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71599728
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Brief Operating Instructions
L20221, L20222

Temperature transmitter
L20221 with 4-20 mA analog output
L20222 with HART® communication

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

Detailed information can be found in the Operating Instructions and the additional documentation.

Table of contents

1 About this document

1.1 Document function

The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

1.2 Safety instructions

When using in hazardous areas, compliance with national regulations is mandatory. Separate Ex-specific documentation is provided for measuring systems that are used in hazardous areas. This documentation is an integral part of these Operating Instructions. The installation specifications, connection data and safety instructions it contains must be strictly observed! Make sure that you use the right Ex-specific documentation for the right device with approval for use in hazardous areas!

1.3 Symbols used

1.3.1 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 dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

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

NOTICE
This symbol contains information on procedures and other facts which do not result in personal injury.

1.3.2 Electrical symbols

Symbol	Meaning	Symbol	Meaning
⎓	Direct current	~	Alternating current
⎓ ~	Direct current and alternating current	⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

Symbol	Meaning
⏚	**Potential equalization connection (PE: protective earth)** 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: ▪ Interior ground terminal: potential equalization is connected to the supply network. ▪ Exterior ground terminal: device is connected to the plant grounding system.

1.3.3 Symbols for certain types of information

Symbol	Meaning	Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.		**Preferred** Procedures, processes or actions that are preferred.
	**Forbidden** Procedures, processes or actions that are forbidden.		**Tip** Indicates additional information.
	Reference to documentation		Reference to page
	Reference to graphic	1., 2., 3...	Series of steps
	Result of a step		Visual inspection

1.3.4 Symbols in graphics

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

1.4 Tool symbols

Symbol	Meaning
 A0011219	Phillips head screwdriver

1.5 Registered trademarks

Bluetooth®
The *Bluetooth*® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks is under license. Other trademarks and trade names are those of their respective owners.

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

2 Basic 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
- They must have read and understood the instructions in the manual, supplementary documentation and certificates (depending on the application) prior to starting work
- Follow instructions and comply with basic conditions

The operating personnel must fulfill the following requirements:
- Must be suitably trained and authorized by the plant operator to meet the requirements of the task
- Follow the instructions in this manual

2.2 Intended use

The device is a universal and user-configurable temperature transmitter with one sensor input for resistance thermometers (RTD), thermocouples (TC), resistance and voltage transmitters. The head transmitter version of the device is intended for mounting in a terminal head (flat face) as per DIN EN 50446. It is also possible to mount the device on a DIN rail using the optional DIN rail clip. The device is also optionally available in a version suitable for DIN rail mounting as per IEC 60715 (TH35).

If the device is used in a manner not specified by the manufacturer, the protection provided by the device may be impaired.

The manufacturer is not liable for damage caused by improper or non-intended use.

2.3 Operational safety

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

Hazardous area

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection or safety equipment):
- 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 transmitter housing.
- Observe the specifications in the separate supplementary documentation that is an integral part of these instructions.

Electromagnetic compatibility

The measuring system complies with the general safety requirements as per EN 61010-1, the EMC requirements as per the IEC/EN 61326 series and the NAMUR recommendations NE 21.

NOTICE

- The device must only be powered by a power unit that operates using an energy-limited electric circuit according to UL/EN/IEC 61010-1, Section 9.4 and the requirements in Table 18.

3 Incoming acceptance and product identification

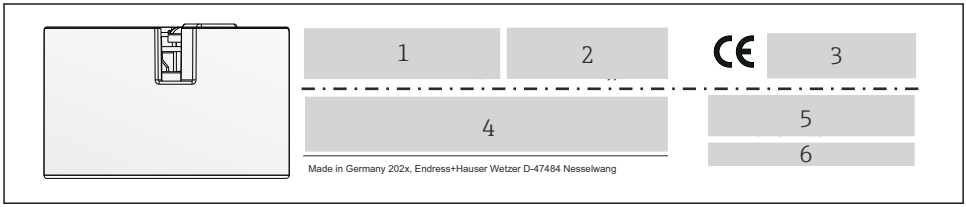
3.1 Incoming acceptance

1. Unpack the temperature transmitter carefully. Is the packaging or content free from damage?
   - ↳ Damaged components must not be installed as the manufacturer can otherwise not guarantee compliance with the original safety requirements or the material resistance, and can therefore not be held responsible for any resulting damage.
2. Is the delivery complete or is anything missing? Check the scope of delivery against your order.
3. Does the nameplate match the ordering information on the delivery note?
4. Are the technical documentation and all other necessary documents provided? If applicable: are the Safety Instructions (e.g. XA) for hazardous areas provided?

3.2 Nameplate

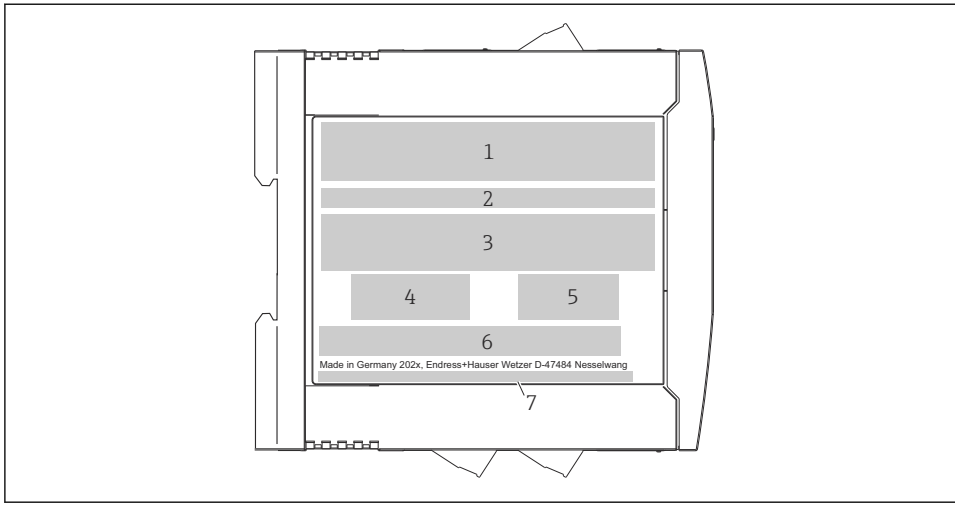
The right device?

Compare and check the data on the nameplate of the device against the requirements of the measuring point:



1 Nameplate of the head transmitter (example)

1 *Power supply, current consumption, serial number, device revision and hardware version*
2 *Radio approval (Bluetooth) and serial number*
3 *Approvals with symbols*
4 *Approval data and order code*
5 *Device name*
6 *Characters for tag name (TAG)*



2 Nameplate of DIN rail transmitter (example)

1 Device name
2 Characters for tag name (TAG)
3 Approval data
4 Power supply and current consumption, output
5 Radio approval (Bluetooth)
6 Approvals with symbols
7 Serial number, device revision, order code

3.3 Name and address of manufacturer

Name of manufacturer:	Endress+Hauser Wetzer GmbH + Co. KG
Address of manufacturer:	Obere Wank 1, D-87484 Nesselwang

3.4 Scope of delivery

The scope of delivery of the device comprises:
- Temperature transmitter
- Mounting material (optional for head transmitter)
- Printed copy of the Brief Operating Instructions in English
- Additional documentation for devices which are suitable for use in the hazardous area (ATEX, FM, CSA).

3.5 Certificates and approvals

The device left the factory in a safe operating condition. The device complies with the requirements of the standards EN 61010-1 "Safety Requirements for Electrical Equipment for

Measurement, Control, and Laboratory Use" and with the EMC requirements as per the IEC/EN 61326 series.

3.5.1 CE/EAC mark, Declaration of Conformity

The device meets the legal requirements of the EU/EEU guidelines. The manufacturer confirms that the device is compliant with the relevant guidelines by applying the CE/EAC mark.

3.5.2 HART® protocol certification

The temperature transmitter is registered by the HART® FieldComm Group. The device meets the requirements of the HART® Communication Protocol Specifications, Revision 7 (HCF 7.6).

3.6 Storage and transport

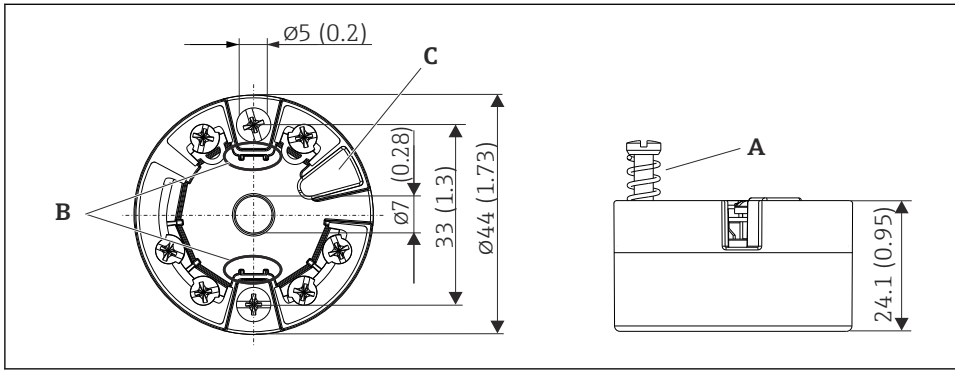
Storage temperature
- Head transmitter: −50 to +100 °C (−58 to +212 °F)
- DIN rail device: −50 to +100 °C (−58 to +212 °F)
- Humidity: (device-specific): max. rel. humidity: 95 % as per IEC 60068-2-30

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.

4 Mounting

4.1 Mounting requirements

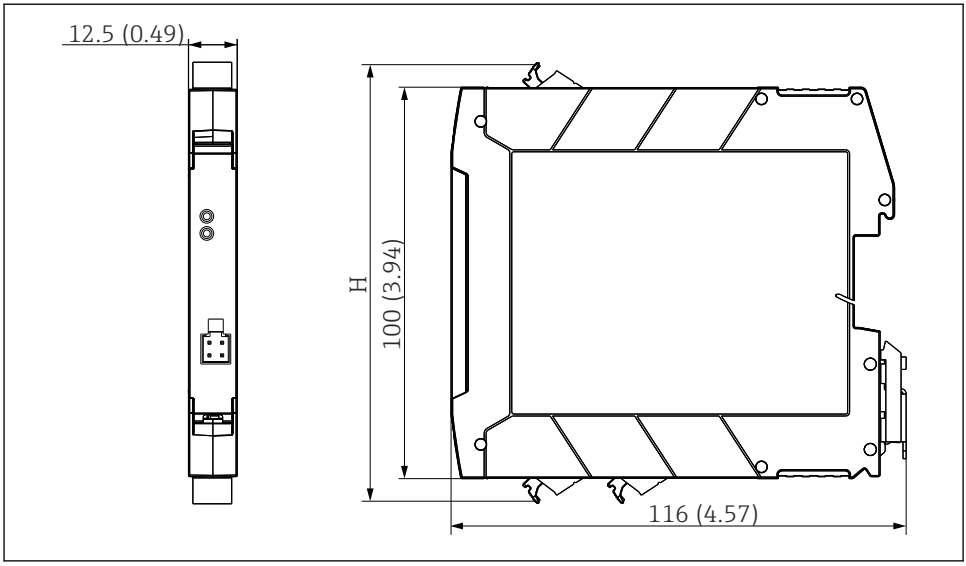
4.1.1 Dimensions



3 Head transmitter version with screw terminals. Dimensions in mm (in)

A Spring travel L ≥ 5 mm (not for US - M4 securing screws)
B Mounting elements for attachable measured value display
C Interface for contacting measured value display

The same dimensions apply to the version with push-in terminals. Exception: housing height H = 30 mm (1.18 in).



H The height of housing H varies depending on the terminal version: screw terminals = 114 mm (4.49 in), push-in terminals = 111.5 mm (4.39 in)

4.1.2 Mounting location

- Head transmitter:
  - In the terminal head, flat face, as per DIN EN 50446, direct mounting on insert with cable entry (middle hole 7 mm)
  - In the field housing, separated from the process
  - With DIN rail clip on DIN rail as per IEC 60715, TH35
- DIN rail transmitter:
  In DIN rail housing on DIN rail as per IEC 60715, TH35

NOTICE

When using a DIN rail transmitter with a thermocouple/mV measurement, increased measurement deviations may occur depending on the installation situation and ambient conditions.

▶ If the DIN rail transmitter is mounted on the DIN rail without any adjacent devices, this may result in deviations of up to ± 1.34 °C. If the DIN rail transmitter is mounted in series between other DIN rail devices (reference operating conditions: 24 V, 12 mA), deviations of up to + 2.94 °C may occur.

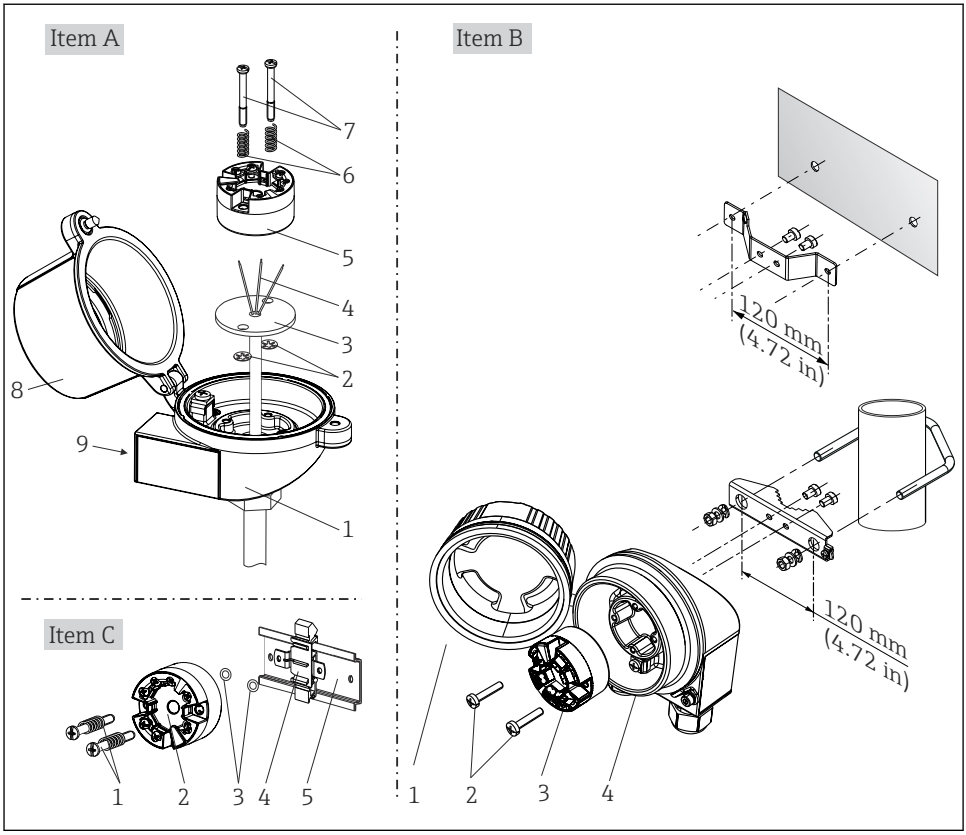
4.1.3 Important ambient conditions

- Ambient temperature: −40 to +85 °C (−40 to 185 °F).
- Head transmitter in accordance with climate class C1, DIN rail transmitter in accordance with B2 as per EN 60654-1
- Condensation as per IEC 60068-2-33 permitted for head transmitter, not permitted for DIN rail transmitter
- Max. rel. humidity: 95% as per IEC 60068-2-30
- Degree of protection:
  - Head transmitter with screw terminals: IP 20, with push-in terminals: IP 30. When the device is installed, the degree of protection depends on the terminal head or field housing used.
  - DIN rail device: IP 20

4.2 Mounting the device

A Phillips head screwdriver is required to mount the head transmitter:
- Maximum torque for securing screws = 1 Nm (¾ foot-pound), screwdriver: Pozidriv Z2
- Maximum torque for screw terminals = 0.35 Nm (¼ foot-pound), screwdriver: Pozidriv Z1

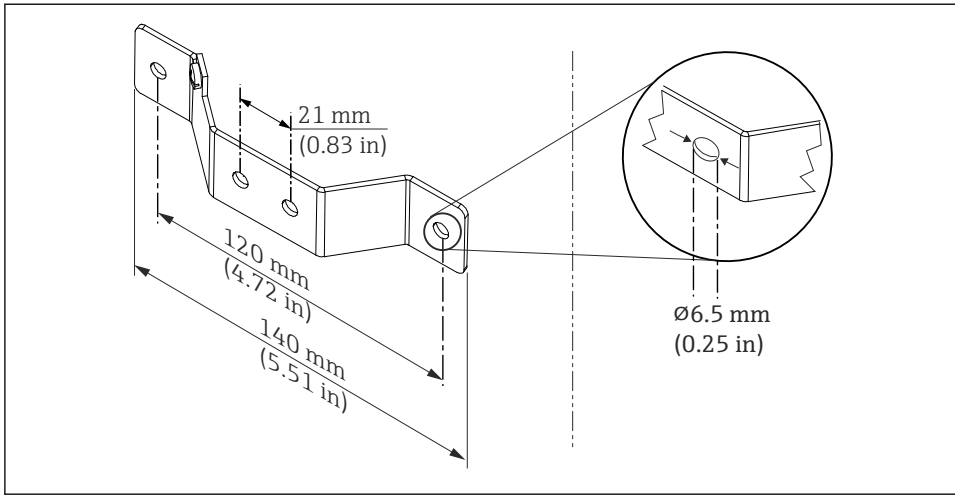
4.2.1 Mounting the head transmitter



4 Head transmitter mounting (three versions)

Procedure for mounting in a terminal head, Fig. A:

1. Open the terminal head cover (8) on the terminal head.
2. Guide the connection wires (4) of the insert (3) through the center hole in the head transmitter (5).
3. Fit the mounting springs (6) on the mounting screws (7).
4. Guide the mounting screws (7) through the side boreholes of the head transmitter and the insert (3). Then fix both mounting screws with the snap rings (2).
5. Then tighten the head transmitter (5) along with the insert (3) in the terminal head.
6. After wiring → 15, close the terminal head cover (8) tightly again.



5 Dimensions of angle bracket for wall mount (complete wall mounting set available as accessory)

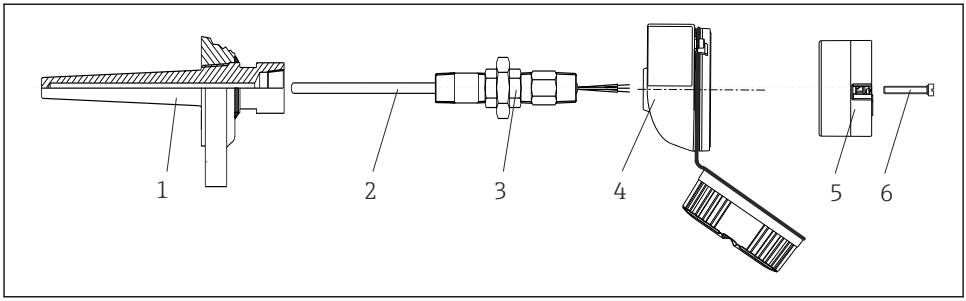
Procedure for mounting in a field housing, Fig. B:

1. Open the cover (1) of the field housing (4).
2. Guide the mounting screws (2) through the lateral bores in the head transmitter (3).
3. Screw the head transmitter to the field housing.
4. After wiring → 15, close the field housing cover (1) again.

Procedure for mounting on a DIN rail, Fig. C:

1. Press the DIN rail clip (4) onto the DIN rail (5) until it engages with a click.
2. Fit the mounting springs on the mounting screws (1) and guide the screws through the side boreholes of the head transmitter (2). Then fix both mounting screws with the snap rings (3).
3. Screw the head transmitter (2) onto the DIN rail clip (4).

Mounting typical of North America



6 Head transmitter mounting

Thermometer design with thermocouples or RTD sensors and head transmitter:

1. Fit the thermowell (1) on the process pipe or the container wall. Secure the thermowell according to the instructions before the process pressure is applied.
2. Fit the necessary neck tube nipples and adapter (3) on the thermowell.
3. Make sure sealing rings are installed if such rings are needed for harsh environmental conditions or special regulations.
4. Guide the mounting screws (6) through the lateral bores of the head transmitter (5).
5. Position the head transmitter (5) in the terminal head (4) in such a way that the bus cable (terminals 1 and 2) point to the cable entry.
6. Using a screwdriver, screw down the head transmitter (5) in the terminal head (4).
7. Guide the connection wires of the insert (3) through the lower cable entry of the terminal head (4) and through the middle hole in the head transmitter (5). Wire the connection wires up to the transmitter → 17.
8. Screw the terminal head (4), with the integrated and wired head transmitter, onto the ready-mounted nipple and adapter (3).

NOTICE

The terminal head cover must be secured properly to meet the requirements for explosion protection.

► After wiring, securely screw the terminal head cover back on.

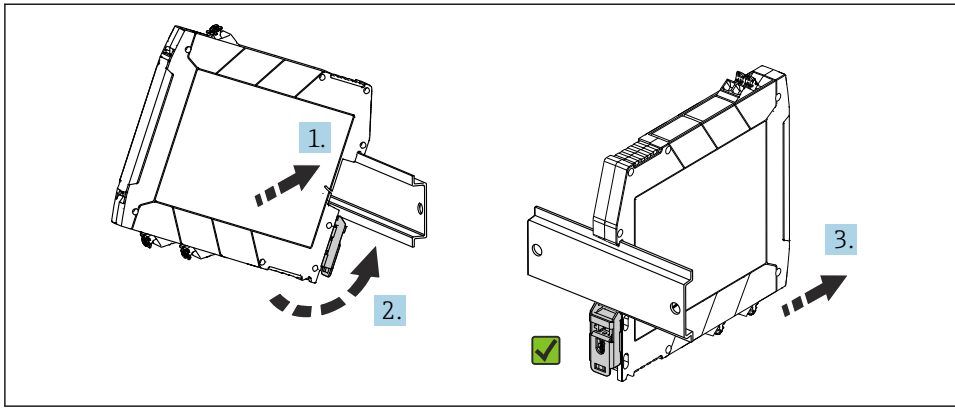
4.2.2 Mounting the DIN rail transmitter

NOTICE

Wrong orientation

Measurement deviates from the maximum accuracy rating when a thermocouple is connected and the internal reference junction is used.

► Mount the device vertically and ensure it is oriented correctly!



7 *Mounting the DIN rail transmitter*

1. Position the top DIN rail groove at the top end of the DIN rail.
2. Slide the bottom of the device over the bottom end of the DIN rail until you can hear the lower DIN rail clip click into place on the DIN rail.
3. Pull gently on the device to check if it is correctly mounted on the DIN rail.

If it doesn't move, the DIN rail transmitter is correctly mounted.

4.3 Post-installation check

After installing the device, run the following final checks:

Device condition and specifications	Notes
Is the device undamaged (visual inspection)?	-
Do the ambient conditions match the device specification (e.g. ambient temperature, measuring range, etc.)?	→ 11

5 Electrical connection

CAUTION

- Switch off the power supply before installing or connecting the device. Failure to observe this may result in the destruction of parts of the electronics.
- Do not occupy the display connection. An incorrect connection can destroy the electronics.

NOTICE

Do not overtighten the screw terminals, as this could damage the transmitter.

- Maximum tightening torque = 1 Nm (¾ lbf ft).

5.1 Connecting requirements

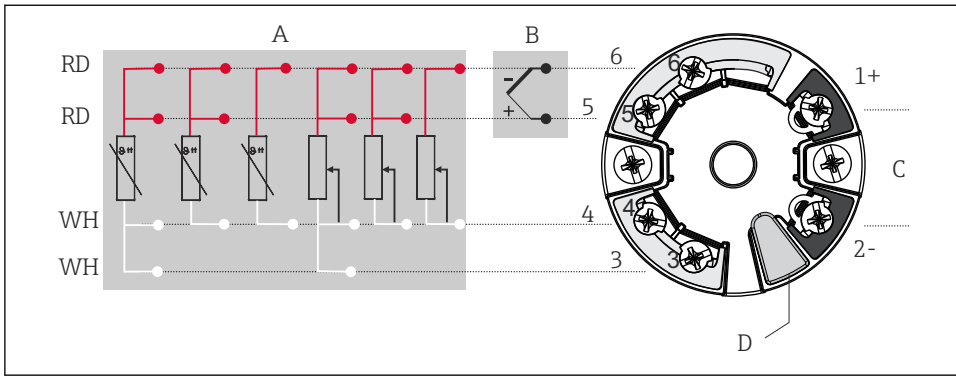
A Phillips head screwdriver is required to wire the head transmitter with screw terminals. Use a flat blade screwdriver for the DIN rail housing version with screw terminals. The push-in terminal version can be wired without any tools.

Proceed as follows to wire a head transmitter mounted in the terminal head or field housing:

1. Open the cable gland and the housing cover on the terminal head or the field housing.
2. Feed the cables through the opening in the cable gland.
3. Connect the cables as shown in → 17. If the head transmitter is fitted with push-in terminals, pay particular attention to the information in the "Connecting to push-in terminals" section. → 18
4. Tighten the cable gland again and close the housing cover.

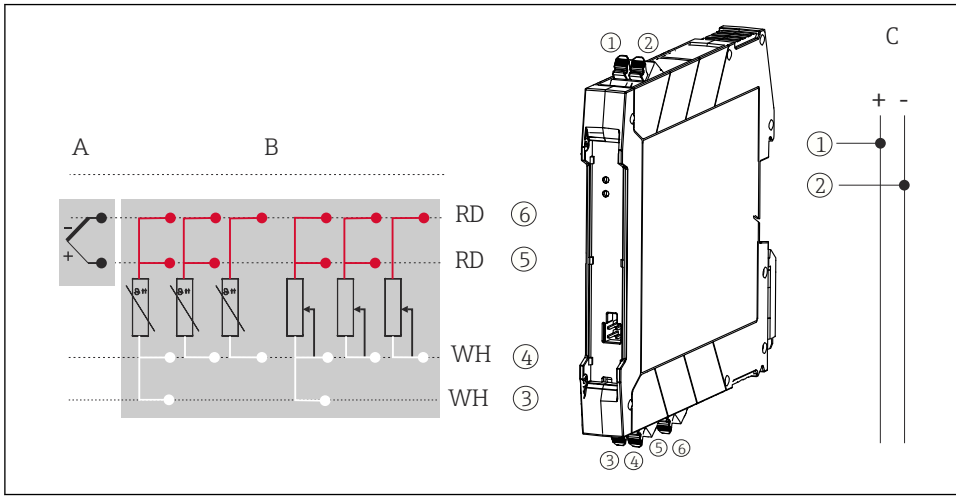
In order to avoid connection errors always follow the instructions in the post-connection check section before commissioning!

5.2 Quick wiring guide



8 *Assignment of terminal connections for head transmitter*

A Sensor input, RTD and Ω, 4-, 3- and 2-wire
B Sensor input, TC and mV
C Bus terminator and power supply
D Display connection and CDI interface



9 *Assignment of terminal connections for DIN rail transmitter*

A Sensor input, TC and mV
B Sensor input, RTD and Ω, 4-, 3- and 2-wire
C Power supply 4 to 20 mA

A minimum load of 250 Ω is required in the signal circuit in order to operate the HART® transmitter via the HART® protocol (terminals 1 and 2).

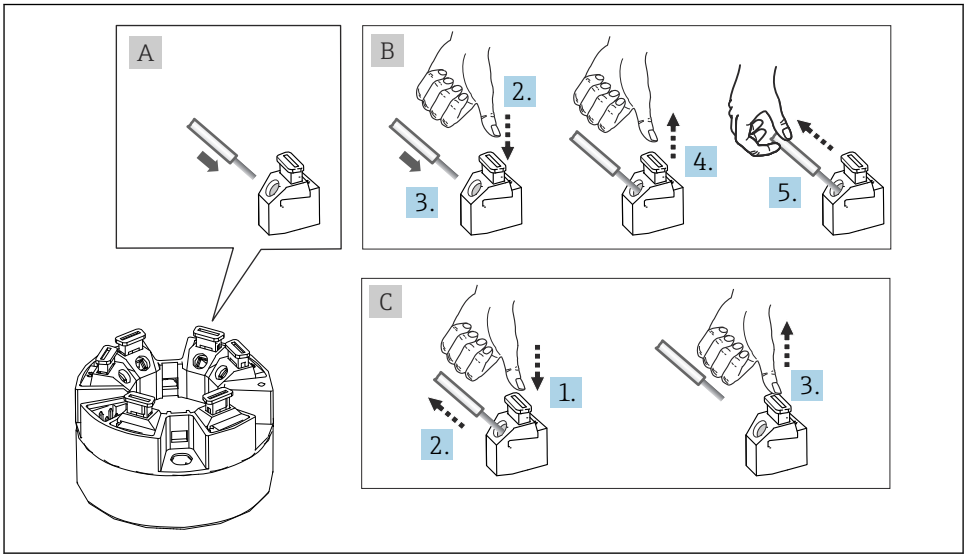
In the case of a thermocouple (TC) measurement, a 2-wire RTD can be connected to measure the reference junction temperature. This is connected to terminals 4 and 6.

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.

5.3 Connecting the sensor cables

5.3.1 Connecting to push-in terminals



10 Push-in terminal connection, using the example of a head transmitter

Fig. A, solid wire:

1. Strip wire end. Minimum 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 starting from step 1 if necessary.

Fig. B, fine-strand wire without ferrule:

1. Strip wire end. Minimum 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 starting from step 1 if necessary.

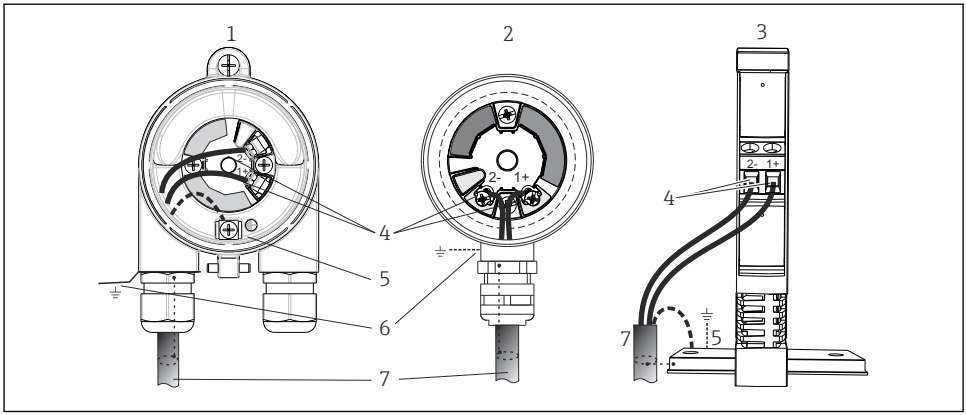
Fig. C, releasing the connection:

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

5.4 Connecting the transmitter

Cable specification
- A normal device cable suffices if only the analog signal is used.
- For the DIN rail version, a shielded cable must be used as of a sensor cable length of 30 m (98.4 ft). The use of shielded sensor cables is generally recommended.

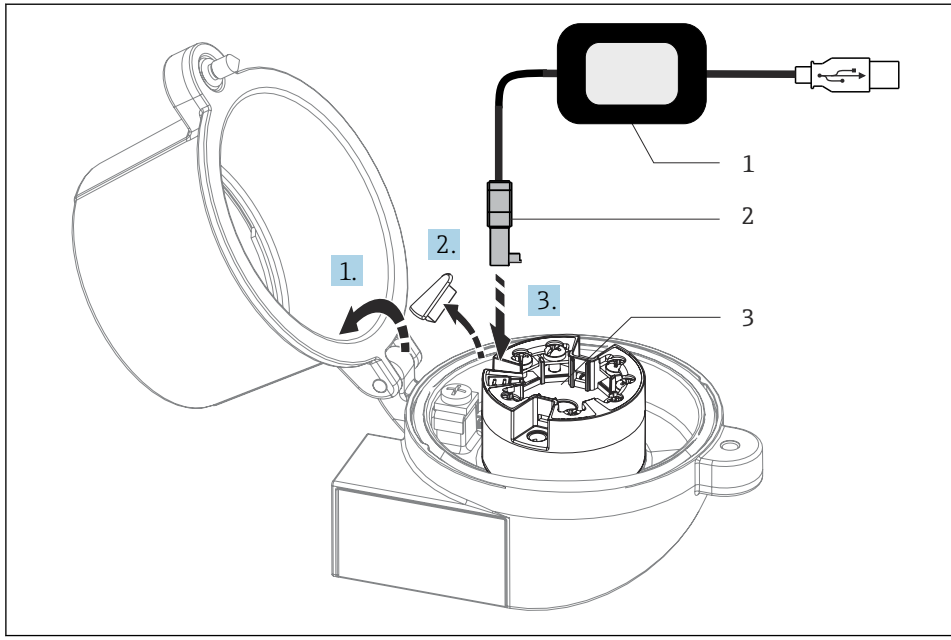
Also observe the general procedure on → 16.



11 Connecting the signal cables and power supply

1 Head transmitter installed in field housing
2 Head transmitter installed in terminal head
3 DIN rail transmitter mounted on DIN rail
4 Terminals for power supply
5 Internal ground connection
6 External ground connection
7 Shielded signal cable

- The terminals for the power supply (1+ and 2-) are protected against reverse polarity.
- Conductor cross-section:
  - Max. 2.5 mm^2 for screw terminals
  - Max. 1.5 mm^2 for push-in terminals. Stripping length of wire at least 10 mm (0.39 in).



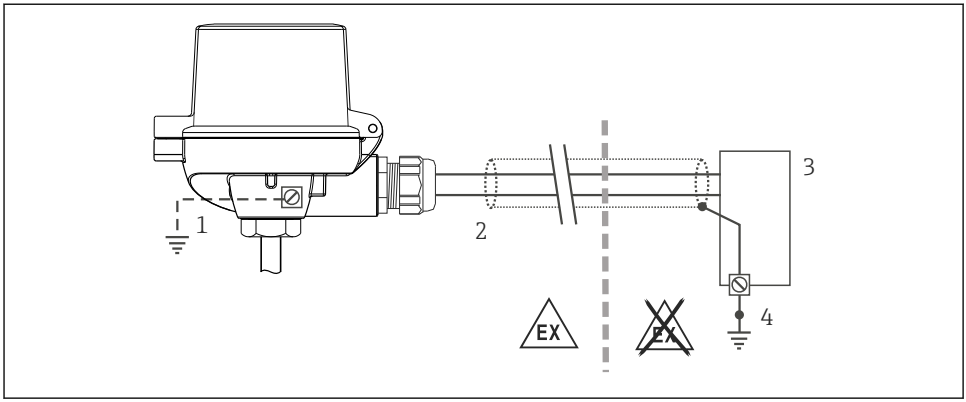
12 Fitting the CDI connector of the configuration kit for configuration, visualization and maintenance of the head transmitter via PC and configuration software

1 Configuration kit with USB port
2 CDI connector
3 Installed head transmitter with CDI interface

5.5 Special connection instructions

Shielding and grounding

The specifications of the HART® FieldComm Group must be observed when installing a HART® transmitter.



13 Shielding and grounding the signal cable at one end with HART® communication

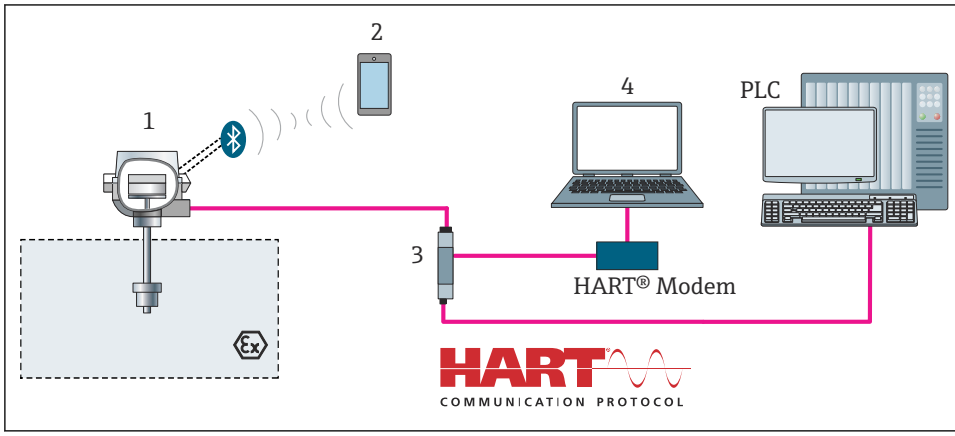
1 Optional grounding of the field device, isolated from cable shielding
2 Grounding of the cable shield at one end
3 Supply unit
4 Grounding point for HART® communication cable shield

5.6 Post-connection check

Device condition and specifications	Notes
Is the device or cable undamaged (visual check)?	--
Electrical connection	**Notes**
Does the supply voltage match the specifications on the nameplate?	▪ Head transmitter: U = 10 to 36 V_{DC} ▪ DIN rail transmitter: U = 11 to 36 V_{DC} ▪ Other values apply in the hazardous area, see the corresponding Ex Safety Instructions.
Are the mounted cables relieved of tension?	--
Are the power supply and signal cables connected correctly?	→ 17
Are all the screw terminals firmly tightened and have the push-in terminal connections been checked?	--
Are all the cable entries mounted, tightened and leak-tight?	--
Are all housing covers installed and firmly tightened?	--

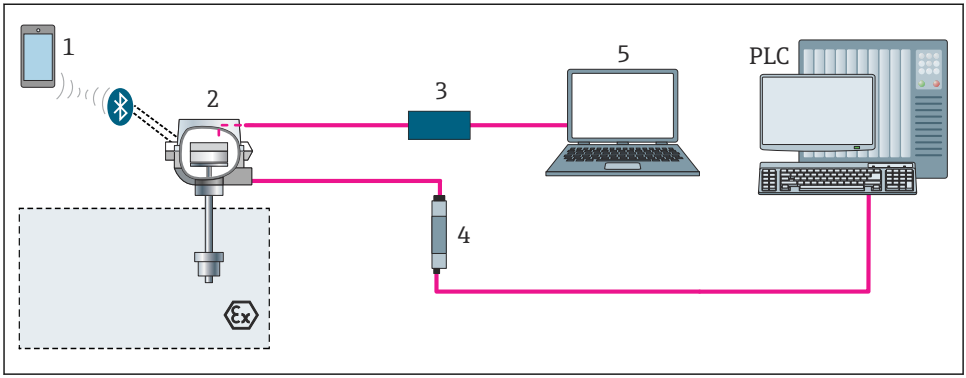
6 Operation options

6.1 Overview of operation options



14 *Operation options for the transmitter via HART® communication*

1 *Transmitter*
2 *Operation via Bluetooth®*
3 *Active barrier*
4 *Configuration software*



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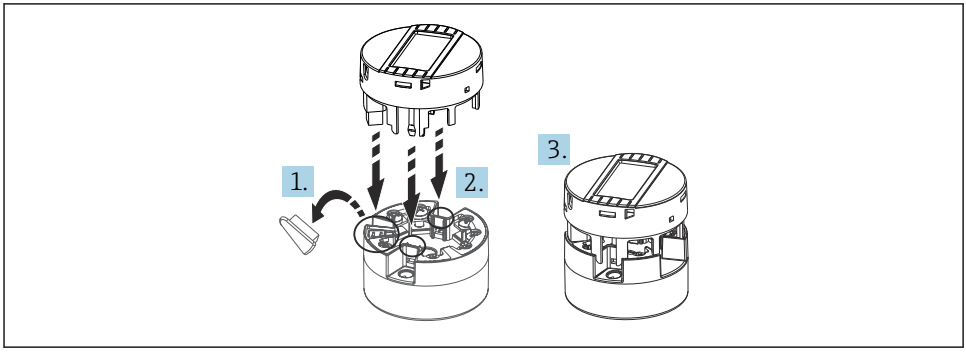
15 *Operation options for the transmitter via the CDI interface*

1 *Operation via Bluetooth®*
2 *Transmitter*
3 *Configuration kit*
4 *Active barrier*
5 *Configuration software*

The transmitter's optional Bluetooth interface is only active if a display unit is not attached or the CDI interface is not used for device configuration.

6.1.1 Measured value display and operating elements

Option: display with transmitter



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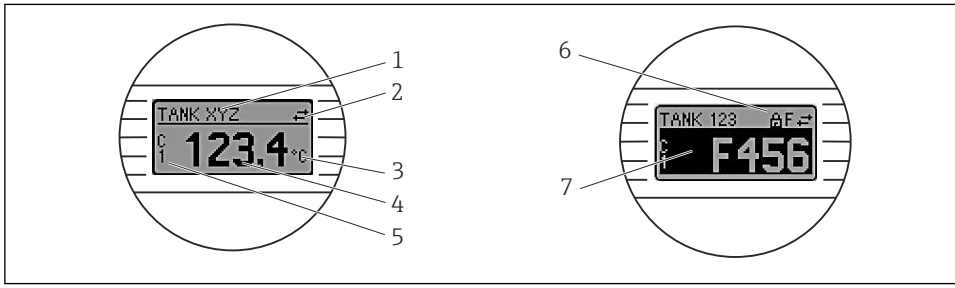
16 *Attach the display to the transmitter*

Display elements

Head transmitter



17 *Optional LC display for head transmitter*

Item no.	Function	Description
1	Displays the TAG	TAG, 32 characters long.
2	'Communication' symbol	The communication symbol appears when read and write-accessing via the fieldbus protocol.
3	Unit display	Unit display for the measured value displayed.
4	Measured value display	Displays the current measured value.
5	Value/channel display DT, PV, I, %	e.g. PV for a measured value from channel 1 or DT for the device temperature
6	'Configuration locked' symbol	The 'configuration locked' symbol appears when configuration is locked via the hardware.
7	Status signals	

DIN rail transmitter

Two LEDs on the front indicate the device status.

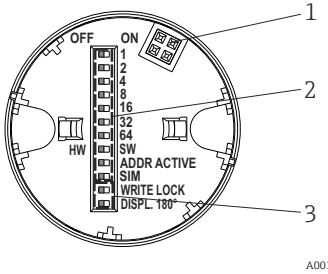
Type	Function and characteristic
Status LED (red)	When the device is operating without errors, the device status is displayed. This function can no longer be guaranteed in the event of an error. ▪ LED off: without diagnostic message ▪ LED is lit: diagnostic display, category F ▪ LED flashing: diagnostic display, categories C, S or M
Power LED (green) 'ON'	When the device is operating without errors, the operating status is displayed. This function can no longer be guaranteed in the event of an error. ▪ LED off: Power failure or insufficient supply voltage ▪ LED is lit: Supply voltage is OK (either via CDI or via supply voltage, terminals 1+, 2-)

The DIN rail transmitter version does not have an interface to the LC display and therefore does not have a local display either.

Local operation

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.



18 *Hardware settings via DIP switches*

1: Connection to head transmitter

2: DIP switches (1 - 64, SW/HW, ADDR and SIM = simulation mode) have **no function** for this head transmitter

3: DIP switch (WRITE LOCK = write protection; DISPL. 180° = switch, turn the display monitor 180°)

Procedure for setting the DIP switch:

1. Open the cover of the terminal head or field housing.
2. Remove the attached display from the head transmitter.
3. Configure the DIP switch on the rear of the display accordingly. In general: switch to ON = function enabled, switch to OFF = function disabled.
4. Fit the display onto the head transmitter in the correct position. The head transmitter accepts the settings within one second.
5. Secure the cover back onto the terminal head or field housing.

Switching write protection on/off

Write protection is switched on and off via a DIP switch on the rear of the optional attachable display. When write protection is active, parameters cannot be modified. A lock symbol on the display indicates that write protection is on. Write protection prevents any write access to the parameters. Write protection remains active even when the display is removed. To deactivate write protection, the display must be attached to the transmitter with the DIP switch switched off (WRITE LOCK = OFF). The transmitter adopts the setting during operation and does not need to be restarted.

Turning the display

The display can be rotated 180° using the "DISPL. 180°" DIP switch.

6.2 Transmitter configuration

The transmitter is configured via the CDI (= Common Data Interface). The Field Device Configurator (FDC) tool is provided for this purpose. The FDC Tool is a configuration tool that is available free of charge. The devices can be connected directly via a modem (point-to-point). The tool is fast, easy and intuitive to use. It can run on a PC, laptop or tablet with a Windows operating system.

For more information, please contact your supplier.

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

6.3 Access to the operating menu via the Wireless Field Device Configurator App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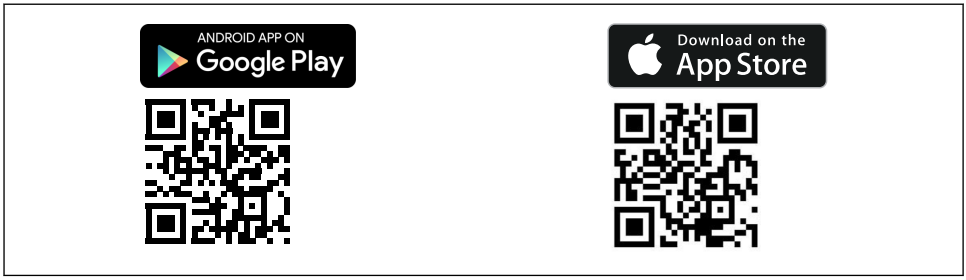
The device, which is equipped with optional Bluetooth communication electronics, can be operated and configured via the Wireless Field Device Configurator (FDC) app. The connection is established via the Bluetooth® interface.

The FDC app is available for free download for Android devices (Google Playstore) and iOS devices (iTunes Apple Shop): *Field Device Configurator*

Directly to the app with the QR code:



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Download the FDC app:

1. Install and start the FDC app.
   ↳ A Live List shows all the devices available.
2. Select the device from the Live List.
   ↳ The Login dialog box opens.

Logging in:

3. Enter the user name: **admin**
4. Enter the initial password: serial number of the device.
5. Confirm your entry.
   ↳ The device information opens.

The transmitter's optional Bluetooth interface is only active if a display unit is not attached or the CDI interface is not used for device configuration.

7 Commissioning

7.1 Post-installation check

Before commissioning the measuring point make sure that all final checks have been carried out:
- "Post-installation check" checklist → 15
- "Post-connection check" checklist→ 22

7.2 Switching on the transmitter

Once you have completed the post-connection checks, switch on the supply voltage. The transmitter performs a number of internal test functions after power-up. During this process, a sequence containing device information appears on the display.

The device works after approx. 7 seconds, including the attached display. Normal measuring mode commences as soon as the switch-on procedure is completed. Measured values and status values appear on the display.

If the display is attached when the Bluetooth interface is activated, display initialization is performed twice and Bluetooth communication is disabled simultaneously.


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