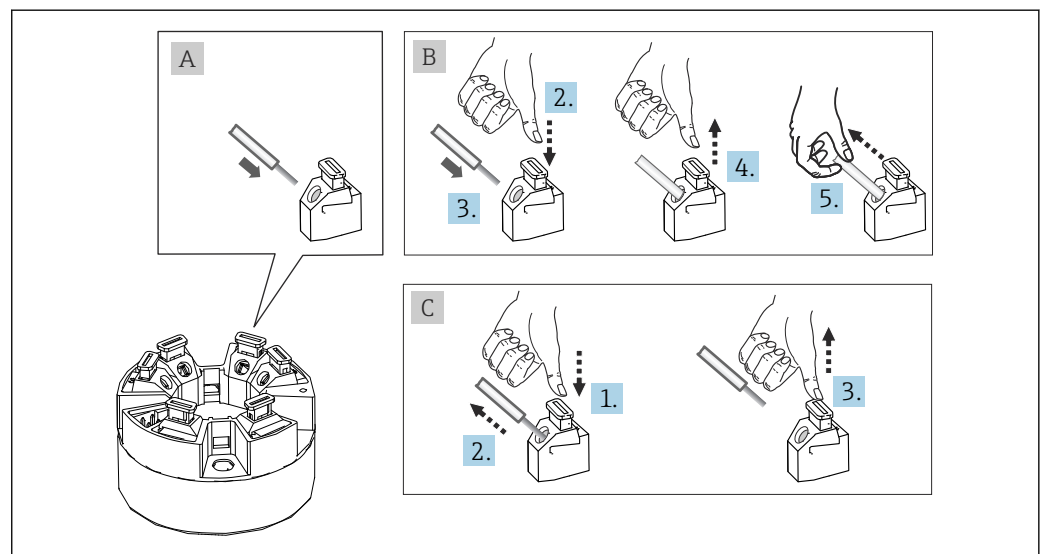
- ▶ Connect the cables according to the electrical connection of the specific cable thermometer →  19.


To avoid connection errors, always pay attention to the "Post-connection check" section before commissioning!

### 6.3.1 Connecting to screw terminals

Maximum torque for screw terminals = 0.35 Nm ( $\frac{1}{4}$  lbf ft), screwdriver: Pozidriv Z1

### 6.3.2 Connecting to push-in terminals



 11 Connecting to push-in terminals

A0039468

#### Item A, solid wire:

1. Strip wire end. Min. stripping length 10 mm (0.39 in).
2. Insert the wire end into the terminal.
3. Pull the wire gently to ensure it is connected correctly. Repeat from step 1 if necessary.

#### Item B, fine-strand wire without ferrule:

1. Strip wire end. Min. stripping length 10 mm (0.39 in).
2. Press down on the lever opener.
3. Insert the wire end into the terminal.
4. Release lever opener.

5. Pull the wire gently to ensure it is connected correctly. Repeat from step 1 if necessary.

**Item C, releasing the connection:**

1. Press down on the lever opener.
2. Remove the wire from the terminal.
3. Release lever opener.

### 6.4 Special connection instructions

**i** Observe grounding concept of the plant.

### 6.5 Ensuring the degree of protection

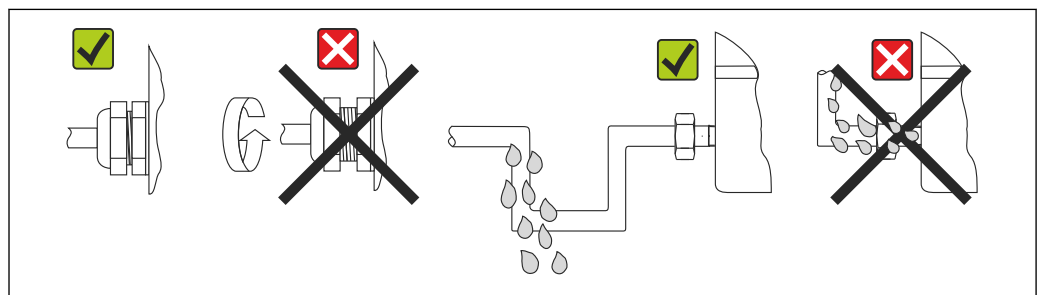
**i** Make sure that the grommet is available in each case!

The device meets all of the requirements in accordance with the degree of protection indicated on the nameplate.

To ensure that the degree of protection of the housing is maintained following installation in the field or after servicing, compliance with the following points is mandatory:

- The housing seals must be clean and undamaged when inserted into their grooves. Dry, clean or replace in the case of moisture or wet seals.
- Tighten all housing screws and screw covers.
- The cables used for the connection must have the specified outer diameter (e.g. M20x1.5, cable diameters  $\varnothing$  8 to 12 mm).
- Firmly tighten the cable gland, and use it only in the specified clamping area (the cable diameter must be appropriate to the cable gland).
- The cables must loop down before they enter the cable gland ("water trap"). This means that any moisture that may form cannot enter the gland. Mount the device in such a way that the cable glands are pointing downwards.
- Do not twist the cables, and use only round cables.
- Cable glands not used are to be blanked off using the dummy plugs provided.
- Do not remove the grommet used from the cable gland.



**i** Repeated opening/closing of the device is possible but has a negative impact on the degree of protection.




**12** Connection tips to retain IP67 protection

### 6.6 Post-connection check

Device condition and specifications	Notes
Are the device and cable undamaged?	

Electrical connection	Notes
Does the supply voltage match the specifications on the nameplate?	
Do the cables have adequate strain relief?	
Are the power supply and signal cables connected correctly?	--
Are all the screw terminals firmly tightened and have the push-in terminal connections been checked?	--
Are all the cable entries installed, tightened and leak-tight?	--



## 7 Operation options

 See the technical documentation for the specific transmitter.

## 8 Commissioning

### 8.1 Function check


Perform the following final checks before commissioning the measuring point:

1. Perform the post-mounting check using the checklist. →  12
2. Perform the post-connection check using the checklist. →  16

### 8.2 Switching on the measuring instrument

Once you have completed the post-connection checks, switch on the supply voltage. During the switch-on procedure, the transmitter runs through internal test functions. Depending on the type of transmitter selected, the device operates after 5 to 33 s. Normal measuring mode commences as soon as the switch-on procedure is completed.

### 8.3 Configuring the measuring instrument

 See the technical documentation for the specific transmitter.

## 9 Diagnostics and troubleshooting

 See the technical documentation for the specific transmitter.


## 10 Maintenance

No special maintenance work is required for the device.

### 10.1 Cleaning

#### 10.1.1 Cleaning of surfaces not in contact with the medium

- Recommendation: Use a lint-free cloth that is either dry or slightly dampened using water.
- Do not use any sharp objects or aggressive cleaning agents that corrode the surfaces (displays, housing, for example) and seals.
- Do not use high-pressure steam.
- Observe the degree of protection of the device.

 The cleaning agent used must be compatible with the materials of the device configuration. Do not use cleaning agents with concentrated mineral acids, bases or organic solvents.



## 10.2 Endress+Hauser services

Service	Description
Calibration	RTD inserts may drift depending on the application. Regular recalibration to verify accuracy is recommended. The calibration can be performed by Endress+Hauser or by qualified technical staff using calibration devices on site.

## 11 Repair

### 11.1 General notes

For the purpose of repair, individual components can be replaced by the customer's technical personnel.

#### 11.1.1 Repair of Ex-certified devices

- Only specialist personnel or the manufacturer may undertake repairs on Ex-certified devices.
- Carry out repairs according to the instructions. On completion of the repair, carry out the routine test specified for the device.
- The prevailing standards, national hazardous area regulations, safety instructions and certificates must be observed.
- Only use original spare parts from the manufacturer.
- When ordering spare parts, check the device designation on the nameplate. Replace individual parts with the same parts.
- A certified device may only be converted to another certified device version by the manufacturer only.
- Document all repairs and modifications.

### 11.2 Spare parts



For spare parts currently available for the product, see online at:  
<https://www.endress.com/deviceviewer> (→ Enter serial number)

### 11.3 Return

The requirements for safe device return can vary depending on the device type and national legislation.

1. Refer to the web page for information:  
<https://www.endress.com/support/return-material>  
 ↳ Select the region.
2. If returning the device, pack the device in such a way that it is reliably protected against impact and external influences. The original packaging offers the best protection.

## 11.4 Disposal



If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

## 12 Accessories

The accessories currently available for the product can be selected at [www.endress.com](http://www.endress.com):

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

### 12.1 Service-specific accessories

#### 12.1.1 Modems/Edge devices

##### Netilion

IIoT ecosystem: Unlock knowledge

With the Netilion IIoT ecosystem, Endress+Hauser enables you to optimize plant performance, digitize workflows, share knowledge, and enhance collaboration. Drawing on decades of experience in process automation, Endress+Hauser provides the process industry with an IIoT ecosystem that unlocks valuable insights from data. These insights allow process optimization, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant.

 [www.netilion.endress.com](http://www.netilion.endress.com)

#### 12.1.2 Software

##### DeviceCare SFE100

Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus field devices

DeviceCare is available for download at [www.software-products.endress.com](http://www.software-products.endress.com). You need to register in the Endress+Hauser software portal to download the application.

 Technical Information TI01134S

##### FieldCare SFE500

FDT-based plant asset management tool

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.

 Technical Information TI00028S

### 12.2 Online tools

Product information over the entire life cycle of the device: [www.endress.com/onlinetools](http://www.endress.com/onlinetools)

### 12.3 System components

#### 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](http://www.endress.com)

#### Process indicators from the RIA product family

Easily readable process indicators with various functions: loop-powered indicators for displaying 4 to 20 mA 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](http://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](http://www.endress.com)

## 13 Technical data

### 13.1 Input

Measured variable      Temperature (temperature-linear transmission behavior)

Measuring range      *Depends on the type of sensor used*


Sensor type <sup>1)</sup>	Measuring range
Pt100 (WW)	-200 to +600 °C (-328 to +1 112 °F)
Pt100 (TF) Basic	-50 to +200 °C (-58 to +392 °F)
Pt100 (TF) Standard	-50 to +400 °C (-58 to +752 °F)
Pt100 (TF) iTHERM QuickSens	-50 to +200 °C (-58 to +392 °F)
Pt100 (TF) iTHERM StrongSens	-50 to +500 °C (-58 to +932 °F)
Thermocouple TC, type J	-40 to +750 °C (-40 to +1 382 °F)
Thermocouple TC, type K	-40 to +1 100 °C (-40 to +2 012 °F)
Thermocouple TC, type N	

1) Options depend on product and configuration

### 13.2 Output

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

- Directly-wired sensors - sensor measured values forwarded without an iTEMP transmitter.
- By selecting the appropriate iTEMP transmitter via all common protocols.

 All iTEMP transmitters are mounted directly in the terminal head and wired with the sensory mechanism.

### 13.3 Power supply

Supply voltage      U = max. 9 to 42 V<sub>DC</sub>, depending on the iTEMP temperature transmitter used.  
See technical documentation of the specific iTEMP transmitter.


Current consumption      I ≤ 23 mA, depending on the iTEMP temperature transmitter used.  
See technical documentation of the specific iTEMP transmitter.

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.

**Connectors**

The manufacturer offers a wide variety of connectors 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 does not recommend attaching 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 conjunction with an 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 one cable entry <sup>1)</sup>*

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

Plug	1x PROFIBUS® PA		1x FOUNDATION™ Fieldbus (FF)	1x PROFINET® and Ethernet-APL™	
2x TMT PROFINET®				APL signal - (#1)	APL signal + (#1)
PIN position and color code	 1 BN 2 GNYE 3 BU 4 GY <small>A0018929</small>	 1 BN 2 GNYE 3 BU 4 GY <small>A0018930</small>	 1 BU 2 BN 3 GY 4 GNYE <small>A0018931</small>	 1 RD 2 GN <small>A0052119</small>	

- 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 one cable entry<sup>1)</sup>

Plug	4-pin / 8-pin							
Plug thread	M12							
PIN number	1	2	3	4	5	6	7	8
<b>Electrical connection (terminal head)</b>								
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	Cannot be combined							
1x TMT FF	Cannot be combined							
2x TMT FF	Cannot be combined							
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 <small>A0018929</small>	 1 WH 2 BN 3 GN 4 YE 5 GY 6 PK 7 BU 8 RD <small>A0018927</small>						

- 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
<b>Electrical connection (terminal head)</b>				
Flying leads	Not connected (not insulated)			
3-wire terminal block (1x Pt100)	RD	i	RD	WH

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

A0055383

Terminal head with two cable entries <sup>1)</sup>

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
<b>Electrical connection (terminal head)</b>																
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		RD/i	RD/i	WH/i	
4-wire terminal block (1x Pt100)			WH/i	WH/i			WH/i	WH/i			WH/i	WH/i			WH/i	WH/i
6-wire terminal block (2x Pt100)	RD/B K	RD/B K	WH/YE		RD/B K	RD/B K	WH/YE		RD/B K	RD/B K	WH/YE		RD/B K	RD/B K	WH/YE	
1x TMT 4 to 20 mA or HART®	+/i		-/i		+/i		-/i		+/i		-/i		+/i		-/i	
2x TMT 4 to 20 mA or HART® in the terminal head with a high cover	+		-	i/i	+		-	i/i	+		-	i/i	+		-	i/i
	(#1)/		(#1)/		(#1)/		(#1)/		(#1)/		(#1)/		(#1)/		(#1)/	
	+		-		+		-		+		-		+		-	
	(#2)		(#2)		(#2)		(#2)		(#2)		(#2)		(#2)		(#2)	
1x TMT PROFIBUS® PA	+/i		-/i		+/i		-/i		Cannot be combined							
2x TMT PROFIBUS® PA	+		-	GND/GND	+		-	GND/GND								
	(#1)/		(#1)/		(#1)/		(#1)/									
	+		-		+		-									
	(#2)		(#2)		(#2)		(#2)									
1x TMT FF	Cannot be combined				Cannot be combined				-/i	+/i	i/i	GND/GND	Cannot be combined			

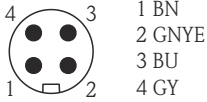
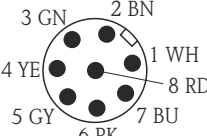


Plug	2x PROFIBUS® PA		2x FOUNDATION™ Fieldbus (FF)				2x PROFINET® and Ethernet-APL™			
			- (#1)/- (#2)	+ (#1)/+ (#2)						
2x TMT FF										
1x TMT PROFINET®	Cannot be combined	Cannot be combined	Cannot be combined				APL signal -	APL signal +	GND	i
2x TMT PROFINET®	Cannot be combined	Cannot be combined	Cannot be combined				APL signal - (#1) and (#2)	APL signal + (#1) and (#2)		
PIN position and color code	 A0018929	 A0018930	 A0018931	 A0052119						

1) Options depend on product and configuration

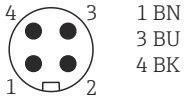
Terminal head with two cable entries <sup>1)</sup>

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							

Plug	4-pin / 8-pin	
2x TMT PROFINET®	Cannot be combined	
PIN position and color code	 <p>1 BN 2 GNYE 3 BU 4 GY</p> <p>A0018929</p>	 <p>1 WH 2 BN 3 GN 4 YE 5 GY 6 PK 7 BU 8 RD</p> <p>A0018927</p>

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	 <p>1 BN 2 BK 3 BU 4 BK</p> <p>A0055383</p>			

Insert connection combination - Transmitter <sup>1)</sup>

Insert	Transmitter connection <sup>2)</sup>			
	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)

Insert	Transmitter connection <sup>2)</sup>			
	iTEMP TMT31/iTEMP TMT7x		iTEMP TMT8x	
	1x 1-channel	2x 1-channel	1x 2-channel	2x 2-channel
1x sensor (Pt100 or TC),with terminal block <sup>3)</sup>	Sensor (#1) : transmitter in cover	Cannot be combined	Sensor (#1) : transmitter in cover	Cannot be combined
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 sensor (2x Pt100 or 2x TC) in conjunction with feature 600, option MG <sup>4)</sup>	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

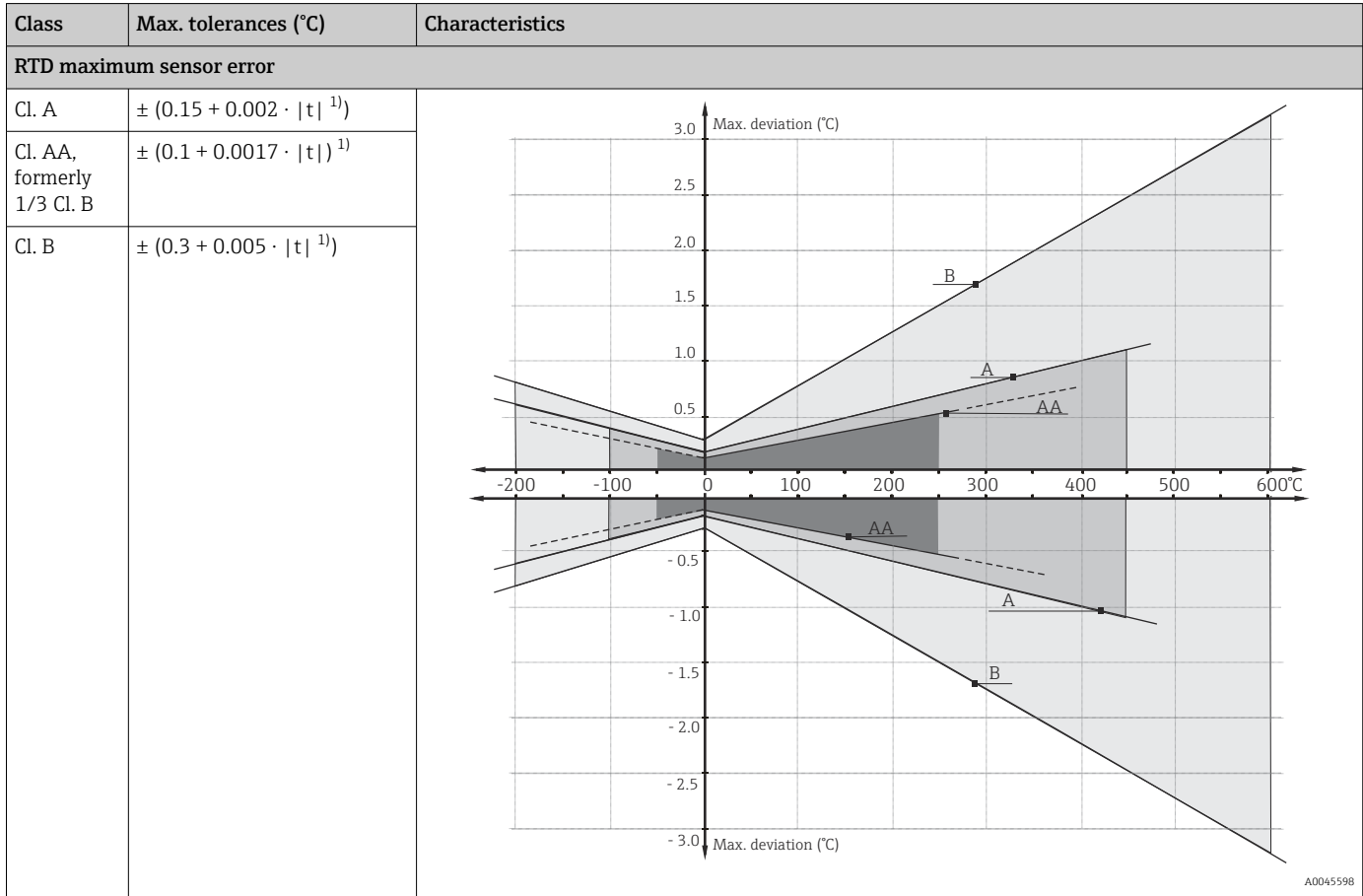
- 1) Options depend on product and configuration
- 2) If 2 transmitters are selected in a terminal head, transmitter (#1) is installed directly on the insert. Transmitter (#2) is installed in the high cover. A TAG cannot be ordered for the 2nd transmitter as standard. The bus address is set to the default 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 with channel 1 of a transmitter

## 13.4 Performance characteristics

Reference conditions

This data is relevant for determining the measurement accuracy of the iTEMP transmitters used. For details, see the relevant Technical Information.

Maximum measurement error **RTD resistance thermometer as per IEC 60751:**



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

- i** For measurement errors in °F, calculate using equation above in °C, then multiply the outcome by 1.8.
- i** The measurement error of the system depends on the installation position, the environment and insulation of the coupling element.

Temperature ranges

Sensor type <sup>1)</sup>	Operating temperature range	Class B	Class A	Class AA
Pt100 (WW)	-200 to +600 °C (-328 to +1112 °F)	-200 to +600 °C (-328 to +1112 °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

Permissible deviation limits of thermoelectric voltages from the standard characteristic for thermocouples as per IEC 60584 or ASTM E230/ANSI MC96.1:

Standard	Type <sup>1)</sup>	Standard tolerance		Special tolerance	
		Class	Deviation	Class	Deviation
IEC 60584	J (Fe-CuNi)	2	$\pm 2.5 \text{ }^\circ\text{C}$ (-40 to +333 $^\circ\text{C}$ ) $\pm 0.0075  t $ <sup>2)</sup> (333 to 750 $^\circ\text{C}$ )	1	$\pm 1.5 \text{ }^\circ\text{C}$ (-40 to +375 $^\circ\text{C}$ ) $\pm 0.004  t $ <sup>2)</sup> (+375 to +750 $^\circ\text{C}$ )
	K (NiCr-NiAl) N (NiCrSi-NiSi)	2	$\pm 0.0075  t $ <sup>2)</sup> (+333 to +1 200 $^\circ\text{C}$ ) $\pm 2.5 \text{ }^\circ\text{C}$ (-40 to +333 $^\circ\text{C}$ ) $\pm 0.0075  t $ <sup>2)</sup> (+333 to +1 200 $^\circ\text{C}$ )	1	$\pm 1.5 \text{ }^\circ\text{C}$ (-40 to +375 $^\circ\text{C}$ ) $\pm 0.004  t $ <sup>2)</sup> (+375 to +1 000 $^\circ\text{C}$ )

- 1) Options depend on product and configuration  
2)  $|t|$  = absolute value in  $^\circ\text{C}$

Thermocouples made of base metals are generally supplied so that they comply with the manufacturing tolerances specified in the tables for temperatures  $> -40 \text{ }^\circ\text{C}$  ( $-40 \text{ }^\circ\text{F}$ ). These materials are not suitable for temperatures  $< -40 \text{ }^\circ\text{C}$  ( $-40 \text{ }^\circ\text{F}$ ). Class 3 tolerances cannot be satisfied. A separate material must be selected for this temperature range. This cannot be processed via the standard product.

Standard	Type <sup>1)</sup>	Standard tolerance	Special tolerance
ASTM E230/ANSI MC96.1		Deviation; the larger value applies in each case	
	J (Fe-CuNi)	$\pm 2.2 \text{ K}$ or $\pm 0.0075  t $ <sup>2)</sup> (0 to 760 $^\circ\text{C}$ )	$\pm 1.1 \text{ K}$ or $\pm 0.004  t $ <sup>2)</sup> (0 to 760 $^\circ\text{C}$ )
	K (NiCr-NiAl) N (NiCrSi-NiSi)	$\pm 2.2 \text{ K}$ or $\pm 0.02  t $ <sup>2)</sup> (-200 to 0 $^\circ\text{C}$ ) $\pm 2.2 \text{ K}$ or $\pm 0.0075  t $ <sup>2)</sup> (0 to 1 260 $^\circ\text{C}$ )	$\pm 1.1 \text{ K}$ or $\pm 0.004  t $ <sup>2)</sup> (0 to 1 260 $^\circ\text{C}$ )

- 1) Options depend on product and configuration  
2)  $|t|$  = absolute value in  $^\circ\text{C}$

The materials for thermocouples are generally supplied in such a way that they comply with the tolerances specified in the table for temperatures  $> 0 \text{ }^\circ\text{C}$  (32  $^\circ\text{F}$ ). These materials are generally not suitable for temperatures  $< 0 \text{ }^\circ\text{C}$  (32  $^\circ\text{F}$ ). The specified tolerances cannot be satisfied. A separate material must be selected for this temperature range. This cannot be processed via the standard product.

#### 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


##### Calibration of thermometers

Calibration involves comparing the measured values of a unit under test (UUT) with those of a more precise measurement standard using a defined and reproducible measurement method. The aim is to determine the deviation of the UUT's measured values from the true value of the measured variable. Two different methods are used for thermometers:

- Calibration at fixed-point temperatures, e.g. at the freezing point of water at 0  $^\circ\text{C}$ ,
- Calibration compared against a precise reference thermometer.

The thermometer to be calibrated must display the fixed point temperature or the temperature of the reference thermometer as accurately as possible. Temperature-controlled calibration baths with very homogeneous thermal values, or special calibration furnaces 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.

 The device is calibrated without the coupling element.

**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 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 your Endress+Hauser Sales Center on request. Calibrations are traceable to national and international standards. The calibration certificate is referenced to the serial number of the 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 insertion 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) <sup>1)</sup>
-80 to +250 °C (-112 to +482 °F)	No minimum immersion length required <sup>2)</sup>
251 to 550 °C (483.8 to 1022 °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	<ul style="list-style-type: none"> <li>■ RTD: Insulation resistance according to IEC 60751 &gt; 100 MΩ at 25 °C between terminals and sheath material measured with a minimum test voltage of 100 V DC</li> <li>■ TC: Insulation resistance according to IEC 1515 between terminals and sheath material with a test voltage of 500 V DC: <ul style="list-style-type: none"> <li>■ &gt; 1 GΩ at 20 °C</li> <li>■ &gt; 5 MΩ at 500 °C</li> </ul> </li> </ul>
-----------------------	--

## 13.5 Environment

Ambient temperature range

### RTD and TC industrial thermometers

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 iTEMP head transmitter	-40 to +85 °C (-40 to +185 °F)
With mounted iTEMP head transmitter and display	-20 to +70 °C (-4 to +158 °F)

### RTD cable thermometers

Material Connecting cable/tube insulation	Temperature in °C (°F)
PVC/PVC	80 °C (176 °F)
PTFE/silicone	180 °C (356 °F)
PTFE/PTFE	200 °C (392 °F)

### TC cable thermometers

Material Connecting cable/tube insulation	Temperature in °C (°F)
PVC/PVC	80 °C (176 °F)
Glass fiber / glass fiber	400 °C (751 °F)

Storage temperature -40 to +85 °C (-40 to +185 °F).

Operating altitude Up to 2 000 m (6 561 ft) above sea level.

Humidity Depending on the transmitter used. If using head transmitters:

- 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 D


Degree of protection	<b>Max. IP 66 (NEMA Type 4x encl.)</b>	Depending on the design (terminal head, connector, etc.).
	<b>Partly IP 68</b>	Tested in 1.83 m (6 ft) over 24 h

Shock and vibration resistance The Endress+Hauser inserts exceed the requirements of IEC 60751 with regard to shock and vibration resistance of 3g in a range of 10 to 500 Hz. The vibration resistance of the measuring point depends on sensor type and design:

Sensor type <sup>1)</sup>	Vibration resistance for the sensor tip
Pt100 (WW)	≤ 30 m/s <sup>2</sup> (≤ 3g)
Pt100 (TF) Basic	
Pt100 (TF) Standard	≤ 40 m/s <sup>2</sup> (≤ 4g)
Pt100 (TF) iTHERM StrongSens	≤ 600 m/s <sup>2</sup> (≤ 60g)
Pt100 (TF) iTHERM QuickSens, version: ø6 mm (0.24 in)	≤ 600 m/s <sup>2</sup> (≤ 60g)
Pt100 (TF) iTHERM QuickSens, version: ø3 mm (0.12 in)	≤ 30 m/s <sup>2</sup> (≤ 3g)
Thermocouple TC, type J, K, N	≤ 30 m/s <sup>2</sup> (≤ 3g)

1) Options depend on product and configuration

 The vibration resistance of the entire device (thermometer and coupling element) for marine applications is ≤ 0.7 g.

 Test certificates for marine applications and rough handling tests at InterTek are available.

Electromagnetic compatibility (EMC) EMC to all relevant requirements of the IEC/EN 61326-series and NAMUR Recommendation EMC (NE21). For details, refer to the Declaration of Conformity.  
Maximum fluctuations during EMC-tests: < 1 % of measuring span.  
Interference immunity to IEC/EN 61326-series, requirements for industrial areas  
Interference emission to IEC/EN 61326-series, electrical equipment Class B

Pollution degree Pollution degree 2.


### 13.6 Process

Process temperature range Depends on sensor type and material used, max. -200 to +400 °C (-328 to +752 °F).

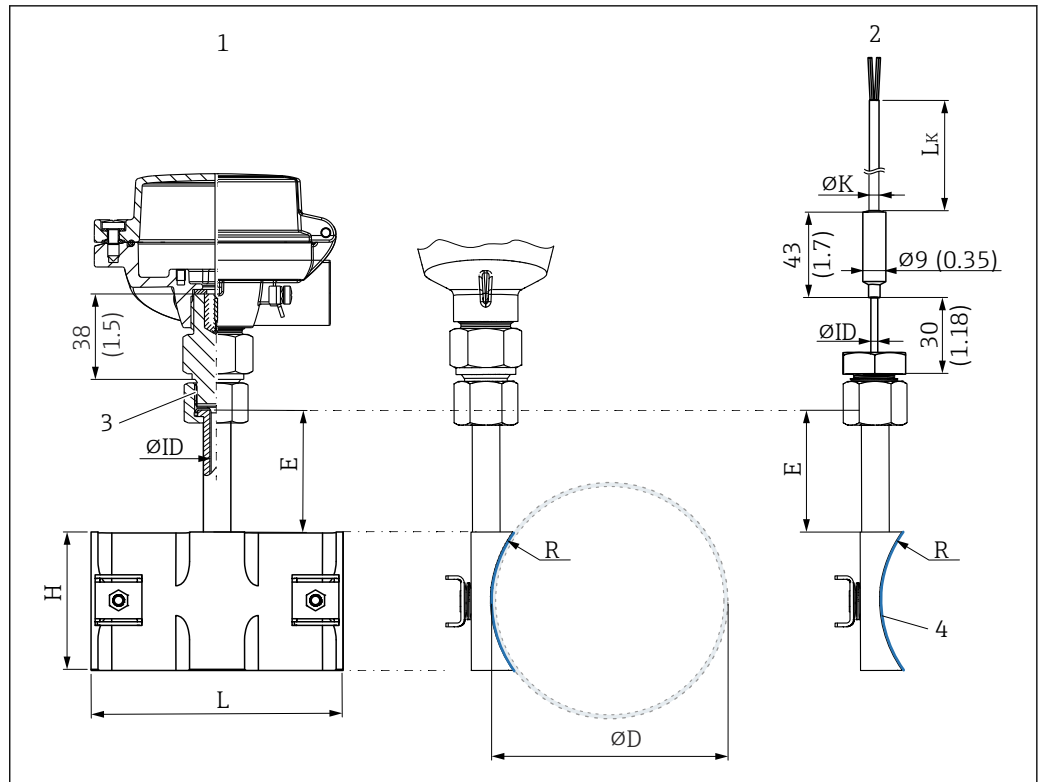
Process pressure range No restrictions as measurement by the thermometer is non-invasive.

### 13.7 Mechanical construction

Design, dimensions All dimensions in mm (in).

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

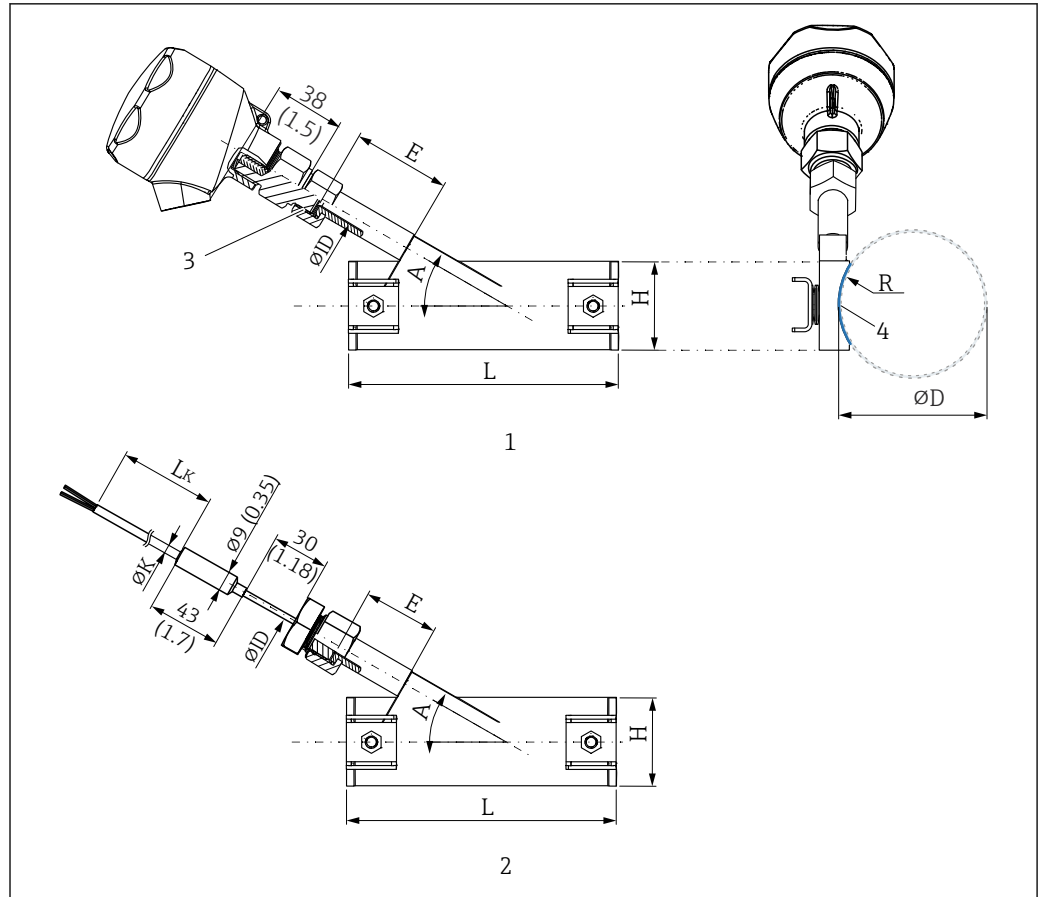




A0055923

13 Dimensions of iTHERM SurfaceLine TM611, vertical connection angle  $A = 90^\circ$

- 1 Industrial thermometer with terminal head
  - 2 RTD or TC cable thermometer
  - 3 Thermometer connection thread - Coupling element  $G\frac{1}{2}"$  (AF 27)
  - 4 Coupling foil
- $\varnothing ID$  Insert diameter:  $\varnothing 3$  mm (0.12 in)



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14 Dimensions of iTHERM SurfaceLine TM611, inclined connection angle  $A < 90^\circ$

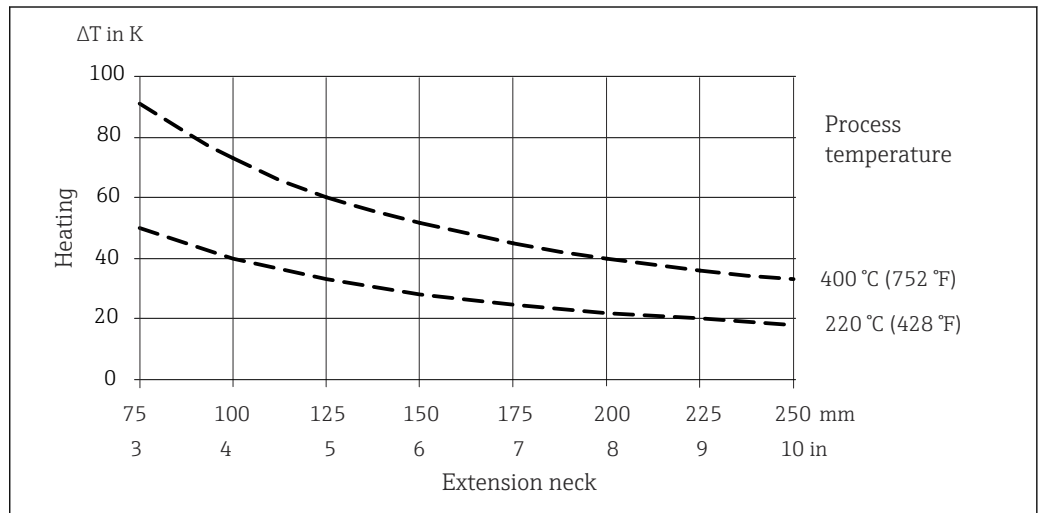
- 1 Industrial thermometer with terminal head
- 2 RTD or TC cable thermometer
- 3 Thermometer connection thread - Coupling element  $G\frac{1}{2}$ " (AF 27)
- 4 Coupling foil
- $\varnothing ID$  Insert diameter:  $\varnothing 3$  mm (0.12 in)

Variable dimensions:

Item	Description	Dimensions
E	Extension neck length	Standard lengths User configurable
$L_K$	Connecting cable length	User configurable

Pipe outer diameter $\varnothing D$	Thermometer connection angle $A$	Coupling element radius $R$	Coupling element length $L$	Coupling element height $H$
DN8, $\frac{1}{4}$ in, 13.5 mm	20°	6.75 mm (0.27 in)	120 mm	15 mm
DN15, $\frac{1}{2}$ in, 21.3 mm		10.65 mm (0.42 in)	110 mm	20 mm
DN25, 1 in, 33.7 mm	30°	16.85 mm (0.66 in)	110 mm	31 mm
DN40, $1\frac{1}{2}$ in, 48.3 mm		24.15 mm (0.95 in)	110 mm	36 mm
DN50, 2 in, 60.3 mm		30.15 mm (1.19 in)	110 mm	36 mm
DN80, 3 in, 88.9 mm	40°	44.45 mm (1.75 in)	110 mm	44 mm
DN100, 4 in, 114.3 mm	90°	57.15 mm (2.25 in)	110 mm	65 mm
DN150, 6 in, 168.3 mm		84.15 mm (3.31 in)	110 mm	70 mm

Connecting cable; sheath insulation	Diameter ØK in mm (in)
PTFE; PTFE; 4-wire RTD	4.5 mm (0.178 in)
PTFE; silicone; 2x3-wire RTD	5.2 mm (0.2 in)
Glass fiber; 1x or 2x TC	3.6 mm (0.14 in) for 1x TC connection 4.1 mm (0.16 in) for 2x TC connection
PVC blue; 1x or 2x TC	5 mm (0.2 in) for 1x TC connection 6 mm (0.24 in) 2x TC connection



15 Heating of the terminal head as a function of the process temperature. Temperature in terminal head = ambient temperature 20 °C + ΔT


The diagram can be used to calculate the transmitter temperature.

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

Result: The temperature of the iTEMP transmitter is OK, the length of the extension neck is sufficient.

**Weight** Depends on product and configuration.  
1 kg for standard version. <sup>1)</sup>

**Materials** 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.

 Please note the maximum temperature depends on the temperature sensor used!

1) E. g. Coupling element with short extension neck and iTHERM ModuLine TM111 with terminal head TA30R.

Material name	Short form	Recommended max. temperature for continuous use in air	Properties
AISI 316L/ 1.4404	X2CrNiMo17-12-2	650 °C (1 202 °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 chlorinated 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> </ul>

1) Contact the manufacturer's sales department for further information.

Inserts

The inserts are not replaceable due to the design of the device.

Sensor type RTD <sup>1)</sup>	Pt100 (TF), Standard thin film	Pt100 (TF), iTHERM StrongSens	Pt100 (TF), iTHERM QuickSens <sup>2)</sup>	Pt100 (WW), Wire wound	
<b>Sensor design; connection method</b>	1x Pt100, 3- or 4-wire, mineral insulated	1x Pt100, 3- or 4-wire, mineral insulated	1x Pt100, 3- or 4-wire <ul style="list-style-type: none"> <li>▪ ø6 mm (0.24 in), mineral insulated</li> <li>▪ ø3 mm (0.12 in), Teflon insulated</li> </ul>	1x Pt100, 3- or 4-wire, mineral insulated	2x Pt100, 3-wire, mineral insulated
<b>Vibration resistance of the insert tip</b>	≤ 3g	Increased vibration resistance ≤ 60g	<ul style="list-style-type: none"> <li>▪ ø3 mm (0.12 in) ≤ 3g</li> <li>▪ ø6 mm (0.24 in) ≤ 60g</li> </ul>	≤ 3g	
<b>Measuring range; accuracy class</b>	-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	
<b>Diameter</b>	ø 3 mm (0.12 in) ø 6 mm (0.24 in)	ø 6 mm (0.24 in)		ø 3 mm (0.12 in) ø 6 mm (0.24 in)	

1) Options depend on product and configuration

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

Sensor type TC <sup>1)</sup>	Type K	Type J	Type N
<b>Sensor design</b>	Mineral insulated, Alloy 600 sheathed cable	Mineral insulated, stainless steel sheathed cable	Mineral insulated, Alloy TD sheathed cable
<b>Vibration resistance of the insert tip</b>	≤ 3g		
<b>Measuring range</b>	-40 to +1 100 °C (-40 to +2 012 °F)	-40 to +750 °C (-40 to +1 382 °F)	-40 to +1 100 °C (-40 to +2 012 °F)
<b>Connection type</b>	Grounded or ungrounded		
<b>Temperature-sensitive length</b>	Insert length		
<b>Diameter</b>	ø 3 mm (0.12 in) ø 6 mm (0.24 in)		

1) Options depend on product and configuration

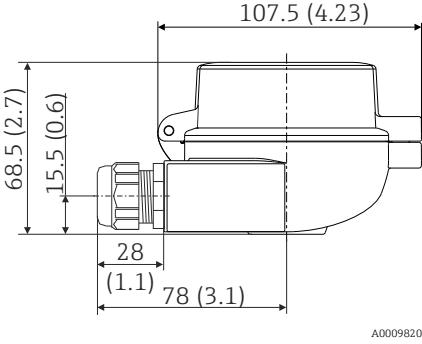
Terminal heads

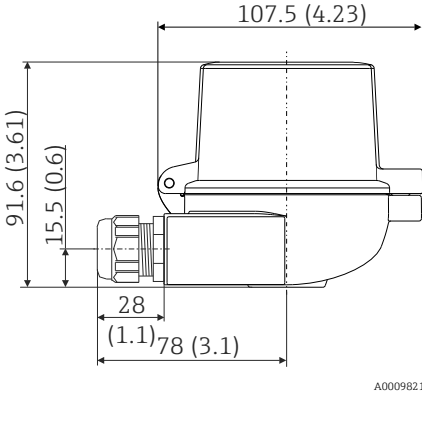
All terminal heads have an internal shape and size in accordance with DIN EN 50446, flat face, and a thermometer connection with a M24x1.5 or ½" NPT thread. All dimensions in mm (in). The sample cable glands in the diagrams correspond to M20x1.5 connections with non-Ex polyamide cable glands. Specifications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

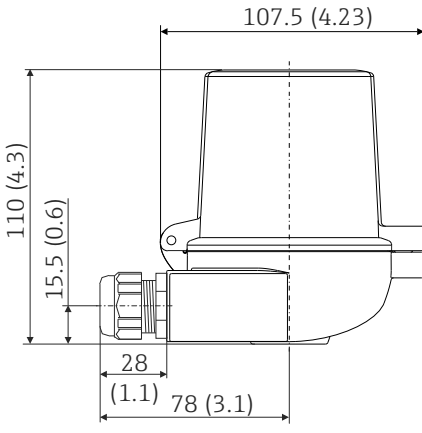
ambient temperatures with head transmitter installed, see the "Ambient temperature range" section. →  39

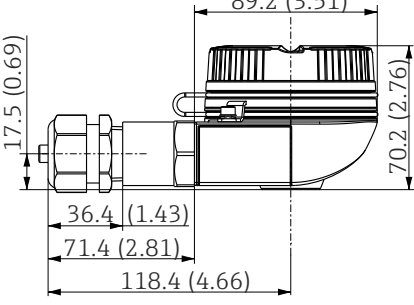
As a special feature, Endress+Hauser offers terminal heads with optimized terminal accessibility for easy installation and maintenance.

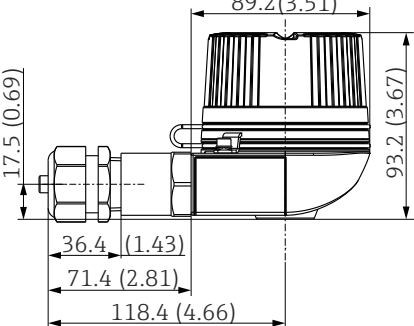
 If the device is selected as a cable thermometer, no terminal head can be configured. See the "Function and system design" section.

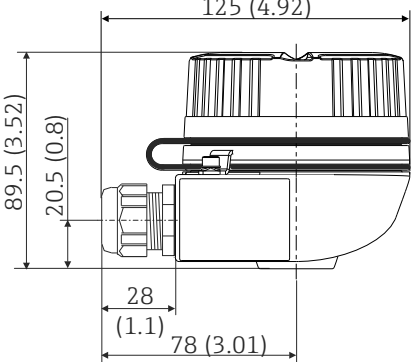
TA30A	Specification
 <p style="text-align: right; font-size: small;">A0009820</p>	<ul style="list-style-type: none"> <li>■ Protection degree:                             <ul style="list-style-type: none"> <li>■ IP66/68 (NEMA Type 4x incl.)</li> <li>■ For ATEX: IP66/67</li> </ul> </li> <li>■ Temperature: -50 to +150 °C (-58 to +302 °F) without cable gland</li> <li>■ Material: aluminum, polyester powder coated</li> <li>Seals: silicone</li> <li>■ Threaded cable entry: G ½", NPT ½" and M20x1.5;</li> <li>■ Color of head: blue, RAL 5012</li> <li>■ Color of cap: gray, RAL 7035</li> <li>■ Weight: 330 g (11.64 oz)</li> <li>■ Ground terminal, internal and external</li> <li>■ Available with sensors with 3-A® symbol</li> </ul>

TA30A with display window in cover	Specification
 <p style="text-align: right; font-size: small;">A0009821</p>	<ul style="list-style-type: none"> <li>■ Protection degree:                             <ul style="list-style-type: none"> <li>■ IP66/68 (NEMA Type 4x incl.)</li> <li>■ For ATEX: IP66/67</li> </ul> </li> <li>■ Temperature: -50 to +150 °C (-58 to +302 °F) without cable gland</li> <li>■ Material: aluminum, polyester powder coated</li> <li>Seals: silicone</li> <li>■ Threaded cable entry: G ½", NPT ½" and M20x1.5</li> <li>■ Color of head: blue, RAL 5012</li> <li>■ Color of cap: gray, RAL 7035</li> <li>■ Weight: 420 g (14.81 oz)</li> <li>■ Display window: single-pane safety glass according to DIN 8902</li> <li>■ Display window in cover for head transmitter with TID10 display</li> <li>■ Ground terminal, internal and external</li> <li>■ Available with sensors with 3-A® symbol</li> </ul>

TA30D	Specification
 <p style="text-align: right; font-size: small;">A0009822</p>	<ul style="list-style-type: none"> <li>■ Protection degree:                             <ul style="list-style-type: none"> <li>■ IP66/68 (NEMA Type 4x incl.)</li> <li>■ For ATEX: IP66/67</li> </ul> </li> <li>■ Temperature: -50 to +150 °C (-58 to +302 °F) without cable gland</li> <li>■ Material: aluminum, polyester powder coated</li> <li>Seals: silicone</li> <li>■ Threaded cable entry: G ½", NPT ½" and M20x1.5</li> <li>■ 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.</li> <li>■ Color of head: blue, RAL 5012</li> <li>■ Color of cap: gray, RAL 7035</li> <li>■ Weight: 390 g (13.75 oz)</li> <li>■ Ground terminal, internal and external</li> <li>■ Available with sensors with 3-A® symbol</li> </ul>

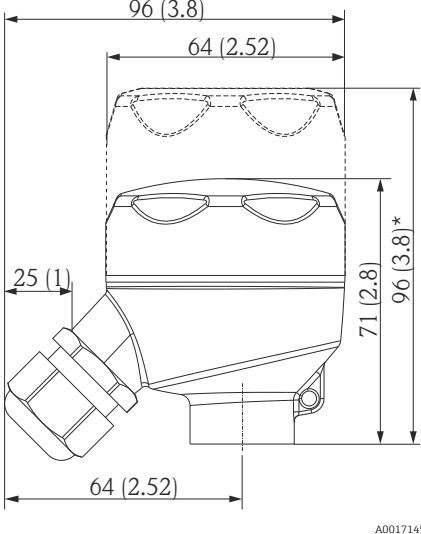
TA30EB	Specification
 <p style="text-align: right; font-size: small;">A0038414</p>	<ul style="list-style-type: none"> <li>▪ Screw cap</li> <li>▪ Degree of protection: IP 66/68, NEMA 4x</li> <li>▪ Temperature: -50 to +150 °C (-58 to +302 °F)</li> <li>▪ Material: aluminum; polyester powder coating; Klüber Syntheso Glep 1 dry-film lubricant</li> <li>▪ Thread: M20x1.5</li> <li>▪ Color of head: blue, RAL 5012</li> <li>▪ Color of cap: gray, RAL 7035</li> <li>▪ Weight: approx. 400 g (14.11 oz)</li> <li>▪ Ground terminal: internal and external</li> </ul> <p><b>i</b> When the housing cover is unscrewed: Before screwing it on, clean the threads in the cover and on the lower part of the housing and lubricate if necessary (recommended lubricant: Klüber Syntheso Glep 1).</p>

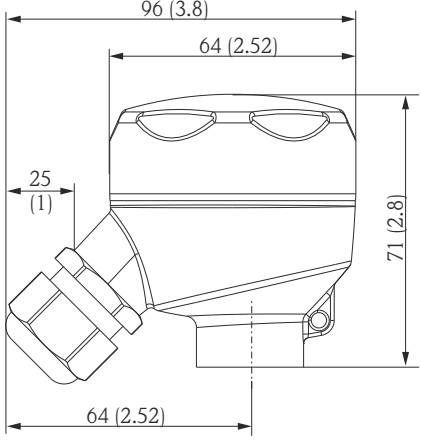
TA30EB with display window in cover	Specification
 <p style="text-align: right; font-size: small;">A0038428</p>	<ul style="list-style-type: none"> <li>▪ Screw cap</li> <li>▪ Degree of protection: IP 66/68, NEMA 4x Ex-version: IP 66/68</li> <li>▪ Temperature: -50 to +150 °C (-58 to +302 °F) for rubber seal without cable gland (observe max. permitted temperature of cable gland!)</li> <li>▪ Material: aluminum; polyester powder coating; Klüber Syntheso Glep 1 dry-film lubricant</li> <li>▪ Display window: single-pane safety glass according to DIN 8902</li> <li>▪ Thread: NPT ½", NPT ¾", M20x1.5, G½"</li> <li>▪ Color of head: blue, RAL 5012</li> <li>▪ Color of cap: gray, RAL 7035</li> <li>▪ Weight: approx. 400 g (14.11 oz)</li> </ul> <p><b>i</b> When the housing cover is unscrewed: Before screwing it on, clean the threads in the cover and on the lower part of the housing and lubricate if necessary (recommended lubricant: Klüber Syntheso Glep 1).</p>

TA30H	Specification
 <p style="text-align: right; font-size: small;">A0009832</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, with polyester powder coating</li> <li>▪ Stainless steel 316L without coating</li> <li>▪ Dry lubricant Klüber Syntheso Glep 1</li> </ul> </li> <li>▪ Thread: NPT ½", NPT ¾", M20x1.5, G½"</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> <p><b>i</b> When the housing cover is unscrewed: Before screwing it on, clean the threads in the cover and on the lower part of the housing and lubricate if necessary (recommended lubricant: Klüber Syntheso Glep 1).</p>

TA30H with display window in cover	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> <li>▪ Dry lubricant Klüber Syntheso Glep 1</li> </ul> </li> <li>▪ Display window: single-pane safety glass according to DIN 8902</li> <li>▪ Thread: NPT 1/2", NPT 3/4", M20x1.5, G1/2"</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>▪ Aluminium 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> <p><b>i</b> When the housing cover is unscrewed: Before screwing it on, clean the threads in the cover and on the lower part of the housing and lubricate if necessary (recommended lubricant: Klüber Syntheso Glep 1).</p>

TA30P	Specification
	<ul style="list-style-type: none"> <li>▪ Degree of protection: IP65</li> <li>▪ Max. temperature: -40 to +120 °C (-40 to +248 °F)</li> <li>▪ Material: polyamide (PA12), antistatic</li> <li>Seals: silicone</li> <li>▪ Threaded cable entry: M20x1.5</li> <li>▪ 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.</li> <li>▪ Head and cap color: black</li> <li>▪ Weight: 135 g (4.8 oz)</li> <li>▪ Type of protection: intrinsic safety (G Ex ia)</li> <li>▪ Ground terminal: only internal via auxiliary clamp</li> <li>▪ Available with sensors with 3-A® symbol</li> </ul>

TA30R (optionally with display window in cover)	Specification
 <p style="text-align: right; font-size: small;">A0017145</p> <p>* Dimensions of version with display window in cover</p>	<ul style="list-style-type: none"> <li>▪ Degree of protection - standard version: IP69K (NEMA Type 4x encl.)</li> <li>▪ Degree of protection - version with display window: IP66/68 (NEMA Type 4x encl.)</li> <li>▪ Temperature: -50 to +130 °C (-58 to +266 °F) without cable gland</li> <li>▪ Material: stainless steel 316L, abrasive-blasted or polished</li> <li>▪ Seals: silicone, optional EPDM for applications free from paint-wetting impairment substances</li> <li>▪ Display window: polycarbonate (PC)</li> <li>▪ Cable entry thread NPT ½" and M20x1.5</li> <li>▪ Weight                             <ul style="list-style-type: none"> <li>▪ Standard version: 360 g (12.7 oz)</li> <li>▪ Version with display window: 460 g (16.23 oz)</li> </ul> </li> <li>▪ Display window in cover optionally for head transmitter with display TID10</li> <li>▪ Ground terminal: internal as standard</li> <li>▪ Available with sensors with 3-A® symbol</li> <li>▪ Not allowed for Class II and III applications</li> </ul>

TA30R	Specification
 <p style="text-align: right; font-size: small;">A0018914</p>	<ul style="list-style-type: none"> <li>▪ Degree of protection - standard version: IP69K (NEMA Type 4x encl.)</li> <li>▪ Temperature: -50 to +130 °C (-58 to +266 °F) without cable gland</li> <li>▪ Material: stainless steel 316L, abrasive-blasted or hand-polished</li> <li>▪ Seals: EPDM</li> <li>▪ Cable entry thread ½" NPT and M20x1.5</li> <li>▪ Weight: 360 g (12.7 oz)</li> <li>▪ Protection armature connection: M24x1.5 or ½" NPT</li> <li>▪ Ground terminal: internal in standard version</li> <li>▪ Not allowed for Class II and III applications</li> <li>▪ Available with 3-A marked sensors</li> </ul>

Cable glands and connectors <sup>1)</sup>

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)



Type	Suitable for cable entry	Degree of protection	Temperature range	Suitable cable diameter
	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.

## 13.8 Certificates and approvals

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







[www.addresses.endress.com](http://www.addresses.endress.com)

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