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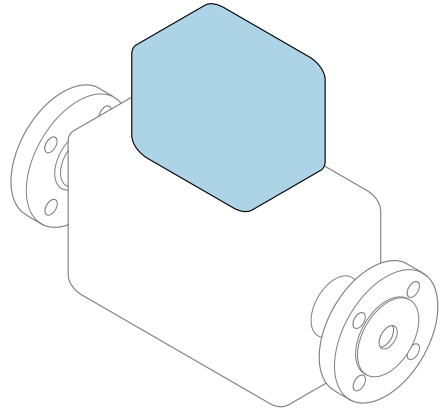
71528710
2021-07-01

Brief Operating Instructions
Proline 500 – digital Modbus RS485

Transmitter with thermal mass flow sensor

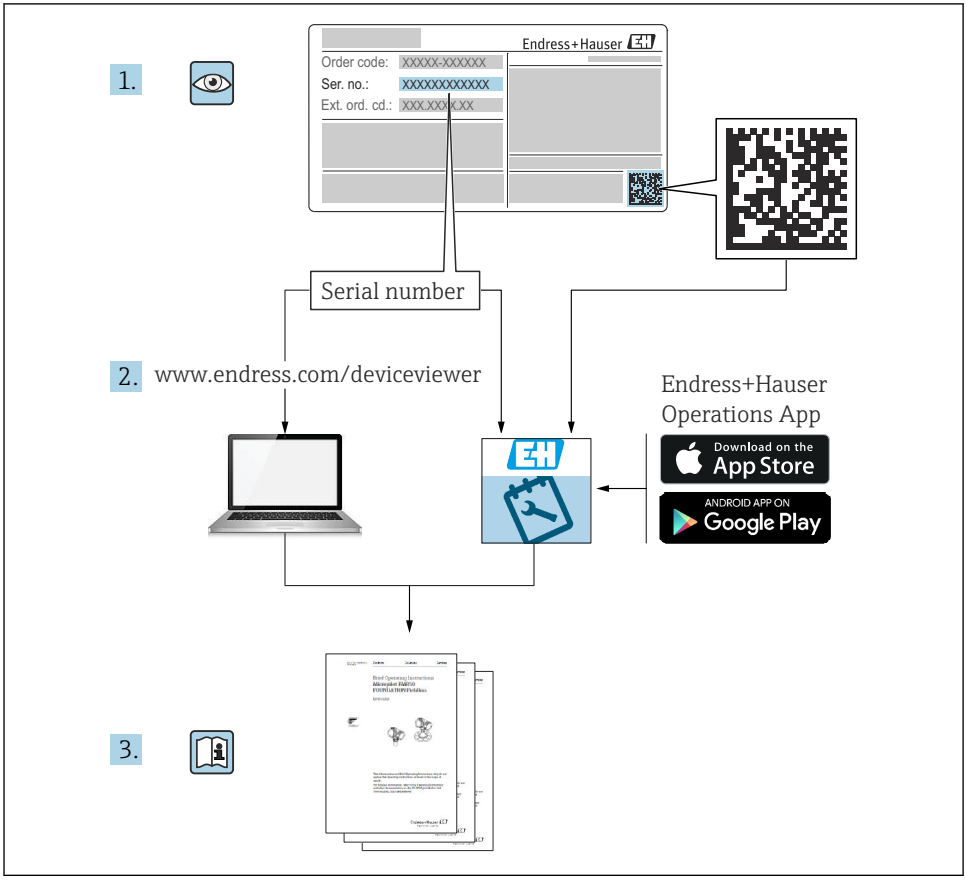


These instructions are Brief Operating Instructions; they are **not** a substitute for the Operating Instructions pertaining to the device.

Brief Operating Instructions part 2 of 2: Transmitter
Contain information about the transmitter.

Brief Operating Instructions part 1 of 2: Sensor → 3

Endress+Hauser
People for Process Automation


1.
Endress+Hauser
Order code: XXXXX-XXXXXX
Ser. no.: XXXXXXXXXXXX
Ext. ord. cd.: XXX.XXX-XXX
Serial number
2.
www.endress.com/deviceviewer
Endress+Hauser
Operations App
Download on the App Store
ANDROID APP ON Google Play
3.

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Brief Operating Instructions for flowmeter

The device consists of a transmitter and a sensor.

The process of commissioning these two components is described in two separate manuals that together form the Brief Operating Instructions for the flowmeter:
- Brief Operating Instructions Part 1: Sensor
- Brief Operating Instructions Part 2: Transmitter

Please refer to both parts of the Brief Operating Instructions when commissioning the device, as the contents of the manuals complement one another:

Brief Operating Instructions Part 1: Sensor
The Sensor Brief Operating Instructions are aimed at specialists with responsibility for installing the measuring device.
- Incoming acceptance and product identification
- Storage and transport
- Installation

Brief Operating Instructions Part 2: Transmitter
The Transmitter Brief Operating Instructions are aimed at specialists with responsibility for commissioning, configuring and parameterizing the measuring device (until the first measured value).
- Product description
- Installation
- Electrical connection
- Operation options
- System integration
- Commissioning
- Diagnostic information

Additional device documentation

These Brief Operating Instructions are **Brief Operating Instructions Part 2: Transmitter**.

The "Brief Operating Instructions Part 1: Sensor" are available via:
- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: *Endress+Hauser Operations App*

Detailed information about the device can be found in the Operating Instructions and the other documentation:
- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: *Endress+Hauser Operations App*

Table of contents

1 About this document

1.1 Symbols used

1.1.1 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.

1.1.2 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

1.1.3 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
	**Protective Earth (PE)** A terminal which must be connected to ground prior to establishing any other connections. The ground terminals are situated inside and outside the device: ▪ Inner ground terminal: Connects the protectiv earth to the mains supply. ▪ Outer ground terminal: Connects the device to the plant grounding system.

1.1.4 Communication symbols

Symbol	Meaning	Symbol	Meaning
	**Wireless Local Area Network (WLAN)** Communication via a wireless, local network.		**Bluetooth** Wireless data transmission between devices over a short distance.
	Promag 800 **Cellular radio** Bidirectional data exchange via cellular network.		**LED** Light emitting diode is off.
	**LED** Light emitting diode is on.		**LED** Light emitting diode is flashing.

1.1.5 Tool symbols

Symbol	Meaning	Symbol	Meaning
	Torx screwdriver		Flat blade screwdriver
	Cross-head screwdriver		Allen key
	Open-ended wrench		

1.1.6 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)
	Flow direction		

2 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 Designated use

Application and media
The measuring device described in this manual is intended only for the flow measurement of gases.

Depending on the version ordered, the measuring device can also measure potentially explosive, flammable, poisonous and oxidizing media.

Measuring devices for use in hazardous areas or where there is an increased risk due to process pressure, are labeled accordingly on the nameplate.

To ensure that the measuring device remains in proper condition for the operation time:
- Keep within the specified pressure and temperature range.
- Only use the measuring device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area (e.g. explosion protection, pressure vessel safety).
- Use the measuring device only for media to which the process-wetted materials are sufficiently resistant.
- If the ambient temperature of the measuring device is outside the atmospheric temperature, it is absolutely essential to comply with the relevant basic conditions as specified in the device documentation.
- Protect the measuring device permanently against corrosion from environmental influences.

Incorrect use
Non-designated use can compromise safety. The manufacturer is not liable for damage caused by improper or non-designated use.

⚠ WARNING

Danger of breakage due to corrosive or abrasive fluids and ambient conditions!
- Verify the compatibility of the process fluid with the sensor material.
- Ensure the resistance of all fluid-wetted materials in the process.
- Keep within the specified pressure and temperature range.

NOTICE

Verification for borderline cases:

- For special fluids and fluids for cleaning, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of fluid-wetted materials, but does not accept any warranty or liability as minute changes in the temperature, concentration or level of contamination in the process can alter the corrosion resistance properties.

WARNING

Injury from sensor being ejected!

- The sensor gland should be opened only when in an unpressurized state.

WARNING

Risk of injury if the process connection and gland of the sensing element are opened under pressure.

- The process connection and sensor gland should be opened only when in an unpressurized state.

NOTICE

Penetration of dust and moisture when the transmitter housing is opened.

- Only open the transmitter housing briefly, ensuring that no dust or moisture enters the housing.

Residual risks

WARNING

If the temperature of the media or electronics unit is high or low, this may cause the surfaces of the device to become hot or cold. This poses a risk of burns or frostbite!

- In the case of hot or cold medium temperatures, install appropriate protection against contact.

2.3 Occupational safety

When working on and with the device:

- Wear the required personal protective equipment as per national regulations.

For welding work on the piping:

- Do not ground the welding unit via the measuring device.

If working on and with the device with wet hands:

- Due to the increased risk of electric shock, wear suitable gloves.

2.4 Operational safety

Risk of injury.

- Operate the device in proper technical condition and fail-safe condition only.
- The operator is responsible for interference-free operation of the device.

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. Endress+Hauser confirms this by affixing the CE mark to the device.

2.6 IT security

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

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

2.7 Device-specific IT security

The device offers a range of specific functions to support protective measures on the operator's side. These functions can be configured by the user and guarantee greater in-operation safety if used correctly.

For detailed information on device-specific IT security, see the Operating Instructions for the device.

2.7.1 Access via service interface (CDI-RJ45)

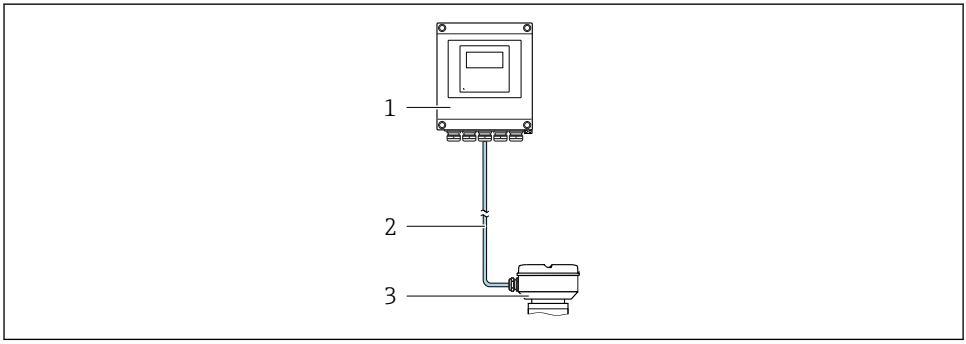
The device can be connected to a network via the service interface (CDI-RJ45). Device-specific functions guarantee the secure operation of the device in a network.

The use of relevant industrial standards and guidelines that have been defined by national and international safety committees, such as IEC/ISA62443 or the IEEE, is recommended. This includes organizational security measures such as the assignment of access authorization as well as technical measures such as network segmentation.

3 Product description

The measuring system consists of a Proline 500 - digital transmitter and a Proline t-mass thermal mass flowmeter sensor.

The transmitter and sensor are mounted in physically separate locations. They are interconnected by a connecting cable.



1 Transmitter
2 Connecting cable: cable, separate, standard
3 Sensor connection housing with integrated ISEM (intelligent sensor electronics module)

For detailed information on the product description, see the Operating Instructions for the device

4 Installation

For detailed information about mounting the sensor, see the Sensor Brief Operating Instructions → 3

CAUTION

Ambient temperature too high!

Danger of electronics overheating and housing deformation.

- Do not exceed the permitted maximum ambient temperature .
- If operating outdoors: Avoid direct sunlight and exposure to weathering, particularly in warm climatic regions.

CAUTION

Excessive force can damage the housing!

- Avoid excessive mechanical stress.

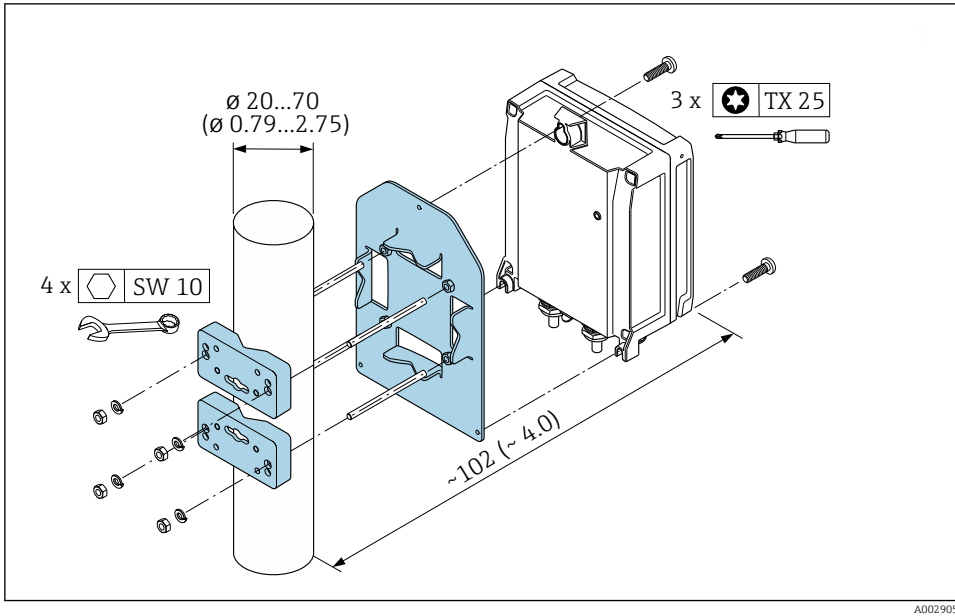
4.1 Post mounting

WARNING

Excessive tightening torque applied to the fixing screws!

Risk of damaging the plastic transmitter.

- Tighten the fixing screws as per the tightening torque: 2 Nm (1.5 lbf ft)



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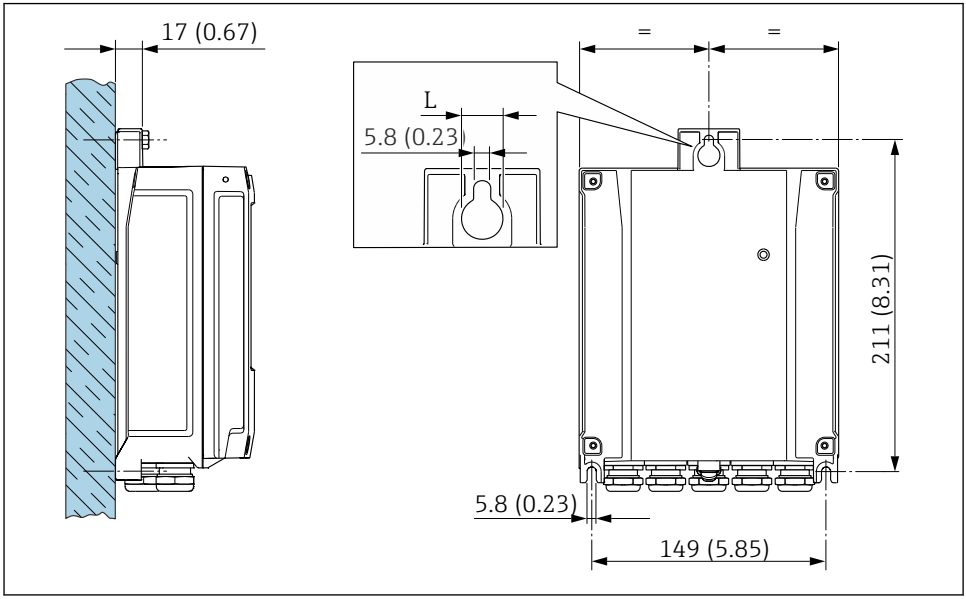
1 *Engineering unit mm (in)*

4.2 Wall mounting



2 Engineering unit mm (in)

L Depends on order code for "Transmitter housing"

Order code for "Transmitter housing"
- Option **A**, aluminum coated: L =14 mm (0.55 in)
- Option **D**, polycarbonate: L = 13 mm (0.51 in)

4.3 Transmitter post-installation check

The post-installation check must always be performed after the following tasks:
Mounting the transmitter housing:
- Post mounting
- Wall mounting

Is the device undamaged (visual inspection)?	❑
Post mounting: Have the fixing screws been tightened with the correct tightening torque?	❑
Wall mounting: Are the securing screws tightened securely?	❑

5 Electrical connection

NOTICE

The measuring device does not have an internal circuit breaker.

- ▶ For this reason, assign the measuring device a switch or power-circuit breaker so that the power supply line can be easily disconnected from the mains.
- ▶ Although the measuring device is equipped with a fuse, additional overcurrent protection (maximum 10 A) should be integrated into the system installation.

5.1 Electrical safety

In accordance with applicable federal/national regulations.

5.2 Connection conditions

5.2.1 Required tools

- For cable entries: Use corresponding tools
- For securing clamp: Allen key 3 mm
- Wire stripper
- When using stranded cables: crimper for wire end ferrule
- For removing cables from terminal: Flat blade screwdriver ≤ 3 mm (0.12 in)

5.2.2 Requirements for connecting cable

The connecting cables provided by the customer must fulfill the following requirements.

Protective grounding cable for the outer ground terminal

Conductor cross-section ≤2.08 mm^2 (14 AWG)

Grounding impedance must be less than 2 Ω.

Permitted temperature range

- The installation guidelines that apply in the country of installation must be observed.
- The cables must be suitable for the minimum and maximum temperatures to be expected.

Power supply cable (incl. conductor for the inner ground terminal)

Standard installation cable is sufficient.

Cable diameter

- Cable glands supplied:
  M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Spring-loaded terminals: Suitable for strands and strands with ferrules.
  Conductor cross-section 0.2 to 2.5 mm^2 (24 to 12 AWG).

Signal cable

Modbus RS485

The EIA/TIA-485 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.

For detailed information about the specification of the connecting cable, see the Operating Instructions for the device.

Current output 0/4 to 20 mA

Standard installation cable is sufficient.

Pulse/frequency/switch output

Standard installation cable is sufficient.

Double pulse output

Standard installation cable is sufficient.

Relay output

Standard installation cable is sufficient.

Current input 0/4 to 20 mA

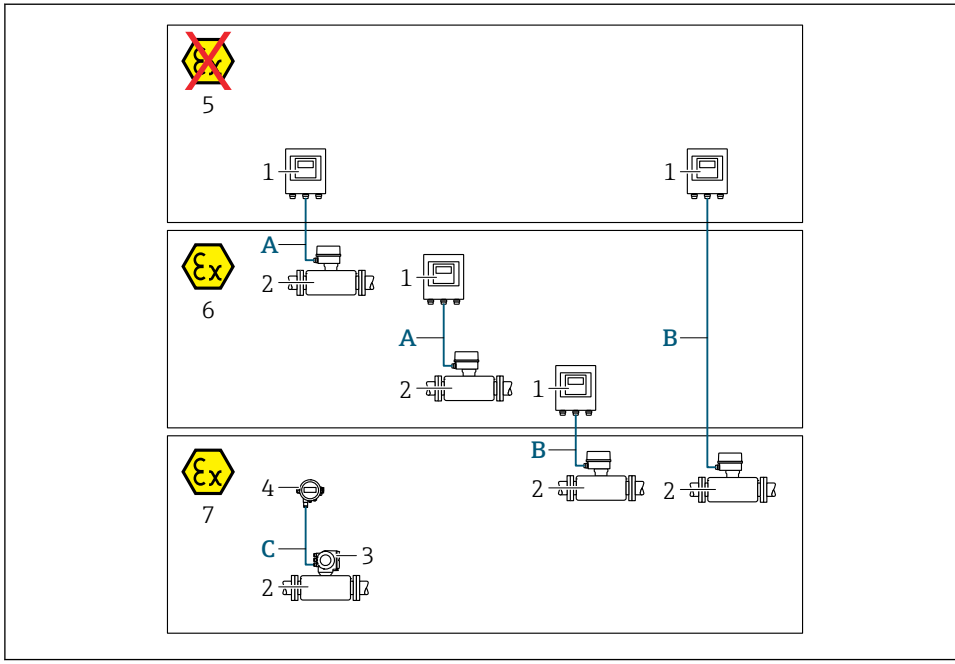
Standard installation cable is sufficient.

Status input

Standard installation cable is sufficient.

5.2.3 Choice of connecting cable between the transmitter and sensor

Depends on the type of transmitter and the installation zones



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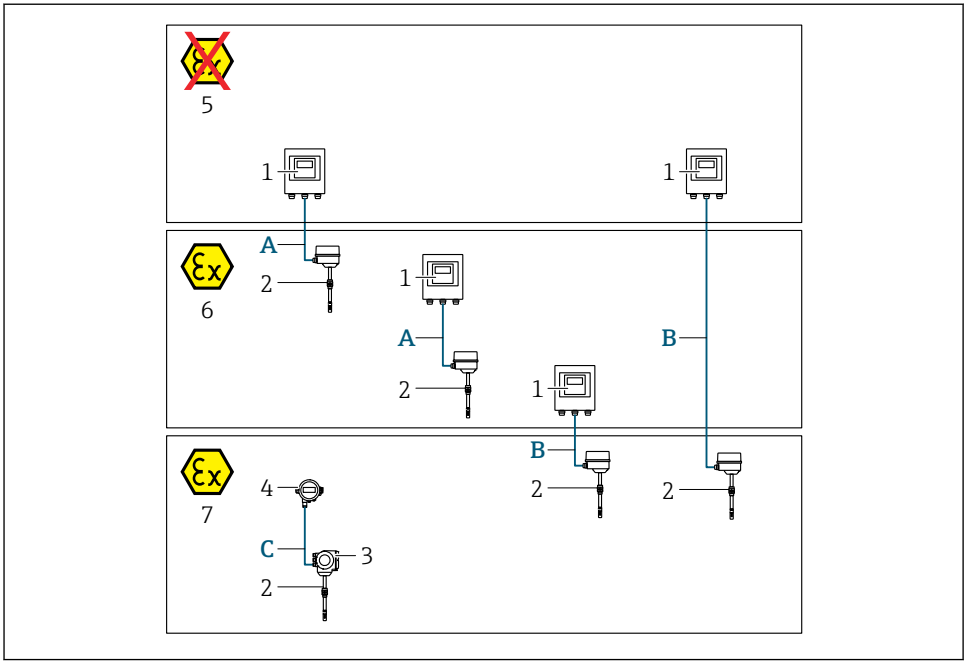
1 *Proline 500 – digital transmitter*
2 *Sensor t-mass*
3 *Proline 300 transmitter*
4 *Remote display (DKX001)*
5 *Non-hazardous area*
6 *Hazardous area: Zone 2; Class I, Division 2*
7 *Hazardous area: Zone 1; Class I, Division 1*
A *Standard cable to 500 – digital transmitter*
Transmitter installed in the non-hazardous area or hazardous area: Zone 2; Class I, Division 2 / sensor installed in the hazardous area: Zone 2; Class I, Division 2
B *Standard cable to 500 – digital transmitter* → 🖹 *17*
Transmitter installed in the hazardous area: Zone 2; Class I, Division 2 / sensor installed in the hazardous area: Zone 1; Class I, Division 1
C *Standard cable to remote display*
Transmitter 300 and remote display installed in the hazardous area: Zone 1; Class I, Division 1



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1 *Proline 500 – digital transmitter*
2 *Sensor t-mass*
3 *Proline 300 transmitter*
4 *Remote display (DKX001)*
5 *Non-hazardous area*
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7 *Hazardous area: Zone 1; Class I, Division 1*
A *Standard cable to 500 – digital transmitter*
Transmitter installed in the non-hazardous area or hazardous area: Zone 2; Class I, Division 2 / sensor installed in the hazardous area: Zone 2; Class I, Division 2
B *Standard cable to 500 – digital transmitter* → 17
Transmitter installed in the hazardous area: Zone 2; Class I, Division 2 / sensor installed in the hazardous area: Zone 1; Class I, Division 1
C *Standard cable to remote display*
Transmitter 300 and remote display installed in the hazardous area: Zone 1; Class I, Division 1

For applications with operation in Zone 1; Class 1, Division 1, we recommend the use of the compact version with the remote display. In this case, the display of the Proline 300 transmitter is a blind version without local operation.

A: Connecting cable between sensor and transmitter: Proline 500 – digital

Standard cable

A standard cable with the following specifications can be used as the connecting cable.

Design	4 cores (2 pairs); uninsulated stranded CU wires; pair-stranded with common shield
Shielding	Tin-plated copper-braid, optical cover ≥ 85 %
Loop resistance	Power supply line (+, –): maximum 10 Ω
Cable length	Maximum 300 m (1000 ft), see the following table.

Cross-section	Cable length [max.]
0.34 mm^2 (AWG 22)	80 m (270 ft)
0.50 mm^2 (AWG 20)	120 m (400 ft)
0.75 mm^2 (AWG 18)	180 m (600 ft)
1.00 mm^2 (AWG 17)	240 m (800 ft)
1.50 mm^2 (AWG 15)	300 m (1000 ft)

Optionally available connecting cable

Design	2 × 2 × 0.34 mm^2 (AWG 22) PVC cable [1] with common shield (2 pairs, uninsulated stranded CU wires; pair-stranded)
Flame resistance	According to DIN EN 60332-1-2
Oil-resistance	According to DIN EN 60811-2-1
Shielding	Tin-plated copper-braid, optical cover ≥ 85 %
Operating temperature	When mounted in a fixed position: –50 to +105 °C (–58 to +221 °F); when cable can move freely: –25 to +105 °C (–13 to +221 °F)
Available cable length	Fixed: 20 m (65 ft); variable: up to maximum 50 m (164 ft)

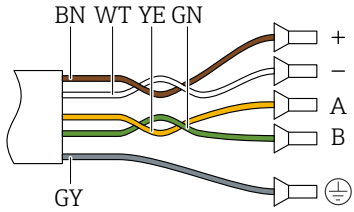
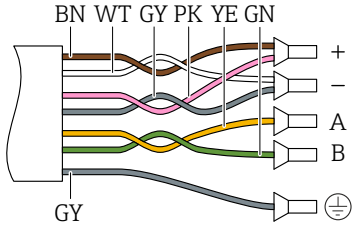
1) UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where possible.

B: Connecting cable between sensor and transmitter: Proline 500 - digital

Standard cable

A standard cable with the following specifications can be used as the connecting cable.

Design	4, 6, 8 cores (2, 3, 4 pairs); uninsulated stranded CU wires; pair-stranded with common shield
Shielding	Tin-plated copper-braid, optical cover ≥ 85 %
Capacitance C	Maximum 760 nF IIC, maximum 4.2 µF IIB
Inductance L	Maximum 26 µH IIC, maximum 104 µH IIB
Inductance/resistance ratio (L/R)	Maximum 8.9 µH/Ω IIC, maximum 35.6 µH/Ω IIB (e.g. in accordance with IEC 60079-25)
Loop resistance	Power supply line (+, –): maximum 5 Ω
Cable length	Maximum 100 m (330 ft), see the following table.

Cross-section	Cable length [max.]	Termination
2 x 2 x 0.50 mm² (AWG 20)	50 m (165 ft)	2 x 2 x 0.50 mm² (AWG 20)  ▪ +, – = 0.5 mm² ▪ A, B = 0.5 mm²
3 x 2 x 0.50 mm² (AWG 20)	100 m (330 ft)	3 x 2 x 0.50 mm² (AWG 20)  ▪ +, – = 1.0 mm² ▪ A, B = 0.5 mm²

Optionally available connecting cable

Connecting cable for	Zone 1; Class I, Division 1
Standard cable	2 × 2 × 0.5 mm² (AWG 20) PVC cable [1] with common shield (2 pairs, pair-stranded)
Flame resistance	According to DIN EN 60332-1-2
Oil-resistance	According to DIN EN 60811-2-1
Shielding	Tin-plated copper-braid, optical cover ≥ 85 %
Operating temperature	When mounted in a fixed position: −50 to +105 °C (−58 to +221 °F); when cable can move freely: −25 to +105 °C (−13 to +221 °F)
Available cable length	Fixed: 20 m (65 ft); variable: up to maximum 50 m (165 ft)

1) UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where possible.

5.2.4 Terminal assignment

Transmitter: supply voltage, input/outputs

The terminal assignment of the inputs and outputs depends on the individual order version of the device. The device-specific terminal assignment is documented on an adhesive label in the terminal cover.

Supply voltage		Input/output 1		Input/output 2		Input/output 3		Input/output 4	
1 (+)	2 (–)	26 (B)	27 (A)	24 (+)	25 (–)	22 (+)	23 (–)	20 (+)	21 (–)
		Device-specific terminal assignment: adhesive label in terminal cover.							

Transmitter and sensor connection housing: connecting cable

The sensor and transmitter, which are mounted in separate locations, are interconnected by a connecting cable. The cable is connected via the sensor connection housing and the transmitter housing.

Terminal assignment and connection of the connecting cable → 20.

5.2.5 Preparing the measuring device

Carry out the steps in the following order:

1. Mount the sensor and transmitter.
2. Connection housing, sensor: Connect connecting cable.
3. Transmitter: Connect connecting cable.
4. Transmitter: Connect signal cable and cable for supply voltage.

NOTICE

Insufficient sealing of the housing!

Operational reliability of the measuring device could be compromised.

► Use suitable cable glands corresponding to the degree of protection.

1. Remove dummy plug if present.
2. If the measuring device is supplied without cable glands:
   Provide suitable cable gland for corresponding connecting cable.
3. If the measuring device is supplied with cable glands:
   Observe requirements for connecting cables → 13.

5.3 Connecting the measuring device

NOTICE

Limitation of electrical safety due to incorrect connection!

- Have electrical connection work carried out by appropriately trained specialists only.
- Observe applicable federal/national installation codes and regulations.
- Comply with local workplace safety regulations.
- Always connect the protective ground cable ⏚ before connecting additional cables.
- For use in potentially explosive atmospheres, observe the information in the device-specific Ex documentation.

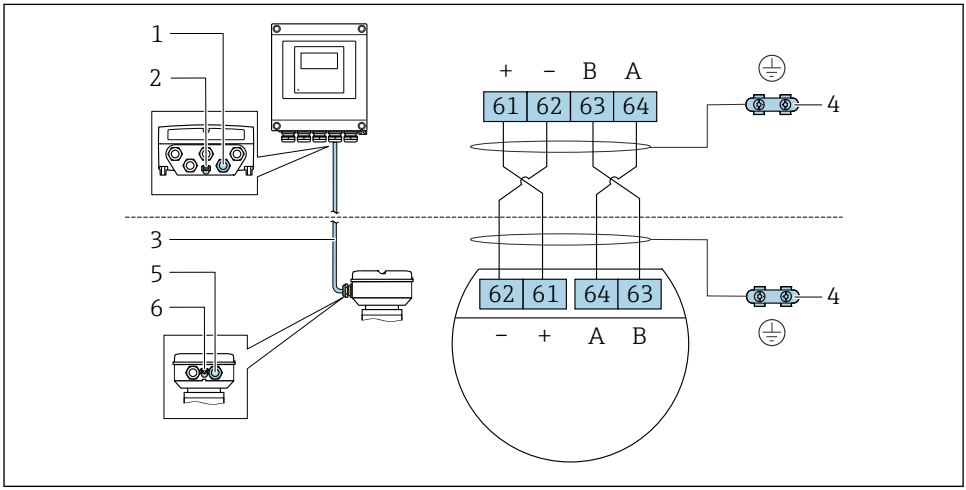
5.3.1 Attaching the connecting cable

⚠ WARNING

Risk of damaging the electronic components!

- Connect the sensor and transmitter to the same potential equalization.
- Only connect the sensor to a transmitter with the same serial number.
- Ground the connection housing of the sensor via the external screw terminal.

Connecting cable terminal assignment



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1 *Cable entry for cable on transmitter housing*
2 *Protective earth (PE)*
3 *Connecting cable ISEM communication*
4 *Grounding via ground connection; on device plug versions grounding is through the plug itself*
5 *Cable entry for cable or connection of device plug on sensor connection housing*
6 *Protective earth (PE)*

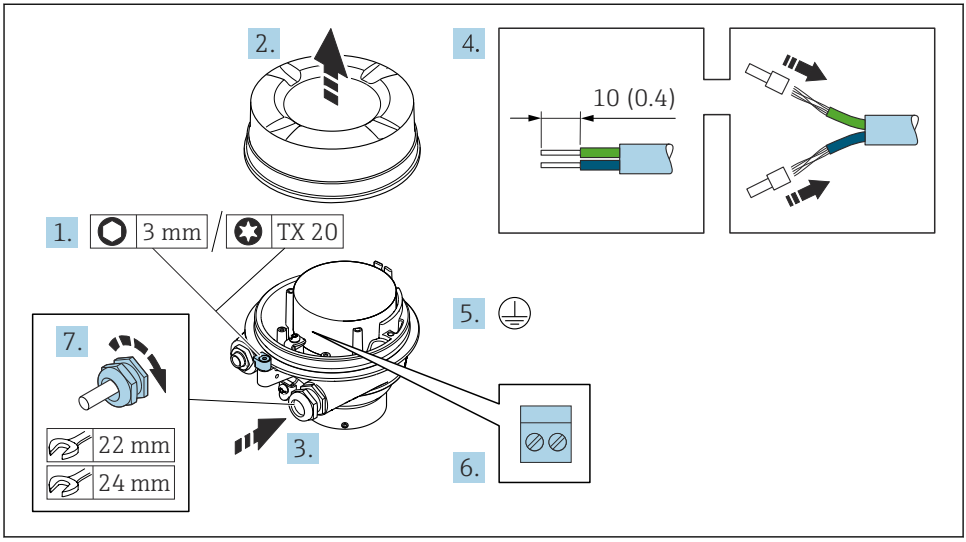
Attaching the connecting cable to the sensor connection housing

Connection via terminals with order code for "Housing"		Available for sensor
Option **A** "Aluminum, coated"	→ 🖹 22	t-mass F, I
Option **L** "Cast, stainless"	→ 🖹 22	t-mass F, I

Attaching the connecting cable to the transmitter

The cable is connected to the transmitter via terminals → 🖹 23.

Connecting the sensor connection housing via terminals



A0029616

1. Loosen the securing clamp of the housing cover.
2. Unscrew the housing cover.
3. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
4. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
5. Connect the protective ground.
6. Connect the cable in accordance with the connecting cable terminal assignment → 20.
7. Firmly tighten the cable glands.
   ↳ This concludes the process for connecting the connecting cable.

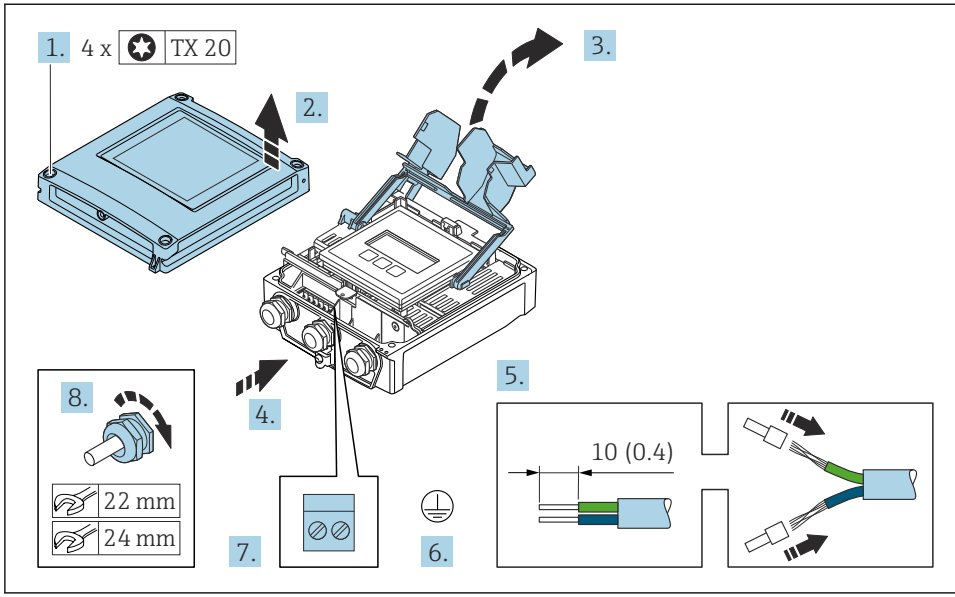
WARNING

Housing degree of protection voided due to insufficient sealing of the housing.

- Screw in the thread on the cover without using any lubricant. The thread on the cover is coated with a dry lubricant.

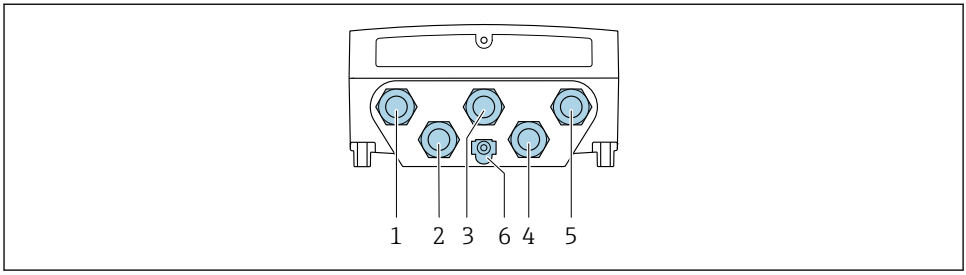
8. Screw on the housing cover.
9. Tighten the securing clamp of the housing cover.

Attaching the connecting cable to the transmitter



1. Loosen the 4 fixing screws on the housing cover.
2. Open the housing cover.
3. Fold open the terminal cover.
4. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
5. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
6. Connect the protective ground.
7. Connect the cable in accordance with the connecting cable terminal assignment → 20.
8. Firmly tighten the cable glands.
   ↳ This concludes the process for attaching the connecting cable.
9. Close the housing cover.
10. Tighten the securing screw of the housing cover.
11. After attaching the connecting cable:
    Connect the signal cable and the supply voltage cable → 24.

5.3.2 Connecting the signal cable and the supply voltage cable



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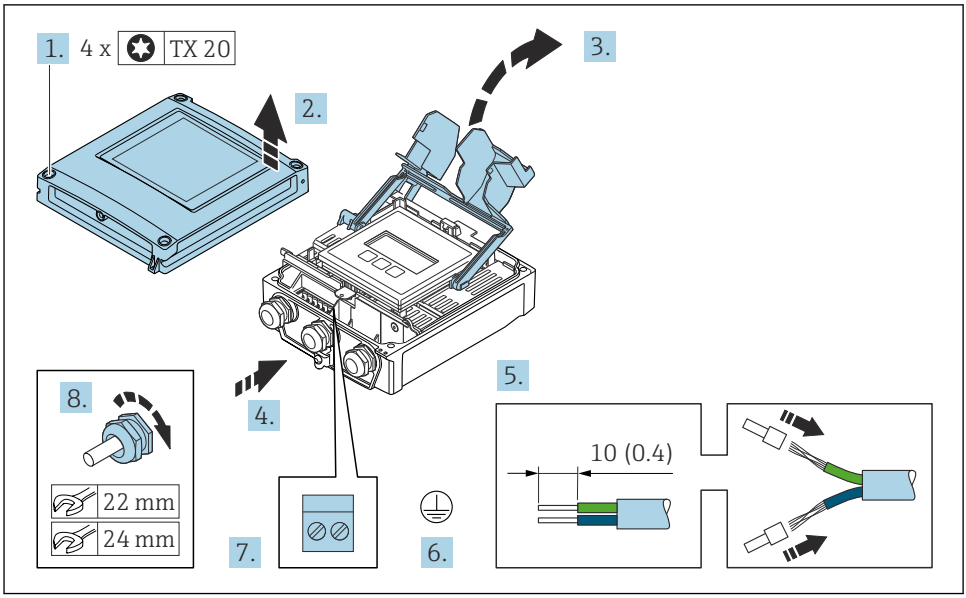
1 *Terminal connection for supply voltage*
2 *Terminal connection for signal transmission, input/output*
3 *Terminal connection for signal transmission, input/output*
4 *Terminal connection for connecting cable between sensor and transmitter*
5 *Terminal connection for signal transmission, input/output; optional: connection for external WLAN antenna*
6 *Protective earth (PE)*



A0029597

1. Loosen the 4 fixing screws on the housing cover.
2. Open the housing cover.
3. Fold open the terminal cover.

4. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
5. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
6. Connect the protective ground.
7. Connect the cable in accordance with the terminal assignment .
   ↳ **Signal cable terminal assignment:** The device-specific terminal assignment is documented on an adhesive label in the terminal cover.
   Supply voltage terminal assignment: Adhesive label in the terminal cover or .
8. Firmly tighten the cable glands.
   ↳ This concludes the cable connection process.
9. Close the terminal cover.
10. Close the housing cover.

⚠ WARNING

Housing degree of protection may be voided due to insufficient sealing of the housing.
► Screw in the screw without using any lubricant.

⚠ WARNING

Excessive tightening torque applied to the fixing screws!
Risk of damaging the plastic transmitter.
► Tighten the fixing screws as per the tightening torque: 2 Nm (1.5 lbf ft)

11. Tighten the 4 fixing screws on the housing cover.

5.4 Ensuring potential equalization

5.4.1 Requirements

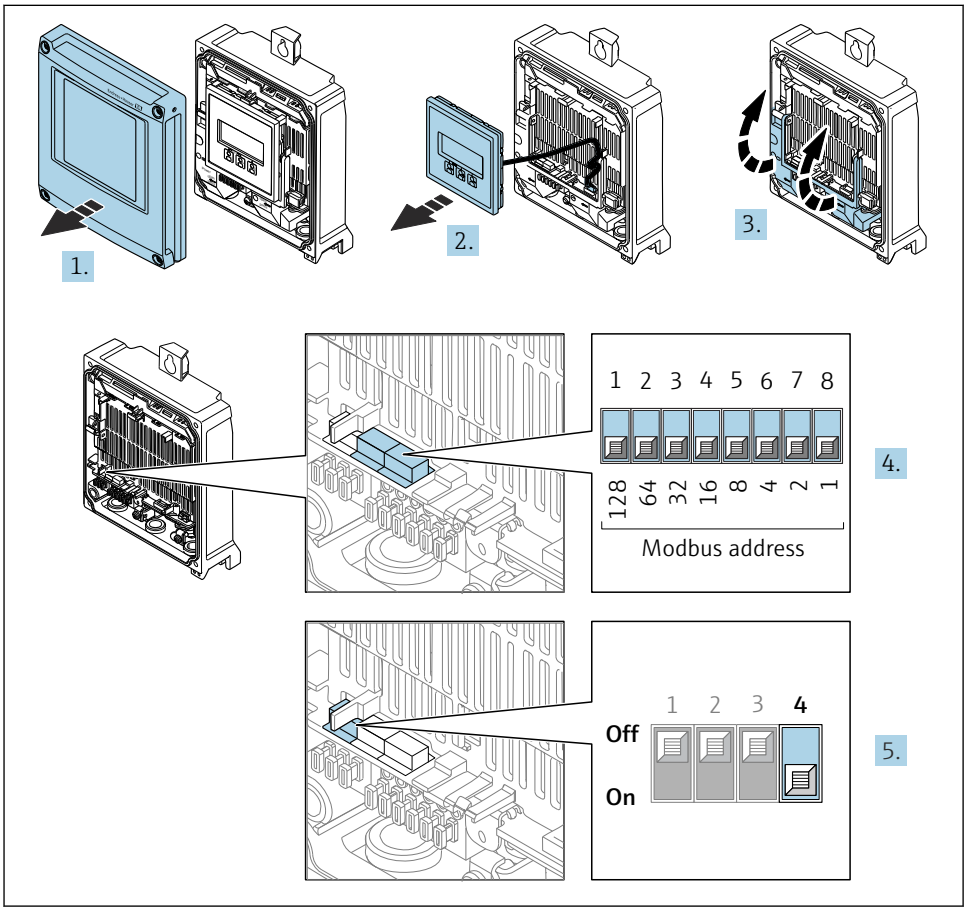
No special measures for potential equalization are required.

5.5 Hardware settings

5.5.1 Setting the device address

The device address must always be configured for a Modbus slave. The valid device addresses are in the range from 1 to 247. Each address may only be assigned once in a Modbus RS485 network. If an address is not configured correctly, the measuring device is not recognized by the Modbus master. All measuring devices are delivered from the factory with the device address 247 and with the "software addressing" address mode.

Hardware addressing



1. Open the housing cover.
2. Remove the display module.
3. Fold open the terminal cover.

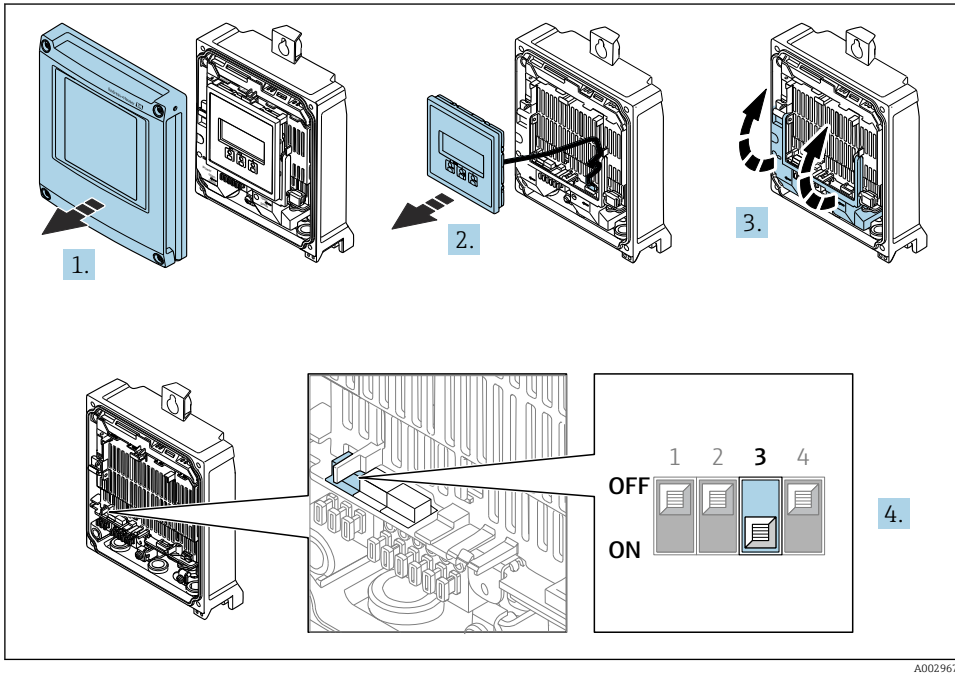
4. Set the desired device address using the DIP switches.
5. To switch addressing from software addressing to hardware addressing: set the DIP switch to **On**.
   ↳ The change of device address takes effect after 10 seconds.

Software addressing

- To switch addressing from hardware addressing to software addressing: set the DIP switch to **Off**.
  ↳ The device address configured in the **Device address** parameter takes effect after 10 seconds.

5.5.2 Enabling the terminating resistor

To avoid incorrect communication transmission caused by impedance mismatch, terminate the Modbus RS485 cable correctly at the start and end of the bus segment.



A0029675

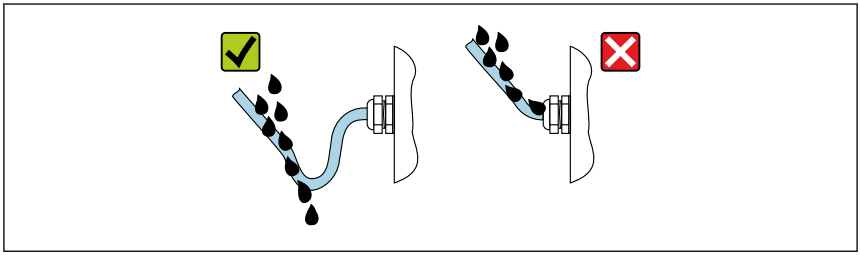
1. Open the housing cover.
2. Remove the display module.
3. Fold open the terminal cover.
4. Switch DIP switch No. 3 to **On**.

5.6 Ensuring the degree of protection

The measuring device fulfills all the requirements for degree of protection IP66/67, Type 4X enclosure.

To guarantee degree of protection IP66/67, Type 4X enclosure, carry out the following steps after the electrical connection:

1. Check that the housing seals are clean and fitted correctly.
2. Dry, clean or replace the seals if necessary.
3. Tighten all housing screws and screw covers.
4. Firmly tighten the cable glands.
5. To ensure that moisture does not enter the cable entry:
   Route the cable so that it loops down before the cable entry ("water trap").



A0029278

6. Insert dummy plugs (corresponding to the housing degree of protection) into unused cable entries.

5.6.1 Degree of protection IP68, Type 6P enclosure, with "Cust-potted" option

Depending on the version, the sensor meets all the requirements of IP68 degree of protection, Type 6P enclosure and can be used as a remote version .

The degree of protection of the transmitter is always only IP66/67, Type 4X enclosure and the transmitter must therefore be treated accordingly .

To guarantee IP68 degree of protection, Type 6P enclosure for the "Cust-potted" options, carry out the following steps after the electrical connection:

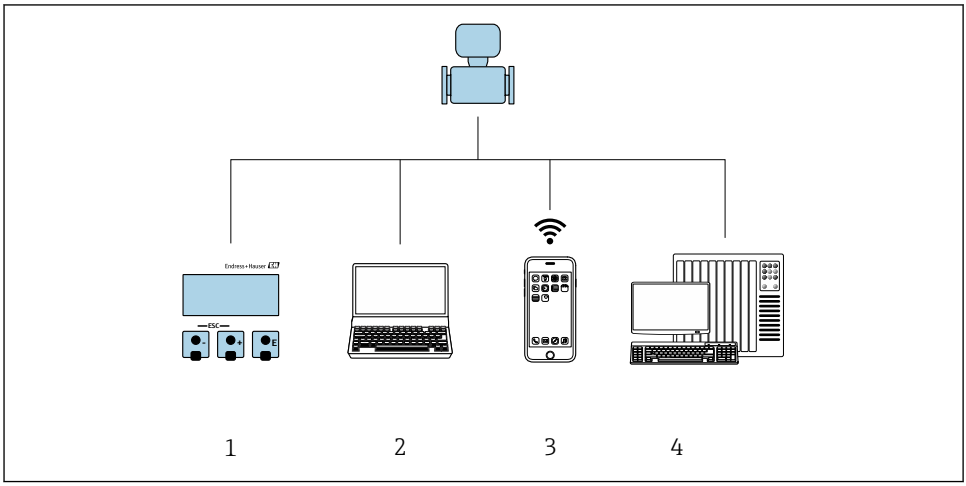
1. Firmly tighten the cable glands (torque: 2 to 3.5 Nm) until there is no gap between the bottom of the cover and the housing support surface.
2. Firmly tighten the union nut of the cable glands.
3. Pot the field housing with a potting compound.
4. Check that the housing seals are clean and fitted correctly. Dry, clean or replace the seals if necessary.
5. Tighten all housing screws and screw covers (torque: 20 to 30 Nm).

5.7 Post-connection check

Are cables or the device undamaged (visual inspection)?	❑
Do the cables used meet the requirements ?	❑
Do the cables have adequate strain relief?	❑
Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" → 🖹 28?	❑

6 Operation options

6.1 Overview of operation options

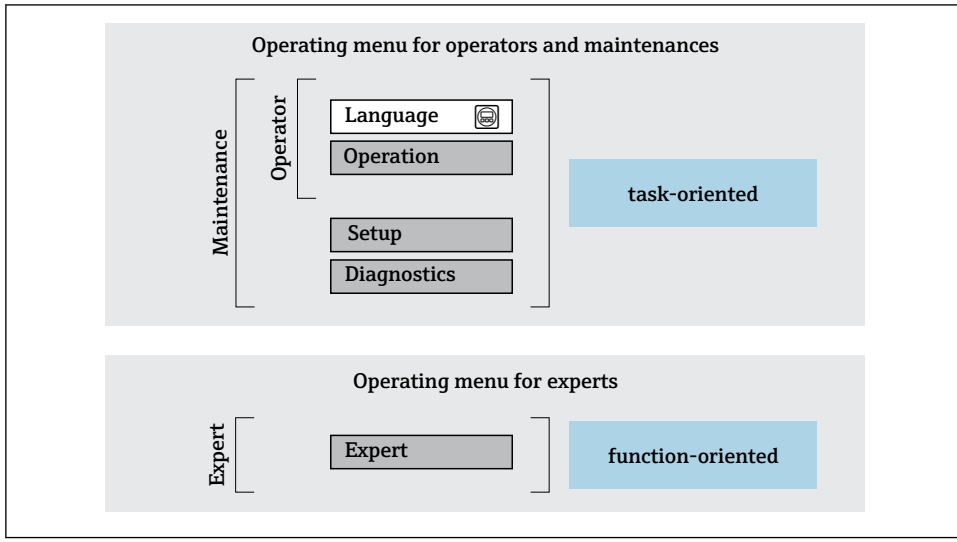


A0030213

1 *Local operation via display module*
2 *Computer with Web browser (e.g. Internet Explorer) or with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM)*
3 *Mobile handheld terminal with SmartBlue App*
4 *Control system (e.g. PLC)*

6.2 Structure and function of the operating menu

6.2.1 Structure of the operating menu



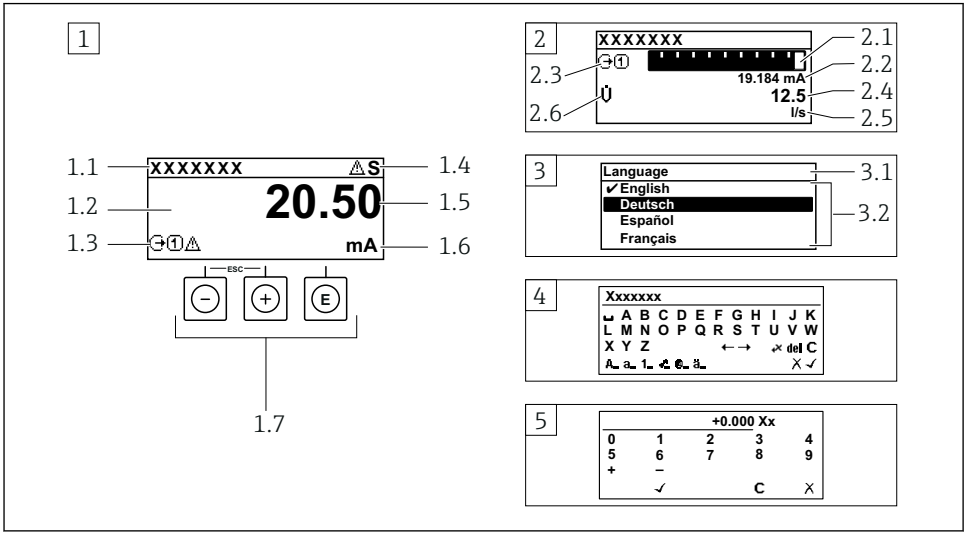
3 Schematic structure of the operating menu

6.2.2 Operating philosophy

The individual parts of the operating menu are assigned to certain user roles (operator, maintenance etc.). Each user role contains typical tasks within the device lifecycle.

For detailed information on the operating philosophy, see the Operating Instructions for the device.

6.3 Access to the operating menu via the local display



A0014013

1 Operational display with measured value shown as "1 value, max." (example)
1.1 Device tag
1.2 Display area for measured values (4-line)
1.3 Explanatory symbols for measured value: Measured value type, measuring channel number, symbol for diagnostic behavior
1.4 Status area
1.5 Measured value
1.6 Unit for the measured value
1.7 Operating elements
2 Operational display with measured value shown as "1 bar graph + 1 value" (example)
2.1 Bar graph display for measured value 1
2.2 Measured value 1 with unit
2.3 Explanatory symbols for measured value 1: measured value type, measuring channel number
2.4 Measured value 2
2.5 Unit for measured value 2
2.6 Explanatory symbols for measured value 2: measured value type, measuring channel number
3 Navigation view: picklist of a parameter
3.1 Navigation path and status area
3.2 Display area for navigation: ✔ designates the current parameter value
4 Editing view: text editor with input mask
5 Editing view: numeric editor with input mask

6.3.1 Operational display

Explanatory symbols for the measured value	Status area

▪ Depends on the device version, e.g.:
  ▪ U̇: Volume flow
  ▪ ṁ: Mass flow
  ▪ ρ: Density
  ▪ **G**: Conductivity
  ▪ 🌡: Temperature
▪ Σ: Totalizer
▪ ⊖: Output
▪ ⊕: Input
▪ ①..④: Measurement channel number [1]
▪ Diagnostic behavior [2]
  ▪ ⊗: Alarm
  ▪ ⚠: Warning
	The following symbols appear in the status area of the operational display at the top right:
	▪ Status signals
	  ▪ **F**: Failure
	  ▪ **C**: Function check
	  ▪ **S**: Out of specification
	  ▪ **M**: Maintenance required
	▪ Diagnostic behavior
	  ▪ ⊗: Alarm
	  ▪ ⚠: Warning
	▪ 🔒: Locking (locked via hardware))
	▪ ⇆: Communication via remote operation is active.

1) If there is more than one channel for the same measured variable type (totalizer, output etc.).
2) For a diagnostic event that concerns the displayed measured variable.

6.3.2 Navigation view

Status area	Display area

The following appears in the status area of the navigation view in the top right corner:
▪ In the submenu
  ▪ The direct access code for the parameter you are navigating to (e.g. 0022-1)
  ▪ If a diagnostic event is present, the diagnostic behavior and status signal
▪ In the wizard
If a diagnostic event is present, the diagnostic behavior and status signal
	▪ Icons for menus
	  ▪ 🔧: Operation
	  ▪ 🔧: Setup
	  ▪ 🔧: Diagnostics
	  ▪ 🔧: Expert
	▪ ▸: Submenus
	▪ 🔧: Wizards
	▪ 🔧: Parameters within a wizard
	▪ 🔒: Parameter locked

6.3.3 Editing view

Text editor		Correction symbols under [✓C←→]	
[✓]	Confirms selection.	[C]	Clears all entered characters.
[X]	Exits the input without applying the changes.	[→]	Moves the input position one position to the right.
[C]	Clears all entered characters.	[←]	Moves the input position one position to the left.
[✓C←→]	Switches to the selection of the correction tools.	[⌫]	Deletes one character immediately to the left of the input position.
[Aa1@]	Toggle ▪ Between upper-case and lower-case letters ▪ For entering numbers ▪ For entering special characters		

Numeric editor			
✓	Confirms selection.	←	Moves the input position one position to the left.
X	Exits the input without applying the changes.	·	Inserts decimal separator at the input position.
–	Inserts minus sign at the input position.	C	Clears all entered characters.

6.3.4 Operating elements

Keys and meaning

Enter key
 	
With an operational display
Pressing the key briefly opens the operating menu.
 	
In a menu, submenu
▪ Pressing the key briefly:
  ▪ Opens the selected menu, submenu or parameter.
  ▪ Starts the wizard.
  ▪ If help text is open:
  Closes the help text of the parameter.
▪ Pressing the key for 2 s in the case of a parameter:
  If present, opens the help text for the function of the parameter.
 	
With a wizard: Opens the editing view of the parameter.
 	
With a text and numeric editor
▪ Pressing the key briefly confirms your selection.
▪ Pressing the key for 2 s confirms the entry.

Minus key ▪ *In a menu, submenu:* Moves the selection bar upwards in a picklist. ▪ *With a wizard:* Confirms the parameter value and goes to the previous parameter. ▪ *With a text and numeric editor:* Moves the cursor position to the left.
Plus key ▪ *In a menu, submenu:* Moves the selection bar downwards in a picklist. ▪ *With a wizard:* Confirms the parameter value and goes to the next parameter. ▪ *With a text and numeric editor:* Moves the cursor position to the right.

Escape key combination (press keys simultaneously)
 	
In a menu, submenu
▪ Pressing the key briefly:
  ▪ Exits the current menu level and takes you to the next higher level.
  ▪ If help text is open, closes the help text of the parameter.
▪ Pressing the key for 2 s in the case of a parameter: Returns you to the operational display ("home position").
 	
With a wizard: Exits the wizard and takes you to the next higher level.
 	
With a text and numeric editor: Closes the editor view without applying any changes.

Keys and meaning
⊖ + Ⓔ **Minus/Enter key combination (press the keys simultaneously)** *With an operational display:* ▪ If keypad lock is active: Pressing the key for 3 s deactivates the keypad lock. ▪ If keypad lock is not active: Pressing the key for 3 s opens the context menu including the option for activating the keypad lock.

6.3.5 Further information

For further information on the following topics, see the Operating Instructions for the device
- Calling up help text
- User roles and related access authorization
- Disabling write protection via access code
- Enabling and disabling the keypad lock

6.4 Access to the operating menu via the operating tool

The operating menu can also be accessed via the FieldCare and DeviceCare operating tools. See the Operating Instructions for the device.

6.5 Access to the operating menu via the Web server

The operating menu can also be accessed via the Web server. See the Operating Instructions for the device.

7 System integration

For detailed information on system integration, see the Operating Instructions for the device.
- Overview of device description files:
  - Current version data for the device
  - Operating tools
- Compatibility with previous model
- Modbus RS485 information
  - Function codes
  - Response time
  - Modbus data map

8 Commissioning

8.1 Function check

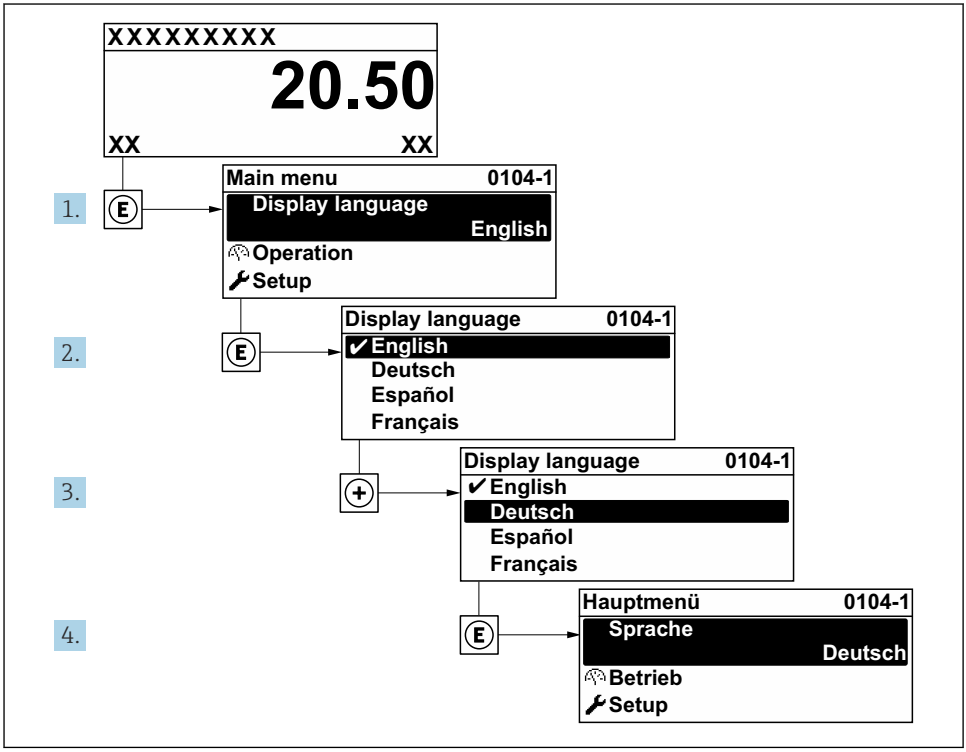
Before commissioning the measuring device:

▶ Make sure that the post-installation and post-connection checks have been performed.

- "Post-installation check" checklist → 12
- "Post-connection check" checklist → 29

8.2 Setting the operating language

Factory setting: English or ordered local language



4 *Taking the example of the local display*

8.3 Configuring the measuring device

The **Setup** menu with its submenus and various guided wizards is used for fast commissioning of the device. They contain all the parameters required for configuration, such as for measurement or communication.

Depending on the device version, not all submenus and parameters are available in every device. The selection can vary depending on the order code.

Example: Available submenus, wizards	Meaning
System units	Configure the units for all measured values
Communication	Configure the communication interface
I/O configuration	User configurable I/O module
Current input	Configuration of the input/output type
Status input	
Current output 1 to n	
Pulse/frequency/switch output 1 to n	
Relay output	
Double pulse output	
Display	Configure the display format on the local display
Low flow cut off	Set the low flow cut off
Advanced setup	Additional parameters for configuration: ▪ Sensor adjustment ▪ Totalizer ▪ Display ▪ WLAN settings ▪ Data backup ▪ Administration

8.4 Protecting settings from unauthorized access

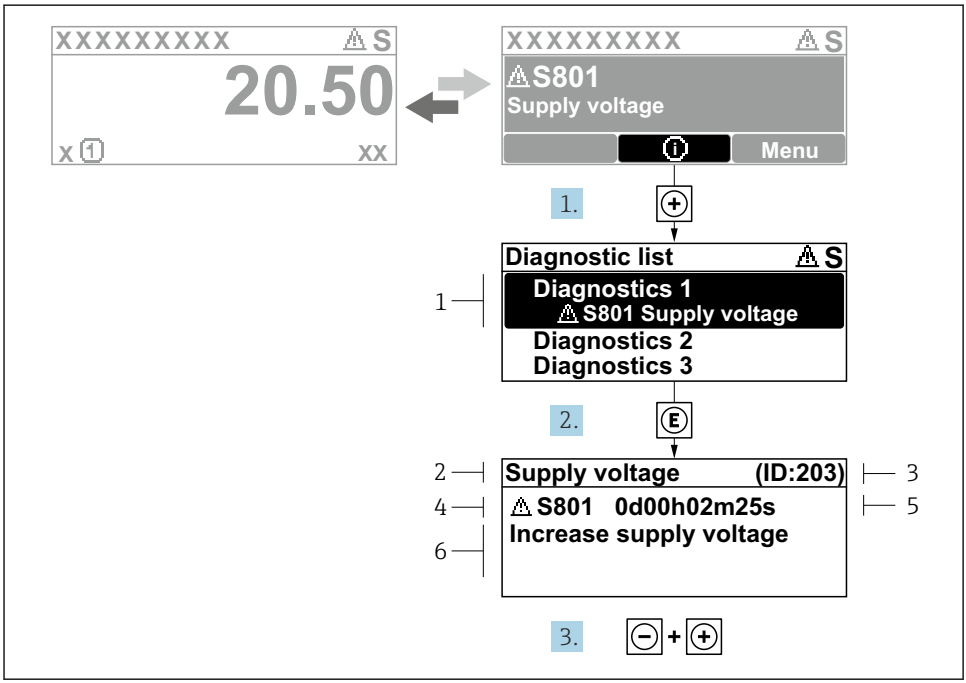
The following write protection options exist in order to protect the configuration of the measuring device from unintentional modification:
- Protect access to parameters via access code
- Protect access to local operation via key locking
- Protect access to measuring device via write protection switch

For detailed information on protecting the settings against unauthorized access, see the Operating Instructions for the device.

For detailed information on protecting the settings against unauthorized access in custody transfer applications, see the Special Documentation for the device.

9 Diagnostic information

Faults detected by the self-monitoring system of the measuring device are displayed as a diagnostic message in alternation with the operational display. The message about remedial measures can be called up from the diagnostic message, and contains important information on the fault.



5 *Message about remedial measures*

1 *Diagnostic information*
2 *Short text*
3 *Service ID*
4 *Diagnostic behavior with diagnostic code*
5 *Operation time of occurrence*
6 *Remedial measures*

1. The user is in the diagnostic message.
   Press ⊞ (ⓘ symbol).
   ↳ The **Diagnostic list** submenu opens.
2. Select the desired diagnostic event with ⊞ or ⊟ and press Ⓔ .
   ↳ The message about the remedial measures opens.
3. Press ⊟ + ⊞ simultaneously.
   ↳ The message about the remedial measures closes.

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