

# Brief Operating Instructions iTHERM TrustSens TM371

Metric RTD thermometer with self-calibration technology for hygienic applications



These Brief Operating Instructions are **not** a substitute for the Operating Instructions pertaining to the device.

Refer to the Operating Instructions and other documentation for detailed information.

Available for all device versions via:

- Internet: [www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)
- Smartphone/tablet: Endress+Hauser Operations app



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## 1 About this document

### 1.1 Symbols

#### 1.1.1 Safety symbols



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



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.

**1.1.2 Electrical symbols**

Symbol	Meaning	Symbol	Meaning
	Direct current		Alternating current
	Direct current and alternating current		<b>Ground connection</b> A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

Symbol	Meaning
	<b>Potential equalization connection (PE: Protective earth)</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: potential equalization connection is connected to the supply network.</li> <li>▪ Exterior ground terminal: device is connected to the plant grounding system.</li> </ul>

**1.1.3 Symbols for certain types of information**

Symbol	Meaning	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.		<b>Tip</b> Indicates additional information.
	Reference to documentation		Reference to page
	Reference to graphic		Series of steps
	Result of a step		Visual inspection

### 1.1.4 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)

### 1.1.5 Tool symbols

Symbol	Meaning
 A0011222	Open-end wrench


## 1.2 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 document types are available in the Downloads area of the Endress+Hauser website ([www.endress.com/downloads](http://www.endress.com/downloads)), depending on the device version:

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> The Operating Instructions contain all the information that is required in various phases of the life cycle 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)	<p>Depending on the approval, safety instructions for electrical equipment in hazardous areas are also supplied with the device. These are an integral part of the Operating Instructions.</p> <p> The nameplate indicates which Safety Instructions (XA) apply to the device.</p>
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.

## 2 Basic safety instructions

### 2.1 Requirements for the personnel

The personnel must fulfill the following requirements for its tasks:

- ▶ 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.

### 2.2 Intended use

The device is a hygienic compact thermometer, which features an automatic self-calibration function. It is used for the acquisition and conversion of temperature input signals for industrial temperature measurement.

The manufacturer is not liable for harm caused by improper or non-designated use.

### 2.3 Operational safety

#### NOTICE

#### Operational safety

- ▶ Operate the device only if it is in proper technical condition, free from errors and faults.
- ▶ The operator is responsible for interference-free operation of the device.

#### Repair

Due to its design, the device cannot be repaired.

- ▶ However, it is possible to send the device in for examination.
- ▶ To ensure continued operational safety and reliability, use original spare parts and accessories from Endress+Hauser only.

## 2.4 Product safety

This state-of-the-art device is designed and tested in accordance with good engineering practice to meet operational safety standards. It 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.

## 2.5 IT security

The manufacturer warranty is valid only if the product is installed and used as described in the Operating Instructions. The product is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the product and associated data transfer, must be implemented by the operators themselves in line with their security standards.

# 3 Incoming acceptance and product identification

## 3.1 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.

## 3.2 Product identification

The device can be identified in the following ways:

- Nameplate specifications
- Enter the serial number from the nameplate into *Device Viewer* ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)): all the information about the device and an overview of the Technical Documentation supplied with the device are displayed.
- Enter the serial number from the nameplate into the *Endress+Hauser Operations App* or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*: all the information about the device and the technical documentation pertaining to the device is displayed.

### 3.2.1 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.

### 3.2.2 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>

## 3.3 Storage and transport


Junction box	
With head transmitter	-40 to +95 °C (-40 to +203 °F)
With DIN rail transmitter	-40 to +95 °C (-40 to +203 °F)

### 3.3.1 Humidity

Condensation according to IEC 60068-2-33:

- Head transmitter: Permitted
- DIN rail transmitter: Not permitted

Maximum relative humidity: 95% according to IEC 60068-2-30

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

Avoid the following environmental influences during storage:

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



### 3.4 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**.

## 4 Installation

### 4.1 Installation requirements

 The immersion length of the thermometer can influence the measurement accuracy. If the immersion length is too small then measurement errors are caused by heat conduction via the process connection. If installing into a pipe then the immersion length should ideally be half of the pipe diameter. →  10

- Installation options: pipes, tanks or other plant components
- Orientation: no restrictions. However, self-draining in the process must be guaranteed. If there is an opening to detect leaks at the process connection, this opening must be at the lowest possible point.

#### 4.1.1 Ambient temperature range

Ambient temperature $T_a$	-40 to +60 °C (-40 to +140 °F)
Maximum device temperature $T$	-40 to +85 °C (-40 to +185 °F)

#### 4.1.2 Climate class

As per IEC 60654-1, Class Dx

### 4.1.3 Degree of protection

- IP65/67 for housing with LED status indication
- IP69 for housing without LED status indication and with connecting cable with M12x1 coupling

### 4.1.4 Shock and vibration resistance

Endress+Hauser temperature sensors meet the requirements of IEC 60751 which specify shock and vibration resistance of 3g in the range from 10 to 500 Hz. This also applies for the quick-fastening iTHERM QuickNeck.

### 4.1.5 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. All tests were passed both with and without ongoing HART® communication.

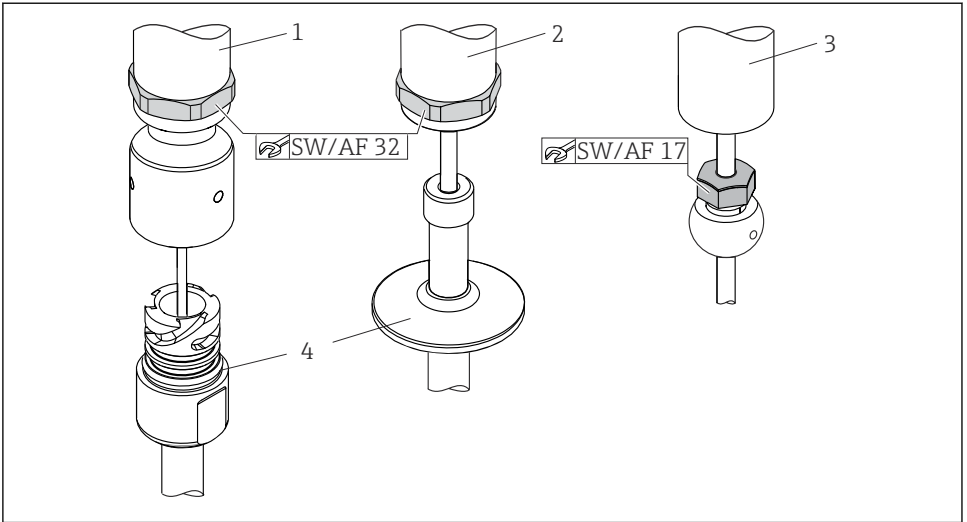
All EMC measurements were performed with a turndown (TD) = 5:1. Maximum fluctuations during EMC tests: < 1% of the measuring span.

Interference immunity according to the IEC/EN 61326 series, industrial requirements.

Interference emission according to the IEC/EN 61326, Class B equipment.

## 4.2 Installing the device

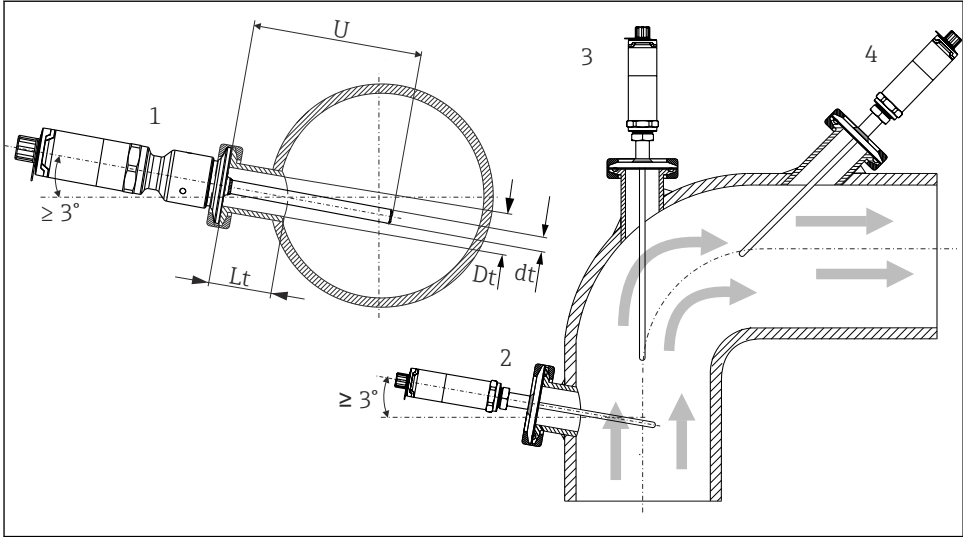
Required tools for installing in an existing thermowell: open-end wrench or socket wrench AF 32



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#### 1 Installing the compact thermometer

- 1 Installation of the iTHERM QuickNeck connection in existing thermowell with iTHERM QuickNeck bottom part: no tools required
- 2 Hexagonal head for installing in an existing thermowell for M24-, G3/8"-thread: open-end wrench AF 32
- 3 Adjustable compression fitting TK40, installation of the hexagonal screw: open-end wrench AF 17
- 4 Thermowell



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**2** Installation possibilities in the process

- 1, 2 Perpendicular to the flow direction, installed at a min. angle of  $3^\circ$  to ensure self-draining
- 3 On elbows
- 4 Inclined installation in pipes with a small nominal diameter
- U Immersion

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

Installation instructions EHEDG/cleanability:  $L_t \leq (D_t - d_t)$

Installation instructions 3-A/cleanability:  $L_t \leq 2(D_t - d_t)$

In the case of small nominal diameters, position the tip of the thermometer in such a way that it protrudes past the pipe axis into the medium. Installation at an angle (4) could be another solution. When determining the immersion length or installation depth, all the parameters of

the thermometer and of the medium to be measured must be taken into account (e.g. flow velocity, process pressure).

Maximum torque			
Thermowell version	TT411, $\phi 6$ mm (0.24 in) (1) TT411, $\phi 6$ mm (0.24 in) and extension neck TE411 (2)	TT411, $\phi 9$ mm (0.35 in) (3)	TT411, $\phi 12.7$ mm ( $\frac{1}{2}$ in) (4) TT411, $\phi 12.7$ mm ( $\frac{1}{2}$ in) and extension neck TE411 (5)
Torque M	3 to 5 Nm (2.2 to 3.7 lbf ft)	10 Nm (7.4 lbf ft)	3 to 5 Nm (2.2 to 3.7 lbf ft)



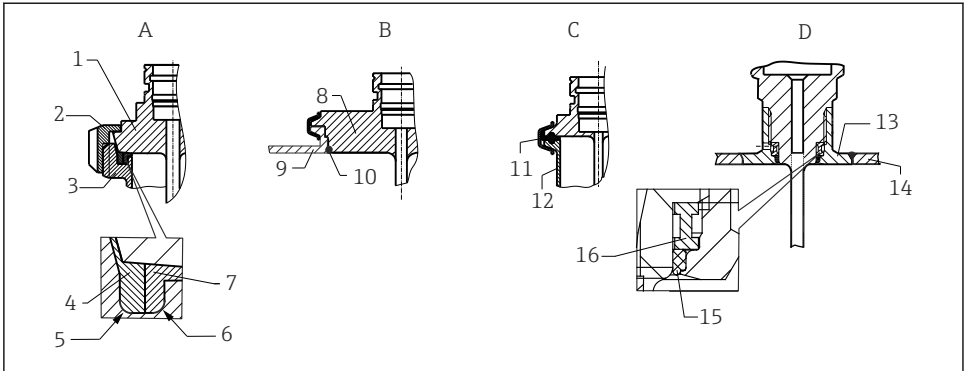
When connecting the device with the thermowell: only tighten the hexagonal wrench flat on the bottom of the housing.



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

1 Elbow thermowell for weld-in as per DIN 11865/ASME BPE



4 Detailed installation instructions for hygiene-compliant installation

- A Dairy fitting according to DIN 11851, only in conjunction with EHEDG-certified, self-centering sealing ring
- 1 Sensor with dairy fitting
  - 2 Grooved union nut
  - 3 Counterpart connection
  - 4 Centering ring
  - 5 R0.4
  - 6 R0.4
  - 7 Sealing ring
- B Varivent® process connection for VARINLINE® housing
- 8 Sensor with Varivent connection
  - 9 Counterpart connection
  - 10 O-ring
- C Clamp according to ISO 2852
- 11 Molded seal
  - 12 Counterpart connection
- D Liquiphant M GI® process connection, horizontal installation
- 13 Weld-in adapter
  - 14 Vessel wall
  - 15 O-ring
  - 16 Thrust collar

## NOTICE

The following actions must be taken if a sealing ring (O-ring) or seal fails:

- ▶ The thermometer must be removed.
- ▶ The thread and the O-ring joint/sealing surface must be cleaned.
- ▶ The sealing ring and/or the seal must be replaced.
- ▶ CIP must be performed after installation.

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

In the case of weld-in connections, exercise care when performing the welding work on the process side:

1. Use suitable welding material.
  2. Flush-weld or weld with welding radius  $\geq 3.2$  mm (0.13 in).
  3. Avoid crevices, folds and gaps.
  4. Ensure the surface is honed and polished,  $R_a \leq 0.76$   $\mu\text{m}$  (30  $\mu\text{in}$ ).
1. Install the thermometers in such a way that their cleanability is not affected. Comply with the requirements of the 3-A Sanitary Standard.
  2. The Varivent<sup>®</sup>, Liquiphant M weld-in adapters and Ingold weld-in adapters enable flush-mounted installation.

### 4.3 Post-installation check

<input type="checkbox"/>	Is the device undamaged (visual inspection)?
<input type="checkbox"/>	Is the device correctly secured?
<input type="checkbox"/>	Does the device comply with the measurement point specifications, such as ambient temperature, etc.?

## 5 Electrical connection

### 5.1 Connection requirements



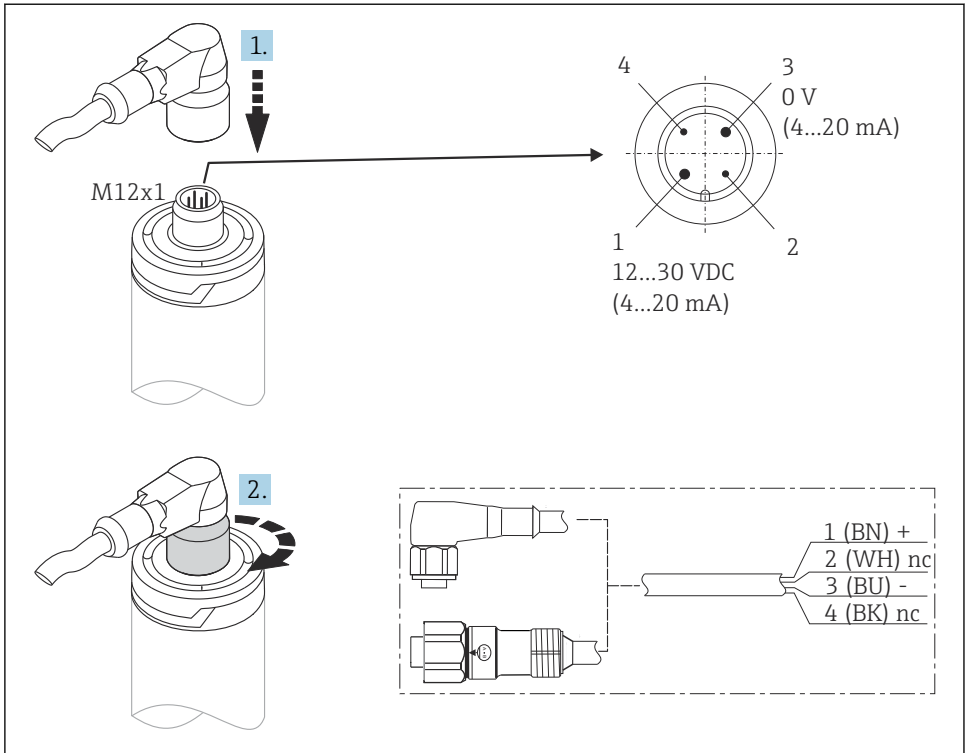
According to the 3-A Sanitary Standard and EHEDG, electrical connecting cables must be smooth, corrosion-resistant and easy to clean.

### 5.2 Connecting the device

#### NOTICE

#### To prevent damage to the device

- ▶ To prevent any kind of damage to the device electronics, leave pins 2 and 4 unconnected. They are reserved for the connection of the configuration cable.
- ▶ Do not overtighten the M12 plug as this could cause mechanical damage to the device. Tightening torque as per cable specification, typically 0.4 Nm.



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5 Cable plug M12x1 and PIN assignment of the connection socket at the device

### 5.3 Ensuring the degree of protection

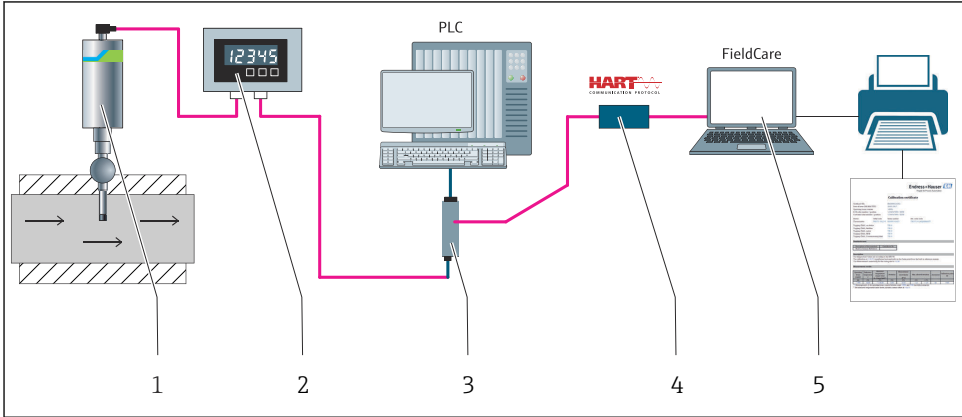
The specified degree of protection is ensured when the M12x1 cable plug is tightened according to specifications. In order to reach IP69 degree of protection, appropriate cord sets with straight or angle plugs are available as accessories.

### 5.4 Post-connection check

<input type="checkbox"/>	Are the device and cables free from damage (visual check)?
<input type="checkbox"/>	Are the mounted cables strain-relieved?
<input type="checkbox"/>	Does the supply voltage match the specifications on the nameplate?

## 6 Operation options

### 6.1 Overview of operation options



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#### 6 Operating options of the device

- 1 Installed iTHERM compact thermometer with HART communication protocol
- 2 RIA15 loop-powered process indicator: The process indicator is integrated in the current loop and displays the measuring signal or HART process variables in digital form. The process indicator does not require an external power supply. It is powered directly from the current loop.
- 3 Active barrier RN42: The active barrier is used for transmission and galvanic isolation of 4-20 mA/HART signals and supplying loop-powered transmitters. The universal power supply works with an input supply voltage of 19.2 to 253 V AC/DC, 50/60 Hz, which means that it can be used in all international power grids.
- 4 Commubox FXA195 for intrinsically safe HART communication with FieldCare via the USB interface.
- 5 FieldCare is an FDT-based plant asset management tool from Endress+Hauser; for more details, see 'Accessories' section. The acquired self-calibration data are stored in the device (1) and can be read using FieldCare. This also allows you to create and print an auditable calibration certificate.

## 6.2 Configuration of transmitter and HART® protocol

The compact thermometer is configured via the HART® protocol or CDI interface <sup>1)</sup>). The following operating tools are available for this purpose:

### Operating tools

FieldCare, DeviceCare, Field Xpert (Endress+Hauser)	SIMATIC PDM (Siemens)
AMS Device Manager (Emerson Process Management)	Field Communicator 375, 475 (Emerson Process Management)



The configuration of device-specific parameters is described in detail in the corresponding Operating Instructions.

## 7 Commissioning

### 7.1 Function check

Before commissioning the device, make sure that all final checks have been carried out:

- "Post-mounting check" checklist, → 16
- "Post-connection check" checklist, → 17

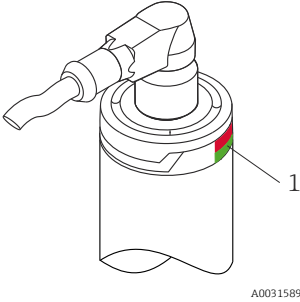
### 7.2 Switching on the device

Once the final checks have been successfully completed, it is time to switch on the supply voltage. The device performs a number of internal test functions after it is powered up. This is indicated by a red LED flashing. The device is operational after 10 seconds approx. and is in normal operating mode. The LED on the device is lit green.

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1) Endress+Hauser Common Data Interface

## 7.2.1 Display elements

Item	LEDs	Functional description
 <p data-bbox="135 616 318 667">1 LED signals indicate different functions</p> <p data-bbox="300 587 352 603">A0031589</p>	LED green (gn) Lit	Voltage supply is correct. The device is operational and the set limit values are met.
	LED green (gn) is flashing	At a frequency of 1 Hz: The device starts the self-calibration until detection has ended. At a frequency of 5 Hz for 5 s: Status OK, calibration point status OK detected.
	LED red (rd) and green (gn) are flashing alternately	At a frequency of 5 Hz: Status OK, calibration point status BAD detected.
	LED red (rd) is flashing	At a frequency of 1 Hz: It signals a diagnostic event (Warning). The device continues to measure. A diagnostic message is generated for the monitoring system.
	LED red (rd) is lit	It signals a diagnostic event (Alarm). Measurement is interrupted. The signal outputs take on the defined alarm condition. A diagnostic message is generated for the monitoring system.



For detailed information, refer to Operating Instructions BA01581T.









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