Operating Instructions
Proline Promag H 500
EtherNet/IP

Electromagnetic flowmeter

EtherNet/IP

Endress+Hauser

People for Process Automation
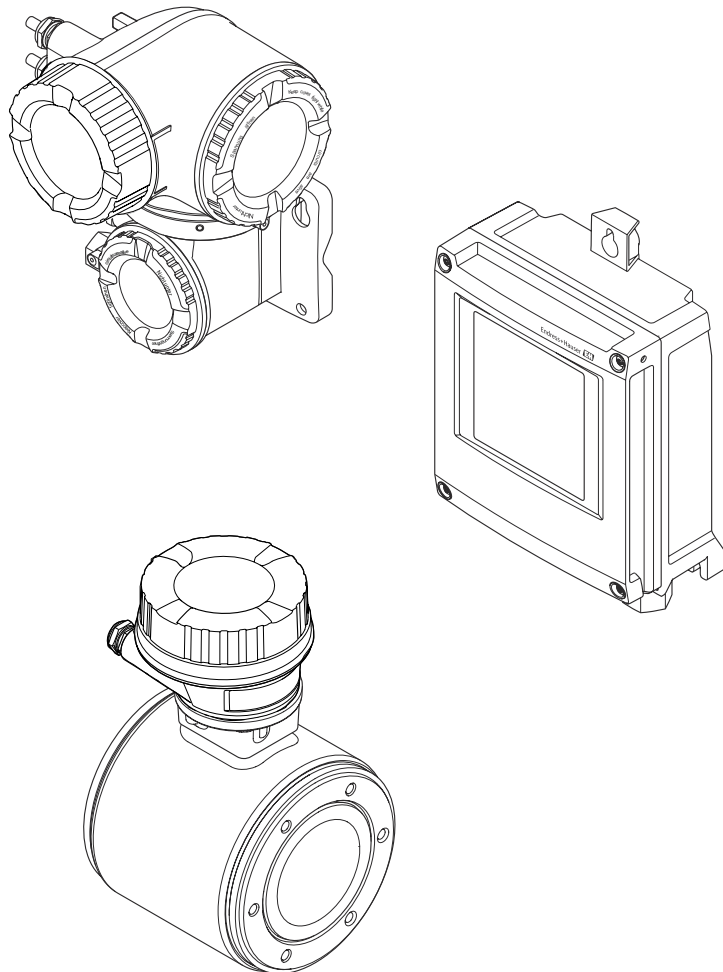
- Make sure the document is stored in a safe place such that it is always available when working on or with the device.
- To avoid danger to individuals or the facility, read the "Basic safety instructions" section carefully, as well as all other safety instructions in the document that are specific to working procedures.
- The manufacturer reserves the right to modify technical data without prior notice. Your Endress+Hauser sales organization will supply you with current information and updates to this manual.

Table of contents

1   About this document

1.1   Document function

These Operating Instructions contain all the information required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to installation, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.

1.2   Symbols

1.2.1   Safety symbols

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

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

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

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

1.2.2   Electrical symbols

Symbol	Meaning
⎓	Direct current
∼	Alternating current
⏦	Direct current and alternating current
⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⏛	**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.
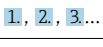
1.2.3   Communication-specific symbols

Symbol	Meaning
📶	**Wireless Local Area Network (WLAN)** Communication via a wireless, local network.
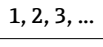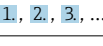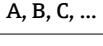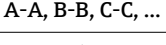
1.2.4   Tool symbols

Symbol	Meaning
	Torx screwdriver
	Phillips head screwdriver
	Open-ended wrench

1.2.5   Symbols for certain types of information

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
▶	Notice or individual step to be observed
1. , 2. , 3. ...	Series of steps
↳	Result of a step
	Help in the event of a problem
	Visual inspection

1.2.6   Symbols in graphics

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

1.3 Documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

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

Document type	Purpose and content of the document
Technical Information (TI)	**Planning aid for your device** 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)	**Guide that takes you quickly to the 1st measured value** The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.
Operating Instructions (BA)	**Your reference document** These Operating Instructions contain all the information that is required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.
Description of Device Parameters (GP)	**Reference for your parameters** 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.
Safety Instructions (XA)	Depending on the approval, safety instructions for electrical equipment in hazardous areas are also supplied with the device. The Safety Instructions are a constituent part of the Operating Instructions. Information on the Safety Instructions (XA) that are relevant for the device is provided on the nameplate.
Supplementary device-dependent documentation (SD/FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is a constituent part of the device documentation.

1.4 Registered trademarks

EtherNet/IP™
Trademark of ODVA, Inc.

TRI-CLAMP®
Registered trademark of Ladish & Co., Inc., Kenosha, USA

2 Safety instructions

2.1 Requirements for the personnel

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

The operating personnel must fulfill the following requirements:
- ▶ Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- ▶ Follow the instructions in this manual.

2.2 Intended use

Application and media

The measuring device described in this manual is intended only for the flow measurement of liquids with a minimum conductivity of 5 µS/cm.

Depending on the version ordered, the measuring instrument can also be used to measure potentially explosive [1], flammable, toxid and oxidizing media.

Measuring instruments for use in hazardous areas, in hygienic applications, or where there is an increased risk due to pressure, are specially labeled on the nameplate.

To ensure that the measuring instrument is in perfect condition during operation:
- ▶ Only use the measuring instrument in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- ▶ Using 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 instrument only for media to which the process-wetted materials are sufficiently resistant.
- ▶ Keep within the specified pressure and temperature range.
- ▶ Keep within the specified ambient temperature range.
- ▶ Protect the measuring instrument 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.

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1)   Not applicable for IO-Link measuring instruments

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.

Residual risks

⚠ CAUTION

Risk of hot or cold burns! The use of media and electronics with high or low temperatures can produce hot or cold surfaces on the device.
‣ Mount suitable touch protection.

2.3   Workplace safety

When working on and with the device:
‣ Wear the required personal protective equipment as per national regulations.

2.4   Operational safety

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

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers!
‣ If modifications are nevertheless required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability:
‣ Carry out repairs on the device only if they are expressly permitted.
‣ Observe federal/national regulations pertaining to the repair of an electrical device.
‣ Use only original spare parts and accessories.

2.5   Product safety

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

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

2.6   IT security

Our 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.

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. The following list provides an overview of the most important functions:

Function/interface	Factory setting	Recommendation
Write protection via hardware write protection switch → 🖹 11	Not enabled	On an individual basis following risk assessment
Access code (also applies to web server login or FieldCare connection) → 🖹 11	Not enabled (0000)	Assign a customized access code during commissioning
WLAN (order option in display module)	Enabled	On an individual basis following risk assessment
WLAN security mode	Enabled (WPA2-PSK)	Do not change
WLAN passphrase (Password) → 🖹 12	Serial number	Assign an individual WLAN passphrase during commissioning
WLAN mode	Access point	On an individual basis following risk assessment
Web server → 🖹 12	Enabled	On an individual basis following risk assessment
Service interface CDI-RJ45 → 🖹 12	–	On an individual basis following risk assessment

2.7.1 Protecting access via hardware write protection

Write access to the parameters of the device via the local display, web browser or operating tool (e.g. FieldCare, DeviceCare) can be disabled via a write protection switch (DIP switch on the main electronics module). When hardware write protection is enabled, only read access to the parameters is possible.

Hardware write protection is disabled when the device is delivered → 🖹 148.

2.7.2 Protecting access via a password

Different passwords are available to protect write access to the device parameters or access to the device via the WLAN interface.

- User-specific access code
  Protect write access to the device parameters via the local display, web browser or operating tool (e.g. FieldCare, DeviceCare). Access authorization is clearly regulated through the use of a user-specific access code.
- WLAN passphrase
  The network key protects a connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface which can be ordered as an option.
- Infrastructure mode
  When the device is operated in infrastructure mode, the WLAN passphrase corresponds to the WLAN passphrase configured on the operator side.

User-specific access code

Write access to the device parameters via the local display, web browser or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code (→ 🖹 146).

When the device is delivered, the device does not have an access code and is equivalent to *0000* (open).

WLAN passphrase: Operation as WLAN access point

A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface (→ 🖺 95), which can be ordered as an optional extra, is protected by the network key. The WLAN authentication of the network key complies with the IEEE 802.11 standard.

When the device is delivered, the network key is pre-defined depending on the device. It can be changed via the **WLAN settings** submenu in the **WLAN passphrase** parameter (→ 🖺 141).

Infrastructure mode

A connection between the device and WLAN access point is protected by means of an SSID and passphrase on the system side. Please contact the relevant system administrator for access.

General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning for safety reasons.
- Follow the general rules for generating a secure password when defining and managing the access code and network key.
- The user is responsible for the management and careful handling of the access code and network key.
- For information on configuring the access code or on what to do if you lose the password, for example, see "Write protection via access code" → 🖺 146.

2.7.3 Access via web server

The integrated web server can be used to operate and configure the device via a web browser → 🖺 85. The connection is established via the service interface (CDI-RJ45), the terminal connection for signal transmission with EtherNet/IP (RJ45 plug) or the WLAN interface.

The web server is enabled when the device is delivered. The web server can be disabled via the **Web server functionality** parameter if necessary (e.g., after commissioning).

The device and status information can be hidden on the login page. This prevents unauthorized access to the information.

📖 Detailed information on the device parameters:
"Description of device parameters" document .

2.7.4 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.

ℹ️ Transmitters with an Ex de approval may not be connected via the service interface (CDI-RJ45)!

Order code for "Approval transmitter + sensor", options (Ex de): BA, BB, C1, C2, GA, GB, MA, MB, NA, NB BB, C2, GB, MB, NB

ℹ️ The device can be integrated into a ring topology. The device is integrated via the terminal connection for signal transmission (output 1) and the connection to the service interface (CDI-RJ45) → 🖺 61 or → 🖺 53.

3 Product description

The measuring system consists of a transmitter and a sensor. The transmitter and sensor are mounted in physically separate locations. They are interconnected by connecting cables.

3.1 Product design

Two versions of the transmitter are available.

3.1.1 Proline 500 – digital

Signal transmission: digital
Order code for "Integrated ISEM electronics", option **A** "Sensor"

For use in applications not required to meet special requirements due to ambient or operating conditions.

As the electronics are located in the sensor, the device is ideal:
For simple transmitter replacement.

- A standard cable can be used as the connecting cable.
- Not sensitive to external EMC interference.
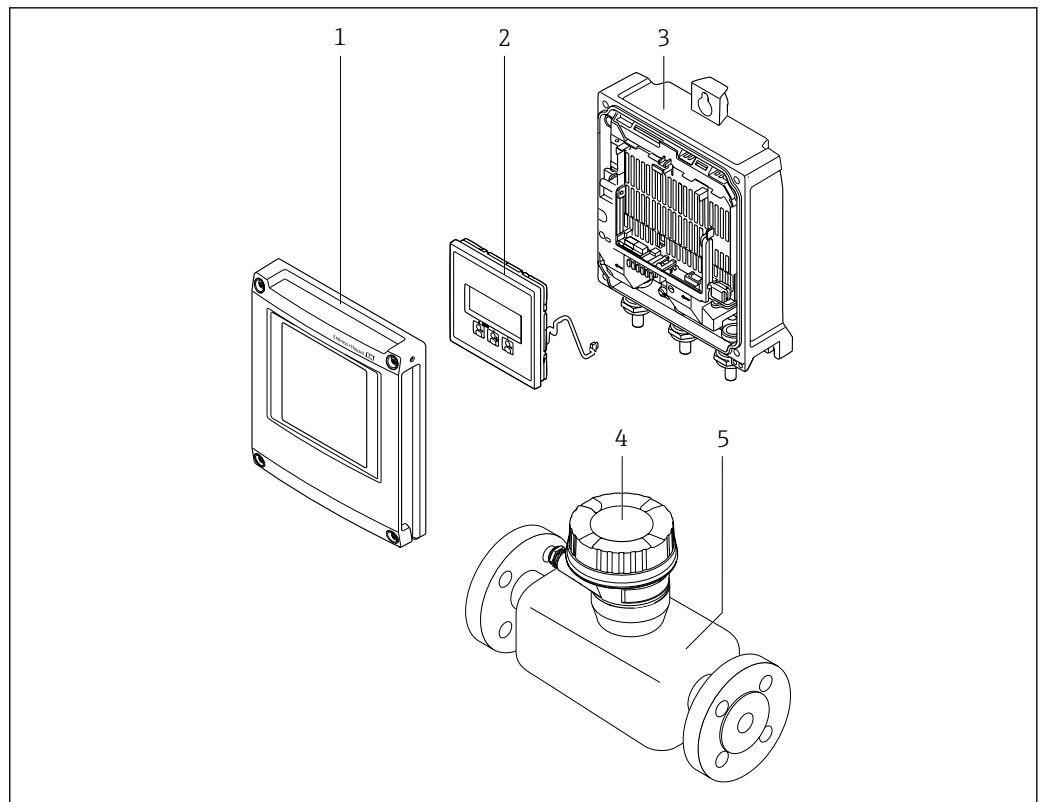
🖾 1   Important components of a measuring device

1   Electronics compartment cover
2   Display module
3   Transmitter housing
4   Sensor connection housing with integrated ISEM electronics: connecting cable connection
5   Sensor

3.1.2   Proline 500

Signal transmission: analog
Order code for "Integrated ISEM electronics", option **B** "Transmitter"

For use in applications required to meet special requirements due to ambient or operating conditions.

As the electronics are located in the transmitter, the device is ideal in the event of:
• Sensor operation in underground installations.
• Permanent sensor immersion in water.
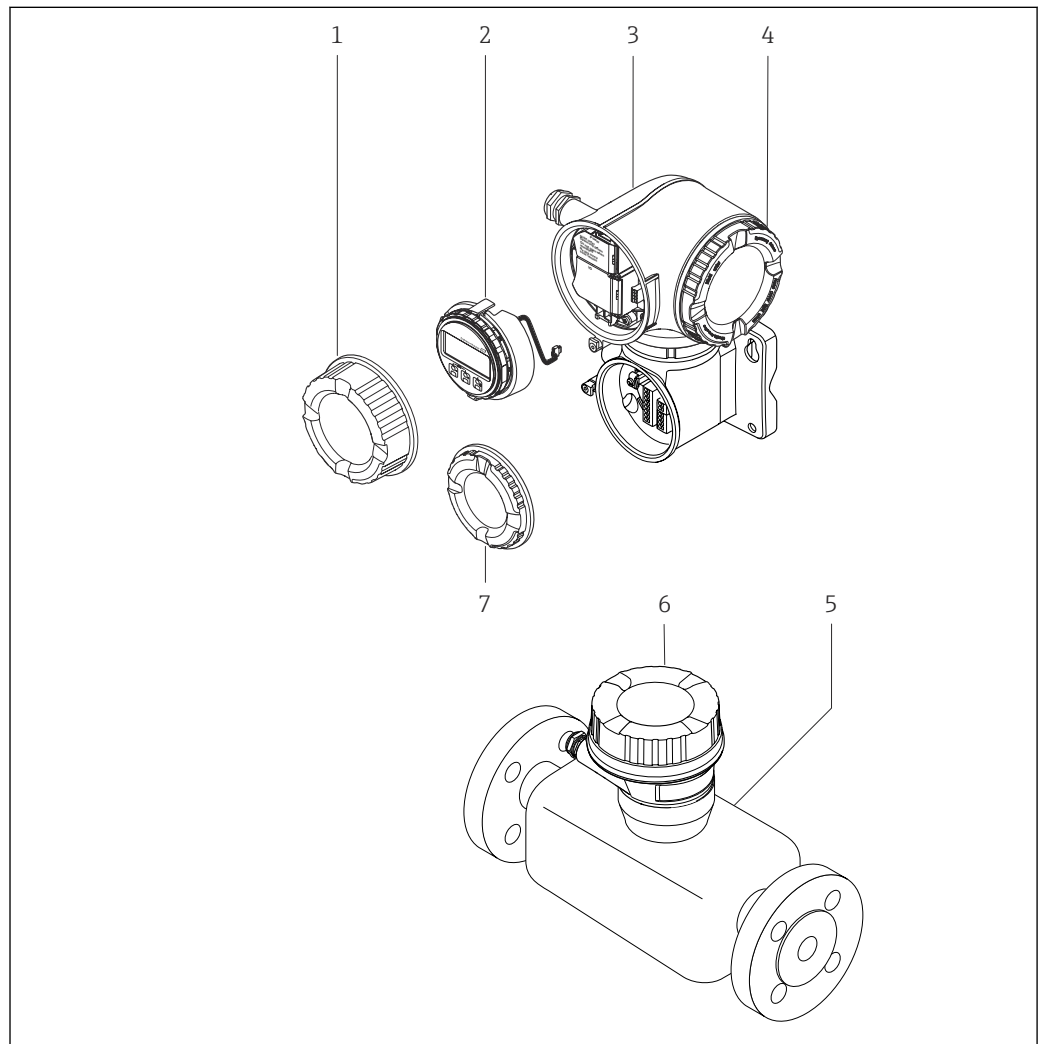
A0029589

🖻 *2   Important components of a measuring device*

1   Connection compartment cover
2   Display module
3   Transmitter housing with integrated ISEM electronics
4   Electronics compartment cover
5   Sensor
6   Sensor connection housing: connecting cable connection
7   Connection compartment cover: connecting cable connection

4   Incoming acceptance and product identification

4.1   Incoming acceptance

On receipt of the delivery:

1. Check the packaging for damage.
   ↳ Report all damage immediately to the manufacturer.
   Do not install damaged components.

2. Check the scope of delivery using the delivery note.

3. Compare the data on the nameplate with the order specifications on the delivery note.

4. Check the technical documentation and all other necessary documents, e.g. certificates, to ensure they are complete.

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

4.2   Product identification

The device can be identified in the following ways:
- Nameplate
- Order code with details of the device features on the delivery note
- Enter the serial numbers from the nameplates in the *Device Viewer* (www.endress.com/deviceviewer): all the information about the device is displayed.
- Enter the serial numbers from the nameplates into the *Endress+Hauser Operations app* or scan the DataMatrix code on the nameplate with the *Endress+Hauser Operations app*: all the information about the device is displayed.

For an overview of the scope of the associated Technical Documentation, refer to the following:
- The "Additional standard device documentation" and "Supplementary device-dependent documentation" sections
- The *Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations app*: Enter the serial number from the nameplate or scan the DataMatrix code on the nameplate.

4.2.1 Transmitter nameplate

Proline 500 – digital
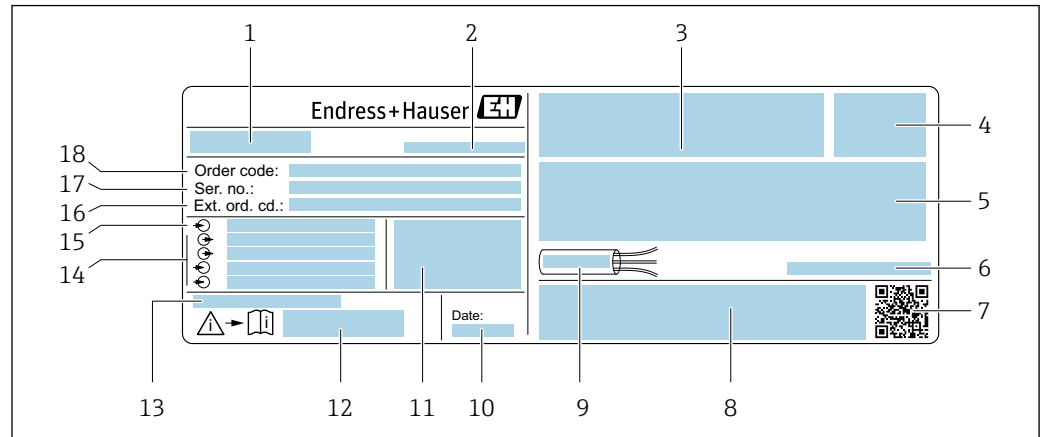
🖾 3 *Example of a transmitter nameplate*

1 Name of the transmitter
2 Manufacturer address/certificate holder
3 Space for approvals: Use in hazardous areas
4 Degree of protection
5 Electrical connection data: available inputs and outputs
6 Allowable ambient temperature (T_a)
7 2-D matrix code
8 Space for approvals and certificates: e.g. CE mark, RCM tick
9 Permitted temperature range for cable
10 Date of manufacture: year-month
11 Firmware version (FW) and device revision (Dev. rev.) from the factory
12 Document number of safety-related supplementary documentation
13 Space for additional information in the case of special products
14 Available inputs and outputs, supply voltage
15 Electrical connection data: supply voltage
16 Extended order code (Ext. ord. cd.)
17 Serial number (Ser. no.)
18 Order code

Proline 500
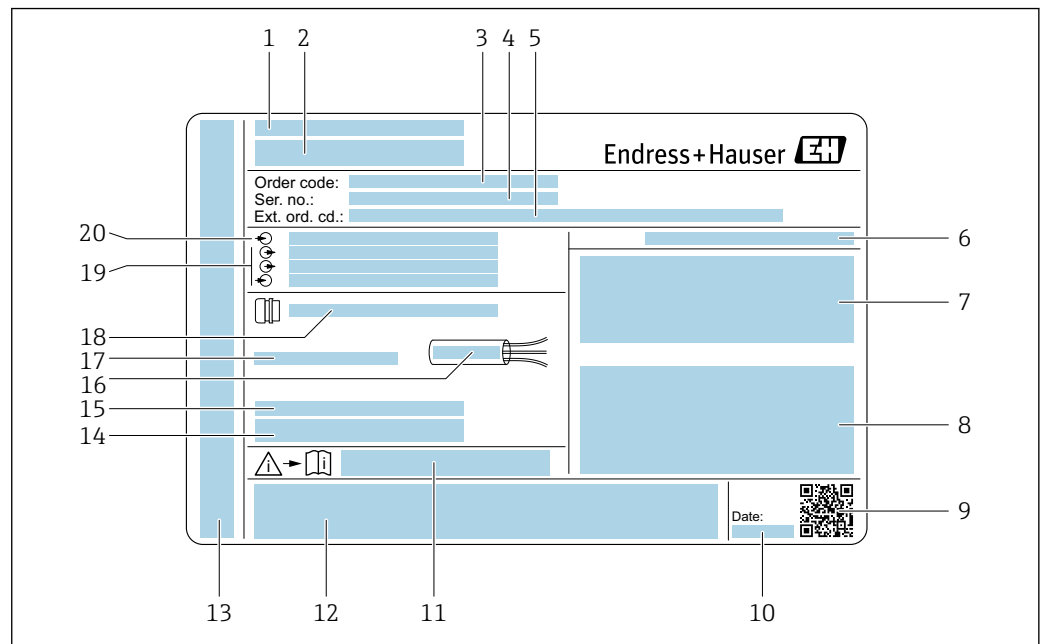
🖾 4   *Example of a transmitter nameplate*

1   Manufacturer address/certificate holder
2   Name of the transmitter
3   Order code
4   Serial number (Ser. no.)
5   Extended order code (Ext. ord. cd.)
6   Degree of protection
7   Space for approvals: use in hazardous areas
8   Electrical connection data: available inputs and outputs
9   2-D matrix code
10   Date of manufacture: year-month
11   Document number of safety-related supplementary documentation
12   Space for approvals and certificates: e.g. CE mark, RCM tick
13   Space for degree of protection of connection and electronics compartment when used in hazardous areas
14   Firmware version (FW) and device revision (Dev. rev.) from the factory
15   Space for additional information in the case of special products
16   Permitted temperature range for cable
17   Allowable ambient temperature (T_a)
18   Information on cable gland
19   Available inputs and outputs, supply voltage
20   Electrical connection data: supply voltage

4.2.2   Sensor nameplate
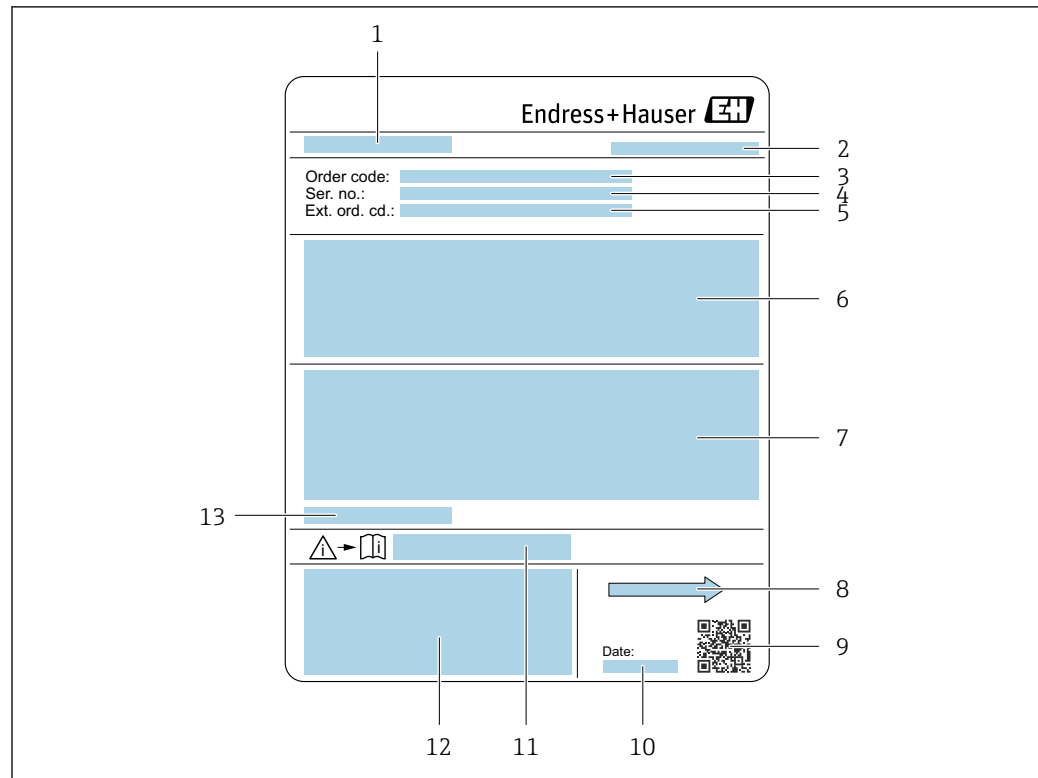
⊠ 5   Example of sensor nameplate

1   Name of sensor
2   Manufacturer address/certificate holder
3   Order code
4   Serial number (Ser. no.)
5   Extended order code (Ext. ord. cd.)
6   Flow; nominal diameter of the sensor; pressure rating; nominal pressure; static pressure; medium
    temperature range; material of liner and electrodes
7   Approval information for explosion protection, Pressure Equipment Directive and degree of protection
8   Flow direction
9   2-D matrix code
10   Date of manufacture: year-month
11   Document number of safety-related supplementary documentation
12   CE mark, RCM-Tick mark
13   Permitted ambient temperature (T_a)

Order code
The measuring device is reordered using the order code.

Extended order code
- The device type (product root) and basic specifications (mandatory features) are always listed.
- Of the optional specifications (optional features), only the safety and approval-related specifications are listed (e.g. LA). If other optional specifications are also ordered, these are indicated collectively using the # placeholder symbol (e.g. #LA#).
- If the ordered optional specifications do not include any safety and approval-related specifications, they are indicated by the + placeholder symbol (e.g. XXXXXX-ABCDE +).

4.2.3   Symbols on the device

Symbol	Meaning
⚠	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. Please consult the documentation for the measuring instrument to discover the type of potential danger and measures to avoid it.
📖	**Reference to documentation** Refers to the corresponding device documentation.
⏚	**Protective ground connection** A terminal that must be connected to the ground prior to establishing any other connections.

5 Storage and transport

5.1 Storage conditions

Observe the following notes for storage:
▸ Store in the original packaging to ensure protection from shock.
▸ Do not remove protective covers or protective caps installed on process connections. They prevent mechanical damage to the sealing surfaces and contamination in the measuring tube.
▸ Protect from direct sunlight. Avoid unacceptably high surface temperatures.
▸ Select a storage location that excludes the possibility of condensation forming on the measuring device. Fungi and bacteria can damage the liner.
▸ Store in a dry and dust-free place.
▸ Do not store outdoors.

Storage temperature → 🗎 211

5.2 Transporting the product

Transport the measuring device to the measuring point in the original packaging.
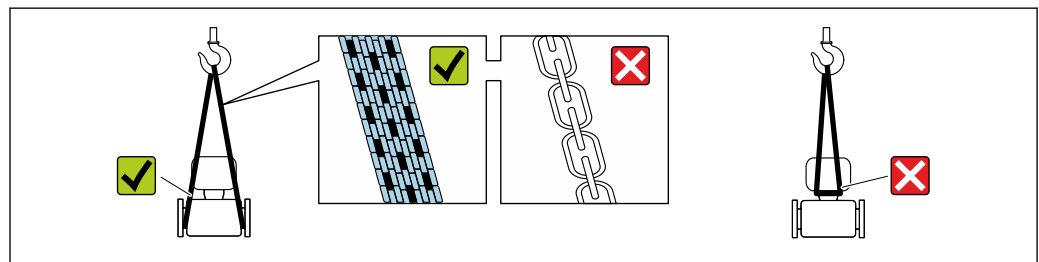
A0029252

ℹ️ Do not remove protective covers or caps installed on process connections. They prevent mechanical damage to the sealing surfaces and contamination in the measuring tube.

5.2.1 Measuring devices without lifting lugs

⚠️ **WARNING**

Center of gravity of the measuring device is higher than the suspension points of the webbing slings.
Risk of injury if the measuring device slips.
▸ Secure the measuring device against slipping or turning.
▸ Observe the weight specified on the packaging (stick-on label).
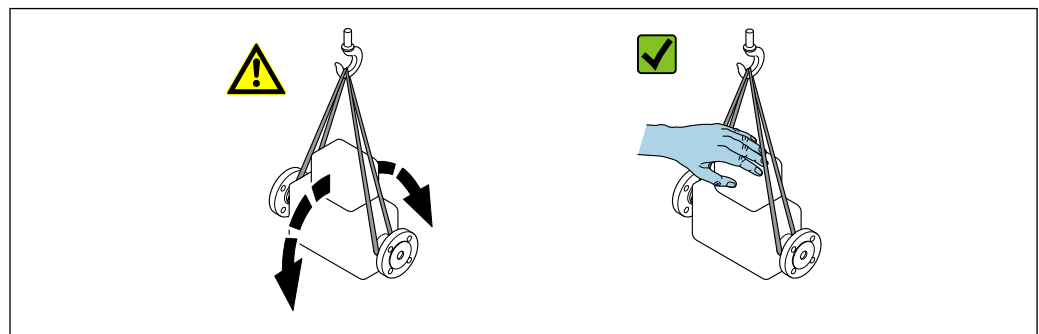
A0029214

5.2.2   Measuring devices with lifting lugs

⚠ CAUTION

Special transportation instructions for devices with lifting lugs
▶ Only use the lifting lugs fitted on the device or flanges to transport the device.
▶ The device must always be secured at two lifting lugs at least.

5.2.3   Transporting with a fork lift

If transporting in wood crates, the floor structure enables the crates to be lifted lengthwise or at both sides using a forklift.

⚠ CAUTION

Risk of damaging the magnetic coil!
▶ If transporting by forklift, do not lift the sensor by the metal casing.
▶ This would buckle the casing and damage the internal magnetic coils.
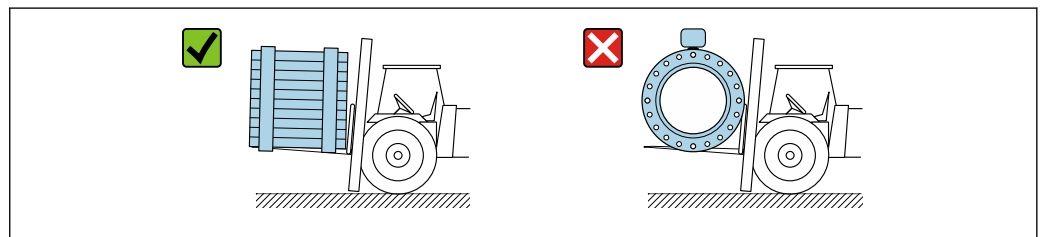
A0029319

5.3   Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:
• Outer packaging of device
  Stretch wrap made of polymer in accordance with EU Directive 2002/95/EC (RoHS)
• Packaging
  • Wood crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
  • Cardboard box in accordance with European packaging guideline 94/62/EC, recyclability confirmed by Resy symbol
• Transport material and fastening fixtures
  • Disposable plastic pallet
  • Plastic straps
  • Plastic adhesive strips
• Filler material
  Paper pads

6   Mounting

6.1   Mounting requirements

6.1.1   Mounting position

Mounting location

• Do not install the device at the highest point of the pipe.
• Do not install the device upstream from a free pipe outlet in a down pipe.

A0042131
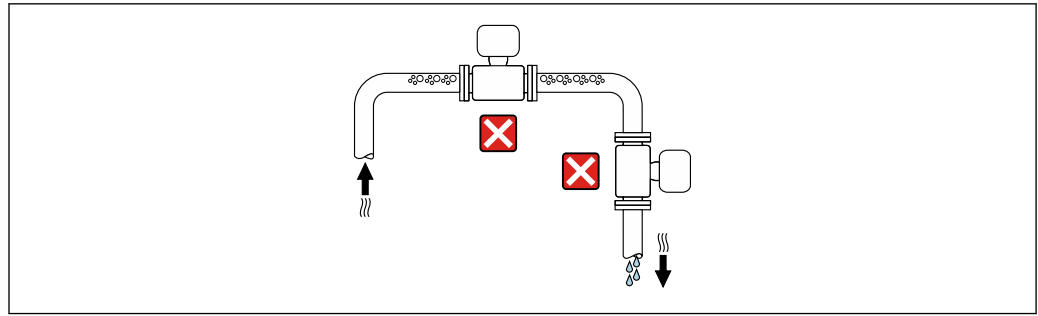
The device should ideally be installed in an ascending pipe.
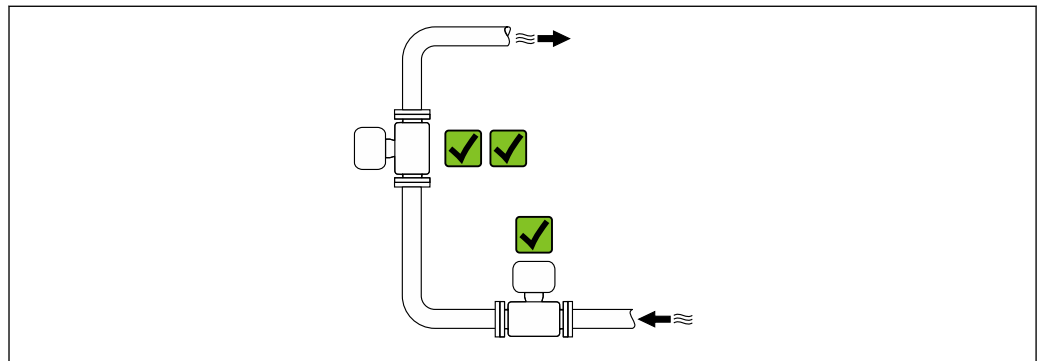
A0042317

Installation upstream from a down pipe

NOTICE
Negative pressure in the measuring pipe can damage the liner!
▶ If installing upstream of down pipes whose length h ≥ 5 m (16.4 ft): install a siphon with a vent valve downstream of the device.

This arrangement prevents the flow of liquid stopping in the pipe and air entrainment.
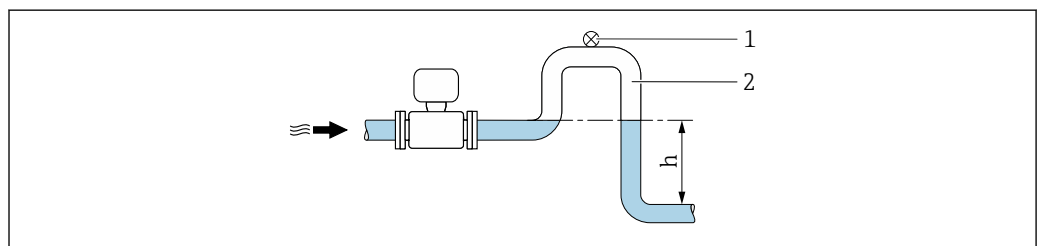
A0028981

1 Vent valve
2 Pipe siphon
h Length of down pipe

Installation with partially filled pipes

• Partially filled pipes with a gradient require a drain-type configuration.
• The installation of a cleaning valve is recommended.
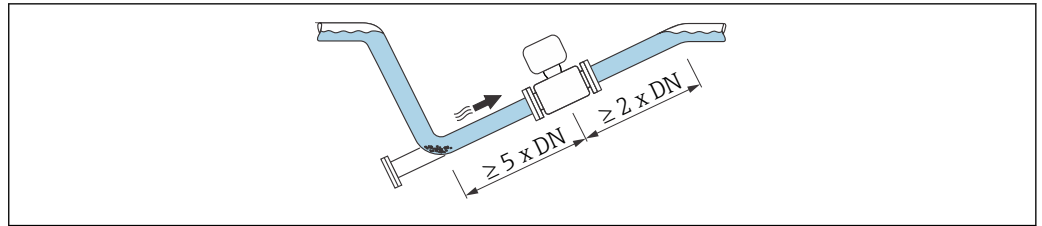
A0041088

Installation near pumps

NOTICE

Negative pressure in the measuring tube can damage the liner!

▸ In order to maintain the system pressure, install the device in the flow direction downstream from the pump.
▸ Install pulsation dampers if reciprocating, diaphragm or peristaltic pumps are used.
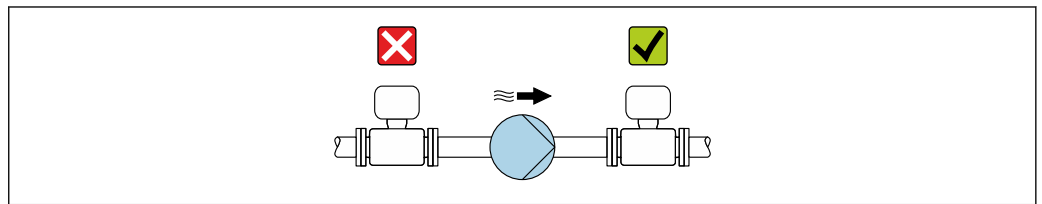
A0041083

• Information on the liner's resistance to partial vacuum
• Information on the measuring system's resistance to vibration and shock → 🖺 211

Installation in event of pipe vibrations

NOTICE

Pipe vibrations can damage the device!

▸ Do not expose the device to strong vibrations.
▸ Support the pipe and fix it in place.
▸ Support the device and fix it in place.
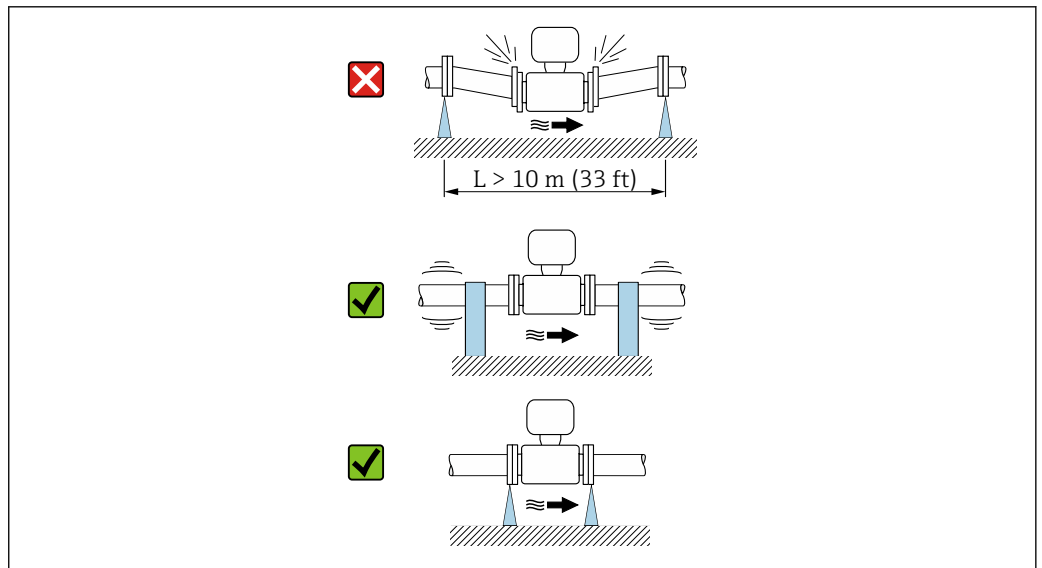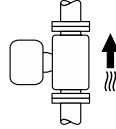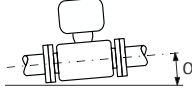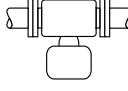
A0041092

Information on the measuring system's resistance to vibration and shock → 🖺 211

Orientation

The direction of the arrow on the nameplate helps you to install the measuring device according to the flow direction (direction of medium flow through the piping).

Orientation		Recommendation
Vertical orientation	A0015591	☑☑
Horizontal orientation	α A0041328	☑ [1]
Horizontal orientation, transmitter at bottom	A0015590	☑☑ [2] [3] ☒ [4]
Horizontal orientation, transmitter at side	A0015592	☒

1) The measuring device should be self-draining for hygiene applications. A vertical orientation is recommended for this. If only a horizontal orientation is possible, an angle of inclination α ≥ 10° is recommended.
2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
3) To prevent the electronics from overheating in the event of strong heat formation (e.g. CIP or SIP cleaning process), install the device with the transmitter part pointing downwards.
4) With the empty pipe detection function switched on: empty pipe detection only works if the transmitter housing is pointing upwards.

Vertical

Optimum for self-emptying pipe systems and for use in conjunction with empty pipe detection.
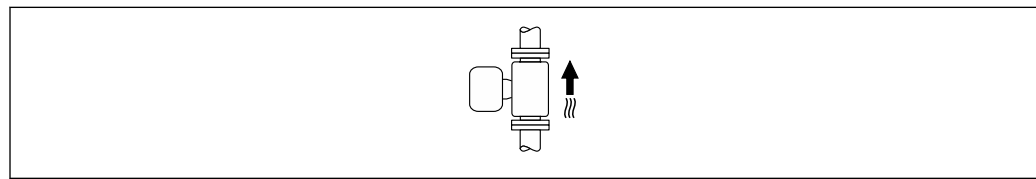
A0015591

Horizontal

- Ideally, the measuring electrode plane should be horizontal. This prevents brief insulation of the measuring electrodes by entrained air bubbles.
- Empty pipe detection only works if the transmitter housing is pointing upwards as otherwise there is no guarantee that the empty pipe detection function will actually respond to a partially filled or empty measuring tube.
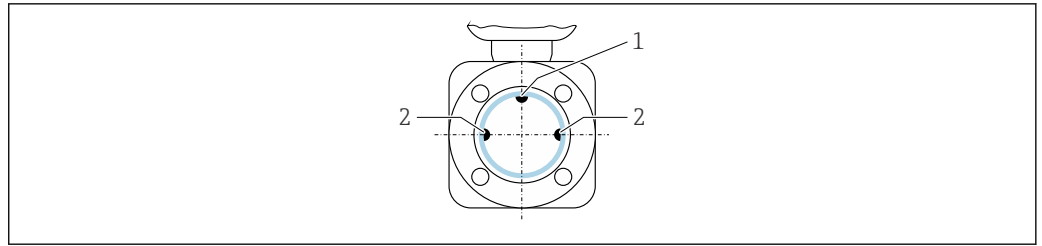
A0028998

1   EPD electrode for empty pipe detection, available from ≥ DN 15 (½")
2   Measuring electrodes for signal detection

Measuring instruments with a nominal diameter < DN 15 (½") do not have an EPD electrode. In this case, empty pipe detection is performed via the measuring electrodes.

Inlet and outlet runs

Installation with inlet and outlet runs

To avoid a vacuum and to maintain the specified level of measurement accuracy, install the device upstream from assemblies that produce turbulence (e.g. valves, T-sections) and downstream from pumps.

Maintain straight, unimpeded inlet and outlet runs.
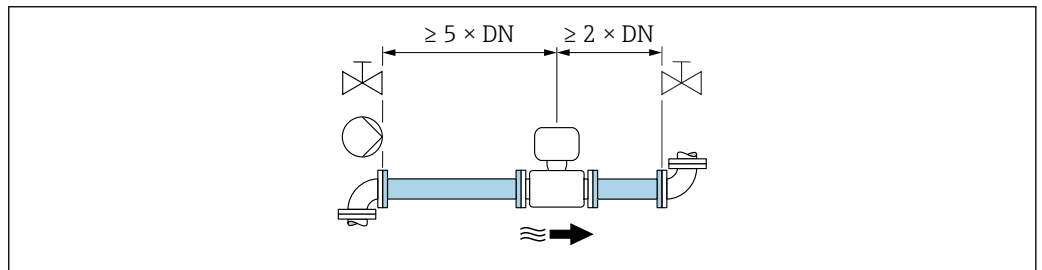
A0028997
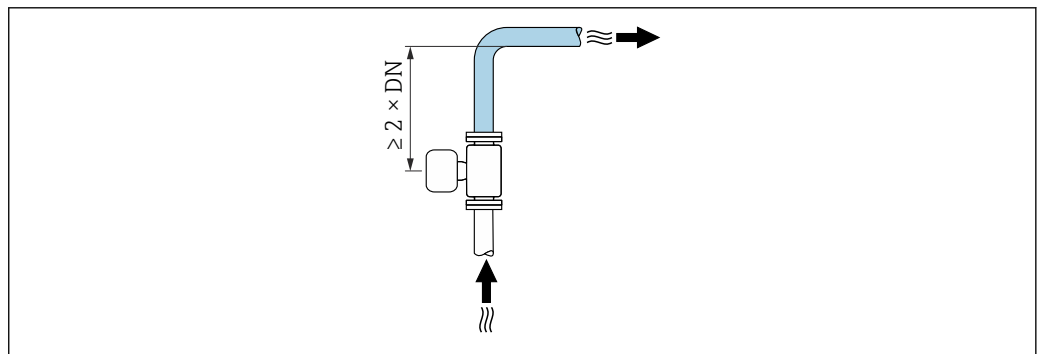
A0042132

Installation dimensions

For the dimensions and installation lengths of the device, see the "Technical Information" document, "Mechanical construction" section

6.1.2   Environmental and process requirements

Ambient temperature range

Transmitter	• Standard: −40 to +60 ℃ (−40 to +140 ℉) • Optional: −50 to +60 ℃ (−58 to +140 ℉) (Order code for "Test, certificate", option **JN** "Ambient temperature of transmitter −50 ℃ (−58 ℉)")
Local display	−20 to +60 ℃ (−4 to +140 ℉), the readability of the display may be impaired at temperatures outside the temperature range.
Sensor	−40 to +60 ℃ (−40 to +140 ℉)
Liner	Do not exceed or fall below the permitted temperature range of the liner .

If operating outdoors:
• Install the measuring device in a shady location.
• Avoid direct sunlight, particularly in warm climatic regions.
• Avoid direct exposure to weather conditions.

System pressure

Installation near pumps → 🖹 23

Vibrations

Installation in event of pipe vibrations → 🖹 23

Adapters

The sensor can also be installed in larger-diameter pipes with the aid of suitable adapters according to DIN EN 545 (double-flange reducers). The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids. The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders.

> • The nomogram only applies to liquids with a viscosity similar to that of water.
> • If the medium has a high viscosity, a larger measuring tube diameter can be considered in order to reduce pressure loss.

1. Calculate the ratio of the diameters d/D.

2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.
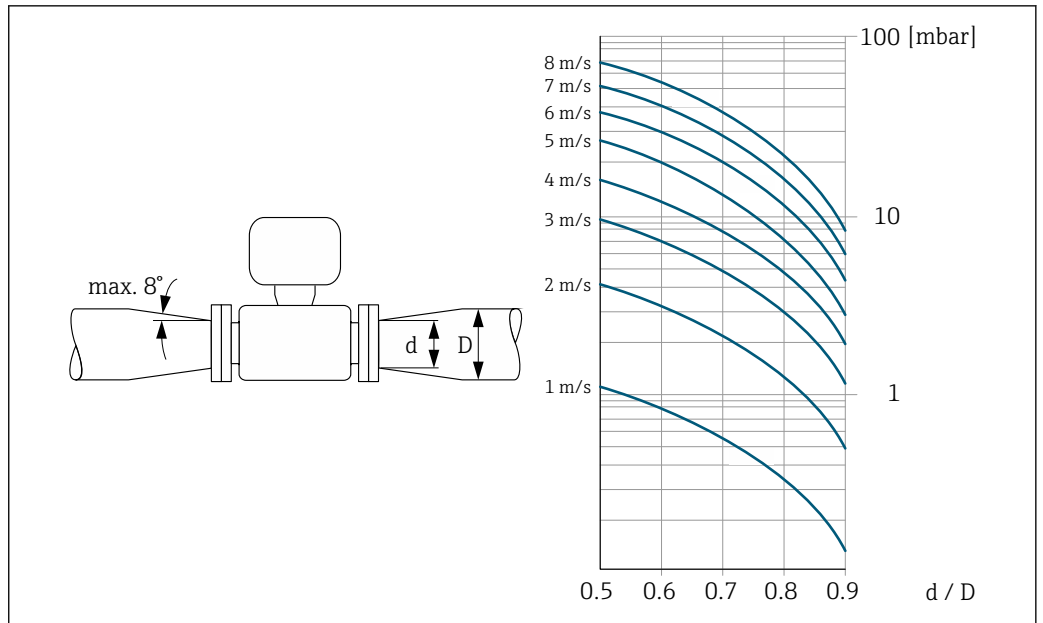
Length of connecting cable

Proline 500 – digital transmitter
Lengths of connecting cable → 🖹 38

Proline 500 transmitter
Max. 200 m (650 ft)

To obtain correct measurement results, observe the permitted connecting cable length of L_{max}. This length is determined by the conductivity of the medium. If measuring liquids in general: 5 µS/cm
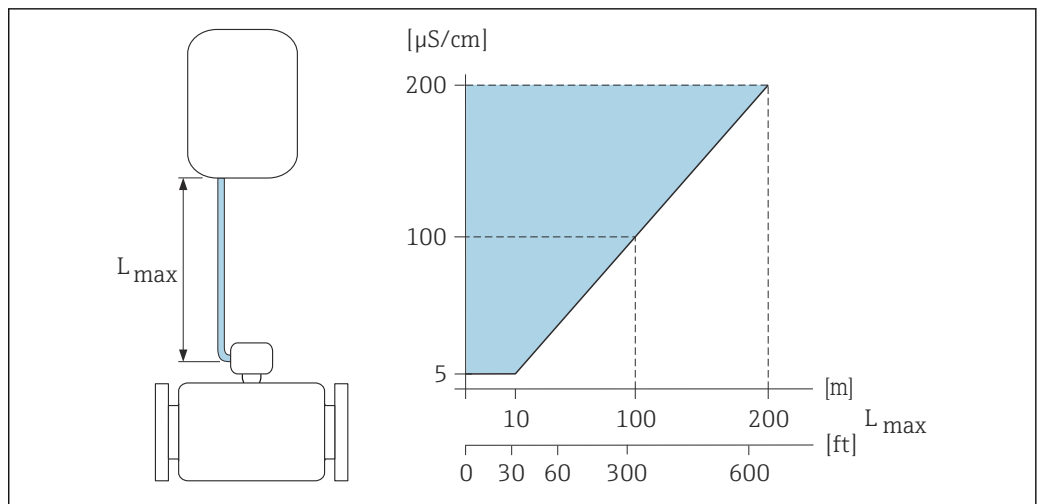
🖻 6   *Permitted length of connecting cable*

Colored area = permitted range
L_{max}= length of connecting cable in [m] ([ft])
[µS/cm] = medium conductivity

6.1.3   Special mounting instructions

Weather protection cover
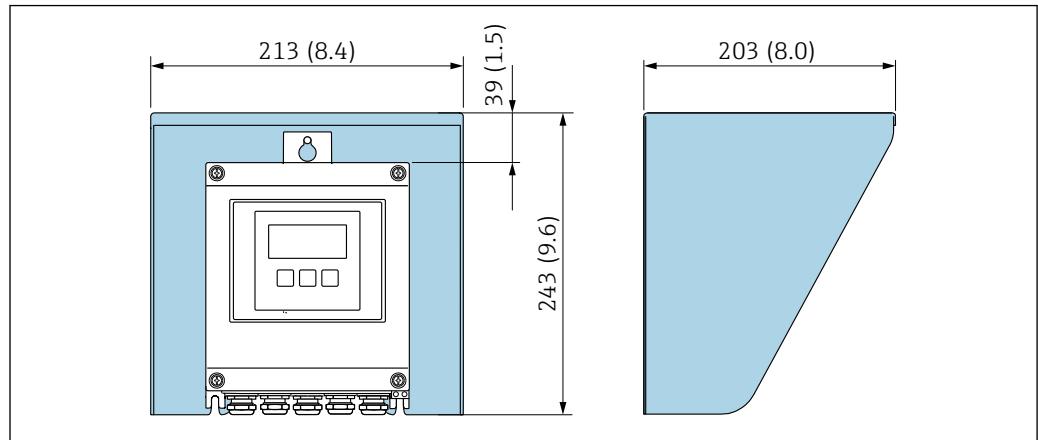
☑ 7   Weather protection cover for Proline 500 – digital; engineering unit mm (in)
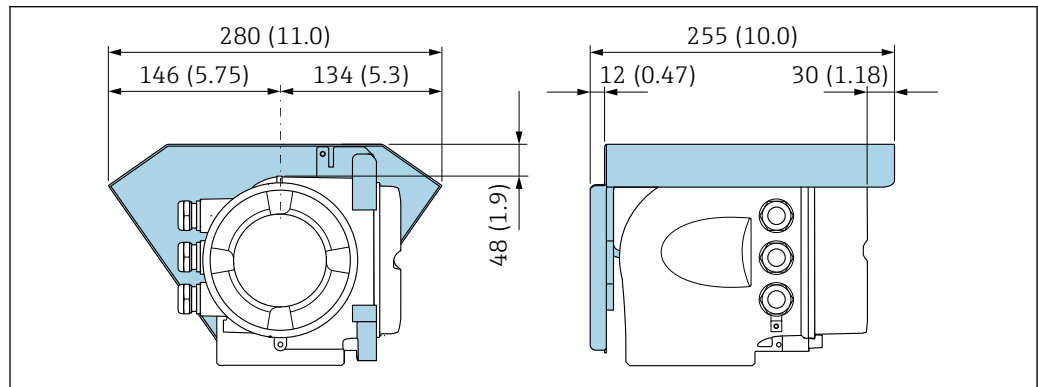
☑ 8   Weather protection cover for Proline 500; engineering unit mm (in)

Hygienic compatibility

When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section → 🖹 222

6.2   Mounting the measuring instrument

6.2.1   Required tools

For transmitter

For mounting on a post:
- Proline 500 – digital transmitter
  - Open-ended wrench AF 10
  - Torx screwdriver TX 25
- Proline 500 transmitter
  Open-ended wrench AF 13

For wall mounting:
Drill with drill bit Ø 6.0 mm

For sensor

For flanges and other process connections: Use a suitable mounting tool.

6.2.2   Preparing the measuring device

1. Remove all remaining transport packaging.

2. Remove any protective covers or protective caps present from the sensor.

3. Remove stick-on label on the electronics compartment cover.

6.2.3   Mounting the sensor

⚠ **WARNING**

Danger due to improper process sealing!
▶ Ensure that the inside diameters of the gaskets are greater than or equal to that of the process connections and piping.
▶ Ensure that the seals are clean and undamaged.
▶ Secure the seals correctly.

1. Ensure that the direction of the arrow on the sensor matches the flow direction of the medium.

2. To ensure compliance with device specifications, install the measuring device between the pipe flanges in a way that it is centered in the measurement section.

3. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.
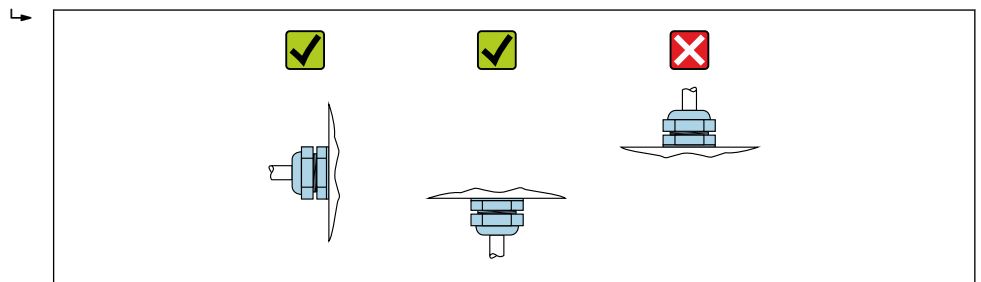
A0029263

The sensor is supplied to order, with or without pre-installed process connections. Pre-installed process connections are firmly secured to the sensor by 4 or 6 hexagonal-headed bolts.

▶ Depending on the application and pipe length:
    Support the sensor or secure it additionally.

▶ If using plastic process connections:
    It is absolutely essential to secure the sensor.

ℹ An appropriate wall mounting kit can be ordered separately as an accessory from Endress+Hauser → 🕮 225.

Welding the sensor into the pipe (welding nipples)

⚠ **WARNING**

Risk of destroying the electronics!
▶ Make sure that the welding system is not grounded via the sensor or transmitter.

1. Tack-weld the sensor to secure it in the pipe. A suitable welding jig can be ordered separately as an accessory → 🕮 225.

2. Loosen the screws on the process connection flange and remove the sensor, along with the seal, from the pipe.

3. Weld the process connection into the pipe.

4. Reinstall the sensor in the pipe, and in doing so make sure that the seal is clean and in the right position.

▶ If thin-walled pipes carrying food are welded correctly:
  Disassemble the sensor and seal even if the seal is not damaged by the heat when mounted.

It must be possible to open the pipe by at least 8 mm (0.31 in) for disassembly.

Mounting the seals

Comply with the following instructions when installing seals:

1. In the case of metal process connections, the screws must be tightened securely. The process connection forms a metal connection with the sensor, which ensures a defined compression of the seal.

2. In the case of plastic process connections, observe the maximum torques for lubricated threads: 7 Nm (5.2 lbf ft); always insert a seal between the connection and the counterflange in the case of plastic flanges.

3. Depending on the application the seals should be replaced periodically, particularly if gasket seals are used (aseptic version)! The interval between changes depends on the frequency of the cleaning cycles, the cleaning temperature and the medium temperature. Replacement seals can be ordered as an accessory → 🕮 225.

Mounting grounding rings (DN 2 to 25 (1/12 to 1"))

Pay attention to the information on potential equalization .

In the case of plastic process connections (e.g. flange connections or adhesive fittings), additional grounding rings must be used to ensure potential matching between the sensor and the fluid. If grounding rings are not installed, this can affect the measuring accuracy or cause the destruction of the sensor as a result of the electrochemical decomposition of the electrodes.

- Depending on the option ordered, plastic disks are used instead of grounding rings on some process connections. These plastic disks only act as "spacers" and do not have any potential matching function. Furthermore, they also perform a significant sealing function at the sensor/process connection interface. Therefore, in the case of process connections without metal grounding rings, these plastic disks/seals should never be removed and should always be installed!
- Grounding rings can be ordered separately as an accessory from Endress+Hauser → 🕮 225. When ordering make sure that the grounding rings are compatible with the material used for the electrodes, as otherwise there is the danger that the electrodes could be destroyed by electrochemical corrosion! Material specifications → 🕮 216.
- Grounding rings, including seals, are mounted inside the process connections. This does not affect the installed length.
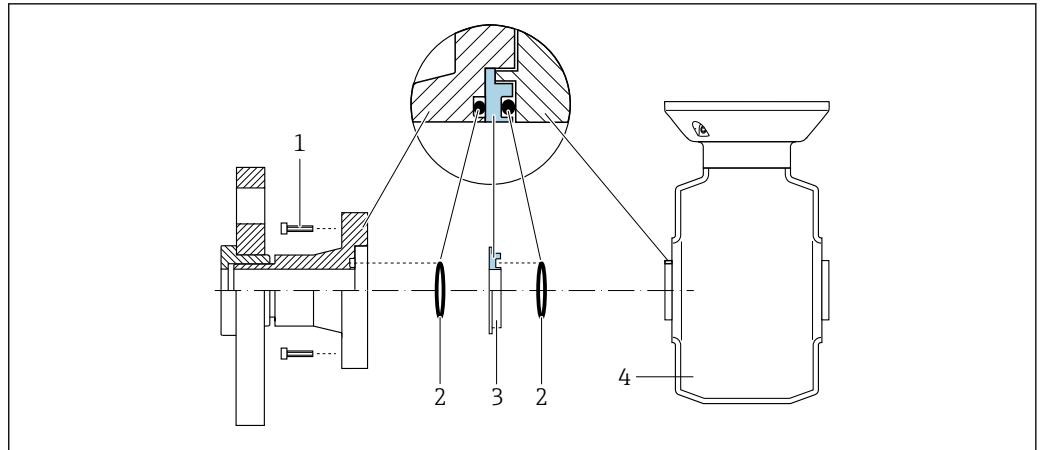
A0028971

🖅 9   Installing grounding rings

1   Hexagonal-headed bolts of process connection
2   O-ring seals
3   Grounding ring or plastic disk (spacer)
4   Sensor

1. Loosen the 4 or 6 hexagonal-headed bolts (1) and remove the process connection from the sensor (4).

2. Remove the plastic disk (3), along with the two O-ring seals (2), from the process connection.

3. Place the first O-ring seal (2) back into the groove of the process connection.

4. Fit the metal grounding ring (3) in the process connection as illustrated.

5. Place the second O-ring seal (2) into the groove of the grounding ring.

6. Mount the process connection back on the sensor. When doing so, make sure to observe the maximum screw tightening torques for lubricated threads:
    7 Nm (5.2 lbf ft)

6.2.4   Mounting the transmitter housing: Proline 500 – digital

⚠ CAUTION

Ambient temperature too high!
Danger of electronics overheating and housing deformation.
▸   Do not exceed the permitted maximum ambient temperature. → 🖺 26
▸   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.

The transmitter can be mounted in the following ways:
• Post mounting
• Wall mounting

Pipe mounting

Required tools:
• Open-ended wrench AF 10
• Torx screwdriver TX 25

NOTICE

Excessive tightening torque applied to the fixing screws!

Risk of damaging the plastic transmitter.

▸ Tighten the fixing screws as per the tightening torque: 2.5 Nm (1.8 lbf ft)
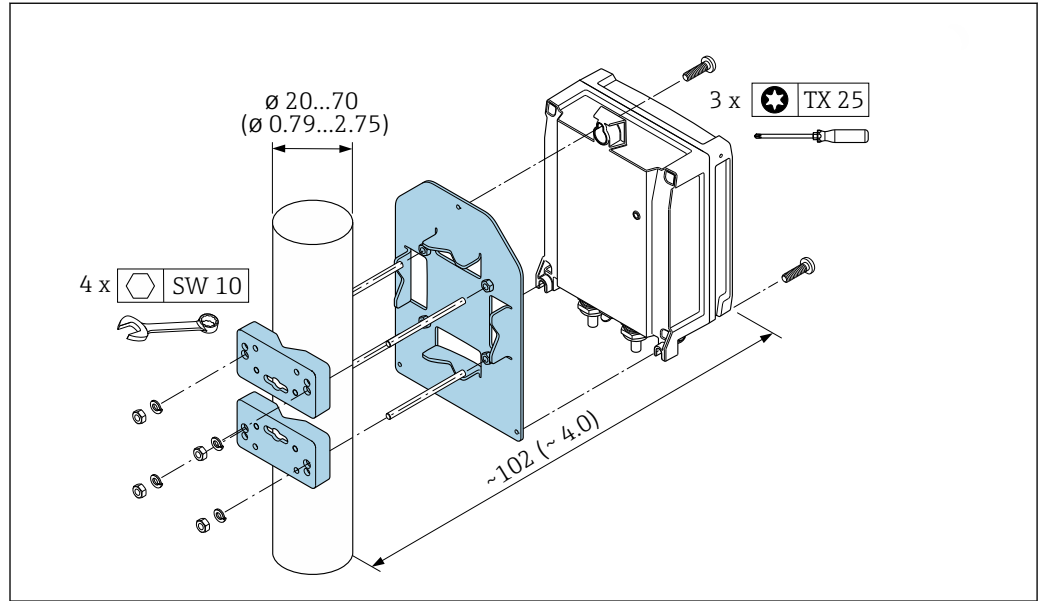
🖼 10   Unit mm (in)

Wall mounting

Required tools:
Drill with drill bit ⌀ 6.0 mm
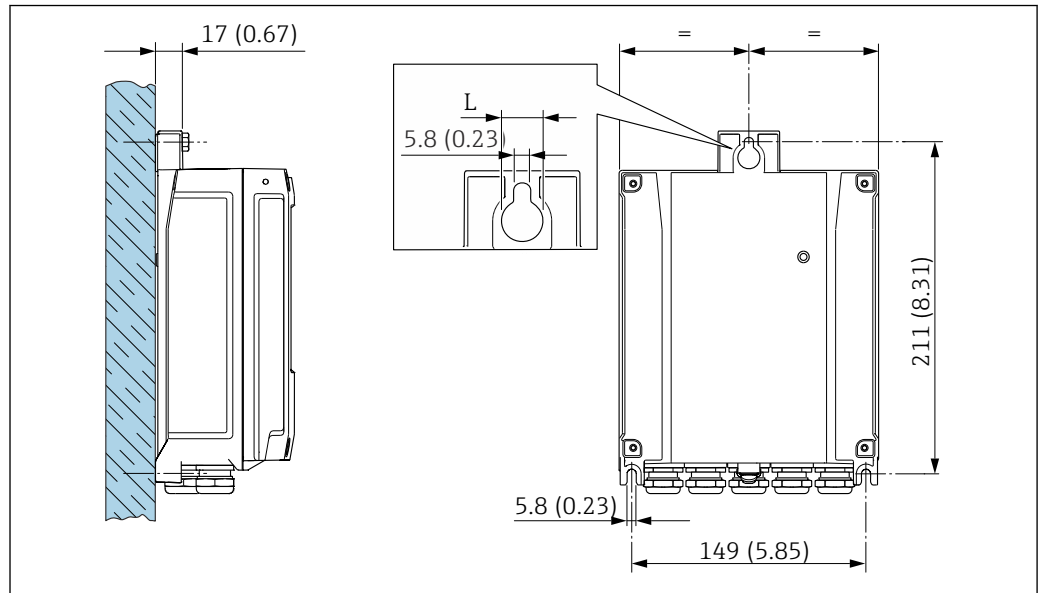
🖼 11   Engineering unit mm (in)

L   Depends on order code for "Transmitter housing"

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

1. Drill the holes.

2. Insert wall plugs into the drilled holes.

3. Screw in the fixing screws slightly.

4. Fit the transmitter housing over the fixing screws and mount in place.

5. Tighten the fixing screws.

6.2.5   Mounting the transmitter housing: Proline 500

⚠ CAUTION

Ambient temperature too high!
Danger of electronics overheating and housing deformation.
▸ Do not exceed the permitted maximum ambient temperature. → 🖹 26
▸ 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.

The transmitter can be mounted in the following ways:
• Post mounting
• Wall mounting

Wall mounting

Required tools
Drill with drill bit Ø 6.0 mm
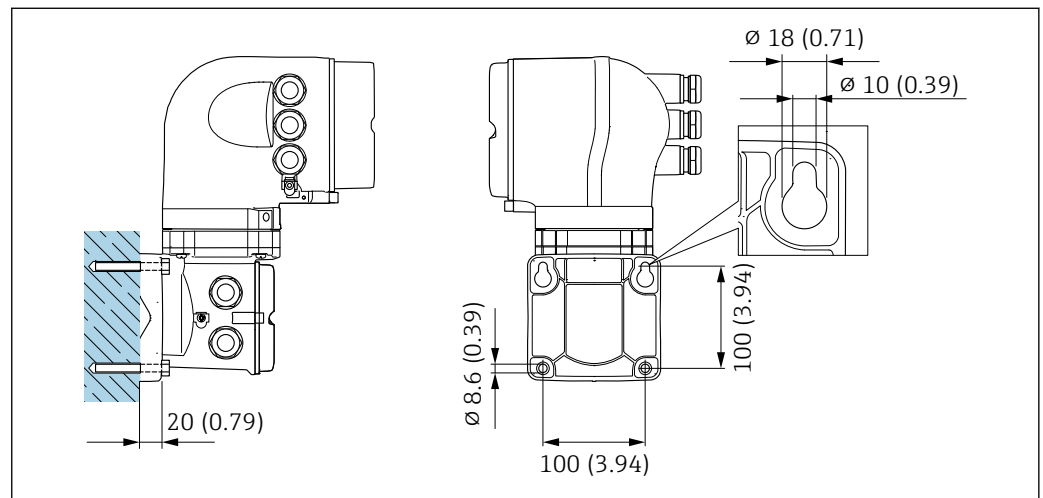
🖻 *12   Engineering unit mm (in)*

1. Drill the holes.

2. Insert wall plugs into the drilled holes.

3. Screw in the fixing screws slightly.

4. Fit the transmitter housing over the fixing screws and mount in place.

5. Tighten the fixing screws.

Pipe mounting

Required tools
Open-ended wrench AF 13
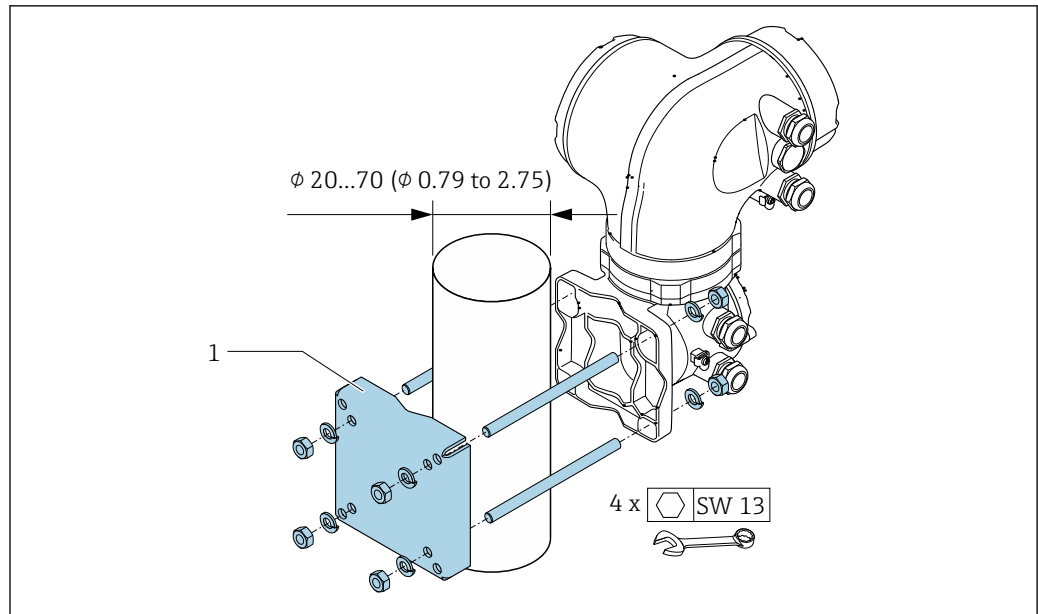
☒ 13   Engineering unit mm (in)

6.2.6   Turning the transmitter housing: Proline 500

To provide easier access to the connection compartment or display module, the transmitter housing can be turned.
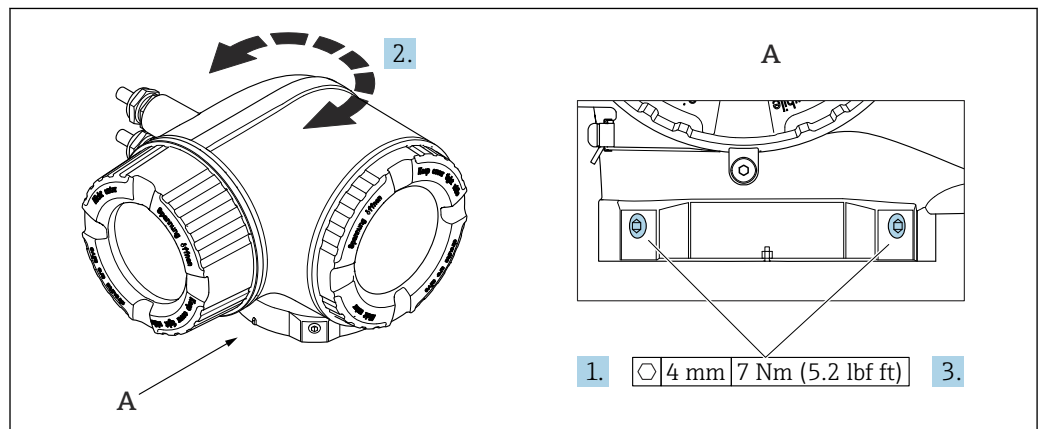
☒ 14   Ex housing

1. Loosen the fixing screws.

2. Turn the housing to the desired position.

3. Tighten the securing screws.

6.2.7   Turning the display module: Proline 500

The display module can be turned to optimize display readability and operability.
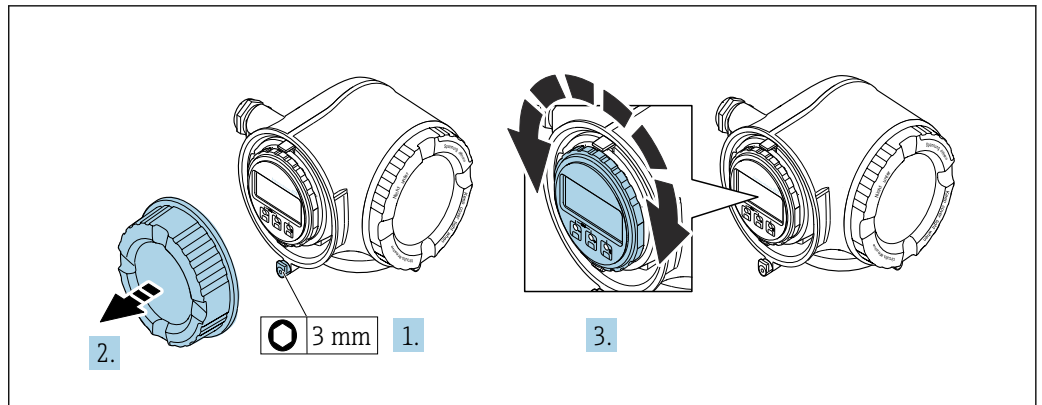
A0030035

1. Depending on the device version: Loosen the securing clamp of the connection compartment cover.

2. Unscrew the connection compartment cover.

3. Turn the display module to the desired position: max. 8 × 45° in each direction.

4. Screw on the connection compartment cover.

5. Depending on the device version: Attach the securing clamp of the connection compartment cover.

6.3   Post-mounting check

Is the device undamaged (visual inspection)?	□
Does the measuring device conform to the measuring point specifications? For example: • Process temperature • Pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document. • Ambient temperature • Measuring range	□
Has the correct orientation been selected for the sensor → 🕮 24 ? • According to sensor type • According to medium temperature • According to medium properties (outgassing, with entrained solids)	□
Does the arrow on the sensor nameplate match the actual direction of flow of the fluid through the piping → 🕮 24?	□
Are the measuring point identification and labeling correct (visual inspection)?	□
Have the fixing screws been tightened with the correct tightening torque?	□

7   Electrical connection

⚠ WARNING

Live parts! Incorrect work performed on the electrical connections can result in an electric shock.

▸ Set up a disconnecting device (switch or power-circuit breaker) to easily disconnect the device from the supply voltage.

▸ In addition to the device fuse, include an overcurrent protection unit with max. 10 A in the plant installation.

7.1   Electrical safety

In accordance with applicable national regulations.

7.2   Connecting requirements

7.2.1   Required tools

• For cable entries: use appropriate tool
• 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)

7.2.2   Requirements for connection cable

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

Protective grounding cable for the outer ground terminal

Conductor cross-section < 2.1 mm^2 (14 AWG)

The use of a cable lug enables the connection of larger cross-sections.

The 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.

Signal cable

EtherNet/IP

The standard ANSI/TIA/EIA-568-B.2 Annex specifies CAT 5 as the minimum category for a cable used for EtherNet/IP. CAT 5e and CAT 6 are recommended.

📖 For more information on planning and installing EtherNet/IP networks, please refer to the "Media Planning and Installation Manual. EtherNet/IP" of ODVA Organization

Current output 0/4 to 20 mA

Standard installation cable is sufficient.

Pulse /frequency /switch 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.

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).

Choice of connecting cable between the transmitter and sensor

Depends on the type of transmitter and the installation zones
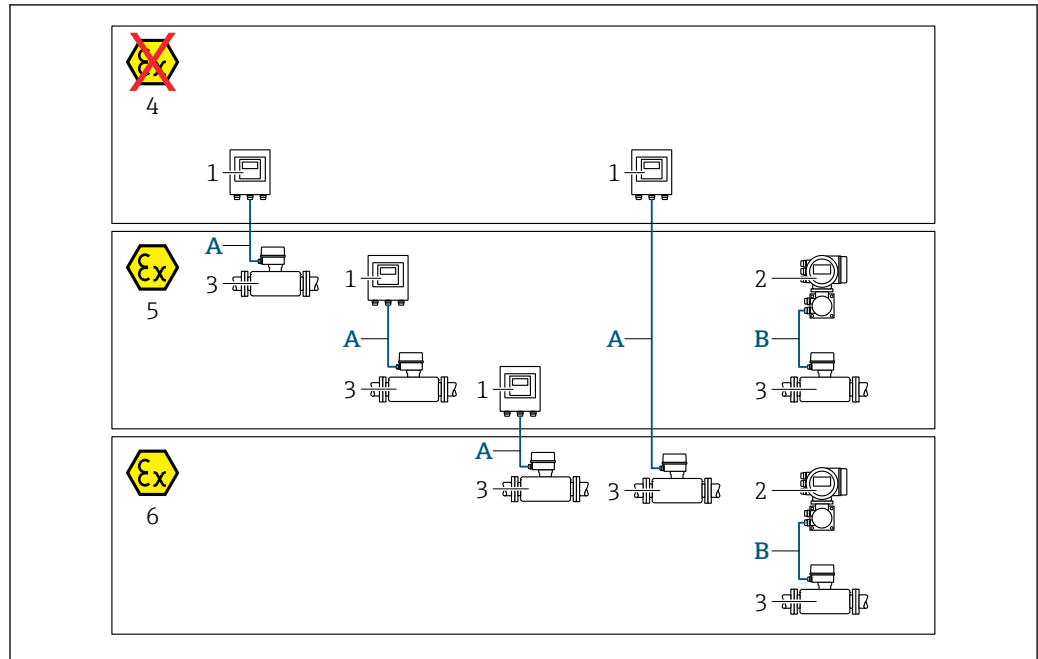
A0032477

1 *Proline 500 digital transmitter*
2 *Proline 500 transmitter*
3 *Promag sensor*
4 *Non-hazardous area*
5 *Hazardous area: Zone 2; Class I, Division 2*
6 *Hazardous area: Zone 1; Class I, Division 1*
A *Standard cable to 500 digital transmitter → 🖹 38*
  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 or Zone 1; Class I, Division 1
B *Signal cable to 500 transmitter → 🖹 39*
  Transmitter and sensor installed in the hazardous area: Zone 2; Class I, Division 2 or Zone 1;
  Class I, Division 1

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 %
Cable length	Maximum 300 m (900 ft), see the following table.

Cross-section	Cable lengths for use in	
	Non-hazardous area, Hazardous area: Zone 2; Class I, Division 2	Hazardous area: Zone 1; Class I, Division 1
0.34 mm² (AWG 22)	80 m (240 ft)	50 m (150 ft)
0.50 mm² (AWG 20)	120 m (360 ft)	60 m (180 ft)
0.75 mm² (AWG 18)	180 m (540 ft)	90 m (270 ft)
1.00 mm² (AWG 17)	240 m (720 ft)	120 m (360 ft)

Cross-section	Cable lengths for use in	
	Non-hazardous area, Hazardous area: Zone 2; Class I, Division 2	Hazardous area: Zone 1; Class I, Division 1
1.50 mm² (AWG 15)	300 m (900 ft)	180 m (540 ft)
2.50 mm² (AWG 13)	300 m (900 ft)	300 m (900 ft)

Optionally available connecting cable

Design	2 × 2 × 0.34 mm² (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 (60 ft); variable: up to maximum 50 m (150 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

Signal cable

Design	3 × 0.38 mm² (20 AWG) with common, braided copper shield (Ø ~ 9.5 mm (0.37 in)) and individual shielded cores
Conductor resistance	≤ 50 Ω/km (0.015 Ω/ft)
Capacitance: core/shield	≤ 420 pF/m (128 pF/ft)
Cable length (max.)	Depends on the medium conductivity, max. 200 m (656 ft)
Cable lengths (available for order)	5 m (15 ft), 10 m (30 ft), 20 m (60 ft) or variable length up to max. 200 m (600 ft)
Cable diameter	9.4 mm (0.37 in) ± 0.5 mm (0.02 in)
Operating temperature	−20 to +80 °C (−4 to +176 °F)

Coil current cable

Design	3 × 0.75 mm² (18 AWG) with common, braided copper shield (Ø ~ 9 mm (0.35 in)) and individual shielded cores
Conductor resistance	≤ 37 Ω/km (0.011 Ω/ft)
Capacitance: core/core, shield grounded	≤ 120 pF/m (37 pF/ft)
Cable length (max.)	Depends on the medium conductivity, max. 200 m (656 ft)
Cable lengths (available for order)	5 m (15 ft), 10 m (30 ft), 20 m (60 ft) or variable length up to max. 200 m (600 ft)
Cable diameter	8.8 mm (0.35 in) ± 0.5 mm (0.02 in)
Continuous operating temperature	−20 to +80 °C (−4 to +176 °F)
Test voltage for cable insulation	≤ AC 1433 V rms 50/60 Hz or ≥ DC 2026 V
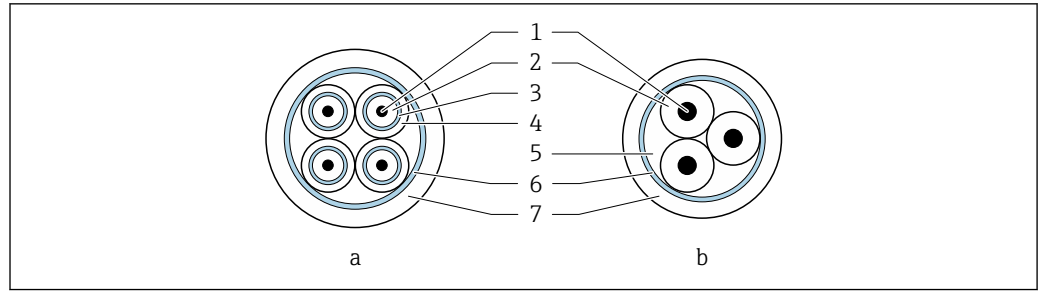
A0029151

🖼 *15   Cable cross-section*

a	*Electrode cable*
b	*Coil current cable*
1	*Core*
2	*Core insulation*
3	*Core shield*
4	*Core jacket*
5	*Core reinforcement*
6	*Cable shield*
7	*Outer jacket*

Operation in zones of severe electrical interference

The measuring system meets the general safety requirements → 🗎 223 and EMC specifications → 🗎 212.

Grounding is by means of the ground terminal provided for the purpose inside the connection housing. The stripped and twisted lengths of cable shield to the ground terminal must be as short as possible.

7.2.3   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 (−)	EtherNet/IP (RJ45 connector)	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:
• Proline 500 – digital → 🗎 44
• Proline 500 → 🗎 54

7.2.4   Available device plugs
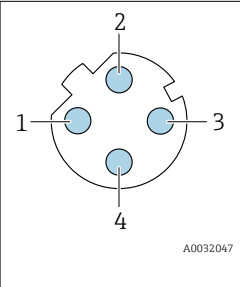
ℹ Device plugs may not be used in hazardous areas!

Order code for "Input; output 1", option NA "EtherNet/IP"

Order code for	Cable entry/connection	
"Electrical connection"	2	3
L, N, P, U	Connector M12 × 1	–
R [1) 2)], S [1) 2)], T [1) 2)], V [1) 2)]	Connector M12 × 1	Connector M12 × 1

1)   Cannot be combined with an external WLAN antenna (order code for "Enclosed accessories", option P8) of an RJ45 M12 adapter for the service interface (order code for "Accessories mounted", option NB) or of the remote display and operating module DKX001

2)   Suitable for integrating the device in a ring topology.

7.2.5   Pin assignment of device plug

Pin		Assignment
1	+	Tx
2	+	Rx
3	-	Tx
4	-	Rx
Coding		**Plug/socket**
D		Socket

A0032047

7.2.6   Preparing the measuring device

Carry out the steps in the following order:

1. Mount the sensor and transmitter.

2. Sensor connection housing: 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.
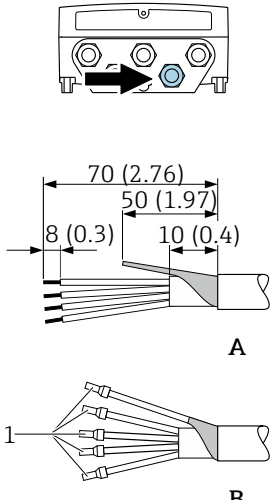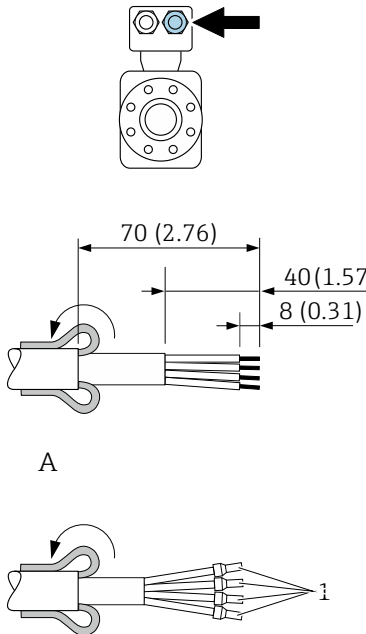
▶ Use suitable cable glands corresponding to the degree of protection.

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 → 🗎 36.

7.2.7   Preparing the connecting cable: Proline 500 – digital

When terminating the connecting cable, pay attention to the following points:
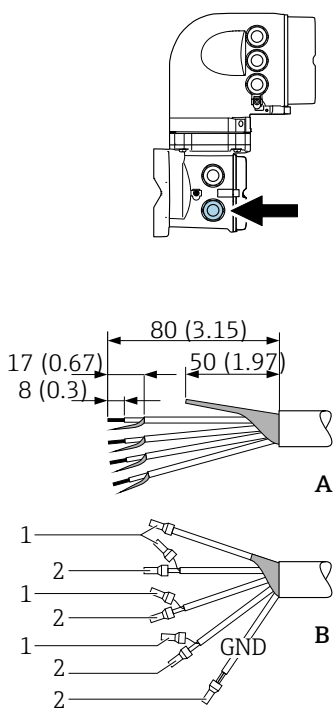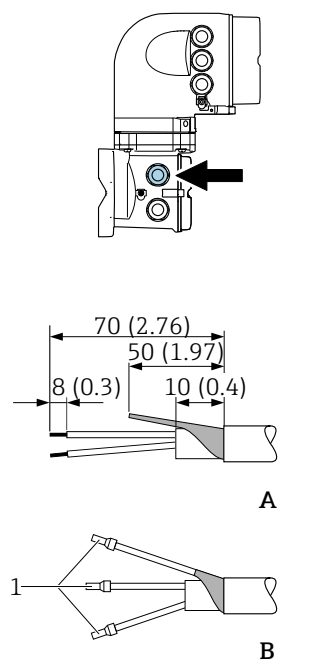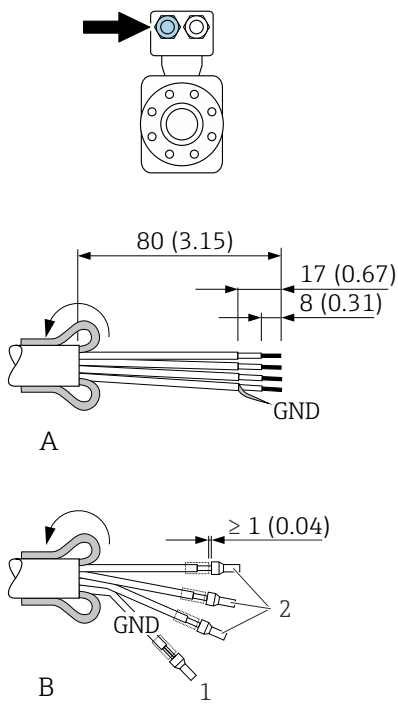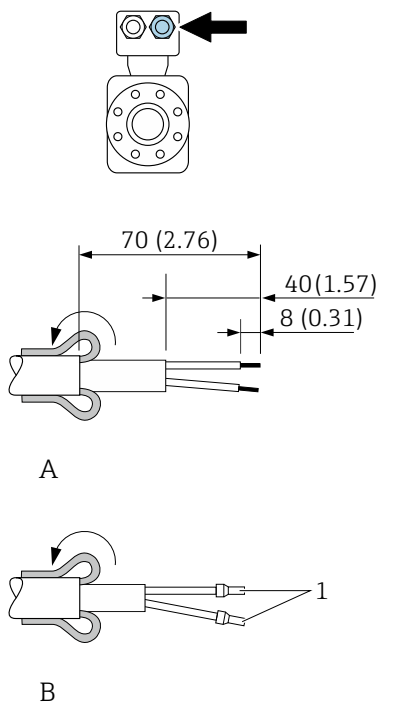
▸ For cables with fine-wire cores (stranded cables):
Fit the cores with ferrules.

Transmitter	Sensor

Engineering unit mm (in)
A = Terminate the cable
B = Fit ferrules on cables with fine-wire cores (stranded cables)
1 = Red ferrules, ⌀ 1.0 mm (0.04 in)

7.2.8   Preparing the connecting cable: Proline 500

When terminating the connecting cable, pay attention to the following points:

1. In the case of the electrode cable:
    Make sure that the ferrules do not touch the core shields on the sensor side.
    Minimum distance = 1 mm (exception: green "GND" cable)

2. In the case of the coil current cable:
    Insulate one core of the three-core cable at the level of the core reinforcement. You only require two cores for the connection.

3. For cables with fine-wire cores (stranded cables):
    Fit the cores with ferrules.

Transmitter	
Electrode cable	**Coil current cable**
A0029543	A0029544
Sensor	
Electrode cable	**Coil current cable**
A0029438	A0029439
Engineering unit mm (in) A = Terminate the cable B = Fit ferrules on cables with fine-wire cores (stranded cables) 1 = Red ferrules, ⌀ 1.0 mm (0.04 in) 2 = White ferrules, ⌀ 0.5 mm (0.02 in)	

7.3   Connecting the measuring instrument: Proline 500 - digital

NOTICE

An incorrect connection compromises electrical safety!

▶ Only properly trained specialist staff may perform electrical connection work.
▶ Observe applicable federal/national installation codes and regulations.
▶ Comply with local workplace safety regulations.
▶ Always connect the protective ground cable ⊕ before connecting additional cables.
▶ When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation.

7.3.1   Connecting the connecting cable

⚠ WARNING

Risk of damaging 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

A0028198
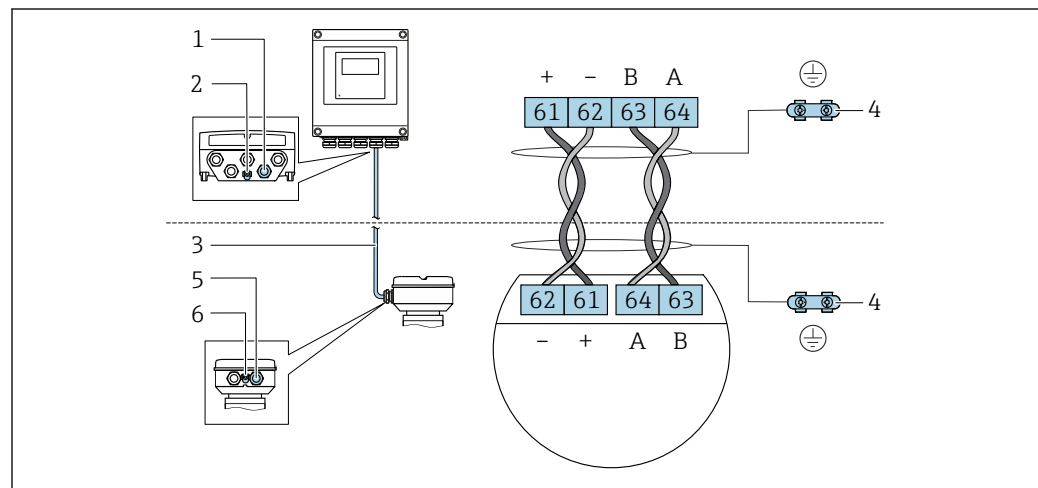
1   Cable entry for cable on transmitter housing
2   Protective earth (PE)
3   Connecting cable ISEM communication
4   Grounding via ground connection; in the version with a device plug, grounding is ensured through the plug itself
5   Cable entry for cable or connection of device plug on sensor connection housing
6   Protective earth (PE)

Connecting the connecting cable to the sensor connection housing

• Connection via terminals with order code for "Sensor connection housing":
  Option **B** "Stainless, hygienic" → 🖺 46
• Connection via connectors with order code for "Sensor connection housing":
  Option **C** "Ultra-compact hygienic, stainless" → 🖺 47

Connecting the connecting cable to the transmitter

The cable is connected to the transmitter via terminals → 🖺 48.

Connecting the sensor connection housing via terminals

For the device version with the order code for "Sensor connection housing":
Option **A** "Aluminum coated"
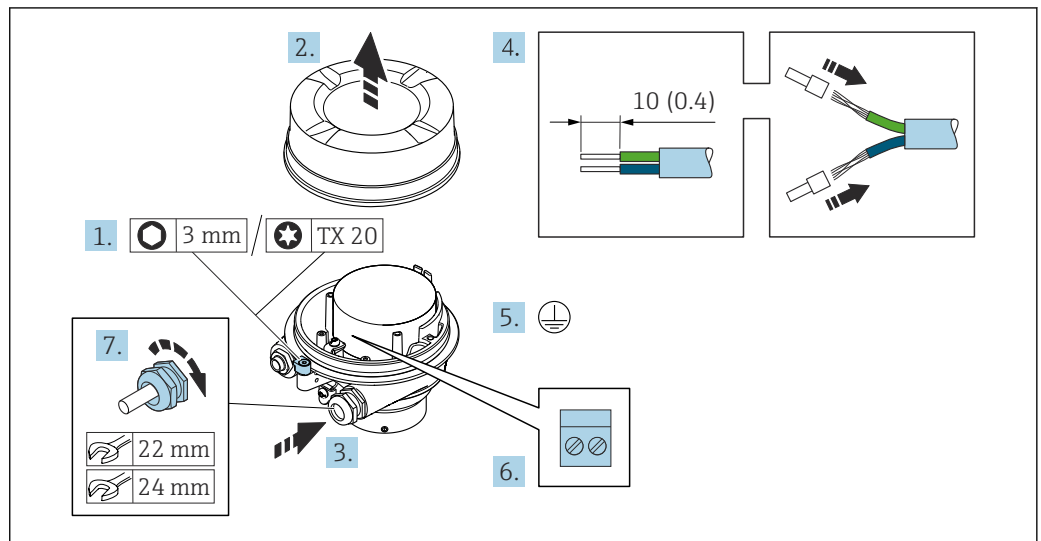
A0029616

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.

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.

Connecting the sensor connection housing via terminals

For the device version with the order code for "Sensor connection housing":
Option **B** "Stainless, hygienic"

A0029613

1. Release the securing screw of the housing cover.

2. Open 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.

7. Firmly tighten the cable glands.
    ↳ This concludes the process for connecting the connecting cable.

8. Close the housing cover.

9. Tighten the securing screw of the housing cover.

Connecting the sensor connection housing via the connector

For the device version with the order code for "Sensor connection housing":
Option **C** "Ultra-compact hygienic, stainless"
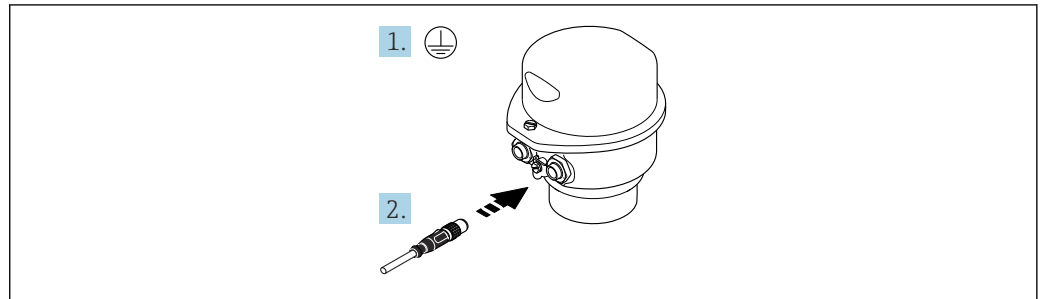
1. Connect the protective ground.

2. Connect the connector.

Connecting the connecting cable to the transmitter
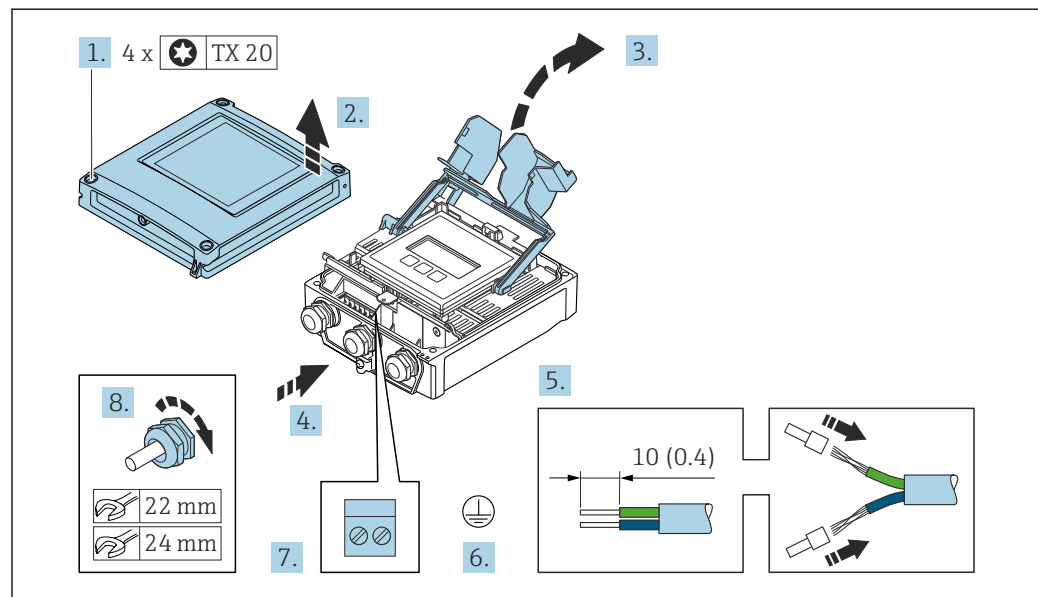
A0029597

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 according to the terminal assignment for the connecting cable → 🖺 44.

8. Firmly tighten the cable glands.
   ↳ The process for connecting the connecting cable is now complete.

9. Close the housing cover.

10. Tighten the securing screw of the housing cover.

11. After connecting the connecting cable:
    Connect the signal cable and the supply voltage cable .

7.3.2   Connecting the transmitter
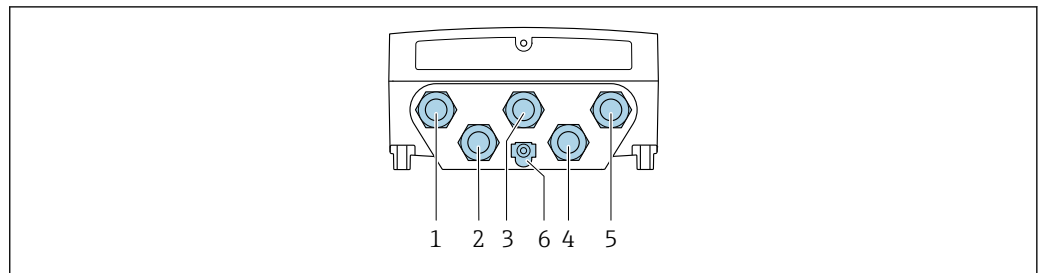
A0028200

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 or terminal for network connection (DHCP client)
*   via service interface (CDI-RJ45); optional: connection for external WLAN antenna*
6   Protective earth (PE)

> In addition to connecting the device via EtherNet/IP and the available input/outputs,
> additional connection options are also available:
> • Integrate into a network via the service interface (CDI-RJ45) → 🖹 52.
> • Integrate the device into a ring topology → 🖹 53.

Connecting the EtherNet/IP plug
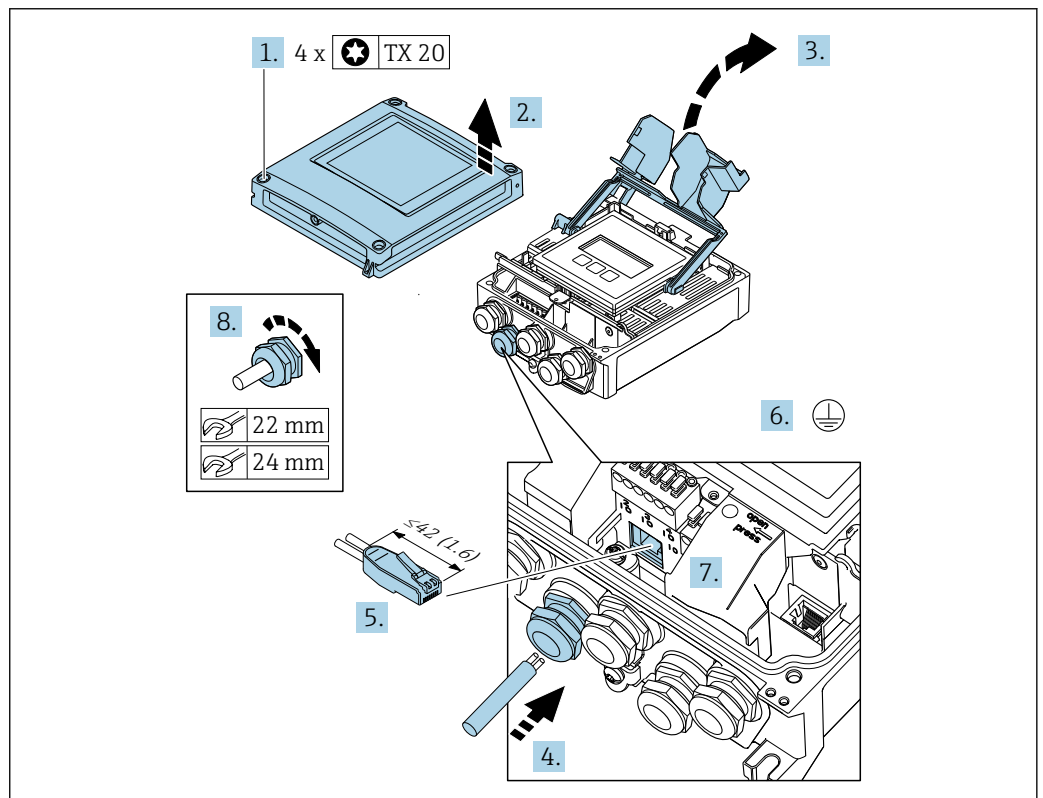
A0033987

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 and connect to the RJ45 connector.

6. Connect the protective ground.

7. Plug in the RJ45 connector.

8. Firmly tighten the cable glands.
   ↳ This concludes the EtherNet/IP connection process.

Connecting the supply voltage and additional inputs/outputs
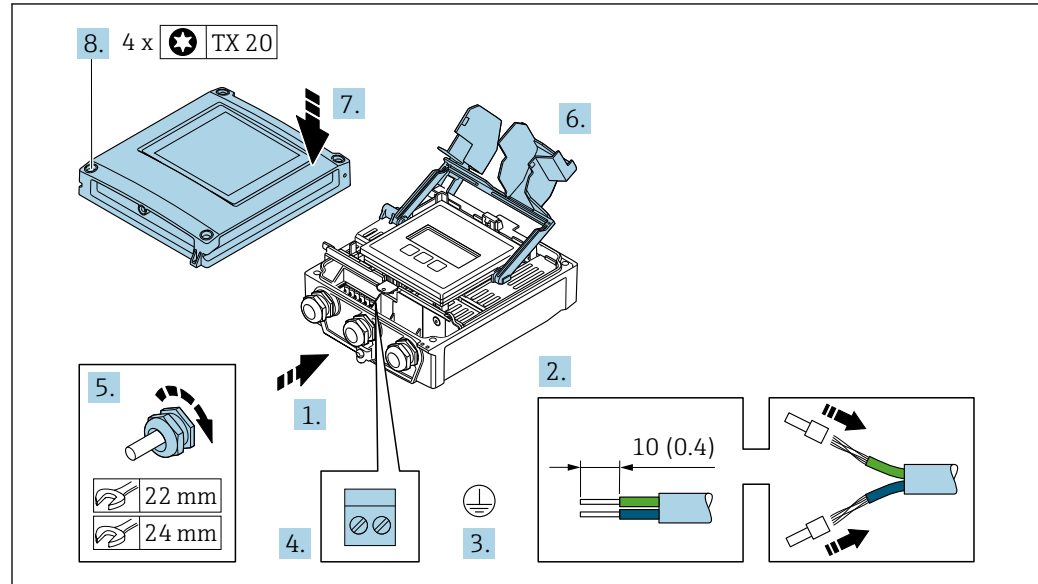
A0033831

1. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.

2. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.

3. Connect the protective ground.

4. Connect the cable according to 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 → 🖺 40.

5. Firmly tighten the cable glands.
   ↳ This concludes the cable connection process.

6. Close the terminal cover.

7. 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.

NOTICE

Excessive tightening torque applied to the fixing screws!
Risk of damaging the plastic transmitter.
▶ Tighten the fixing screws as per the tightening torque: 2.5 Nm (1.8 lbf ft)

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

Removing a cable

To remove a cable from the terminal:
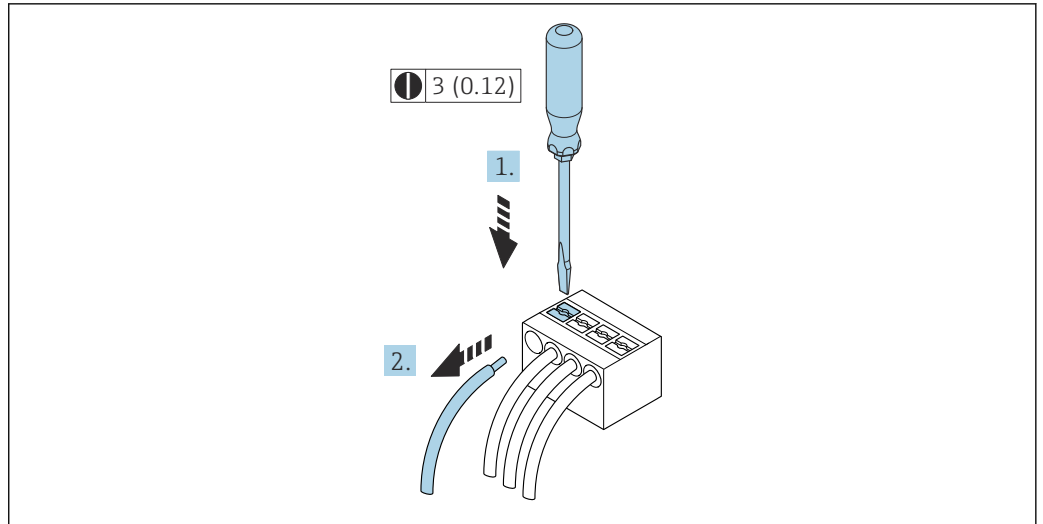
□ 16   Engineering unit mm (in)

1. Use a flat-blade screwdriver to press down on the slot between the two terminal holes.

2. Remove the cable end from the terminal.

7.3.3   Integrating the transmitter into a network

This section only presents the basic options for integrating the device into a network.

For information on the procedure to follow to connect the transmitter correctly → 🗎 44.

Integrating via the service interface

The device is integrated via the connection to the service interface (CDI-RJ45).

Note the following when connecting:
- Recommended cable: CAT5e, CAT6 or CAT7, with shielded connector (e.g. brand: YAMAICHI ; Part No. Y-ConProfixPlug63/Prod. ID: 82-006660)
- Maximum cable thickness: 6 mm
- Length of plug including anti-bend protection: 42 mm
- Bending radius: 5 x cable thickness

A0033832

1   Service interface (CDI-RJ45)

ℹ️ An adapter for the RJ45 to the M12 plug is optionally available for the non-hazardous area:

Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

The adapter connects the service interface (CDI-RJ45) to an M12 plug mounted in the cable entry. The connection to the service interface can thus be established via an M12 plug without opening the device.

Integrating into a ring topology

The device is integrated via the terminal connection for signal transmission (output 1) and the connection to the service interface (CDI-RJ45).

Note the following when connecting:
- Recommended cable: CAT5e, CAT6 or CAT7, with shielded connector (e.g. brand: YAMAICHI ; Part No. Y-ConProfixPlug63/Prod. ID: 82-006660)
- Maximum cable thickness: 6 mm
- Length of plug including anti-bend protection: 42 mm
- Bending radius: 2.5 x cable thickness

A0033830

1   EtherNet/IP connection
2   Service interface (CDI-RJ45)

ℹ️ An adapter for the RJ45 to the M12 plug is optionally available:
Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

The adapter connects the service interface (CDI-RJ45) to an M12 plug mounted in the cable entry. The connection to the service interface can thus be established via an M12 plug without opening the device.

7.4   Connecting the measuring instrument: Proline 500

NOTICE

An incorrect connection compromises electrical safety!

▶ Only properly trained specialist staff may perform electrical connection work.
▶ Observe applicable federal/national installation codes and regulations.
▶ Comply with local workplace safety regulations.
▶ Always connect the protective ground cable ⊕ before connecting additional cables.
▶ When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation.

7.4.1   Connecting the connecting cable

⚠ **WARNING**

Risk of damaging 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.

⚠ **CAUTION**

Measurement error due to shortening of the connecting cable

▶ The connecting cable is ready for installation and must be used in the length supplied. Shortening the connecting cable can affect the sensor's measurement accuracy.

Connecting cable terminal assignment
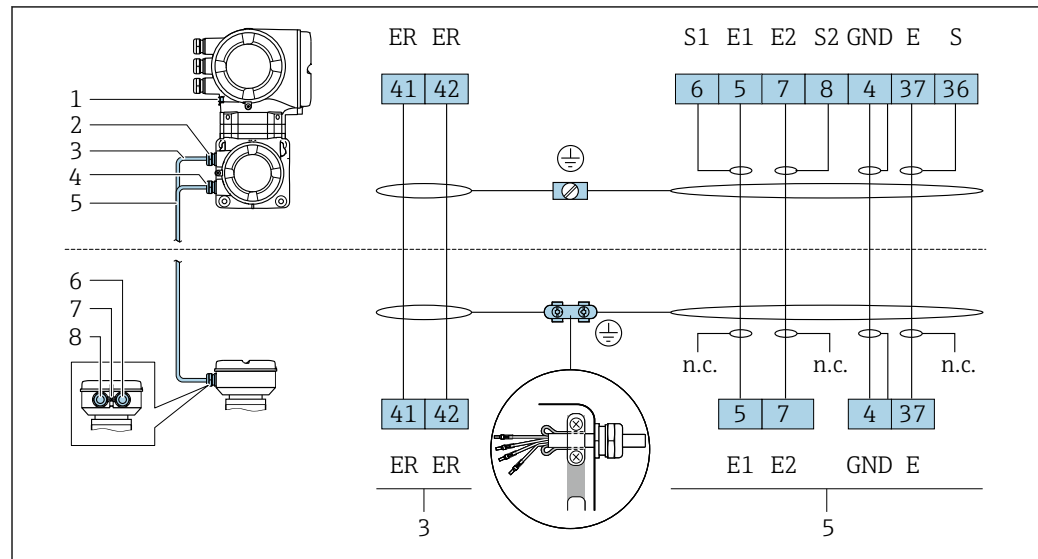
1   Protective earth (PE)
2   Cable entry for coil current cable on transmitter connection housing
3   Coil current cable
4   Cable entry for signal cable on transmitter connection housing
5   Signal cable
6   Cable entry for signal cable on sensor connection housing
7   Protective earth (PE)
8   Cable entry for coil current cable on sensor connection housing

**Connecting the connecting cable to the sensor connection housing**

Connection via terminals with order code for "Sensor connection housing":
Option **B** "Stainless, hygienic" → 🗎 55

Connecting the sensor connection housing via terminals

For the device version, order code for "Sensor connection housing":
Option **B**: stainless, hygienic
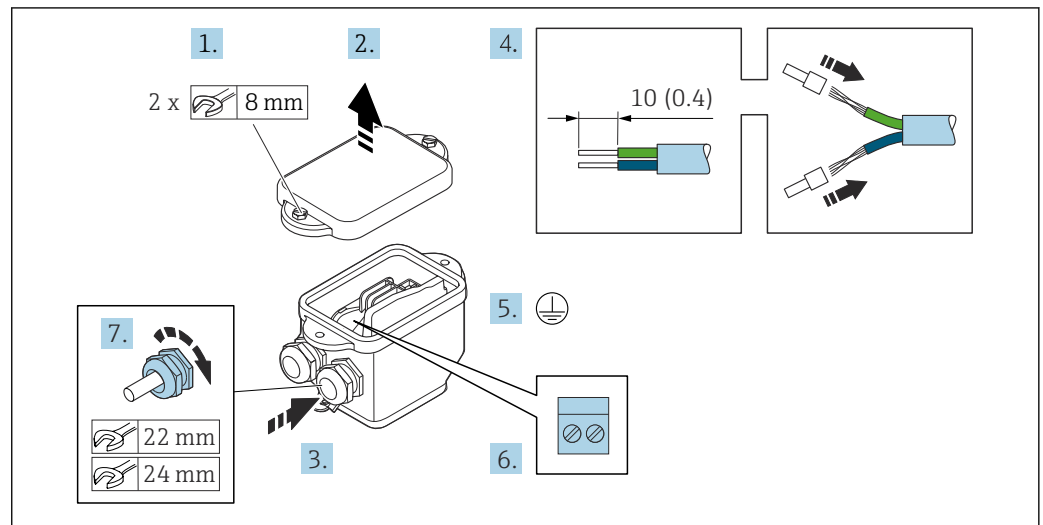
A0029617

1. Release the securing screw of the housing cover.

2. Open 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.

7. Firmly tighten the cable glands.
   ↳ This concludes the process for connecting the connecting cables.
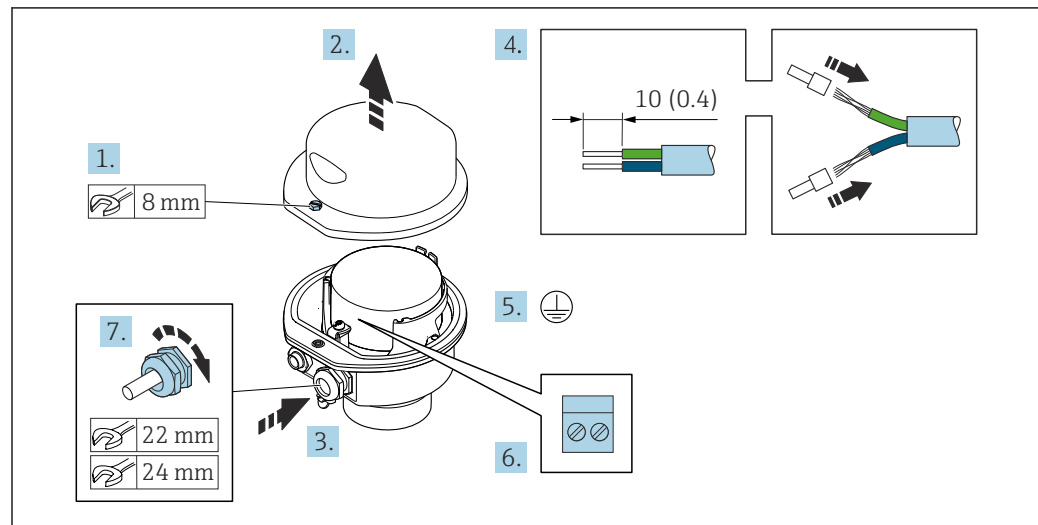
8. Close the housing cover.

9. Tighten the securing screw of the housing cover.

Attaching the connecting cable to the transmitter
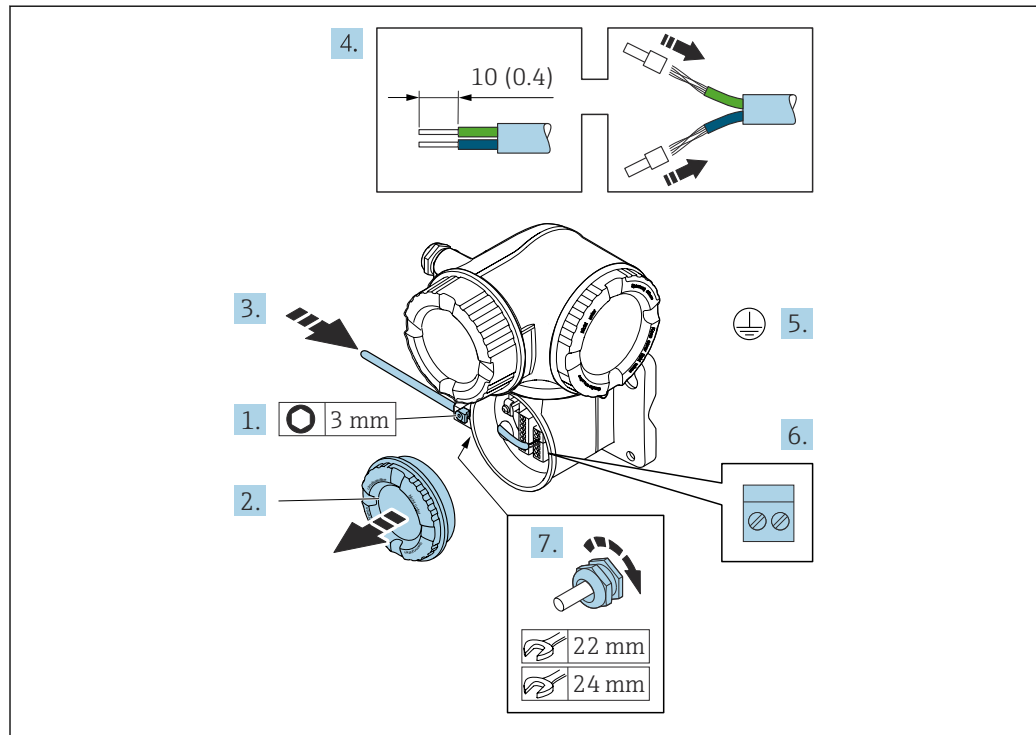
A0029592

1. Loosen the securing clamp of the connection compartment cover.

2. Unscrew the connection compartment 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, also fit ferrules.

5. Connect the protective ground.

6. Connect the cable in accordance with the connecting cable terminal assignment → 🖹 54.

7. Firmly tighten the cable glands.
   ↳ This concludes the process for connecting the connecting cables.

8. Screw on the connection compartment cover.

9. Tighten the securing clamp of the connection compartment cover.

10. After connecting the connecting cables:
    Connect the signal cable and the supply voltage cable .

7.4.2 Connecting the transmitter
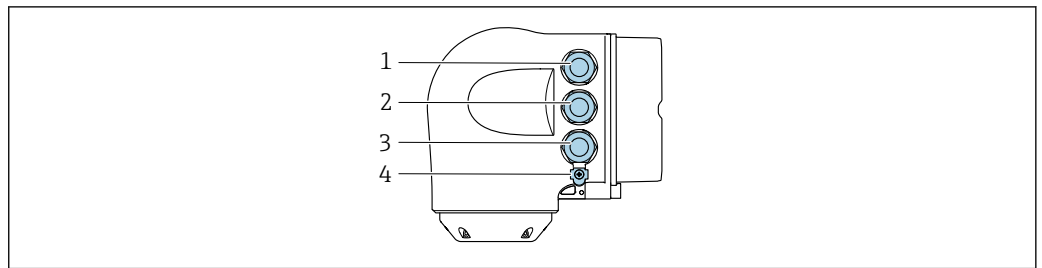
A0026781

1 Terminal connection for supply voltage
2 Terminal connection for signal transmission, input/output
3 Terminal connection for signal transmission, input/output or terminal connection for network connection via service interface (CDI-RJ45)
4 Protective earth (PE)

In addition to connecting the device via PROFINET with Ethernet-APL and the available inputs/outputs, an additional connection option is also available: Integrate into a network via the service interface (CDI-RJ45) → 🖺 60.

Connecting connector
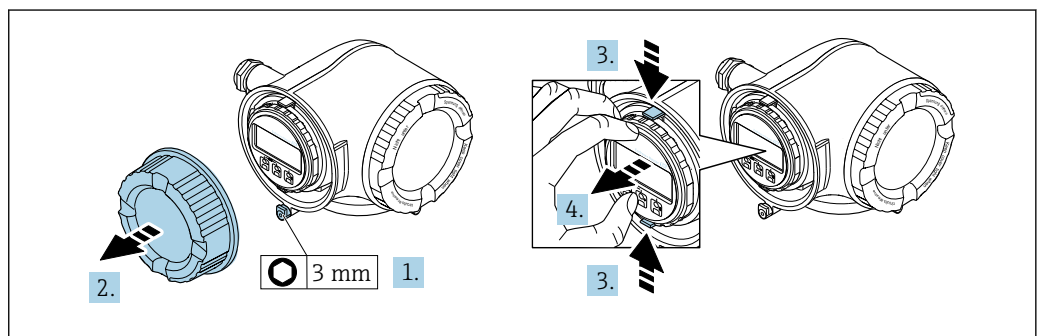
A0029813

1. Loosen the securing clamp of the connection compartment cover.

2. Unscrew the connection compartment cover.

3. Squeeze the tabs of the display module holder together.

4. Remove the display module holder.
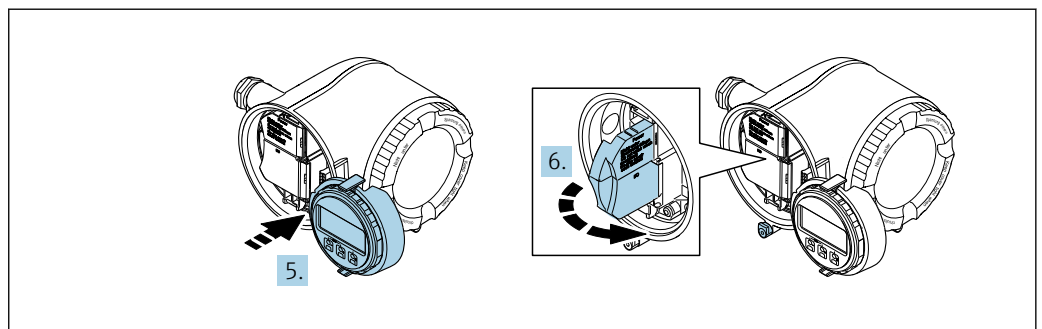
A0029814

5. Attach the holder to the edge of the electronics compartment.

6. Open the terminal cover.
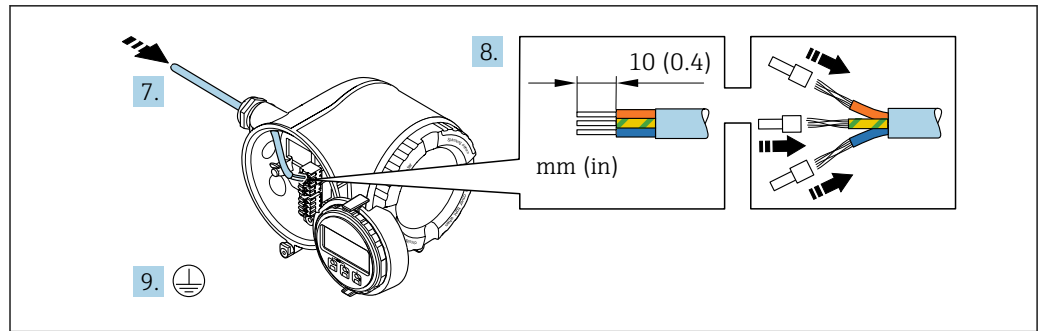
A0029815

7. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.

8. Strip the cable and cable ends and connect to terminals 26-27. In the case of stranded cables, also fit ferrules.

9. Connect protective earth (PE).

10. Firmly tighten the cable glands.
    ↳ This concludes the connection via the APL port.

Connecting the supply voltage and additional inputs/outputs
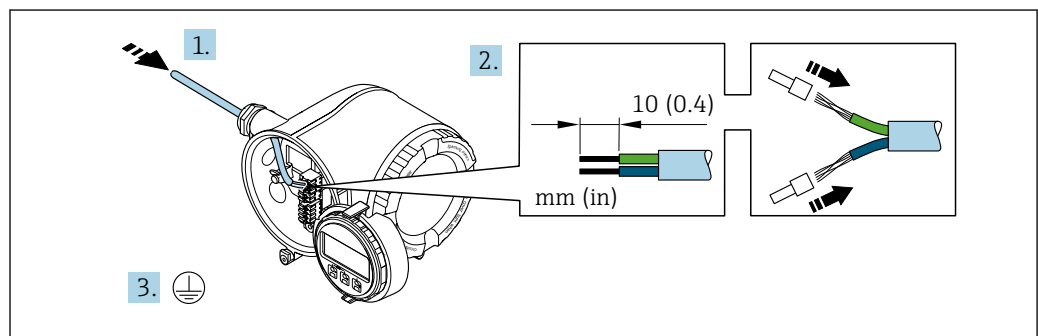
A0033983

1. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.

2. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.

3. Connect the protective ground.
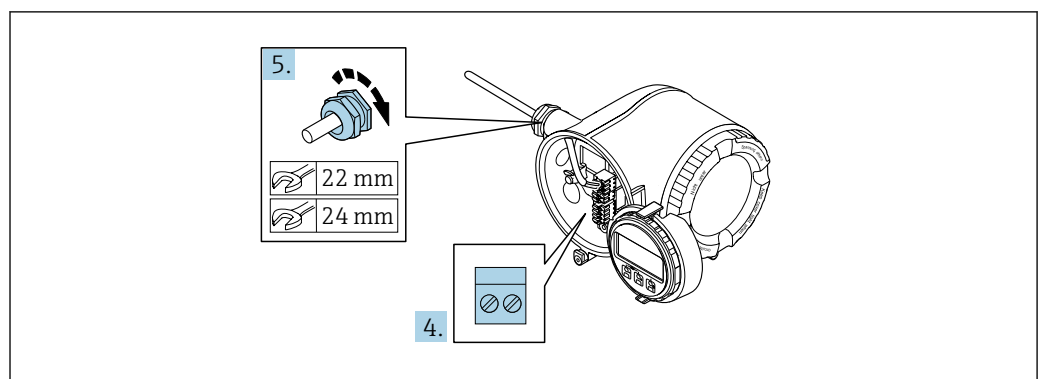
A0033984

4. Connect the cable according to 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 → 🖺 40.

5. Firmly tighten the cable glands.
   ↳ This concludes the cable connection process.

6. Close the terminal cover.

7. Fit the display module holder in the electronics compartment.

8. Screw on the connection compartment cover.

9. Secure the securing clamp of the connection compartment cover.

Removing a cable

To remove a cable from the terminal:
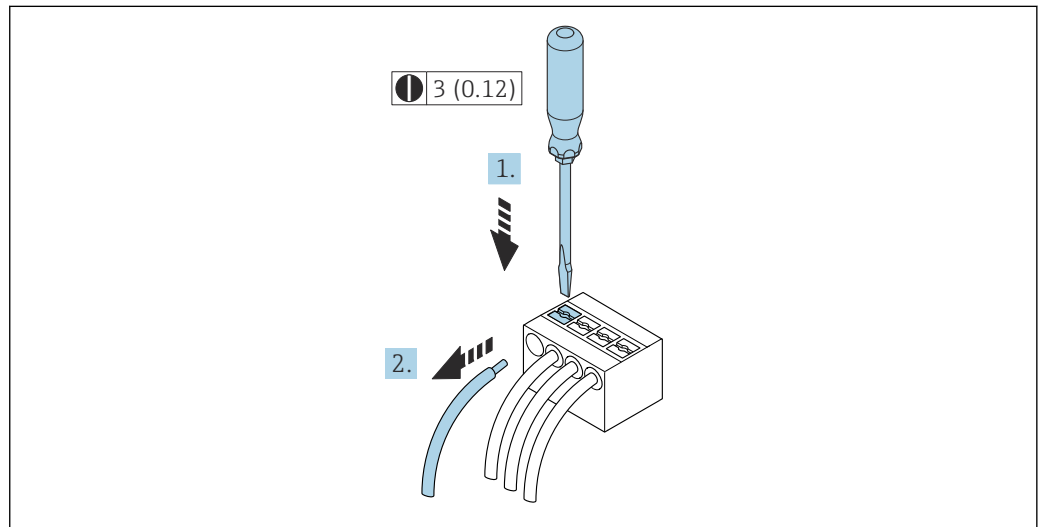
⊡ *17   Engineering unit mm (in)*

1. Use a flat-blade screwdriver to press down on the slot between the two terminal holes.

2. Remove the cable end from the terminal.

7.4.3   Integrating the transmitter into a network

This section only presents the basic options for integrating the device into a network.

For information on the procedure to follow to connect the transmitter correctly → 🖹 54.

Integrating via the service interface

The device is integrated via the connection to the service interface (CDI-RJ45).

Note the following when connecting:
- Recommended cable: CAT 5e, CAT 6 or CAT 7, with shielded connector (e.g. brand: YAMAICHI ; Part No Y-ConProfixPlug63 / Prod. ID: 82-006660)
- Maximum cable thickness: 6 mm
- Length of plug including anti-bend protection: 42 mm
- Bending radius: 5 x cable thickness

1   Service interface (CDI-RJ45)

ℹ️ An adapter for the RJ45 to the M12 plug is optionally available:
Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

The adapter connects the service interface (CDI-RJ45) to an M12 plug mounted in the cable entry. The connection to the service interface can thus be established via an M12 plug without opening the device.

Integrating into a ring topology

The device is integrated via the terminal connection for signal transmission (output 1) and the connection to the service interface (CDI-RJ45).

Note the following when connecting:
- Recommended cable: CAT5e, CAT6 or CAT7, with shielded connector (e.g. brand: YAMAICHI ; Part No Y-ConProfixPlug63 / Prod. ID: 82-006660)
- Maximum cable thickness: 6 mm
- Length of plug including anti-bend protection: 42 mm
- Bending radius: 2.5 x cable thickness

1   EtherNet/IP connection
2   Service interface (CDI-RJ45)

An adapter for the RJ45 to the M12 plug is optionally available:
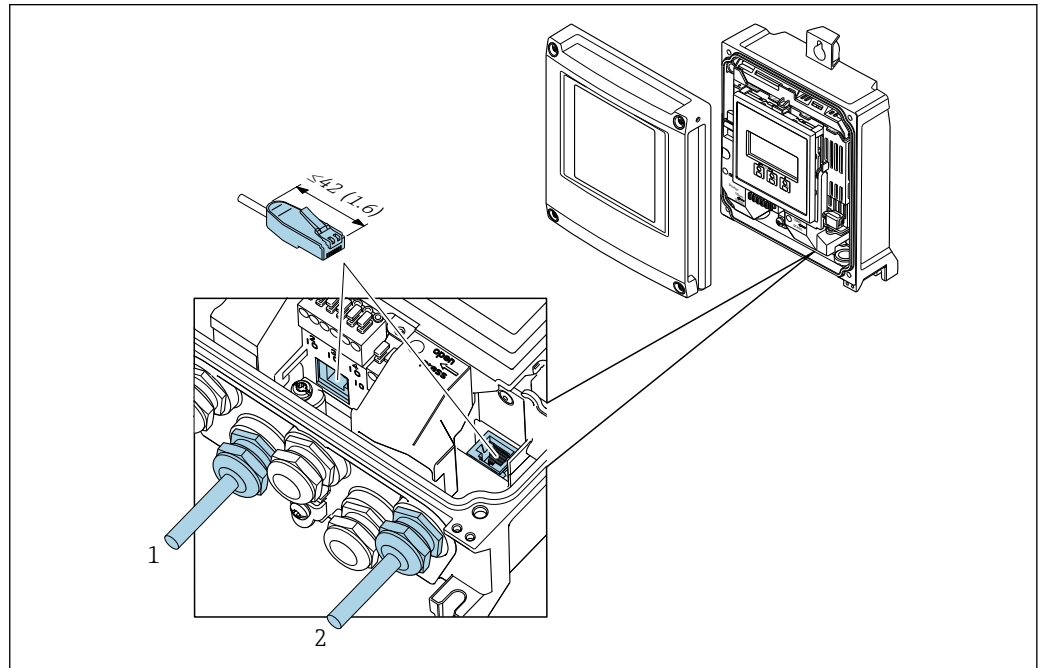Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

The adapter connects the service interface (CDI-RJ45) to an M12 plug mounted in the cable entry. The connection to the service interface can thus be established via an M12 plug without opening the device.

7.5   Ensuring potential equalization

7.5.1   Requirements

For potential equalization:
- Pay attention to in-house grounding concepts
- Take account of operating conditions like the pipe material and grounding
- Connect the medium, sensor and transmitter to the same electric potential
- Use a ground cable with a minimum cross-section of 6 mm^2 (10 AWG) and a cable lug for potential equalization connections

7.5.2   Connection example, standard scenario

Metal process connections

Potential equalization is generally via the metal process connections that are in contact with the medium and mounted directly on the sensor. Therefore there is generally no need for additional potential equalization measures.

7.5.3   Connection example in special situations

Plastic process connections

In the case of plastic process connections, additional grounding rings or process connections with an integrated grounding electrode must be used to ensure potential matching between the sensor and the fluid. If there is no potential matching, this can affect the measuring accuracy or cause the destruction of the sensor as a result of the electrochemical decomposition of the electrodes.

Note the following when using grounding rings:
- Depending on the option ordered, plastic disks are used instead of grounding rings on some process connections. These plastic disks only act as "spacers" and do not have any potential matching function. Furthermore, they also perform a significant sealing function at the sensor/connection interface. Therefore, in the case of process connections without metal grounding rings, these plastic disks/seals should never be removed and should always be installed!
- Grounding rings can be ordered separately as accessory DK5HR* from Endress+Hauser (does not contain any seals). When ordering make sure that the grounding rings are compatible with the material used for the electrodes, as otherwise there is the danger that the electrodes could be destroyed by electrochemical corrosion!
- If seals are required, they can be additionally ordered with seal set DK5G*.
- Grounding rings including seals are mounted inside the process connections. This does not affect the installed length.

Potential equalization via additional grounding ring
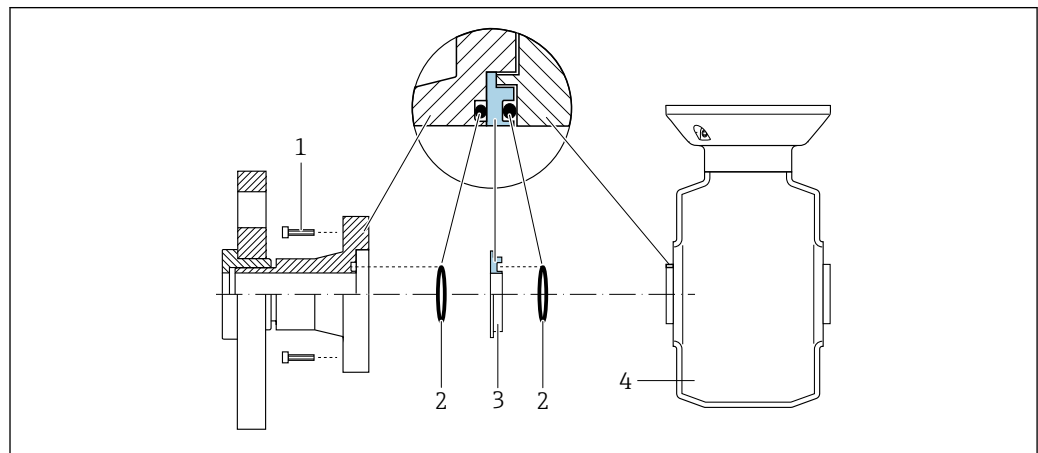
A0028971

1   *Hexagonal-headed bolts of process connection*
2   *O-ring seals*
3   *Plastic disk (spacer) or grounding ring*
4   *Sensor*

Potential equalization via grounding electrodes on process connection
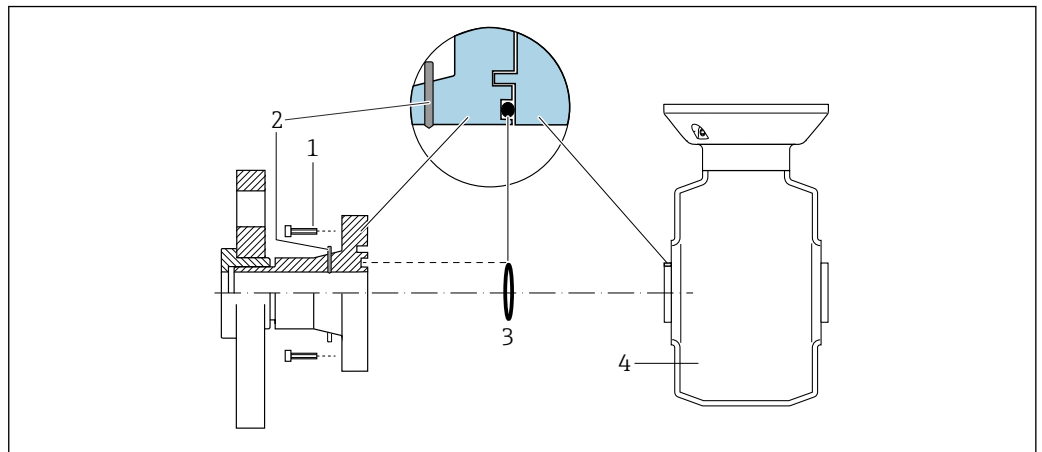
A0028972

1   Hexagonal-headed bolts of process connection
2   Integrated grounding electrodes
3   O-ring seal
4   Sensor

7.6   Special connection instructions

7.6.1   Connection examples

EtherNet/IP
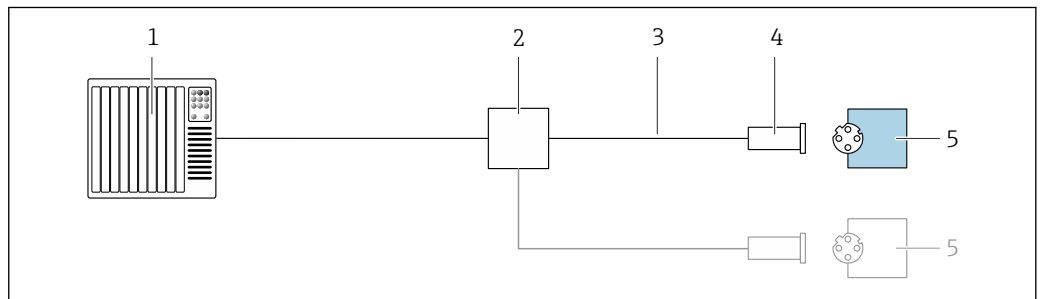
A0028767

⊡ *18   Connection example for EtherNet/IP*

1   Control system (e.g. PLC)
2   Ethernet switch
3   Observe cable specifications
4   Device plug
5   Transmitter

EtherNet/IP: DLR (Device Level Ring)
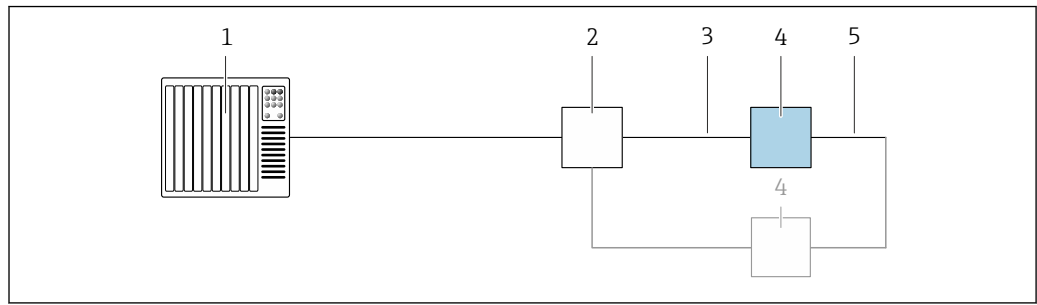
A0027544

1   Control system (e.g. PLC)

2   Ethernet switch

3   Observe cable specifications → 🗎 36

4   Transmitter

5   Connecting cable between the two transmitters

Current output 4-20 mA
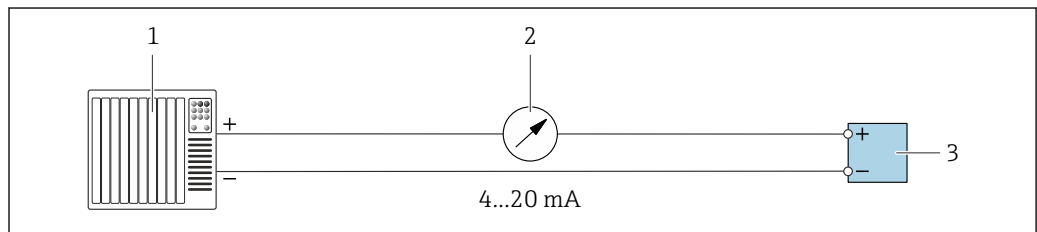
A0028758

🖾 *19   Connection example for 4-20 mA current output (active)*

1   Automation system with current input (e.g. PLC)

2   Analog display unit: observe maximum load

3   Transmitter
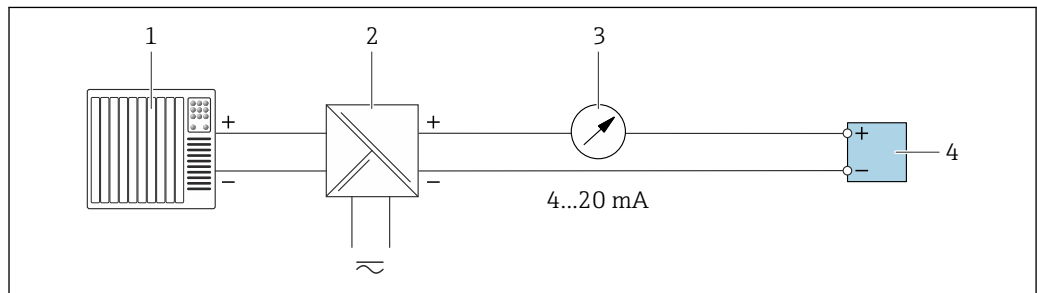
A0028759

🖾 *20   Connection example for 4-20 mA current output (passive)*

1   Automation system with current input (e.g. PLC)

2   Active barrier for power supply (e.g. RN221N)

3   Analog display unit: observe maximum load

4   Transmitter

Pulse/frequency output
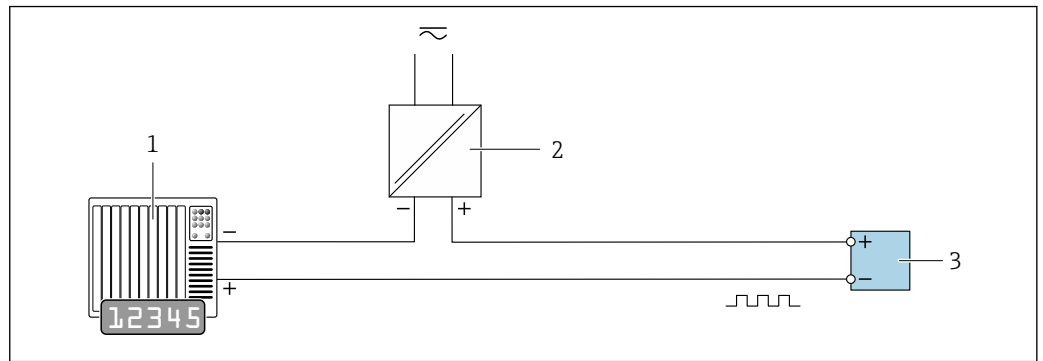
☑ 21   Connection example for pulse/frequency output (passive)

1   Automation system with pulse/frequency input (e.g. PLC with 10 kΩ pull-up or pull-down resistor)

2   Power supply

3   Transmitter: observe input values → 🖻 203

Switch output
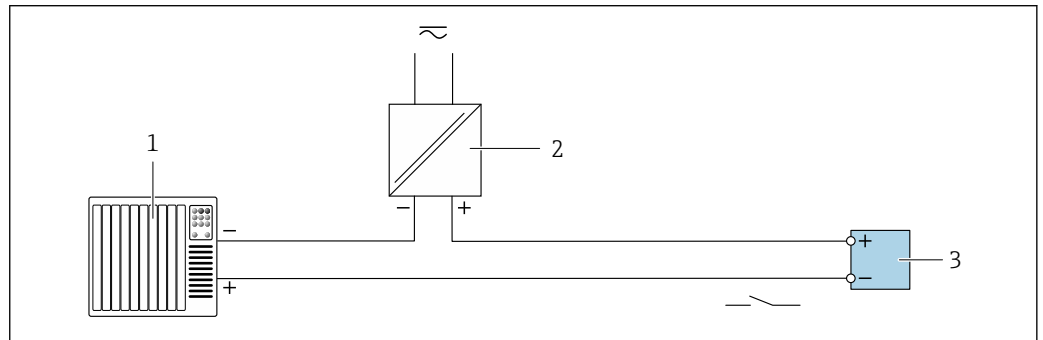
☑ 22   Connection example for switch output (passive)

1   Automation system with switch input (e.g. PLC with a 10 kΩ pull-up or pull-down resistor)

2   Power supply

3   Transmitter: observe input values → 🖻 203

Relay output
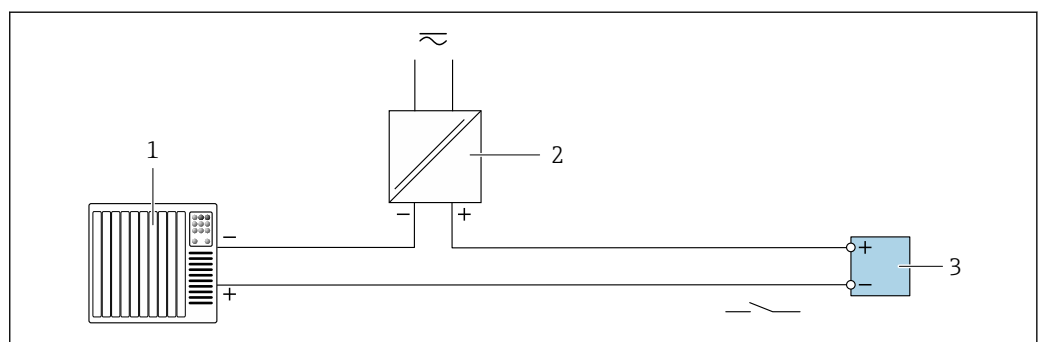
☑ 23   Connection example for relay output (passive)

1   Automation system with relay input (e.g. PLC)

2   Power supply

3   Transmitter: observe input values → 🖻 204

Current input
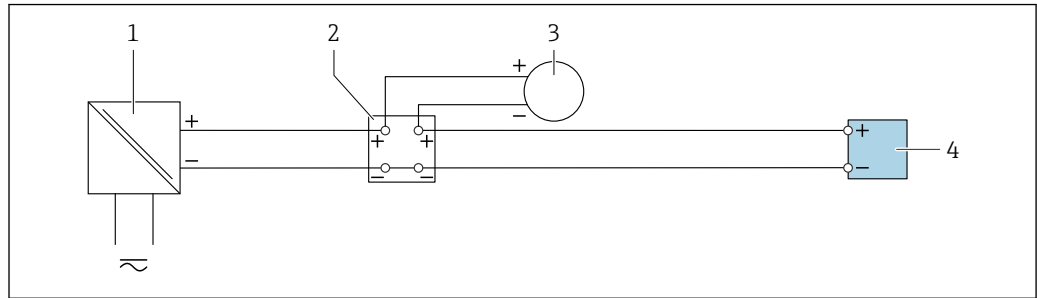
24   Connection example for 4 to 20 mA current input

1   Power supply
2   Terminal box
3   External measuring device (to read in pressure or temperature, for instance)
4   Transmitter

Status input
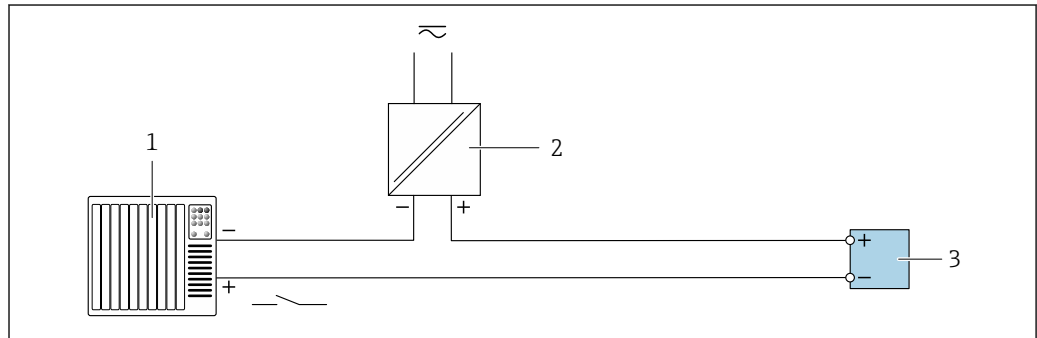
25   Connection example for status input

1   Automation system with status output (e.g. PLC)
2   Power supply
3   Transmitter

7.7   Hardware settings

7.7.1   Setting the device address

The IP address of the measuring device can be configured for the network via DIP switches.

Addressing data

IP address and configuration options			
1st octet	2nd octet	3rd octet	4th octet
192.	168.	1.	XXX
	↓		↓
Can only be configured via software addressing			Can be configured via software addressing and hardware addressing

IP address range	1 to 254 (4th octet)
IP address broadcast	255

Addressing mode ex works	Software addressing; all DIP switches for hardware addressing are set to OFF.
IP address ex works	DHCP server active

ℹ️ Software addressing: The IP address is entered via the **IP address** parameter (→ 🖩 115) .

Setting the IP address: Proline 500 - digital

Risk of electric shock when opening the transmitter housing.
▶ Before opening the transmitter housing:
▶ Disconnect the device from the power supply.

ℹ️ The default IP address may **not** be activated → 🖩 68.
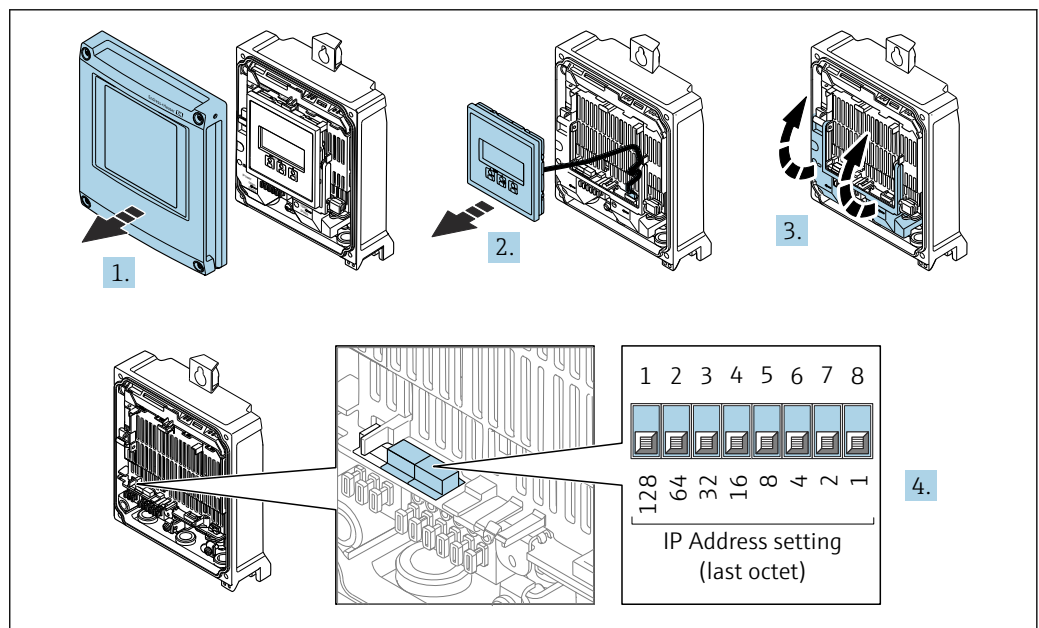
A0029678

1. Loosen the 4 fixing screws on the housing cover.

2. Open the housing cover.

3. Fold open the terminal cover.

4. Set the desired IP address using the corresponding DIP switches on the I/O electronics module.

5. Reassemble the transmitter in the reverse order.

6. Reconnect the device to the power supply.
   ↳ The configured device address is used once the device is restarted.

Setting the IP address: Proline 500

Risk of electric shock when opening the transmitter housing.
▶ Before opening the transmitter housing:
▶ Disconnect the device from the power supply.

ℹ️ The default IP address may **not** be activated → 🖩 69.
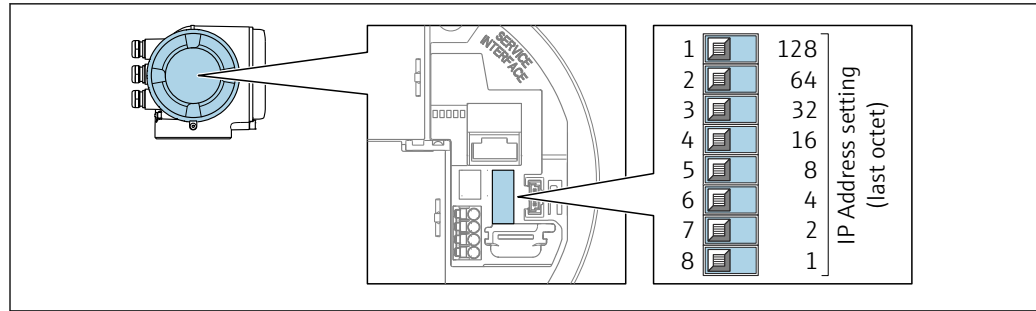
A0029635

1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.

2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary.

3. Set the desired IP address using the corresponding DIP switches on the I/O electronics module.

4. Reassemble the transmitter in the reverse order.

5. Reconnect the device to the power supply.

   ↳ The configured device address is used once the device is restarted.

7.7.2   Activating the default IP address

Activating the default IP address by DIP switch: Proline 500 - digital

Risk of electric shock when opening the transmitter housing.
▶ Before opening the transmitter housing:
▶ Disconnect the device from the power supply.
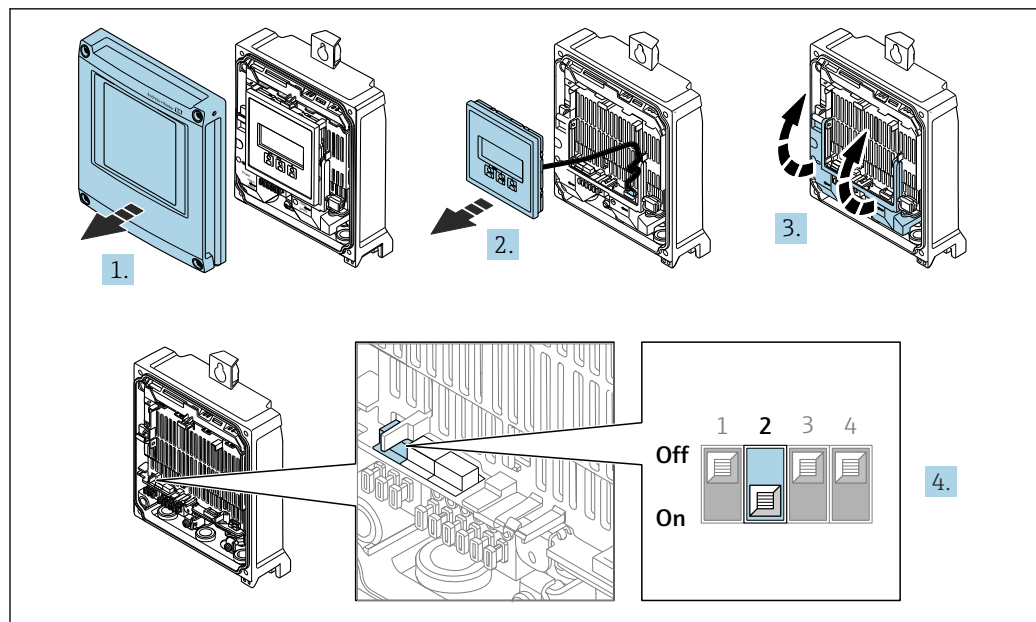
A0034500

1. Loosen the 4 fixing screws on the housing cover.

2. Open the housing cover.

3. Fold open the terminal cover.

4. Set DIP switch no. 2 on the I/O electronics module from **OFF** → **ON**.

5. Reassemble the transmitter in the reverse order.

6. Reconnect the device to the power supply.
   ↳ The default IP address is used once the device is restarted.

Activating the default IP address by DIP switch: Proline 500

Risk of electric shock when opening the transmitter housing.
▸ Before opening the transmitter housing:
▸ Disconnect the device from the power supply.

A0034499
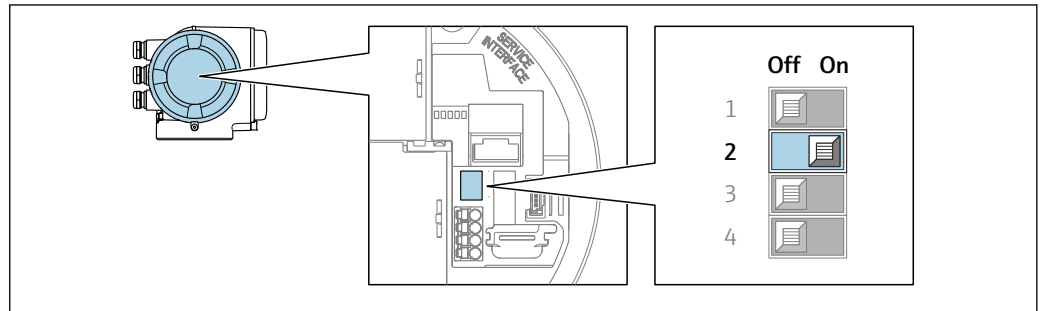
1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.

2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary .

3. Set DIP switch no. 2 on the I/O electronics module from **OFF** → **ON**.

4. Reassemble the transmitter in the reverse order.

5. Reconnect the device to the power supply.
   ↳ The default IP address is used once the device is restarted.

7.8   Ensuring the degree of protection

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

To guarantee the 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
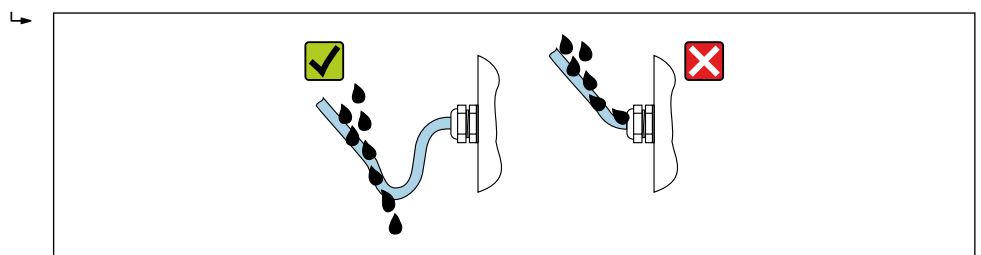
6. The cable glands supplied do not ensure housing protection when not in use. They must therefore be replaced by dummy plugs corresponding to the housing protection.

7.9   Post-connection check

Are cables or the device undamaged (visual inspection)?	❏
Is the protective earthing established correctly?	❏
Do the cables used comply with the requirements ?	❏
Are the mounted cables relieved of tension?	❏
Are all cable glands installed, securely tightened and leak-tight? Cable run with "water trap" → 🕮 69?	❏
Is the terminal assignment correct ?	❏
Is the potential equalization established correctly ?	❏
Are dummy plugs inserted in unused cable entries and have transportation plugs been replaced with dummy plugs?	❏

8 Operation options

8.1 Overview of operation options
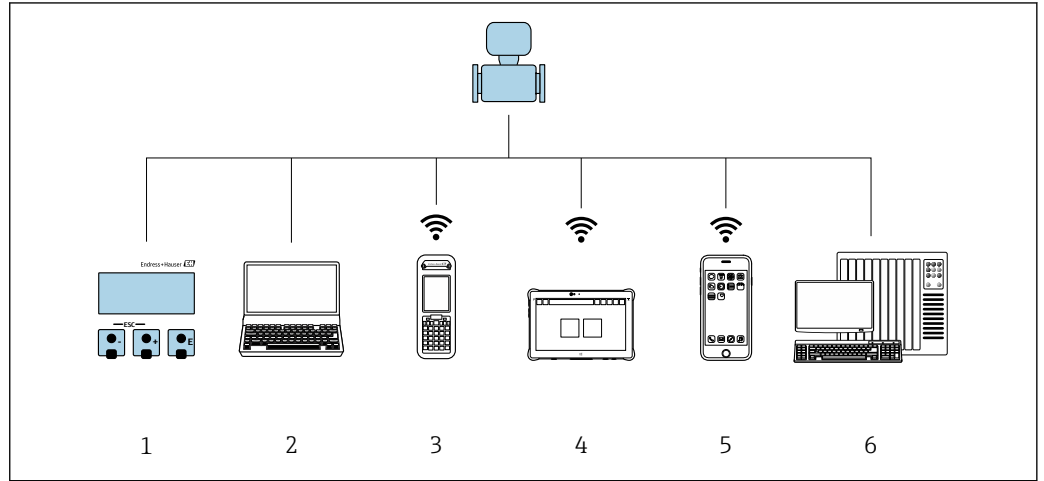
A0034513

1 *Local operation via display module*
2 *Computer with web browser or operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM)*
3 *Field Xpert SFX350 or SFX370*
4 *Field Xpert SMT70*
5 *Mobile handheld terminal*
6 *Automation system (e.g. PLC)*

8.2 Structure and function of the operating menu

8.2.1 Structure of the operating menu

For an overview of the operating menu for experts: see the "Description of Device Parameters" document supplied with the device → 🖺 225

🖻 *26   Schematic structure of the operating menu*

8.2.2 Operating philosophy

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

Menu/parameter		User role and tasks	Content/meaning
Language	Task-oriented	**Role "Operator", "Maintenance"** Tasks during operation: • Configuration of the operational display • Reading measured values	• Defining the operating language • Defining the Web server operating language • Resetting and controlling totalizers
Operation			• Configuration of the operational display (e.g. display format, display contrast) • Resetting and controlling totalizers
Setup		**"Maintenance" role** Commissioning: • Configuration of the measurement • Configuration of the inputs and outputs • Configuration of the communication interface	Wizards for fast commissioning: • Configuring the system units • Displaying the I/O configuration • Configuring the inputs • Configuring the outputs • Configuration of the operational display • Configuring the low flow cut off • Configuring empty pipe detection Advanced setup • For more customized configuration of the measurement (adaptation to special measuring conditions) • Configuration of totalizers • Configuration of electrode cleaning (optional) • Configuration of WLAN settings • Administration (define access code, reset measuring device)
Diagnostics		**"Maintenance" role** Troubleshooting: • Diagnostics and elimination of process and device errors • Measured value simulation	Contains all parameters for error detection and analyzing process and device errors: • Diagnostic list Contains up to 5 currently pending diagnostic messages. • Event logbook Contains event messages that have occurred. • Device information Contains information for identifying the device • Measured values Contains all current measured values. • **Data logging** submenu with the "Extended HistoROM" order option Storage and visualization of measured values • Heartbeat Technology Verification of device functionality on request and documentation of verification results • Simulation Used to simulate measured values or output values.
Expert	Function-oriented	Tasks that require detailed knowledge of the function of the device: • Commissioning measurements under difficult conditions • Optimal adaptation of the measurement to difficult conditions • Detailed configuration of the communication interface • Error diagnostics in difficult cases	Contains all of the device parameters and allows direct access to these by means of an access code. The structure of this menu is based on the function blocks of the device: • System Contains all higher-level device parameters that do not affect measurement or measured value communication • Sensor Configuration of the measurement. • Input Configuration of the status input • Output Configuration of the analog current outputs as well as the pulse/frequency and switch output • Communication Configuration of the digital communication interface and the Web server • Application Configuration of the functions that go beyond the actual measurement (e.g. totalizer) • Diagnostics Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology.

8.3 Access to operating menu via local display

8.3.1 Operational display
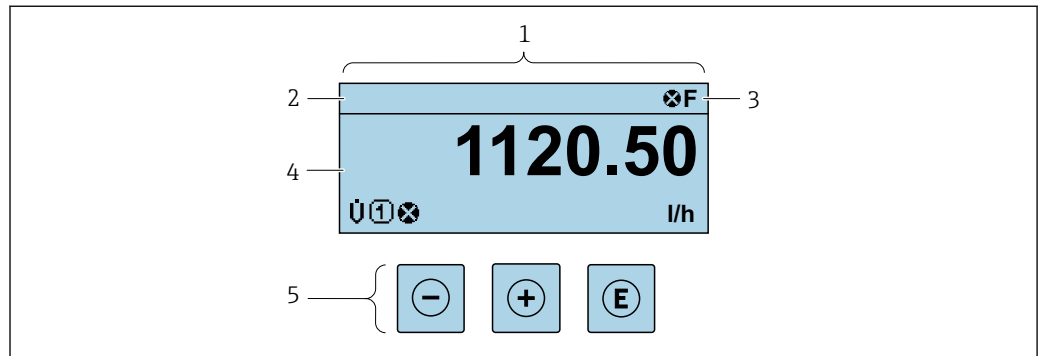
1   Operational display
2   Device tag → 🖹 112
3   Status area
4   Display range for measured values (up to 4 lines)
5   Operating elements → 🖹 80

Status area

The following symbols appear in the status area of the operational display at the top right:
- Status signals→ 🖹 167
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
  - **M**: Maintenance required
- Diagnostic behavior→ 🖹 168
  - ⊗: Alarm
  - ⚠: Warning
- 🔒: Locking (the device is locked via the hardware)
- ↔: Communication (communication via remote operation is active)

Display area

In the display area, each measured value is prefaced by certain symbol types for further description:

Measured variable	Measurement channel number	Diagnostic behavior
↓	↓	↓

Example
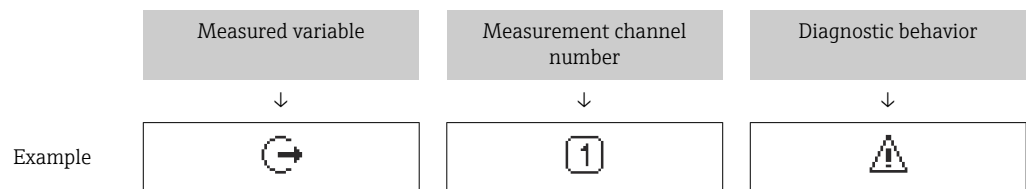
⟜	①	⚠
		Appears only if a diagnostics event is present for this measured variable.

Measured variables

Symbol	Meaning
G	Conductivity
ṁ	Mass flow

The number and display format of the measured variables can be configured via the **Format display** parameter (→ 🖺 129).

Totalizer

Symbol	Meaning
Σ	Totalizer ℹ The measurement channel number indicates which of the three totalizers is displayed.

Output

Symbol	Meaning
⟼	Output ℹ The measurement channel number indicates which of the outputs is displayed.

Input

Symbol	Meaning
⟶	Status input

Measurement channel numbers

Symbol	Meaning
1 ... 4	Measurement channel 1 to 4 ℹ The measurement channel number is displayed only if more than one channel is present for the same measured variable type (e.g. totalizer 1 to 3).

Diagnostic behavior

Symbol	Meaning
⊗	**Alarm** • Measurement is interrupted. • Signal outputs and totalizers assume the defined alarm condition. • A diagnostic message is generated.
⚠	**Warning** • Measurement is resumed. • The signal outputs and totalizers are not affected. • A diagnostic message is generated.

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable.

8.3.2   Navigation view

1   Navigation view
2   Navigation path to current position
3   Status area
4   Display area for navigation
5   Operating elements → 🗎 80
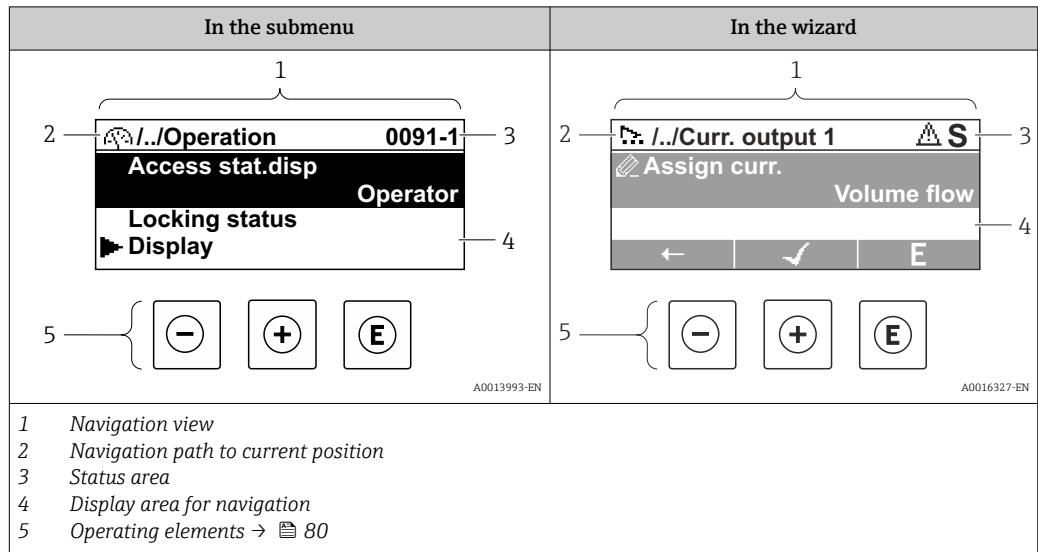
Navigation path

The navigation path to the current position is displayed at the top left in the navigation view and consists of the following elements:
• The display symbol for the menu/submenu (▶) or the wizard (⤳).
• An omission symbol (/ ../) for operating menu levels in between.
• Name of the current submenu, wizard or parameter

Display symbol	Omission symbol	Parameter
↓	↓	↓
Example	▶	/ ../	Indication

For more information about the icons in the menu, refer to the "Display area" section → 🗎 76

Status area

The following appears in the status area of the navigation view in the top right corner:
• In the submenu
  • The direct access code to the parameter (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

• For information on the diagnostic behavior and status signal → 🗎 167
• For information on the function and entry of the direct access code → 🗎 82

Display area

Menus

Symbol	Meaning
🧭	**Operation** Is displayed: • In the menu next to the "Operation" selection • At the left in the navigation path in the **Operation** menu

	Setup Is displayed: • In the menu next to the "Setup" selection • At the left in the navigation path in the **Setup** menu
	Diagnosis Is displayed: • In the menu next to the "Diagnostics" selection • At the left in the navigation path in the **Diagnostics** menu
	Expert Is displayed: • In the menu next to the "Expert" selection • At the left in the navigation path in the **Expert** menu

Submenus, wizards, parameters

Symbol	Meaning
	Submenu
	Wizards
	Parameters within a wizard No display symbol exists for parameters in submenus.

Locking procedure

Symbol	Meaning
	Parameter locked When displayed in front of a parameter name, indicates that the parameter is locked. • By a user-specific access code • By the hardware write protection switch

Wizards

Symbol	Meaning
	Switches to the previous parameter.
	Confirms the parameter value and switches to the next parameter.
	Opens the editing view of the parameter.

8.3.3 Editing view

Numeric editor
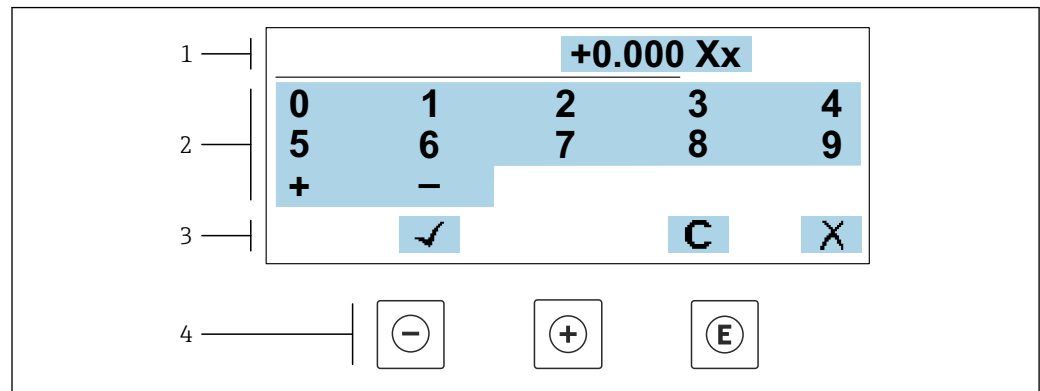
⊠ 27   For entering values in parameters (e.g. limit values)

1   Entry display area
2   Input screen
3   Confirm, delete or reject entry
4   Operating elements

Text editor
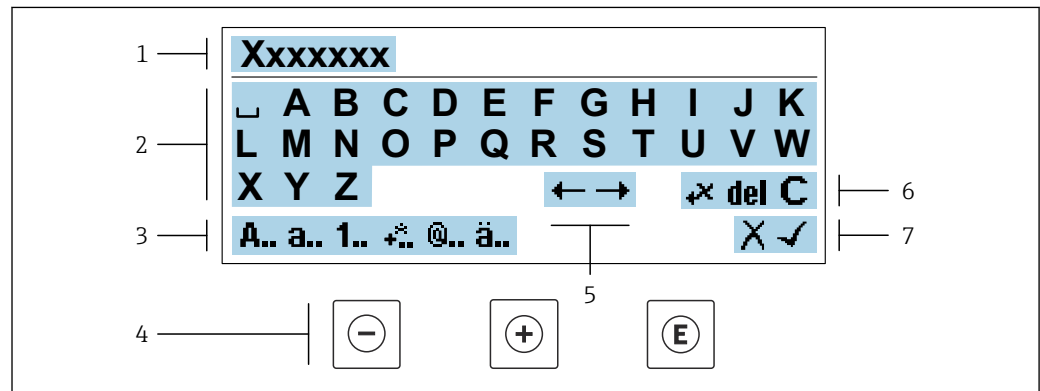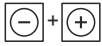
⊠ 28   For entering text in parameters (e.g. device tag)

1   Entry display area
2   Current input screen
3   Change input screen
4   Operating elements
5   Move entry position
6   Delete entry
7   Reject or confirm entry

Using the operating elements in the editing view

Operating key	Meaning
⊖	**Minus key** Move the entry position to the left.
⊕	**Plus key** Move the entry position to the right.

Operating key	Meaning
Ⓔ	**Enter key** • Pressing the key briefly confirms your selection. • Pressing the key for 2 s confirms your entry.
⊖ + ⊕	**Escape key combination (press keys simultaneously)** Close the editing view without accepting a change.

Input screens

Symbol	Meaning
Ⱥ..	Upper case
ä..	Lower case
1..	Numbers
+⁙..	Punctuation marks and special characters: = + – * / ² ³ ¼ ½ ¾ ( ) [ ] < > { }
@..	Punctuation marks and special characters: ' " ` ^ . , ; : ? ! % µ ° € $ £ ¥ § @ # / \ I ~ & _
ä..	Umlauts and accents

Controlling data entries

Symbol	Meaning
←→	Move entry position
✗	Reject entry
✓	Confirm entry
✗	Delete character immediately to the left of the entry position
del	Delete character immediately to the right of the entry position
C	Clear all the characters entered

8.3.4 Operating elements

Operating key	Meaning
⊖	**Minus key** *In menu, submenu* Moves the selection bar upwards in a picklist *In wizards* Goes to previous parameter *In the text and numeric editor* Move the entry position to the left.
⊕	**Plus key** *In menu, submenu* Moves the selection bar downwards in a picklist *In wizards* Goes to the next parameter *In the text and numeric editor* Move the entry position to the right.
Ⓔ	**Enter key** *In the operational display* Pressing the key briefly opens the operating menu. *In 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 a parameter: If present, opens the help text for the function of the parameter. *In wizards* Opens the editing view of the parameter and confirms the parameter value *In the text and numeric editor* • Pressing the key briefly confirms your selection. • Pressing the key for 2 s confirms your entry.
⊖ + ⊕	**Escape key combination (press keys simultaneously)** *In 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 returns you to the operational display ("home position"). *In wizards* Exits the wizard and takes you to the next higher level *In the text and numeric editor* Exits the Editing view without applying the changes.
⊖ + Ⓔ	**Minus/Enter key combination (press and hold down the keys simultaneously)** • 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.

8.3.5 Opening the context menu

Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Data backup
- Simulation

Calling up and closing the context menu

The user is in the operational display.

1. Press the ⊟ and ⒠ keys for longer than 3 seconds.
   ↳ The context menu opens.

| XXXXXXXXX |
| **Setup** |
| **Conf.backup** |
| **Simulation** |
| **Keylock on** |
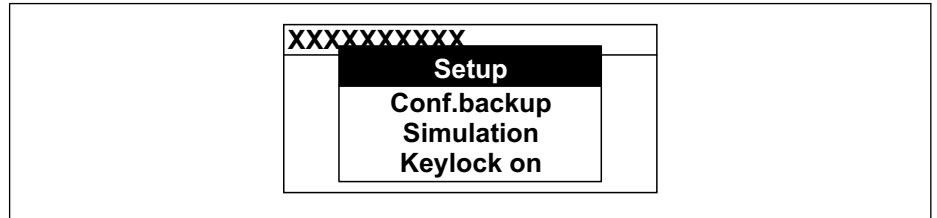
A0034608-EN

2. Press ⊟ + ⊞ simultaneously.
   ↳ The context menu is closed and the operational display appears.

Calling up the menu via the context menu

1. Open the context menu.

2. Press ⊞ to navigate to the desired menu.

3. Press ⒠ to confirm the selection.
   ↳ The selected menu opens.

8.3.6   Navigating and selecting from list

Different operating elements are used to navigate through the operating menu. The navigation path is displayed on the left in the header. Icons are displayed in front of the individual menus. These icons are also shown in the header during navigation.

For an explanation of the navigation view with symbols and operating elements → 🖹 76

Example: Setting the number of displayed measured values to "2 values"
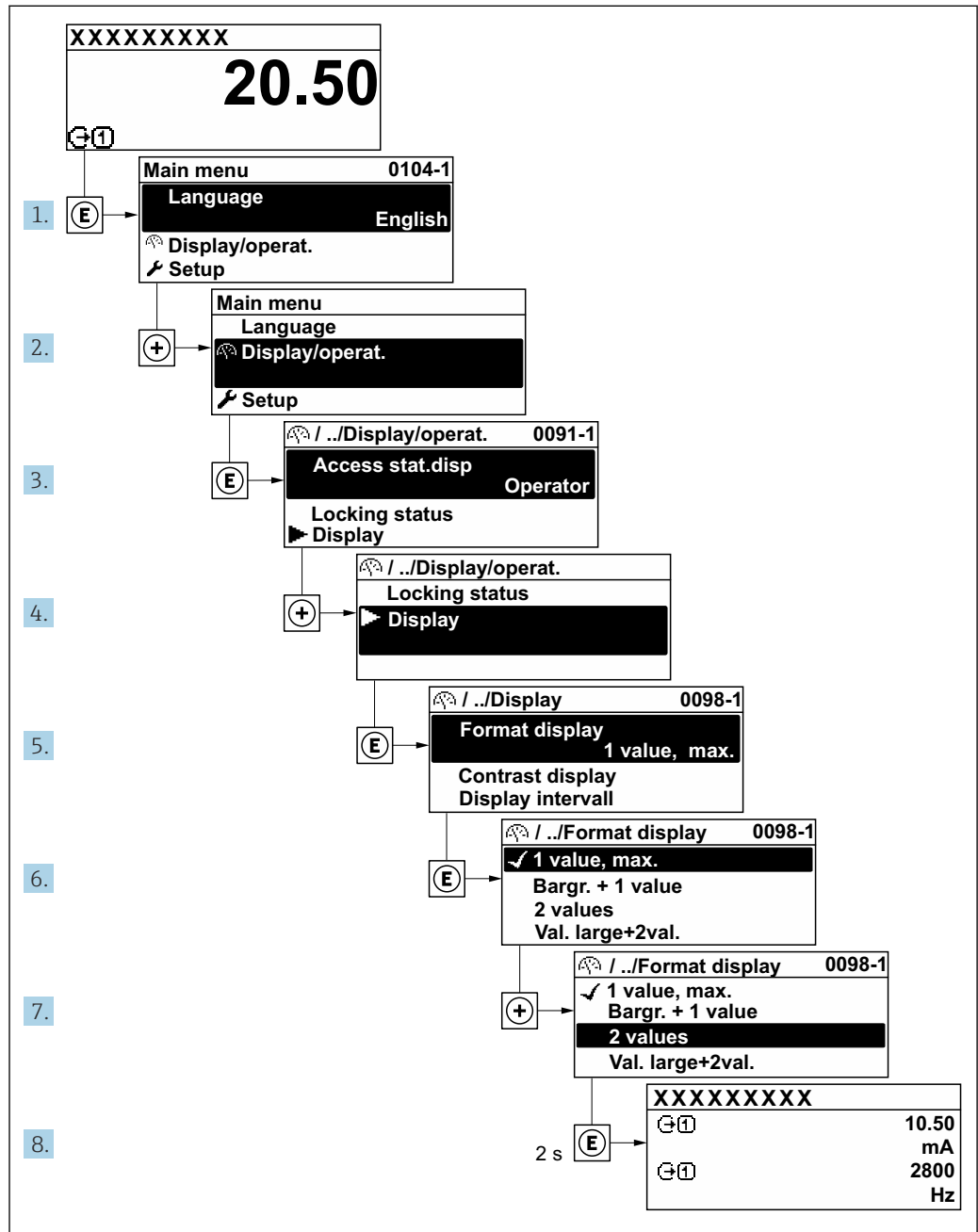
A0029562-EN

8.3.7   Calling the parameter directly

A parameter number is assigned to every parameter to be able to access a parameter directly via the onsite display. Entering this access code in the **Direct access** parameter calls up the desired parameter directly.

Navigation path
Expert → Direct access

The direct access code consists of a 5-digit number (at maximum) and the channel number, which identifies the channel of a process variable: e.g. 00914-2. In the navigation view, this appears on the right-hand side in the header of the selected parameter.
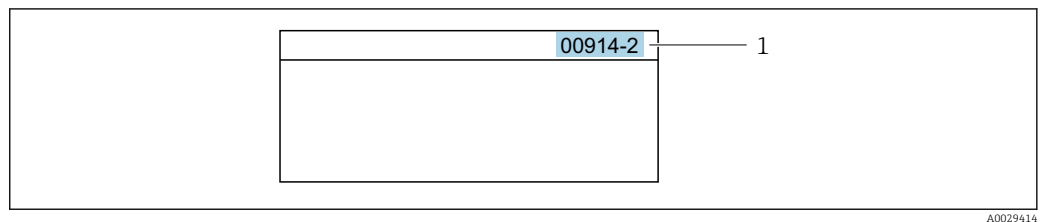
1   Direct access code

Note the following when entering the direct access code:
- The leading zeros in the direct access code do not have to be entered.
  Example: Enter **"914"** instead of **"00914"**
- If no channel number is entered, channel 1 is opened automatically.
  Example: Enter **00914** → **Assign process variable** parameter
- If a different channel is opened: Enter the direct access code with the corresponding channel number.
  Example: Enter **00914-2** → **Assign process variable** parameter

📖 For the direct access codes of the individual parameters, see the "Description of Device Parameters" document for the device

8.3.8   Calling up help text

Help text is available for some parameters and can be called up from the navigation view. The help text provides a brief explanation of the parameter function and thereby supports swift and safe commissioning.

Calling up and closing the help text

The user is in the navigation view and the selection bar is on a parameter.

1. Press Ⓔ for 2 s.
   ↳ The help text for the selected parameter opens.
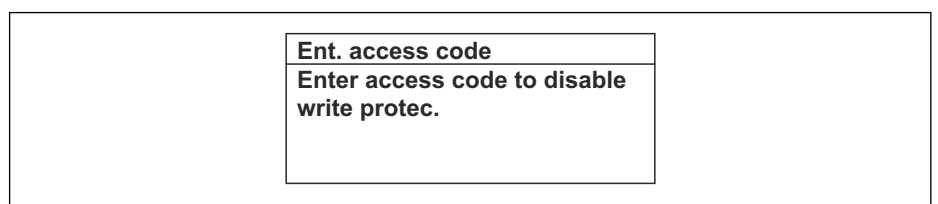
🖾 *29   Example: Help text for parameter "Enter access code"*

2. Press ⊟ + ⊞ simultaneously.
   ↳ The help text is closed.

8.3.9   Changing the parameters

Parameters can be changed via the numeric editor or text editor.
- Numeric editor: Change values in a parameter, e.g. specifications for limit values.
- Text editor: Enter text in a parameter, e.g. tag name.

A message is displayed if the value entered is outside the permitted value range.

```
┌─────────────────────────────────────────┐
│     Ent. access code                      │
│     Invalid or out of range input         │
│     value                                 │
│     Min:0                                  │
│     Max:9999                               │
└─────────────────────────────────────────┘
```
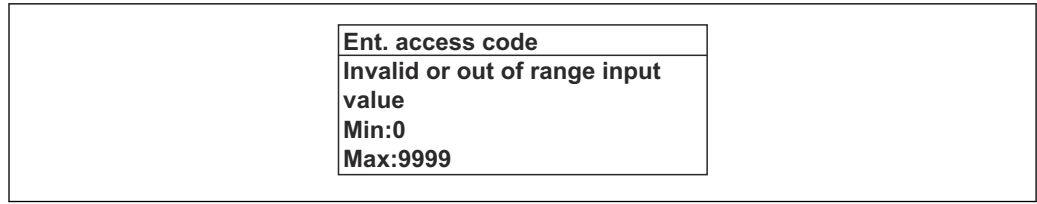
A0014049-EN

For a description of the editing view - consisting of the text editor and numeric editor - with symbols → 🗎 78, for a description of the operating elements → 🗎 80

8.3.10 User roles and related access authorization

The two user roles "Operator" and "Maintenance" have different write access to the parameters if the customer defines a user-specific access code. This protects the device configuration via the local display from unauthorized access → 🗎 146.

Defining access authorization for user roles

An access code is not yet defined when the device is delivered from the factory. Access authorization (read and write access) to the device is not restricted and corresponds to the "Maintenance" user role.

▸ Define the access code.
   ↳ The "Operator" user role is redefined in addition to the "Maintenance" user role. Access authorization differs for the two user roles.

Access authorization to parameters: "Maintenance" user role

Access code status	Read access	Write access
An access code has not yet been defined (factory setting).	✔	✔
After an access code has been defined.	✔	✔ [1]

1) The user only has write access after entering the access code.

Access authorization to parameters: "Operator" user role

Access code status	Read access	Write access
After an access code has been defined.	✔	– [1]

1) Despite the defined access code, certain parameters can always be modified and thus are excluded from the write protection as they do not affect the measurement: write protection via access code → 🗎 146

The user role with which the user is currently logged on is indicated by the **Access status** parameter. Navigation path: Operation → Access status

8.3.11 Disabling write protection via access code

If the 🖉-symbol appears on the local display in front of a parameter, the parameter is write-protected by a user-specific access code and its value cannot be changed at the moment using local operation → 🗎 146.

Parameter write protection via local operation can be disabled by entering the user-specific access code in the **Enter access code** parameter (→ 🗎 134) via the respective access option.

1. After you press 🗉, the input prompt for the access code appears.

2. Enter the access code.
   ↳ The ⌦-symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

8.3.12   Enabling and disabling the keypad lock

The keypad lock makes it possible to block access to the entire operating menu via local operation. As a result, it is no longer possible to navigate through the operating menu or change the values of individual parameters. Users can only read the measured values on the operational display.

The keypad lock is switched on and off via the context menu.

Switching on the keypad lock

The keypad lock is switched on automatically:
• If the device has not been operated via the display for > 1 minute.
• Each time the device is restarted.

To activate the keylock manually:

1. The device is in the measured value display.
   Press the ⊟ and ⌷ keys for 3 seconds.
   ↳ A context menu appears.

2. In the context menu select the **Keylock on** option.
   ↳ The keypad lock is switched on.

If the user attempts to access the operating menu while the keypad lock is active, the **Keylock on** message appears.

Switching off the keypad lock

▸ The keypad lock is switched on.
   Press the ⊟ and ⌷ keys for 3 seconds.
   ↳ The keypad lock is switched off.

8.4   Access to operating menu via web browser

8.4.1   Function range

With the integrated web server, the device can be operated and configured via a web browser and via the service interface (CDI-RJ45) or WLAN interface. The structure of the operating menu is the same as for the local display. In addition to the measured values, status information on the device is displayed and can be used to monitor device health. Furthermore the device data can be managed and the network parameters can be configured.

A device that has a WLAN interface (can be ordered as an option) is required for the WLAN connection: order code for "Display; operation", option G "4-line, illuminated; touch control + WLAN". The device acts as an Access Point and enables communication by computer or a mobile handheld terminal.

For additional information on the web server, see the Special Documentation for the device.

8.4.2   Requirements

Computer hardware

Hardware	Interface	
	CDI-RJ45	**WLAN**
Interface	The computer must have a RJ45 interface. [1]	The operating unit must have a WLAN interface.
Connection	Standard Ethernet cable	Connection via Wireless LAN.
Screen	Recommended size: ≥12" (depends on the screen resolution)	

1)   Recommended cable: CAT5e, CAT6 or CAT7, with shielded plug (e.g. YAMAICHI product; part no. Y-ConProfixPlug63/Prod. ID: 82-006660)

Computer software

Software	Interface	
	CDI-RJ45	**WLAN**

Recommended operating systems	• Microsoft Windows 8 or higher.
	• Mobile operating systems:
	  • iOS
	  • Android
	
	ℹ Microsoft Windows XP and Windows 7 is supported.	

Web browsers supported	• Microsoft Internet Explorer 8 or higher • Microsoft Edge • Mozilla Firefox • Google Chrome • Safari	

Computer settings

Settings	Interface	
	CDI-RJ45	**WLAN**
User rights	Appropriate user rights (e.g. administrator rights) for TCP/IP and proxy server settings are necessary (e.g. for adjusting the IP address, subnet mask etc.).	
Proxy server settings of the web browser	The web browser setting *Use a proxy server for your LAN* must be **disabled** .	
JavaScript	JavaScript must be enabled. ℹ If JavaScript cannot be enabled: Enter http://192.168.1.212/servlet/basic.html in the address bar of the web browser. A fully functional but simplified version of the operating menu structure starts in the web browser. ℹ When installing a new firmware version: To enable correct data display, clear the temporary memory (cache) under **Internet options** in the web browser.	JavaScript must be enabled. ℹ The WLAN display requires JavaScript support.
Network connections	Only use the active network connections to the measuring device.	
	Switch off all other network connections such as WLAN for example.	Switch off all other network connections.

ℹ In the event of connection problems: → 🖪 162

Measuring device: Via CDI-RJ45 service interface

Device	CDI-RJ45 service interface
Measuring device	The measuring device has an RJ45 interface.
Web server	Web server must be enabled; factory setting: ON ⓘ For information on enabling the Web server → 🖹 92

IP address	If the IP address of the device is not known:
	• The IP address can be read out via local operation:
	  Diagnostics → Device information → IP address
	• Communication with the Web server can be established via the default IP address 192.168.1.212.
	  The DHCP function is enabled in the device at the factory, i.e. the device expects an IP address to be assigned by the network. This function can be disabled and the device can be set to the default IP address 192.168.1.212: set DIP switch No. 2 from **OFF → ON**.
	
	ⓘ Set the default IP address → 🖹 68.

Measuring device: via WLAN interface

Device	WLAN interface
Measuring device	The measuring device has a WLAN antenna: • Transmitter with integrated WLAN antenna • Transmitter with external WLAN antenna
Web server	Web server and WLAN must be enabled; factory setting: ON ⓘ For information on enabling the Web server → 🖹 92

IP address	If the IP address of the device is not known:
	• The IP address can be read out via local operation:
	  Diagnostics → Device information → IP address
	• Communication with the Web server can be established via the default IP address 192.168.1.212.
	  The DHCP function is enabled in the device at the factory, i.e. the device expects an IP address to be assigned by the network. This function can be disabled and the device can be set to the default IP address 192.168.1.212: set DIP switch No. 2 from **OFF → ON**.
	
	ⓘ Set the default IP address → 🖹 68.

8.4.3 Connecting the device

Via service interface (CDI-RJ45)

Preparing the measuring device

Proline 500 – digital

1. Loosen the 4 fixing screws on the housing cover.

2. Open the housing cover.

3. The location of the connection socket depends on the measuring device and the communication protocol.
   Connect the computer to the RJ45 plug via the standard Ethernet cable .

Proline 500

1. Depending on the housing version:
   Loosen the securing clamp or fixing screw of the housing cover.

2. Depending on the housing version:
   Unscrew or open the housing cover.

3. Connect the computer to the RJ45 plug via the standard Ethernet connecting cable..

Configuring the Internet protocol of the computer

The IP address can be assigned to the measuring device in a variety of ways:
- Dynamic Host Configuration Protocol (DHCP), factory setting:
  The IP address is automatically assigned to the measuring device by the automation system (DHCP server).
- Hardware addressing:
  The IP address is set via DIP switches .
- Software addressing:
  The IP address is entered via the **IP address** parameter (→ 🗎 115) .
- DIP switch for "Default IP address":
  To establish the network connection via the service interface (CDI-RJ45): the fixed IP address 192.168.1.212 is used .

The device works with the Dynamic Host Configuration Protocol (DHCP) ex-works, i.e. the IP address of the measuring device is automatically assigned by the automation system (DHCP server).

To establish a network connection via the service interface (CDI-RJ45): set the "Default IP address" DIP switch to **ON**. The measuring device then has the fixed IP address: 192.168.1.212. The fixed IP address 192.168.1.212 can now be used to establish the connection to the network.

1. Via DIP switch 2, activate the default IP address 192.168.1.212: .

2. Switch on the measuring device.

3. Connect the computer to the RJ45 plug via the standard Ethernet cable → 🗎 94.

4. If a 2nd network card is not used, close all the applications on the notebook.
   ↳ Applications requiring Internet or a network, such as e-mail, SAP applications, Internet or Windows Explorer.

5. Close any open Internet browsers.

6. Configure the properties of the Internet protocol (TCP/IP) as defined in the table:

IP address	192.168.1.XXX; for XXX all numerical sequences except: 0, 212 and 255 → e.g. 192.168.1.213
Subnet mask	255.255.255.0
Default gateway	192.168.1.212 or leave cells empty

Via WLAN interface

Configuring the Internet protocol of the mobile terminal

NOTICE

If the WLAN connection is lost during the configuration, settings made may be lost.
▶ Make sure that the WLAN connection is not disconnected while configuring the device.

NOTICE

Note the following to avoid a network conflict:
▶ Avoid accessing the measuring device simultaneously from the same mobile terminal via the service interface (CDI-RJ45) and the WLAN interface.
▶ Only activate one service interface (CDI-RJ45 or WLAN interface).
▶ If simultaneous communication is necessary: configure different IP address ranges, e.g. 192.168.0.1 (WLAN interface) and 192.168.1.212 (CDI-RJ45 service interface).

Preparing the mobile terminal

▸ Enable WLAN on the mobile terminal.

Establishing a WLAN connection from the mobile terminal to the measuring device

1. In the WLAN settings of the mobile terminal:
   Select the measuring device using the SSID (e.g. EH_Promag_500_A802000).

2. If necessary, select the WPA2 encryption method.

3. Enter the password:
   Serial number of the measuring device ex-works (e.g. L100A802000).
   ↳ The LED on the display module flashes. It is now possible to operate the measuring device with the web browser, FieldCare or DeviceCare.

The serial number can be found on the nameplate.

To ensure the safe and swift assignment of the WLAN network to the measuring point, it is advisable to change the SSID name. It should be possible to clearly assign the new SSID name to the measuring point (e.g. tag name) because it is displayed as the WLAN network.

Terminating the WLAN connection

▸ After configuring the device:
   Terminate the WLAN connection between the mobile terminal and measuring device.

Starting the web browser

1. Start the web browser on the computer.

2. Enter the IP address of the web server in the address line of the web browser: 192.168.1.212

   ↳ The login page appears.
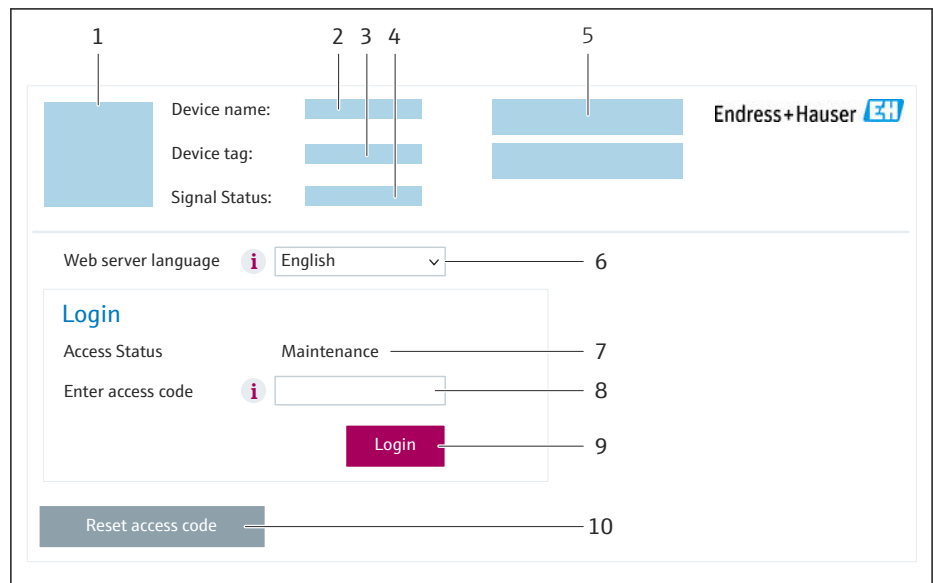
1 Picture of device
2 Device name
3 Device tag
4 Status signal
5 Current measured values
6 Operating language
7 User role
8 Access code
9 Login
10 Reset access code (→ 🖺 144)

ℹ️ If a login page does not appear, or if the page is incomplete → 🖺 162

8.4.4 Logging on

1. Select the preferred operating language for the Web browser.

2. Enter the user-specific access code.

3. Press **OK** to confirm your entry.

Access code	0000 (factory setting); can be changed by customer

ℹ️ If no action is performed for 10 minutes, the Web browser automatically returns to the login page.

8.4.5   User interface
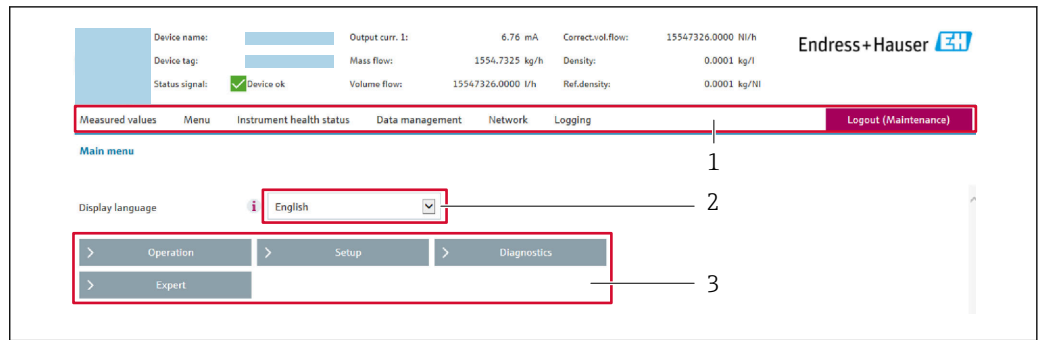
1   Function row
2   Local display language
3   Navigation area

Header

The following information appears in the header:
- Device name
- Device tag
- Device status with status signal → 🗎 170
- Current measured values

Function row

Functions	Meaning
Measured values	Displays the measured values of the device
Menu	• Access to the operating menu from the measuring device • The structure of the operating menu is the same as for the local display 📖 Detailed information on the operating menu structure: Description of Device Parameters
Device status	Displays the diagnostic messages currently pending, listed in order of priority

Data management	Data exchange between computer and measuring device:
	• Device configuration:
	  ▪ Load settings from the device
	    (XML format, save configuration)
	  ▪ Save settings to the device
	    (XML format, restore configuration)
	• Logbook - Export Event logbook (.csv file)
	• Documents - Export documents:
	  ▪ Export backup data record
	    (.csv file, create documentation of the measuring point configuration)
	  ▪ Verification report
	    (PDF file, only available with the "Heartbeat Verification" application package)
	• File for system integration - If using fieldbuses, upload device drivers for system integration from the measuring device:
	  EtherNet/IP: EDS file
	• Firmware update - Flashing a firmware version

Network	Configuration and checking of all the parameters required for establishing the connection to the measuring device: • Network settings (e.g. IP address, MAC address) • Device information (e.g. serial number, firmware version)
Logout	End the operation and call up the login page

Navigation area

The menus, the associated submenus and parameters can be selected in the navigation area.

Working area

Depending on the selected function and the related submenus, various actions can be performed in this area:
- Configuring parameters
- Reading measured values
- Calling up help text
- Starting an upload/download

8.4.6   Disabling the Web server

The Web server of the measuring device can be switched on and off as required using the **Web server functionality** parameter.

Navigation
"Expert" menu → Communication → Web server

Parameter overview with brief description

Parameter	Description	Selection
Web server functionality	Switch the Web server on and off.	• Off • HTML Off • On

Function scope of the "Web server functionality" parameter

Option	Description
Off	• The Web server is completely disabled. • Port 80 is locked.
HTML Off	The HTML version of the Web server is not available.
On	• The complete Web server functionality is available. • JavaScript is used. • The password is transferred in an encrypted state. • Any change to the password is also transferred in an encrypted state.

Enabling the Web server

If the Web server is disabled it can only be re-enabled with the **Web server functionality** parameter via the following operating options:
- Via local display
- Via Bedientool "FieldCare"
- Via "DeviceCare" operating tool

8.4.7   Logging out

Before logging out, perform a data backup via the **Data management** function (upload configuration from device) if necessary.

1. Select the **Logout** entry in the function row.
    ↳ The home page with the Login box appears.

2. Close the Web browser.

3. If no longer needed:

   Reset the modified properties of the Internet protocol (TCP/IP) → 🖩 88.

ℹ️ If communication with the web server was established via the default IP address 192.168.1.212, DIP switch no. 10 must be reset (from **ON** → **OFF**). Afterwards, the IP address of the device is active again for network communication.

8.5 Access to the operating menu via the operating tool

The structure of the operating menu in the operating tools is the same as for operation via the local display.

8.5.1 Connecting the operating tool

Via EtherNet/IP network

This communication interface is available in device versions with EtherNet/IP.

Star topology
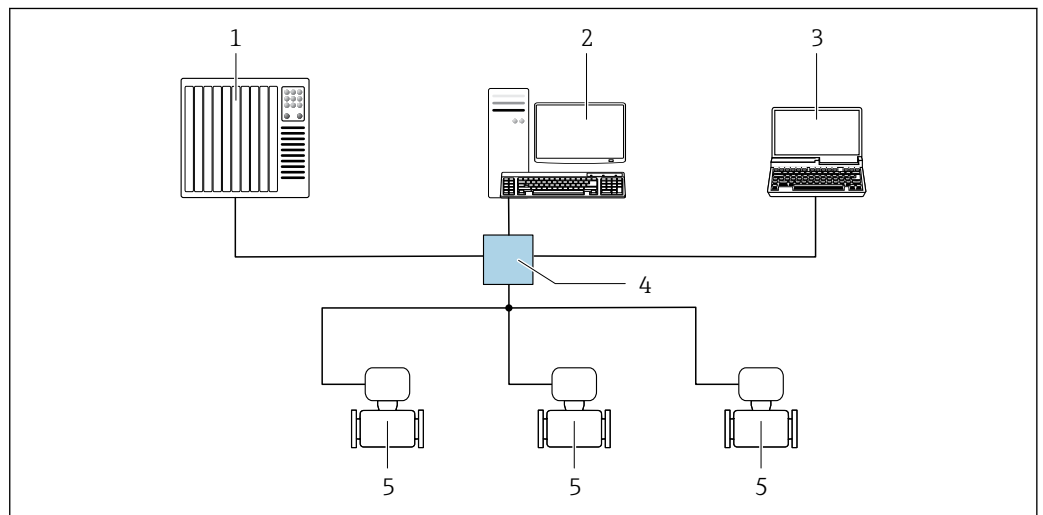
🖼 *30   Options for remote operation via EtherNet/IP network: star topology*

1   Automation system, e.g. "RSLogix" (Rockwell Automation)
2   Workstation for measuring device operation: with Custom Add-On Profile for "RSLogix 5000" (Rockwell Automation) or with Electronic Data Sheet (EDS)
3   Computer with Web browser (e.g. Internet Explorer) for accessing the integrated Web server or computer with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP"
4   Standard Ethernet switch, e.g. Scalance X204 (Siemens)
5   Measuring device

Ring topology

The device is integrated via the terminal connection for signal transmission (output 1) and the service interface (CDI-RJ45).
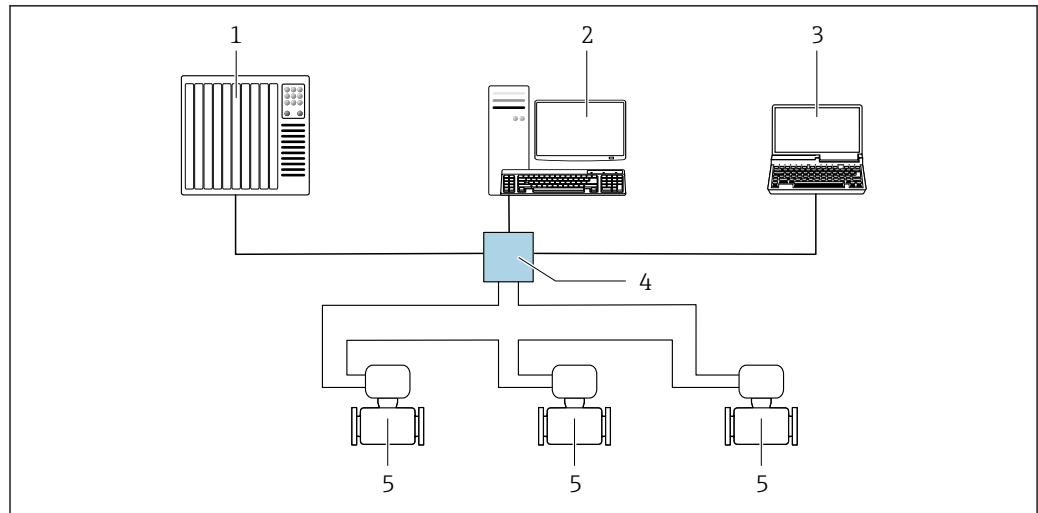
⊠ *31   Options for remote operation via EtherNet/IP network: ring topology*

1   Automation system, e.g. "RSLogix" (Rockwell Automation)
2   Workstation for measuring device operation: with Custom Add-On Profile for "RSLogix 5000" (Rockwell
      Automation) or with Electronic Data Sheet (EDS)
3   Computer with Web browser (e.g. Internet Explorer) for accessing the integrated Web server or computer
      with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP"
4   Standard Ethernet switch, e.g. Scalance X204 (Siemens)
5   Measuring device

Service interface

Via service interface (CDI-RJ45)

A point-to-point connection can be established to configure the device onsite. With the
housing open, the connection is established directly via the service interface (CDI-RJ45) of
the device.

[i] An adapter for the RJ45 to the M12 plug is optionally available for the non-hazardous
    area:

Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

The adapter connects the service interface (CDI-RJ45) to an M12 plug mounted in the
cable entry. The connection to the service interface can be established via an M12
plug without opening the device.

Proline 500 – digital transmitter
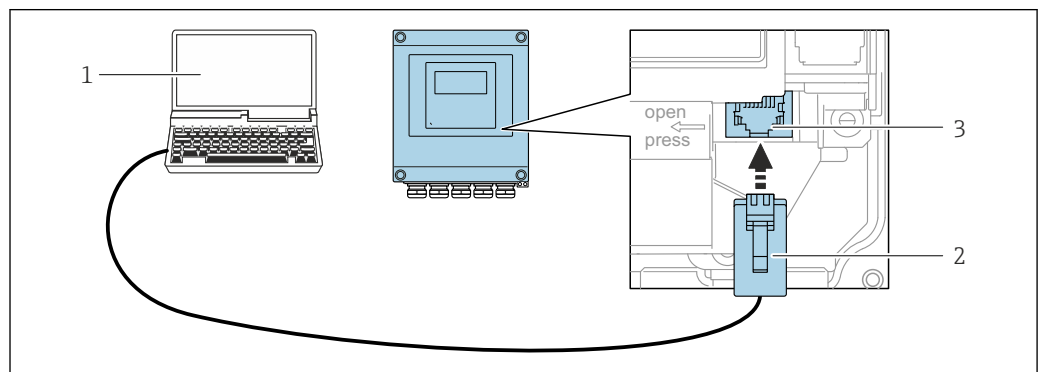
⊠ *32   Connection via service interface (CDI-RJ45)*

1   Computer with web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated
      web server or with "FieldCare" operating tool, "DeviceCare" with COM DTM "CDI Communication TCP/IP"
2   Standard Ethernet connecting cable with RJ45 plug
3   Service interface (CDI-RJ45) of the measuring device with access to the integrated Web server

Proline 500 transmitter
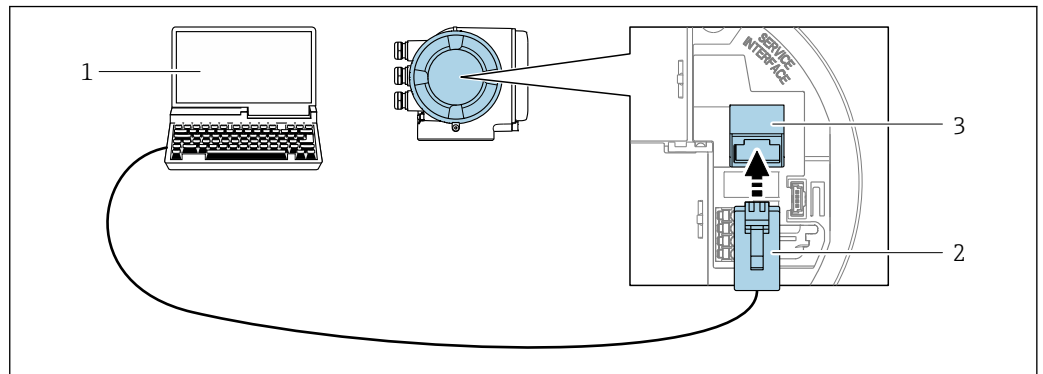
A0027563

☒ 33   Connection via service interface (CDI-RJ45)

1   Computer with web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated web server or with "FieldCare" operating tool, "DeviceCare" with COM DTM "CDI Communication TCP/IP"
2   Standard Ethernet connecting cable with RJ45 plug
3   Service interface (CDI-RJ45) of the measuring device with access to the integrated Web server

Via WLAN interface

The optional WLAN interface is available on the following device version:
Order code for "Display; operation", option G "4-line, illuminated; touch control + WLAN"
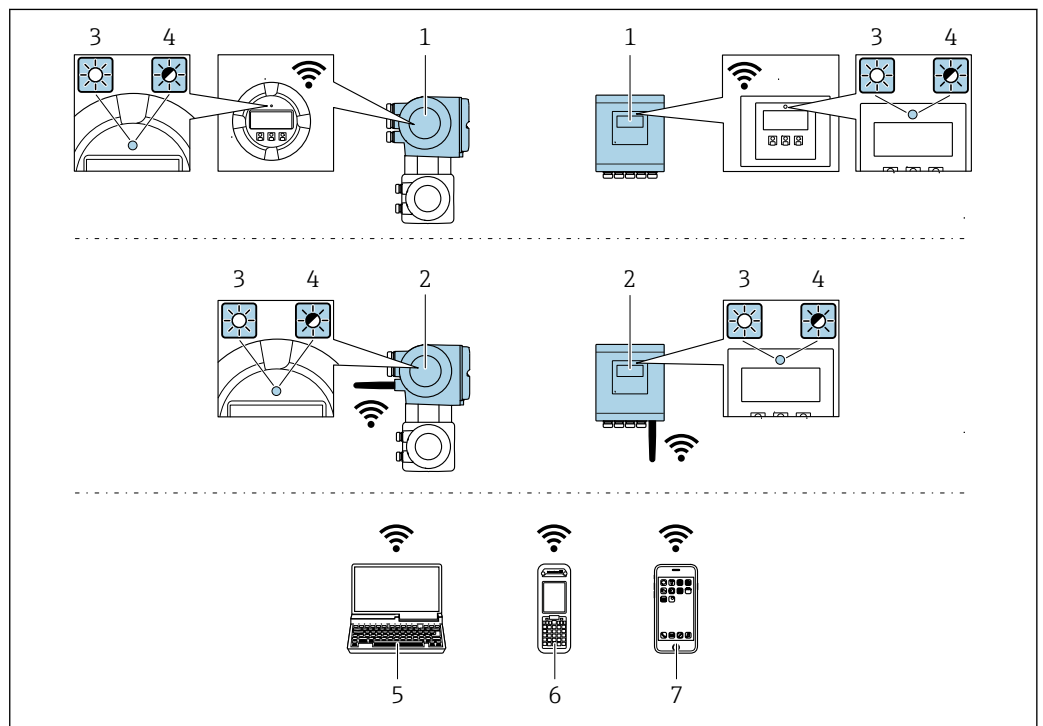
A0034569

1   Transmitter with integrated WLAN antenna
2   Transmitter with external WLAN antenna
3   LED lit constantly: WLAN reception is enabled on measuring device
4   LED flashing: WLAN connection established between operating unit and measuring device
5   Computer with WLAN interface and web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device web server or with operating tool (e.g. FieldCare, DeviceCare)
6   Mobile handheld terminal with WLAN interface and web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device web server or operating tool (e.g. FieldCare, DeviceCare)
7   Smart phone or tablet (e.g. Field Xpert SMT70)

Function	WLAN: IEEE 802.11 b/g (2.4 GHz) • Access Point with DHCP server (factory setting) • Network
Encryption	WPA2-PSK AES-128 (in accordance with IEEE 802.11i)
Configurable WLAN channels	1 to 11
Degree of protection	IP67
Available antennas	• Internal antenna • External antenna (optional) In the event of poor transmission/reception conditions at the place of installation. ℹ Only 1 antenna is active at any one time!
Range	• Internal antenna: typically 10 m (32 ft) • External antenna: typically 50 m (164 ft)
Materials (external antenna)	• Antenna: ASA plastic (acrylonitrile styrene acrylate) and nickel-plated brass • Adapter: Stainless steel and nickel-plated brass • Cable: Polyethylene • Plug: Nickel-plated brass • Angle bracket: Stainless steel

Configuring the Internet protocol of the mobile terminal

NOTICE

If the WLAN connection is lost during the configuration, settings made may be lost.

▶ Make sure that the WLAN connection is not disconnected while configuring the device.

NOTICE

Note the following to avoid a network conflict:

▶ Avoid accessing the measuring device simultaneously from the same mobile terminal via the service interface (CDI-RJ45) and the WLAN interface.
▶ Only activate one service interface (CDI-RJ45 or WLAN interface).
▶ If simultaneous communication is necessary: configure different IP address ranges, e.g. 192.168.0.1 (WLAN interface) and 192.168.1.212 (CDI-RJ45 service interface).

Preparing the mobile terminal

▶ Enable WLAN on the mobile terminal.

Establishing a WLAN connection from the mobile terminal to the measuring device

1. In the WLAN settings of the mobile terminal:
   Select the measuring device using the SSID (e.g. EH_Promag_500_A802000).

2. If necessary, select the WPA2 encryption method.

3. Enter the password:
   Serial number of the measuring device ex-works (e.g. L100A802000).
   ↳ The LED on the display module flashes. It is now possible to operate the measuring device with the web browser, FieldCare or DeviceCare.

ℹ The serial number can be found on the nameplate.

ℹ To ensure the safe and swift assignment of the WLAN network to the measuring point, it is advisable to change the SSID name. It should be possible to clearly assign the new SSID name to the measuring point (e.g. tag name) because it is displayed as the WLAN network.

Terminating the WLAN connection

▸ After configuring the device:
  Terminate the WLAN connection between the mobile terminal and measuring device.

8.5.2   FieldCare

Function range

FDT-based (Field Device Technology) plant asset management tool from Endress+Hauser. It can configure all smart field units in a system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.

Access is via:
• CDI-RJ45 service interface → 🖹 94
• WLAN interface → 🖹 95

Typical functions:
• Transmitter parameter configuration
• Loading and saving of device data (upload/download)
• Documentation of the measuring point
• Visualization of the measured value memory (line recorder) and event logbook

📖 • Operating Instructions BA00027S
   • Operating Instructions BA00059S

ℹ️ Source for device description files → 🖹 99

Establishing a connection

1. Start FieldCare and launch the project.

2. In the network: Add a device.
   ↳ The **Add device** window opens.

3. Select the **CDI Communication TCP/IP** option from the list and press **OK** to confirm.

4. Right-click **CDI Communication TCP/IP** and select the **Add device** option in the context menu that opens.

5. Select the desired device from the list and press **OK** to confirm.
   ↳ The **CDI Communication TCP/IP (Configuration)** window opens.

6. Enter the device address in the **IP address** field: 192.168.1.212 and press **Enter** to confirm.

7. Establish the online connection to the device.

📖 • Operating Instructions BA00027S
   • Operating Instructions BA00059S

User interface
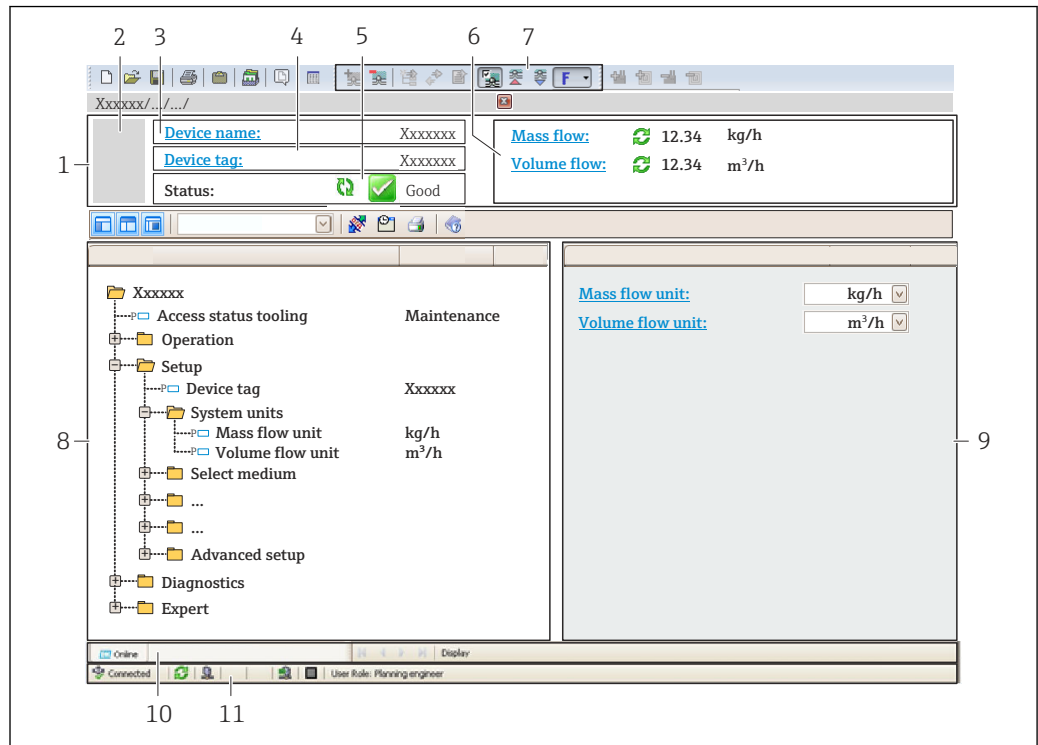
1   *Header*
2   *Picture of device*
3   *Device name*
4   *Device tag*
5   *Status area with status signal → 🖺 170*
6   *Display area for current measured values*
7   *Editing toolbar with additional functions such as save/load, event list and create documentation*
8   *Navigation area with operating menu structure*
9   *Work area*
10   *Action area*
11   *Status area*

8.5.3   DeviceCare

Function range

Tool for connecting and configuring Endress+Hauser field devices.

The fastest way to configure Endress+Hauser field devices is with the dedicated "DeviceCare" tool. Together with the device type managers (DTMs) it presents a convenient, comprehensive solution.

📖 Innovation brochure IN01047S

ℹ️ Source for device description files → 🖺 99

9   System integration

9.1   Overview of device description files

9.1.1   Current version data for the device

Firmware version	01.00.zz	• On the title page of the manual • On the transmitter nameplate • Firmware version Diagnostics → Device information → Firmware version
Release date of firmware version	10.2017	---
Manufacturer ID	0x11	Manufacturer ID Diagnostics → Device information → Manufacturer ID
Device type code	0x103C	Device type Diagnostics → Device information → Device type
Device revision	• Major revision 1 • Minor revision 1	• On the transmitter nameplate • Device revision Diagnostics → Device information → Device revision
Device profile	Generic device (product type: 0x2B)	

For an overview of the various firmware versions for the device → 🕮 190

9.1.2   Operating tools

The suitable device description file for the individual operating tools is listed in the table below, along with information on where the file can be acquired.

Operating tool via Service interface (CDI-RJ45)	Sources for obtaining device descriptions
FieldCare	• www.endress.com → Downloads area • USB stick (contact Endress+Hauser) • DVD (contact Endress+Hauser)
DeviceCare	• www.endress.com → Downloads area • CD–ROM (contact Endress+Hauser) • DVD (contact Endress+Hauser)

9.2   Overview of system files

System files	Version	Description	How to acquire
Electronic Data Sheet (EDS system file)	2.1	Certified in accordance with the following ODVA guidelines: • Conformance test • Performance test • PlugFest Embedded EDS Support (File Object 0x37)	• www.endress.com → Download Area • EDS system file integrated in the device: can be downloaded via the web browser
Add-on Profile	• Major revision 1 • Minor revision 1	System file for "Studio 5000" software (Rockwell Automation)	www.endress.com → Download Area

9.3 Integrating the measuring device in the system

For detailed information on system integration, see the Operating Instructions for the device

A detailed description of how to integrate the device into an automation system (e.g. from Rockwell Automation) is available as a separate document:
www.endress.com→ Select your country → Solutions → Fieldbus planning
→ Fieldbus technologies → EtherNet/IP

9.4 Cyclic data transmission

Cyclic data transmission when using the EDS system file.

9.4.1 Block model

The block model shows which input and output data the measuring instrument makes available for implicit messaging. Cyclical data exchange is performed using an EtherNet/IP scanner, e.g. a distributed control system etc.

Measuring instrument				Control system
Transducer Block	Input Assembly Fix (Assem100) 40 byte	→ 🖺 102	Permanently assigned input group →	EtherNet/IP
	Volume flow fixed input assembly (Assem106) 40 byte	→ 🖺 103	Permanently assigned input group →	
	Mass flow fixed input assembly (Assem107) 58 byte	→ 🖺 103	Permanently assigned input group →	
	Heartbeat monitoring fixed input assembly [1] (Assem112) 44 byte	→ 🖺 103	Permanently assigned input group →	
	Input assembly custom (Assem101) 88 byte	→ 🖺 103	Configurable input group →	
	Output assembly fix (Assem102) 30 byte	→ 🖺 104	Permanently assigned output group ←	

1) Only available with the Heartbeat Verification application package.

9.4.2 Input and output groups

Possible configurations

Configuration 1: Exclusive Owner Multicast

Input Assembly Fix		Instance	Size (byte)	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 64	398	–
Output Assembly Fix	O → T Configuration	0 x 66	64	5
Input Assembly Fix	T → O Configuration	0 x 64	44	5

Configuration 2: Input Only Multicast

Input Assembly Fix		Instance	Size (byte)	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 68	398	–
Output Assembly Fix	O → T Configuration	0 x C7	–	–
Input Assembly Fix	T → O Configuration	0 x 64	44	5

Configuration 3: Exclusive Owner Multicast

Input Assembly Configurable		Instance	Size (byte)	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 68	398	–
Output Assembly Fix	O → T Configuration	0 x 66	64	5
Input Assembly Fix	T → O Configuration	0 x 65	88	5

Configuration 4: Input Only Multicast

Input Assembly Configurable		Instance	Size (byte)	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 68	398	–
Output Assembly Fix	O → T Configuration	0 x C7	–	–
Input Assembly Fix	T → O Configuration	0 x 64	88	5

Configuration 5: Exclusive Owner Multicast

Input Assembly Fix		Instance	Size (byte)	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 69	–	–
Output Assembly Fix	O → T Configuration	0 x 66	64	5
Input Assembly Fix	T → O Configuration	0 x 64	44	5

Configuration 6: Input Only Multicast

Input Assembly Fix		Instance	Size (byte)	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 69	–	–
Output Assembly Fix	O → T Configuration	0 x C7	–	–
Input Assembly Fix	T → O Configuration	0 x 65	44	5

Configuration 7: Exclusive Owner Multicast

Input Assembly Configurable		Instance	Size (byte)	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 69	–	–
Output Assembly Fix	O → T Configuration	0 x 66	64	5
Input Assembly Fix	T → O Configuration	0 x 64	88	5

Configuration 8: Input Only Multicast

Input Assembly Configurable		Instance	Size (byte)	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 69	–	–
Output Assembly Fix	O → T Configuration	0 x C7	–	–
Input Assembly Fix	T → O Configuration	0 x 65	88	5

Possible connections

No.	#1	#2	#3	#4	#5
Number of connections	**1**	**1**	**1**	**1**	**1**
Input assembly fixed (Assem100)	X				
Volume flow fixed input assembly (Assem106)		X			
Mass flow fixed input assembly (Assem107)			X		
Input assembly custom (Assem101)				X	
Heartbeat monitoring fixed input assembly (Assem112)					X

Permanently assigned input group

Input assembly fixed (Assem100), 40 byte

Description		Byte
1.	File header (not visible)	1 to 4
2.	Current diagnosis [1]	5 to 8
3.	Volume flow	9 to 12
4.	Mass flow	13 to 16
5.	Corrected volume flow	17 to 20
6.	Conductivity	21 to 24
7.	Temperature	25 to 28
8.	Totalizer 1	29 to 32
9.	Totalizer 2	33 to 36
10.	Totalizer 3	37 to 40

1) Diagnostic information via EtherNet/IP → 🖹 107

Volume flow fixed input assembly (Assem106), 40 byte

Description	Byte
1. File header (not visible)	1 to 4
2. Current diagnosis [1]	5 to 8
3. Volume flow	9 to 12
4. Corrected volume flow	13 to 16
5. Conductivity	17 to 20
6. Temperature	21 to 24
7. Totalizer 1	25 to 28
8. Volume flow unit	29 to 30
9. Corrected volume flow unit	31 to 32
10. Conductivity unit	33 to 34
11. Temperature unit	35 to 36
12. Totalizer 1 unit	37 to 38
13. Padding byte	39 to 40

1)   Diagnostic information via EtherNet/IP → 🕮 107

Mass flow fixed input assembly (Assem107), 58 byte

Description	Byte
1. Mass flow	1 to 40
2. Totalizer 2	41 to 44
3. Totalizer 3	45 to 48
4. Mass flow unit	49 to 52
5. Totalizer 2 unit	53 to 54
6. Totalizer 3 unit	55 to 56

Heartbeat monitoring fixed input assembly (Assem112), 56 byte [1]

Description	Byte
1. Verification status	1 to 40
2. Verification result	41 to 44

1)   Only available with the Heartbeat Verification application package.

Configurable input group

Input assembly custom (Assem101), 88 byte

Description	Format
1. - 10. Input values 1 to 10	Real
11. - 20. Input values 11 to 20	Double integer

Possible input values

Possible input values 1 to 10:		
• Off	• Flow velocity	• Electronics temperature
• Volume flow	• Conductivity	• Totalizer 1
• Mass flow	• Corrected conductivity	• Totalizer 2
• Corrected volume flow	• Temperature	• Totalizer 3

Possible input values 11 to 20:		
• Off	• Temperature unit	• Verification results [1]
• Current diagnostics	• Conductivity unit	• Verification status
• Previous diagnosis	• Totalizer 1 unit	
• Mass flow unit	• Totalizer 2 unit	
• Volume flow unit	• Totalizer 3 unit	
• Corrected volume flow unit		

1)   Only available with the Heartbeat Verification application package.

Permanently assigned output group

Output assembly fix (Assem102), 30 byte

Description (format)	Byte	Bit	Value
1. Activation of totalizer check 1	1	0	
2. Activation of totalizer check 2		1	
3. Activation of totalizer check 3		2	
4. Activation of reference density compensation		3	• 0: Disable • 1: Enable
5. Activation of temperature compensation		4	
6. Activation of verification		5	
7. Activation of flow override		6	
8. Not used		7	
9. Not used	2	8	–
10. Not used	3 to 4	16	–
11. Totalizer 1 – control (integer)	5 to 6	16	• -32226: Add • -32490: Reset (0) and stop • -32228: Default value and stop
12. Totalizer 2 – control (integer)	7 to 8	16	• 198: Reset (0) and start totalizing • 199: Default value and start totalizing • -32608: Stop
13. Totalizer 3 – control (integer)	9 to 10	16	
14. Not used	11 to 12	16	–
15. External density (real)	13 to 16	32	External reference density to field device in "IEEE 754" data format

Description (format)	Byte	Bit	Value
16. External density unit (integer)	17 to 18	16	■ 12040: g/cm^3 ■ 12051: g/m^3 ■ 12048: kg/l ■ 12053: kg/dm^3 ■ 12039: kg/m^3 ■ 12065: SD4℃ ■ 12066: SD15℃ ■ 12067: SD20℃ ■ 12068: SG4℃ ■ 12069: SG15℃ ■ 12070: SG20℃ ■ 12044: lb/ft^3 ■ 12043: lb/gal (us) ■ 12058: lb/bbl (us;liq.) ■ 12057: lb/bbl (us;beer) ■ 12059: lb/bbl (us;oil) ■ 12060: lb/bbl (us;tank) ■ 12063: lb/gal (imp) ■ 12061: lb/bbl (imp;beer) ■ 12062: lb/bbl (imp;oil)
17. Not used	19 to 20	16	–
18. External temperature (real)	21 to 24	32	External reference density to field device in "IEEE 754" data format
19. External temperature unit (integer)	25 to 26	16	■ 4608: ℃ ■ 4609: ℉ ■ 4610: K ■ 4611: ℝ
20. Start verification (integer)	27 to 28	16	■ -32713: Cancel ■ -32378: Start
21. Flow override – control	29 to 30	16	■ -32532: Off ■ -32530: On

Permanently assigned configuration group

Config assembly (Assem104), 1512 byte

Description (format)				Bits	Byte	Offset
1.	None			32	4	0
2.	Parameter 28	–	Write protection	8	4	4
3.	None			8	4	5
4.	Parameter 74	System units	Mass flow unit	16	4	6
5.	Parameter 73	System units	Mass unit	16	4	8
6.	Parameter 77	System units	Volume flow unit	16	4	10
7.	Parameter 76	System units	Volume unit	16	4	12
8.	Parameter 71	System units	Corrected volume flow unit	16	4	14
9.	Parameter 72	System units	Density unit	16	4	16
10.	Parameter 75	System units	Temperature unit	16	4	18
11.	Parameter 69	System units	Conductivity unit	16	4	20
12.	None			192	4	22
13.	Parameter 147	–	Enter access code	16	4	46
14.	Parameter 78	Totalizer 1	Assign process variable	16	4	48
15.	Parameter 90	Totalizer 1	Unit totalizer	16	4	50
16.	Parameter 87	Totalizer 1	Totalizer operating mode	16	4	52

Description (format)				Bits	Byte	Offset
17.	Parameter 84	Totalizer 1	Fault mode	16	4	54
18.	Parameter 149	Totalizer operation	Preset value tot. 1	32	4	56
19.	Parameter 81	Totalizer operation	Control totalizer 1	16	4	60
20.	Parameter 79	Totalizer 2	Assign process variable	16	4	62
21.	Parameter 91	Totalizer 2	Unit totalizer	16	4	64
22.	Parameter 88	Totalizer 2	Totalizer operating mode	16	4	66
23.	Parameter 85	Totalizer 2	Fault mode	16	4	68
24.	Parameter 82	Totalizer operation	Control totalizer 2	16	4	70
25.	Parameter 150	Totalizer operation	Preset value tot. 2	32	4	72
26.	Parameter 80	Totalizer 3	Assign process variable	16	4	76
27.	Parameter 92	Totalizer 3	Unit totalizer	16	4	78
28.	Parameter 89	Totalizer 3	Totalizer operating mode	16	4	80
29.	Parameter 86	Totalizer 3	Fault mode	16	4	82
30.	Parameter 130	Totalizer operation	Preset value tot. 3	32	4	84
31.	Parameter 83	Totalizer operation	Control totalizer 3	16	4	88
32.	Parameter 8	Configurable input assembly	Input assembly position 1	16	4	90
33.	Parameter 19	Configurable input assembly	Input assembly position 2	16	4	92
34.	Parameter 21	Configurable input assembly	Input assembly position 3	16	4	94
35.	Parameter 22	Configurable input assembly	Input assembly position 4	16	4	96
36.	Parameter 23	Configurable input assembly	Input assembly position 5	16	4	98
37.	Parameter 24	Configurable input assembly	Input assembly position 6	16	4	100
38.	Parameter 25	Configurable input assembly	Input assembly position 7	16	4	102
39.	Parameter 26	Configurable input assembly	Input assembly position 8	16	4	104
40.	Parameter 27	Configurable input assembly	Input assembly position 9	16	4	106
41.	Parameter 9	Configurable input assembly	Input assembly position 10	16	4	108
42.	Parameter 10	Configurable input assembly	Input assembly position 11	16	4	110
43.	Parameter 11	Configurable input assembly	Input assembly position 12	16	4	112
44.	Parameter 12	Configurable input assembly	Input assembly position 13	16	4	114
45.	Parameter 13	Configurable input assembly	Input assembly position 14	16	4	116
46.	Parameter 14	Configurable input assembly	Input assembly position 15	16	4	118
47.	Parameter 15	Configurable input assembly	Input assembly position 16	16	4	120
48.	Parameter 16	Configurable input assembly	Input assembly position 17	16	4	122
49.	Parameter 17	Configurable input assembly	Input assembly position 18	16	4	124
50.	Parameter 18	Configurable input assembly	Input assembly position 19	16	4	126
51.	Parameter 20	Configurable input assembly	Input assembly position 20	16	4	128
52.	Parameter 30	Sensor adjustment	Flow direction	16	4	130
53.	Parameter 29	Low flow cut off	Assign process variable	16	4	132
54.	Parameter 31	Empty pipe detection	Assign process variable	16	4	134
55.	Parameter 110	Low flow cut off	Switch-on point low flow cut off	32	4	136
56.	Parameter 109	Low flow cut off	Off value low flow cutoff	32	4	140
57.	Parameter 118	Low flow cut off	Pressure shock suppression	32	4	144
58.	Parameter 111	Empty pipe detection	Response time part. filled pipe detect.	32	4	148
59.	Parameter 106	Process parameter	Conductivity damping	32	4	152

Description (format)				Bits	Byte	Offset
60.	Parameter 32	Process parameter	Flow override	16	4	156
61.	Parameter 45	Empty pipe detection	New adjustment	16	4	158
62.	Parameter 42	External compensation	Density source	16	4	160
63.	Parameter 49	External compensation	Temperature source	16	4	162
64.	Parameter 138	Empty pipe detection	Switch point empty pipe detection	32	4	164
65.	Parameter 140	External compensation	Fixed density	32	4	168
66.	Parameter 48	Process parameter	Filter options	16	4	172
67.	Parameter 141	Process parameter	Flow damping	8	4	174
68.	None			8	4	175
69.	Parameter 146	Diagnostic settings	Alarm delay	32	4	176
70.	Parameter 53	Diagnostic behavior	Assign behavior for diagnostic information 832	8	4	180
71.	Parameter 54	Diagnostic behavior	Assign behavior for diagnostic information 833	8	4	181
72.	Parameter 55	Diagnostic behavior	Assign behavior for diagnostic information 834	8	4	182
73.	Parameter 56	Diagnostic behavior	Assign behavior for diagnostic information 835	8	4	183
74.	Parameter 57	Diagnostic behavior	Assign behavior for diagnostic information 962	8	4	184
75.	Parameter 52	Diagnostic behavior	Assign behavior for diagnostic information 531	8	4	185
76.	Parameter 58	Diagnostic behavior	Assign behavior for diagnostic information 937	8	4	186
77.	Parameter 51	Diagnostic behavior	Assign behavior for diagnostic information 302	8	4	187

9.5 Diagnostic information via EtherNet/IP

Status signal	No.	Short text	Value
	000	–	0
F	882	Input signal	16777265
F	281	Electronic initialization	16777276
F	437	Configuration incompatible	16777312
F	242	Software incompatible	16777319
F	252	Modules incompatible	16777323
F	272	Main electronic failure	16777337
F	270	Main electronic failure	16777340
F	271	Main electronic failure	16777341
F	270	Main electronic failure	16777343
F	270	Main electronic failure	16777344
F	410	Data transfer	16777355
F	273	Main electronic failure	16777368
F	270	Main electronic failure	16777375
F	083	Memory content	16777376

Status signal	No.	Short text	Value
F	833	Electronic temperature too low	16777409
F	832	Electronic temperature too high	16777411
F	834	Process temperature too high	16777413
F	835	Process temperature too low	16777414
F	022	Sensor temperature	16777429
F	022	Sensor temperature	16777430
F	311	Electronic failure	16777441
F	273	Main electronic failure	16777445
F	082	Data storage	16777447
F	190	Special event 1	16777450
F	273	Main electronic failure	16777483
F	390	Special event 2	16777490
F	222	Electronic drift	16777497
F	938	EMC interference	16777499
F	062	Sensor connection	16777500
F	590	Special event 3	16777508
F	990	Special event 4	16777509
F	262	Module connection	16777545
F	537	Configuration	16777546
F	201	Device failure	16777547
F	937	EMC interference	16777556
F	500	Electrode 1 potential exceeded	16777563
F	500	Electrode 2 potential exceeded	16777564
F	500	Electrode difference voltage too high	16777565
F	382	Data storage	16777581
F	383	Memory content	16777582
F	283	Memory content	16777583
C	411	Up-/download active	33554536
C	411	Up-/download active	33554537
C	411	Up-/download active	33554540
C	484	Simulation failure mode	33554576
C	485	Simulation measured variable	33554579
C	453	Flow override	33554580
C	833	Electronic temperature too low	33554625
C	832	Electronic temperature too high	33554627
C	834	Process temperature too high	33554629
C	835	Process temperature too low	33554630
C	937	EMC interference	33554772
C	530	Electrode cleaning is running	33554778
C	495	Simulation diagnostic event	33554782
C	302	Device verification active	33554926
M	438	Dataset	67108970
M	833	Electronic temperature too low	67109057

Status signal	No.	Short text	Value
M	832	Electronic temperature too high	67109059
M	834	Process temperature too high	67109061
M	835	Process temperature too low	67109062
M	311	Electronic failure	67109090
M	937	EMC interference	67109204
S	842	Process limit	134217873
S	962	Empty pipe	134217874
S	833	Electronic temperature too low	134217921
S	832	Electronic temperature too high	134217923
S	834	Process temperature too high	134217925
S	835	Process temperature too low	134217926
S	004	Sensor	134218013
S	043	Sensor short circuit	134218067
S	937	EMC interference	134218068
S	322	Electronic drift	134218071
S	322	Electronic drift	134218072
S	531	Empty pipe detection	134218091

10   Commissioning

10.1   Post-mounting and post-connection check

Before commissioning the device:

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

- Checklist for "Post-mounting" check→ 🖹 35
- Checklist for "Post-connection check" → 🖹 70

10.2   Switching on the measuring device

▶   Switch on the device upon successful completion of the post-mounting and post-
    connection check.
    ↳   After a successful startup, the local display switches automatically from the startup
        display to the operational display.

ℹ️   If nothing appears on the local display or if a diagnostic message is displayed, refer to
     the section on "Diagnostics and troubleshooting" → 🖹 161.

10.3   Connecting via FieldCare

- For connecting FieldCare → 🖹 94
- For connecting via FieldCare → 🖹 97
- For user interface of FieldCare → 🖹 98

10.4   Setting the operating language

Factory setting: English or ordered local language
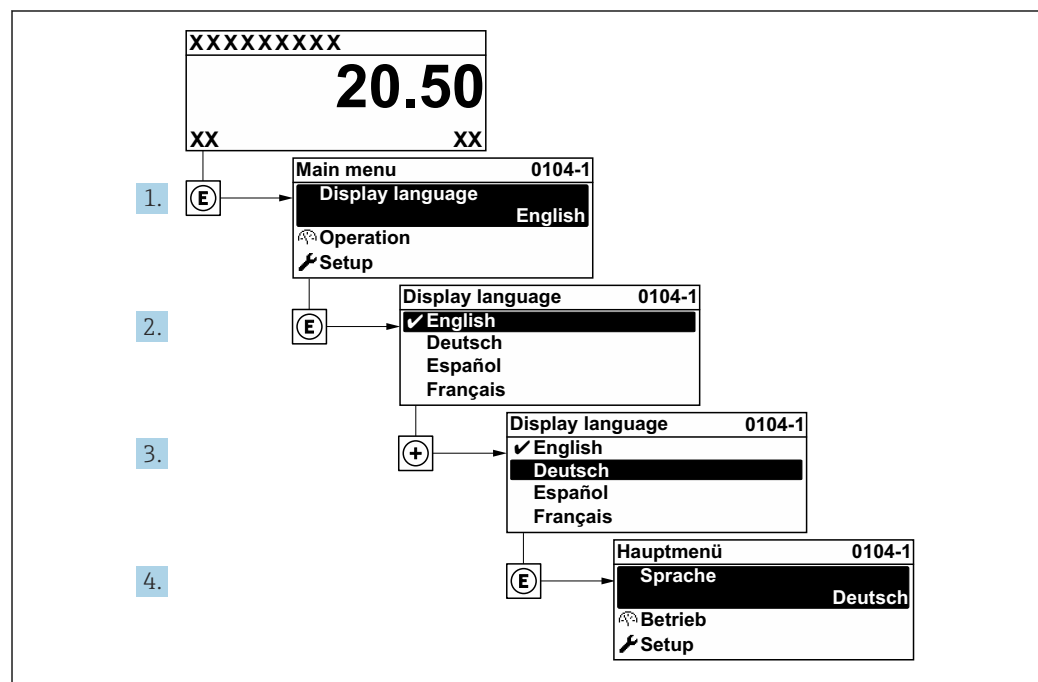
🖼 34   *Taking the example of the local display*

10.5   Configuring the measuring instrument

The **Setup** menu with its guided wizards contains all the parameters needed for standard operation.
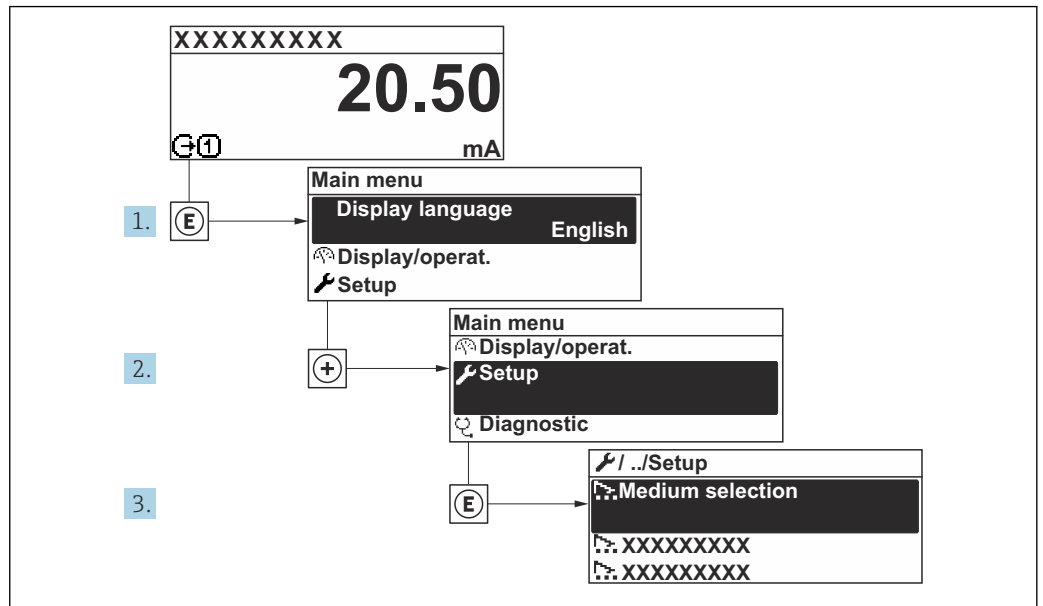
🖼 35   Navigation to "Setup" menu using the example of the local display

The number of submenus and parameters can vary depending on the device version. Certain submenus and parameters in these submenus are not described in the Operating Instructions. Instead a description is provided in the Special Documentation for the device ("Supplementary documentation").

Navigation
"Setup" menu

🔧 Setup		
Device tag	→ 🗎	112
▸ System units	→ 🗎	112
▸ Communication	→ 🗎	114
▸ I/O configuration	→ 🗎	115
▸ Current input 1 to n	→ 🗎	116
▸ Status input 1 to n	→ 🗎	117
▸ Current output 1 to n	→ 🗎	118
▸ Pulse/frequency/switch output 1 to n	→ 🗎	121

► Relay output 1 to n	→ 🖹 127
► Display	→ 🖹 129
► Low flow cut off	→ 🖹 130
► Empty pipe detection	→ 🖹 132
► Advanced setup	→ 🖹 133

10.5.1   Defining the tag name

To enable fast identification of the measuring point within the system, you can enter a unique designation using the **Device tag** parameter and thus change the factory setting.

A0029422
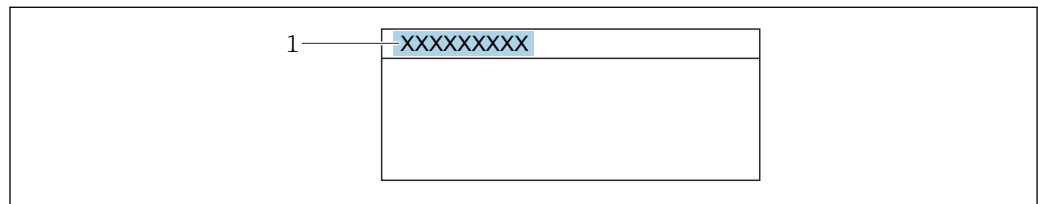
🖻 *36   Header of the operational display with tag name*

1   Tag name

ℹ️ Enter the tag name in the "FieldCare" operating tool → 🖹 98

Navigation
"Setup" menu → Device tag

Parameter overview with brief description

Parameter	Description	User entry
Device tag	Enter the name for the measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).

10.5.2   Setting the system units

In the **System units** submenu the units of all the measured values can be set.

ℹ️ The number of submenus and parameters can vary depending on the device version. Certain submenus and parameters in these submenus are not described in the Operating Instructions. Instead a description is provided in the Special Documentation for the device ("Supplementary documentation").

Navigation
"Setup" menu → System units

| ► System units | |
| Volume flow unit | → 🖹 113 |
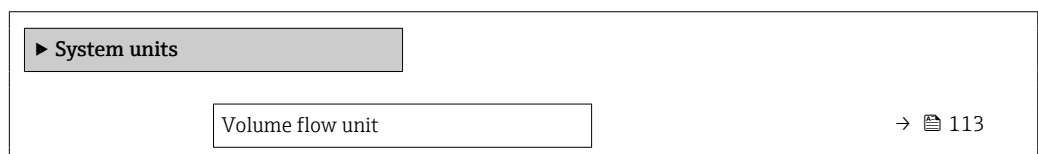
Volume unit	→ 🗎	113
Conductivity unit	→ 🗎	113
Temperature unit	→ 🗎	113
Mass flow unit	→ 🗎	113
Mass unit	→ 🗎	113
Density unit	→ 🗎	114
Corrected volume flow unit	→ 🗎	114
Corrected volume unit	→ 🗎	114

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Volume flow unit	–	Select volume flow unit. *Result* The selected unit applies to: • Output • Low flow cut off • Simulation process variable	Unit choose list	Country-specific: • l/h • gal/min (us)
Volume unit	–	Select volume unit.	Unit choose list	Country-specific: • m³ • gal (us)
Conductivity unit	The **On** option is selected in the **Conductivity measurement** parameter.	Select conductivity unit. *Result* The selected unit applies to: Simulation process variable	Unit choose list	–
Temperature unit	–	Select temperature unit. *Result* The selected unit applies to: • **Temperature** parameter • **Maximum value** parameter • **Minimum value** parameter • **External temperature** parameter • **Maximum value** parameter • **Minimum value** parameter	Unit choose list	Country-specific: • ℃ • ℉
Mass flow unit	–	Select mass flow unit. *Result* The selected unit applies to: • Output • Low flow cut off • Simulation process variable	Unit choose list	Country-specific: • kg/h • lb/min
Mass unit	–	Select mass unit.	Unit choose list	Country-specific: • kg • lb

Parameter	Prerequisite	Description	Selection	Factory setting
Density unit	–	Select density unit. *Result* The selected unit applies to: • Output • Simulation process variable	Unit choose list	Country-specific: • kg/l • lb/ft³
Corrected volume flow unit	–	Select corrected volume flow unit. *Result* The selected unit applies to: **Corrected volume flow** parameter (→ 🖺 152)	Unit choose list	Country-specific: • Nl/h • Sft³/h
Corrected volume unit	–	Select corrected volume unit.	Unit choose list	Country-specific: • Nm³ • Sft³

10.5.3 Configuring the communication interface

The **Communication** submenu guides you systematically through all the parameters that have to be configured for selecting and setting the communication interface.

Navigation
"Setup" menu → Communication

▶ Communication	
MAC address	→ 🖺 114
Default network settings	→ 🖺 114
DHCP client	→ 🖺 115
IP address	→ 🖺 115
Subnet mask	→ 🖺 115
Default gateway	→ 🖺 115

Parameter overview with brief description

Parameter	Description	User interface / Selection / User entry	Factory setting
MAC address	Displays the MAC address of the measuring device. ⓘ MAC = Media Access Control	Unique 12-digit character string comprising letters and numbers, e.g.: 00:07:05:10:01:5F	Each measuring device is given an individual address.
Default network settings	Select whether to restore network settings.	• Off • On	–

Parameter	Description	User interface / Selection / User entry	Factory setting
DHCP client	Select to activate/deactivate DHCP client functionality. **Effect** If the DHCP client functionality of the web server is selected, the IP address, Subnet mask and Default gateway are set automatically. • Identification is via the MAC address of the measuring device. • The IP address in the **IP address** parameter is ignored as long as the **DHCP client** parameter is active. This is also the case, in particular, if the DHCP server cannot be reached. The IP address in the parameter of the same name is only used if the **DHCP client** parameter is inactive.	• Off • On	On
IP address	IP address of the Web server integrated in the measuring device. If the DHCP client is switched off and write access is enabled, the IP address can also be entered.	4 octet: 0 to 255 (in the particular octet)	–
Subnet mask	Displays the subnet mask. If the DHCP client is switched off and write access is enabled, the Subnet mask can also be entered.	4 octet: 0 to 255 (in the particular octet)	–
Default gateway	Displays the default gateway. If the DHCP client is switched off and write access is enabled, the Default gateway can also be entered.	4 octet: 0 to 255 (in the particular octet)	–

10.5.4 Displaying the I/O configuration

The **I/O configuration** submenu guides the user systematically through all the parameters in which the configuration of the I/O modules is displayed.

Navigation
"Setup" menu → I/O configuration

‣ I/O configuration

I/O module 1 to n terminal numbers	→ 🗎 116
I/O module 1 to n information	→ 🗎 116
I/O module 1 to n type	→ 🗎 116
Apply I/O configuration	→ 🗎 116
Alteration code	→ 🗎 116

Parameter overview with brief description

Parameter	Description	User interface / Selection / User entry
I/O module 1 to n terminal numbers	Shows the terminal numbers used by the I/O module.	• Not used • 26-27 (I/O 1) • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *
I/O module 1 to n information	Shows information of the plugged I/O module.	• Not plugged • Invalid • Not configurable • Configurable • EtherNet/IP
I/O module 1 to n type	Shows the I/O module type.	• Off • Current output • Current input • Status input • Pulse/frequency/switch output • Double pulse output • Relay output
Apply I/O configuration	Apply parameterization of the freely configurable I/O module.	• No • Yes
Alteration code	Enter the code in order to change the I/O configuration.	Positive integer

*   Visibility depends on order options or device settings

10.5.5   Configuring the current input

The **"Current input" wizard** guides the user systematically through all the parameters that have to be set for configuring the current input.

Navigation
"Setup" menu → Current input

▶ Current input 1 to n

Terminal number	→ 🖹 117
Signal mode	→ 🖹 117
0/4 mA value	→ 🖹 117
20 mA value	→ 🖹 117
Current span	→ 🖹 117
Failure mode	→ 🖹 117
Failure value	→ 🖹 117

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	–	Shows the terminal numbers used by the current input module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *	–
Signal mode	The measuring device is **not** approved for use in the hazardous area with type of protection Ex-i.	Select the signal mode for the current input.	• Passive • Active	Active
0/4 mA value	–	Enter 4 mA value.	Signed floating-point number	–
20 mA value	–	Enter 20 mA value.	Signed floating-point number	Depends on country and nominal diameter
Current span	–	Select current range for process value output and upper/lower level for alarm signal.	• 4…20 mA • 4…20 mA NAMUR • 4…20 mA US • 0…20 mA	Country-specific: • 4…20 mA NAMUR • 4…20 mA US
Failure mode	–	Define input behavior in alarm condition.	• Alarm • Last valid value • Defined value	–
Failure value	In the **Failure mode** parameter, the **Defined value** option is selected.	Enter value to be used by the device if input value from external device is missing.	Signed floating-point number	–

*   Visibility depends on order options or device settings

10.5.6   Configuring the status input

The **Status input** submenu guides the user systematically through all the parameters that have to be set for configuring the status input.

Navigation
"Setup" menu → Status input 1 to n

▶ Status input 1 to n

Assign status input	→ 🖹 118
Terminal number	→ 🖹 118
Active level	→ 🖹 118
Terminal number	→ 🖹 118
Response time status input	→ 🖹 118
Terminal number	→ 🖹 118

Parameter overview with brief description

Parameter	Description	Selection / User interface / User entry
Assign status input	Select function for the status input.	• Off • Reset totalizer 1 • Reset totalizer 2 • Reset totalizer 3 • Reset all totalizers • Flow override
Terminal number	Shows the terminal numbers used by the status input module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *
Active level	Define input signal level at which the assigned function is triggered.	• High • Low
Response time status input	Define the minimum amount of time the input signal level must be present before the selected function is triggered.	5 to 200 ms

*   Visibility depends on order options or device settings

10.5.7   Configuring the current output

The **Current output** wizard guides you systematically through all the parameters that have to be set for configuring the current output.

Navigation
"Setup" menu → Current output

► Current output 1 to n	
Terminal number	→ 🖹 119
Signal mode	→ 🖹 119
Assign current output 1 to n	→ 🖹 119
Current span	→ 🖹 119
0/4 mA value	→ 🖹 119
20 mA value	→ 🖹 119
Fixed current	→ 🖹 119
Damping output 1 to n	→ 🖹 119
Failure mode	→ 🖹 120
Failure current	→ 🖹 120

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	–	Shows the terminal numbers used by the current output module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *	–
Signal mode	–	Select the signal mode for the current output.	• Passive • Active	Active
Assign current output 1 to n	–	Select process variable for current output.	• Off • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity • Corrected conductivity * • Temperature * • Electronic temperature	–
Current span	–	Select current range for process value output and upper/lower level for alarm signal.	• 4...20 mA NAMUR • 4...20 mA US • 4...20 mA • 0...20 mA • Fixed current	Depends on country: • 4...20 mA NAMUR • 4...20 mA US
0/4 mA value	In **Current span** parameter (→ 🖺 119), one of the following options is selected: • 4...20 mA NAMUR • 4...20 mA US • 4...20 mA • 0...20 mA	Enter 4 mA value.	Signed floating-point number	Depends on country: • 0 l/h • 0 gal/min (us)
20 mA value	In **Current span** parameter (→ 🖺 119), one of the following options is selected: • 4...20 mA NAMUR • 4...20 mA US • 4...20 mA • 0...20 mA	Enter 20 mA value.	Signed floating-point number	Depends on country and nominal diameter
Fixed current	The **Fixed current** option is selected in the **Current span** parameter (→ 🖺 119).	Defines the fixed output current.	0 to 22.5 mA	22.5 mA
Damping output 1 to n	A process variable is selected in the **Assign current output** parameter (→ 🖺 119) and one of the following options is selected in the **Current span** parameter (→ 🖺 119): • 4...20 mA NAMUR • 4...20 mA US • 4...20 mA • 0...20 mA	Set reaction time for output signal to fluctuations in the measured value.	0.0 to 999.9 s	–

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Failure mode	A process variable is selected in the **Assign current output** parameter (→ 🕮 119) and one of the following options is selected in the **Current span** parameter (→ 🕮 119): • 4...20 mA NAMUR • 4...20 mA US • 4...20 mA • 0...20 mA	Define output behavior in alarm condition.	• Min. • Max. • Last valid value • Actual value • Defined value	–
Failure current	The **Defined value** option is selected in the **Failure mode** parameter.	Enter current output value in alarm condition.	0 to 22.5 mA	22.5 mA

*   Visibility depends on order options or device settings

10.5.8 Configuring the pulse/frequency/switch output

The **Pulse/frequency/switch output** wizard guides you systematically through all the parameters that can be set for configuring the selected output type.

Navigation

"Setup" menu → Advanced setup → Pulse/frequency/switch output

```
▶ Pulse/frequency/switch output
  1 to n

                    Operating mode                              → 🖹 121
```
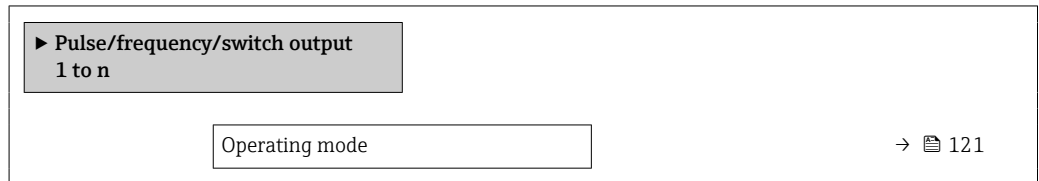
Parameter overview with brief description

Parameter	Description	Selection
Operating mode	Define the output as a pulse, frequency or switch output.	• Pulse • Frequency • Switch

Configuring the pulse output

Navigation

"Setup" menu → Pulse/frequency/switch output

```
▶ Pulse/frequency/switch output
  1 to n

                    Operating mode                              → 🖹 122

                    Terminal number                             → 🖹 122

                    Signal mode                                 → 🖹 122

                    Assign pulse output                         → 🖹 122

                    Pulse scaling                               → 🖹 122

                    Pulse width                                 → 🖹 122

                    Failure mode                                → 🖹 122

                    Invert output signal                        → 🖹 122
```

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	• Pulse • Frequency • Switch	–
Terminal number	–	Shows the terminal numbers used by the PFS output module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *	–
Signal mode	–	Select the signal mode for the PFS output.	• Passive • Active	–
Assign pulse output 1 to n	The **Pulse** option is selected in **Operating mode** parameter.	Select process variable for pulse output.	• Off • Volume flow • Mass flow • Corrected volume flow	–
Value per pulse	The **Pulse** option is selected in the **Operating mode** parameter (→ 🖺 121) and a process variable is selected in the **Assign pulse output** parameter (→ 🖺 122).	Enter measured value at which a pulse is output.	Positive floating point number	Depends on country and nominal diameter
Pulse width	The **Pulse** option is selected in the **Operating mode** parameter (→ 🖺 121) and a process variable is selected in the **Assign pulse output** parameter (→ 🖺 122).	Define time width of the output pulse.	0.05 to 2 000 ms	–
Failure mode	The **Pulse** option is selected in the **Operating mode** parameter (→ 🖺 121) and a process variable is selected in the **Assign pulse output** parameter (→ 🖺 122).	Define output behavior in alarm condition.	• Actual value • No pulses	–
Invert output signal	–	Invert the output signal.	• No • Yes	–

*   Visibility depends on order options or device settings

Configuring the frequency output

Navigation

"Setup" menu → Pulse/frequency/switch output

▶ Pulse/frequency/switch output 1 to n	
Operating mode	→ 🖺 123
Terminal number	→ 🖺 123
Signal mode	→ 🖺 123
Assign frequency output	→ 🖺 123

Minimum frequency value		→ 🖹 123
Maximum frequency value		→ 🖹 123
Measuring value at minimum frequency		→ 🖹 124
Measuring value at maximum frequency		→ 🖹 124
Failure mode		→ 🖹 124
Failure frequency		→ 🖹 124
Invert output signal		→ 🖹 124

Parameter overview with brief description

| Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	• Pulse • Frequency • Switch	–
Terminal number	–	Shows the terminal numbers used by the PFS output module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *	–
Signal mode	–	Select the signal mode for the PFS output.	• Passive • Active	–
Assign frequency output	The **Frequency** option is selected in **Operating mode** parameter (→ 🖹 121).	Select process variable for frequency output.	• Off • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity * • Corrected conductivity * • Temperature * • Electronic temperature	–
Minimum frequency value	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 121) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 123).	Enter minimum frequency.	0.0 to 10 000.0 Hz	–
Maximum frequency value	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 121) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 123).	Enter maximum frequency.	0.0 to 10 000.0 Hz	–

| Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Measuring value at minimum frequency	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖺 121) and a process variable is selected in the **Assign frequency output** parameter (→ 🖺 123).	Enter measured value for minmum frequency.	Signed floating-point number	Depends on country and nominal diameter
Measuring value at maximum frequency	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖺 121) and a process variable is selected in the **Assign frequency output** parameter (→ 🖺 123).	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖺 121) and a process variable is selected in the **Assign frequency output** parameter (→ 🖺 123).	Define output behavior in alarm condition.	• Actual value • Defined value • 0 Hz	–
Failure frequency	In the **Operating mode** parameter (→ 🖺 121), the **Frequency** option is selected, in the **Assign frequency output** parameter (→ 🖺 123) a process variable is selected, and in the **Failure mode** parameter, the **Defined value** option is selected.	Enter frequency output value in alarm condition.	0.0 to 12 500.0 Hz	–
Invert output signal	–	Invert the output signal.	• No • Yes	–

* Visibility depends on order options or device settings

Configuring the switch output

Navigation

"Setup" menu → Pulse/frequency/switch output

| ▶ Pulse/frequency/switch output 1 to n		
	Operating mode	→ 🗎 125
	Terminal number	→ 🗎 125
	Signal mode	→ 🗎 125
	Switch output function	→ 🗎 126
	Assign diagnostic behavior	→ 🗎 126
	Assign limit	→ 🗎 126
	Assign flow direction check	→ 🗎 126
	Assign status	→ 🗎 126
	Switch-on value	→ 🗎 126
	Switch-off value	→ 🗎 126
	Switch-on delay	→ 🗎 126
	Switch-off delay	→ 🗎 127
	Failure mode	→ 🗎 127
	Invert output signal	→ 🗎 127

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	• Pulse • Frequency • Switch	–
Terminal number	–	Shows the terminal numbers used by the PFS output module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *	–
Signal mode	–	Select the signal mode for the PFS output.	• Passive • Active	–

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch output function	The **Switch** option is selected in the **Operating mode** parameter.	Select function for switch output.	• Off • On • Diagnostic behavior • Limit • Flow direction check • Status	–
Assign diagnostic behavior	• In the **Operating mode** parameter, the **Switch** option is selected. • In the **Switch output function** parameter, the **Diagnostic behavior** option is selected.	Select diagnostic behavior for switch output.	• Alarm • Alarm or warning • Warning	–
Assign limit	• The **Switch** option is selected in **Operating mode** parameter. • The **Limit** option is selected in **Switch output function** parameter.	Select process variable for limit function.	• Off • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity * • Corrected conductivity * • Totalizer 1 • Totalizer 2 • Totalizer 3 • Temperature * • Electronic temperature	–
Assign flow direction check	• The **Switch** option is selected in the **Operating mode** parameter. • The **Flow direction check** option is selected in the **Switch output function** parameter.	Select process variable for flow direction monitoring.		–
Assign status	• The **Switch** option is selected in **Operating mode** parameter. • The **Status** option is selected in **Switch output function** parameter.	Select device status for switch output.	• Empty pipe detection • Low flow cut off	–
Switch-on value	• The **Switch** option is selected in the **Operating mode** parameter. • The **Limit** option is selected in the **Switch output function** parameter.	Enter measured value for the switch-on point.	Signed floating-point number	Depends on country: • 0 l/h • 0 gal/min (us)
Switch-off value	• The **Switch** option is selected in the **Operating mode** parameter. • The **Limit** option is selected in the **Switch output function** parameter.	Enter measured value for the switch-off point.	Signed floating-point number	Depends on country: • 0 l/h • 0 gal/min (us)
Switch-on delay	• The **Switch** option is selected in the **Operating mode** parameter. • The **Limit** option is selected in the **Switch output function** parameter.	Define delay for the switch-on of status output.	0.0 to 100.0 s	–

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch-off delay	• The **Switch** option is selected in the **Operating mode** parameter. • The **Limit** option is selected in the **Switch output function** parameter.	Define delay for the switch-off of status output.	0.0 to 100.0 s	–
Failure mode	–	Define output behavior in alarm condition.	• Actual status • Open • Closed	–
Invert output signal	–	Invert the output signal.	• No • Yes	–

*   Visibility depends on order options or device settings

10.5.9 Configuring the relay output

The **Relay output** wizard guides the user systematically through all the parameters that have to be set for configuring the relay output.

Navigation
"Setup" menu → Relay output 1 to n

► Relay output 1 to n	
Terminal number	→ 🖺 128
Relay output function	→ 🖺 128
Assign flow direction check	→ 🖺 128
Assign limit	→ 🖺 128
Assign diagnostic behavior	→ 🖺 128
Assign status	→ 🖺 128
Switch-off value	→ 🖺 128
Switch-off delay	→ 🖺 128
Switch-on value	→ 🖺 128
Switch-on delay	→ 🖺 128
Failure mode	→ 🖺 128
Switch status	→ 🖺 128
Powerless relay status	→ 🖺 128

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	–	Shows the terminal numbers used by the relay output module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4)	–
Relay output function	–	Select the function for the relay output.	• Closed • Open • Diagnostic behavior • Limit • Flow direction check • Digital Output	–
Assign flow direction check	The **Flow direction check** option is selected in the **Relay output function** parameter.	Select process variable for flow direction monitoring.		–
Assign limit	The **Limit** option is selected in **Relay output function** parameter.	Select process variable for limit function.	• Off • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity * • Corrected conductivity * • Totalizer 1 • Totalizer 2 • Totalizer 3 • Temperature * • Electronic temperature	–
Assign diagnostic behavior	In the **Relay output function** parameter, the **Diagnostic behavior** option is selected.	Select diagnostic behavior for switch output.	• Alarm • Alarm or warning • Warning	–
Assign status	In the **Relay output function** parameter, the **Digital Output** option is selected.	Select device status for switch output.	• Partially filled pipe detection • Low flow cut off	–
Switch-off value	The **Limit** option is selected in the **Relay output function** parameter.	Enter measured value for the switch-off point.	Signed floating-point number	Depends on country: • 0 l/h • 0 gal(us)/min
Switch-off delay	In the **Relay output function** parameter, the **Limit** option is selected.	Define delay for the switch-off of status output.	0.0 to 100.0 s	–
Switch-on value	The **Limit** option is selected in the **Relay output function** parameter.	Enter measured value for the switch-on point.	Signed floating-point number	Depends on country: • 0 l/h • 0 gal(us)/min
Switch-on delay	In the **Relay output function** parameter, the **Limit** option is selected.	Define delay for the switch-on of status output.	0.0 to 100.0 s	–
Failure mode	–	Define output behavior in alarm condition.	• Actual status • Open • Closed	–
Switch status	–	Shows the current relay switch status.	• Open • Closed	–
Powerless relay status	–		• Open • Closed	–

*   Visibility depends on order options or device settings

10.5.10 Configuring the local display

The **Display** wizard guides you systematically through all the parameters that can configured for configuring the local display.

Navigation

"Setup" menu → Display

▸ Display		
	Format display	→ 🖺 129
	Value 1 display	→ 🖺 129
	0% bargraph value 1	→ 🖺 130
	100% bargraph value 1	→ 🖺 130
	Value 2 display	→ 🖺 130
	Value 3 display	→ 🖺 130
	0% bargraph value 3	→ 🖺 130
	100% bargraph value 3	→ 🖺 130
	Value 4 display	→ 🖺 130

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	• 1 value, max. size • 1 bargraph + 1 value • 2 values • 1 value large + 2 values • 4 values	–
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	• Volume flow • Mass flow • Corrected volume flow • Flow velocity • Corrected conductivity * • Totalizer 1 • Totalizer 2 • Totalizer 3 • Current output 1 • Current output 2 * • Current output 3 * • Current output 4 * • Temperature * • Electronic temperature	–

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: • 0 l/h • 0 gal/min (us)
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see **Value 1 display** parameter (→ 🖺 129)	–
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see **Value 1 display** parameter (→ 🖺 129)	–
0% bargraph value 3	A selection was made in the **Value 3 display** parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: • 0 l/h • 0 gal/min (us)
100% bargraph value 3	A selection was made in the **Value 3 display** parameter.	Enter 100% value for bar graph display.	Signed floating-point number	–
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see **Value 1 display** parameter (→ 🖺 129)	–
Value 5 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see **Value 1 display** parameter (→ 🖺 129)	–
Value 6 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see **Value 1 display** parameter (→ 🖺 129)	–
Value 7 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see **Value 1 display** parameter (→ 🖺 129)	–
Value 8 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see **Value 1 display** parameter (→ 🖺 129)	–

*   Visibility depends on order options or device settings

10.5.11 Configuring the low flow cut off

The **Low flow cut off** wizard systematically guides the user through all the parameters that must be set to configure low flow cut off.

Navigation
"Setup" menu → Low flow cut off

▶ Low flow cut off		
	Assign process variable	→ 🖺 131
	On value low flow cutoff	→ 🖺 131

| Off value low flow cutoff | → 🗐 131 |
| Pressure shock suppression | → 🗐 131 |

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for low flow cut off.	• Off • Volume flow • Mass flow • Corrected volume flow	–
On value low flow cutoff	A process variable is selected in the **Assign process variable** parameter (→ 🗐 131).	Enter on value for low flow cut off.	Positive floating-point number	Depends on country and nominal diameter
Off value low flow cutoff	A process variable is selected in the **Assign process variable** parameter (→ 🗐 131).	Enter off value for low flow cut off.	0 to 100.0 %	–
Pressure shock suppression	A process variable is selected in the **Assign process variable** parameter (→ 🗐 131).	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	–

10.5.12 Configuring empty pipe detection

 • The measuring instruments are calibrated with water (approx. 500 µS/cm) at the factory. For liquids with a lower conductivity, it is advisable to perform a new full pipe adjustment onsite.
 • It is recommended to perform a new empty pipe adjustment onsite if a cable that is longer than 50 meters is used.

The **Empty pipe detection** submenu contains parameters that must be configured for the configuration of empty pipe detection.

Navigation
"Setup" menu → Empty pipe detection

► Empty pipe detection	
Empty pipe detection	→ 🖹 132
New adjustment	→ 🖹 132
Progress	→ 🖹 132
Switch point empty pipe detection	→ 🖹 132
Response time empty pipe detection	→ 🖹 132

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Empty pipe detection	–	Switch empty pipe detection on and off.	• Off • On	–
New adjustment	The **On** option is selected in the **Empty pipe detection** parameter.	Select type of adjustment.	• Cancel • Empty pipe adjust • Full pipe adjust	–
Progress	The **On** option is selected in the **Empty pipe detection** parameter.	Shows the progress.	• Ok • Busy • Not ok	–
Switch point empty pipe detection	The **On** option is selected in the **Empty pipe detection** parameter.	Enter hysteresis in %, below this value the measuring tube will detected as empty.	0 to 100 %	–
Response time empty pipe detection	A process variable is selected in the **Assign process variable** parameter (→ 🖹 132).	Use this function to enter the minimum time (hold time) the signal must be present before diagnostic message S962 "Empty pipe" is triggered in the event of a partially filled or empty measuring pipe.	0 to 100 s	–

10.6 Advanced settings

The **Advanced setup** submenu with its submenus contains parameters for specific settings.

Navigation to the "Advanced setup" submenu
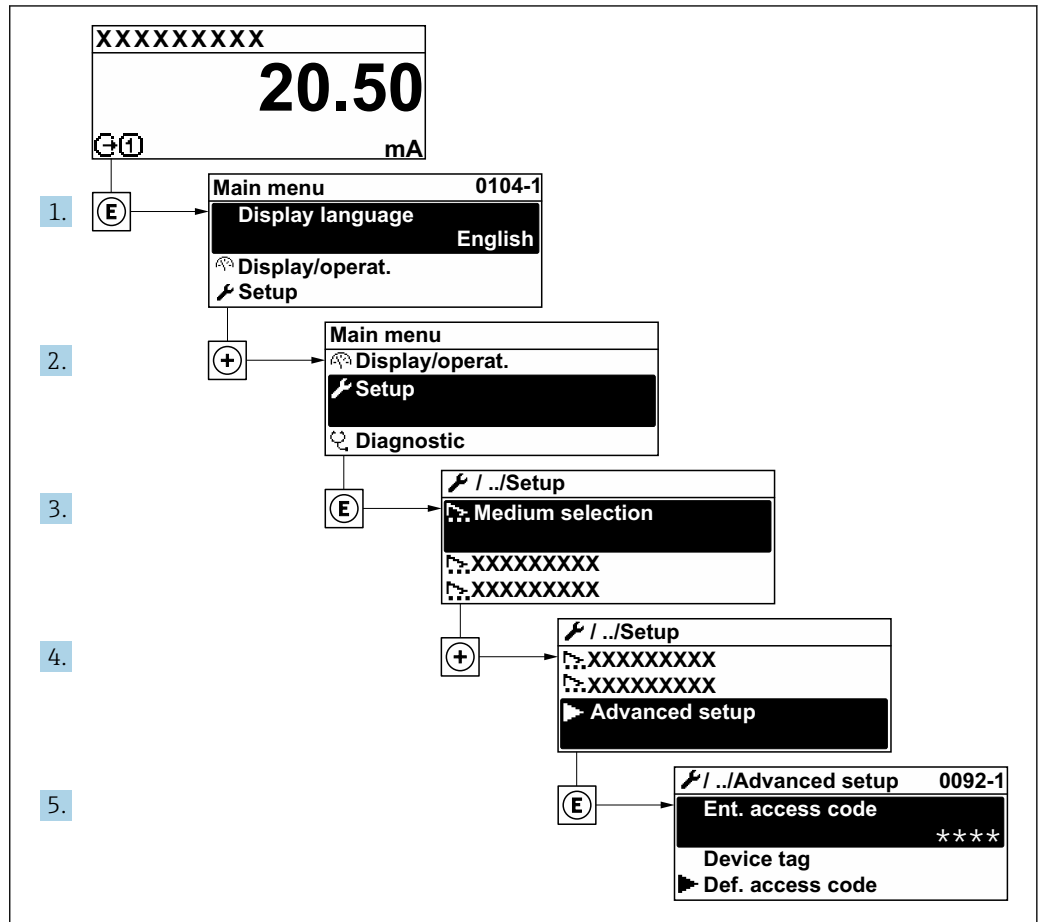
A0032223-EN

The number of submenus and parameters can vary depending on the device version. Certain submenus and parameters in these submenus are not described in the Operating Instructions. Instead a description is provided in the Special Documentation for the device ("Supplementary documentation").

Navigation
"Setup" menu → Advanced setup

► Advanced setup		
Enter access code	→	🖺 134
► Sensor adjustment	→	🖺 134
► Totalizer 1 to n	→	🖺 134
► Display	→	🖺 136

▶ Electrode cleaning circuit		→ 🖹 138
▶ WLAN settings		→ 🖹 139
▶ Heartbeat setup		
▶ Configuration backup		→ 🖹 141
▶ Administration		→ 🖹 142

10.6.1 Using the parameter to enter the access code

Navigation
"Setup" menu → Advanced setup

Parameter overview with brief description

Parameter	Description	User entry
Enter access code	Enter access code to disable write protection of parameters.	Max. 16-digit character string comprising numbers, letters and special characters

10.6.2 Carrying out a sensor adjustment

The **Sensor adjustment** submenu contains parameters that pertain to the functionality of the sensor.

Navigation
"Setup" menu → Advanced setup → Sensor adjustment

▶ Sensor adjustment		
	Installation direction	→ 🖹 134

Parameter overview with brief description

Parameter	Description	Selection
Installation direction	Set sign of flow direction to match the direction of the arrow on the sensor.	▪ Flow in arrow direction ▪ Flow against arrow direction

10.6.3 Configuring the totalizer

In the **"Totalizer 1 to n" submenu**, you can configure the specific totalizer.

Navigation

"Setup" menu → Advanced setup → Totalizer 1 to n

▶ Totalizer 1 to n	
Assign process variable	→ 🖻 135
Unit totalizer 1 to n	→ 🖻 135
Totalizer operation mode	→ 🖻 135
Failure mode	→ 🖻 135

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable	–	Select process variable for totalizer.	• Off • Volume flow • Mass flow • Corrected volume flow	–
Unit totalizer 1 to n	A process variable is selected in the **Assign process variable** parameter (→ 🖻 135) of the **Totalizer 1 to n** submenu.	Select process variable totalizer unit.	Unit choose list	Depends on country: • l • gal (us)
Totalizer operation mode	A process variable is selected in the **Assign process variable** parameter (→ 🖻 135) of the **Totalizer 1 to n** submenu.	Select totalizer calculation mode.	• Net flow total • Forward flow total • Reverse flow total	–
Failure mode	A process variable is selected in the **Assign process variable** parameter (→ 🖻 135) of the **Totalizer 1 to n** submenu.	Define totalizer behavior in alarm condition.	• Stop • Actual value • Last valid value	–

10.6.4 Carrying out additional display configurations

In the **Display** submenu you can set all the parameters associated with the configuration of the local display.

Navigation
"Setup" menu → Advanced setup → Display

▸ Display	
Format display	→ 🖺 137
Value 1 display	→ 🖺 137
0% bargraph value 1	→ 🖺 137
100% bargraph value 1	→ 🖺 137
Decimal places 1	→ 🖺 137
Value 2 display	→ 🖺 137
Decimal places 2	→ 🖺 137
Value 3 display	→ 🖺 137
0% bargraph value 3	→ 🖺 137
100% bargraph value 3	→ 🖺 137
Decimal places 3	→ 🖺 137
Value 4 display	→ 🖺 138
Decimal places 4	→ 🖺 138
Display language	→ 🖺 138
Display interval	→ 🖺 138
Display damping	→ 🖺 138
Header	→ 🖺 138
Header text	→ 🖺 138
Separator	→ 🖺 138
Backlight	→ 🖺 138

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	1 value, max. size 1 bargraph + 1 value 2 values 1 value large + 2 values 4 values	–
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	- Volume flow - Mass flow - Corrected volume flow - Flow velocity - Corrected conductivity * - Totalizer 1 - Totalizer 2 - Totalizer 3 - Current output 1 - Current output 2 * - Current output 3 * - Current output 4 * - Temperature * - Electronic temperature	–
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: 0 l/h 0 gal/min (us)
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Decimal places 1	A measured value is specified in the **Value 1 display** parameter.	Select the number of decimal places for the display value.	- x - x.x - x.xx - x.xxx - x.xxxx	–
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see **Value 1 display** parameter (→ 🖺 129)	–
Decimal places 2	A measured value is specified in the **Value 2 display** parameter.	Select the number of decimal places for the display value.	- x - x.x - x.xx - x.xxx - x.xxxx	–
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see **Value 1 display** parameter (→ 🖺 129)	–
0% bargraph value 3	A selection was made in the **Value 3 display** parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: 0 l/h 0 gal/min (us)
100% bargraph value 3	A selection was made in the **Value 3 display** parameter.	Enter 100% value for bar graph display.	Signed floating-point number	–
Decimal places 3	A measured value is specified in the **Value 3 display** parameter.	Select the number of decimal places for the display value.	- x - x.x - x.xx - x.xxx - x.xxxx	–

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see **Value 1 display** parameter (→ 🖺 129)	–
Decimal places 4	A measured value is specified in the **Value 4 display** parameter.	Select the number of decimal places for the display value.	• x • x.x • x.xx • x.xxx • x.xxxx	–
Display language	A local display is provided.	Set display language.	• English • Deutsch * • Français * • Español * • Italiano * • Nederlands * • Portuguesa * • Polski * • русский язык (Russian) * • Svenska * • Türkçe * • 中文 (Chinese) * • 日本語 (Japanese) * • 한국어 (Korean) * • tiếng Việt (Vietnamese) * • čeština (Czech) *	English (alternatively, the ordered language is preset in the device)
Display interval	A local display is provided.	Set time measured values are shown on display if display alternates between values.	1 to 10 s	–
Display damping	A local display is provided.	Set display reaction time to fluctuations in the measured value.	0.0 to 999.9 s	–
Header	A local display is provided.	Select header contents on local display.	• Device tag • Free text	–
Header text	The **Free text** option is selected in the **Header** parameter.	Enter display header text.	Max. 12 characters, such as letters, numbers or special characters (e.g. @, %, /)	–
Separator	A local display is provided.	Select decimal separator for displaying numerical values.	• . (point) • , (comma)	. (point)
Backlight	One of the following conditions is met: • Order code for "Display; operation", option **F** "4-line, illum.; touch control" • Order code for "Display; operation", option **G** "4-line, illum.; touch control +WLAN"	Switch the local display backlight on and off.	• Disable • Enable	–

*   Visibility depends on order options or device settings

10.6.5   Performing electrode cleaning

The **Electrode cleaning cycle** submenu contains the parameters that must be set for the configuration of electrode cleaning.

ℹ️ The submenu is only available if the device was ordered with electrode cleaning.

▶ Electrode cleaning circuit	
Electrode cleaning circuit	→ 🖹 139
ECC duration	→ 🖹 139
ECC recovery time	→ 🖹 139
ECC cleaning cycle	→ 🖹 139
ECC Polarity	→ 🖹 139

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Electrode cleaning circuit	For the following order code: "Application package", option **EC** "ECC electrode cleaning"	Enable the cyclic electrode cleaning circuit.	• Off • On	On
ECC duration	For the following order code: "Application package", option **EC** "ECC electrode cleaning"	Enter the duration of electrode cleaning in seconds.	0.01 to 30 s	–
ECC recovery time	For the following order code: "Application package", option **EC** "ECC electrode cleaning"	Define recovery time after electrode cleaning. During this time the current output values will be held at last valid value.	1 to 600 s	–
ECC cleaning cycle	For the following order code: "Application package", option **EC** "ECC electrode cleaning"	Enter the pause duration between electrode cleaning cycles.	0.5 to 168 h	–
ECC Polarity	For the following order code: "Application package", option **EC** "ECC electrode cleaning"	Select the polarity of the electrode cleaning circuit.	• Positive • Negative	Depends on the electrode material: • Tantalum: **Negative** option • Platinum, Alloy C22, stainless steel: **Positive** option

10.6.6 WLAN configuration

The **WLAN Settings** submenu guides the user systematically through all the parameters that have to be set for the WLAN configuration.

▶ WLAN settings	
WLAN	→ 🖹 140

WLAN mode	→ 🖹 140
SSID name	→ 🖹 140
Network security	→ 🖹 140
Security identification	→ 🖹 140
User name	→ 🖹 140
WLAN password	→ 🖹 140
WLAN IP address	→ 🖹 140
WLAN passphrase	→ 🖹 141
Assign SSID name	→ 🖹 141
SSID name	→ 🖹 141
Connection state	→ 🖹 141
Received signal strength	→ 🖹 141

Parameter overview with brief description

| Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
WLAN	–	Switch WLAN on and off.	• Disable • Enable	–
WLAN mode	–	Select WLAN mode.	• WLAN access point • WLAN Client	–
SSID name	The client is activated.	Enter the user-defined SSID name (max. 32 characters).	–	–
Network security	–	Select the security type of the WLAN network.	• Unsecured • WPA2-PSK • EAP-PEAP with MSCHAPv2 • EAP-PEAP MSCHAPv2 no server authentic. • EAP-TLS	–
Security identification	–	Select security settings and download these settings via menu Data management > Security > WLAN.	• Root certificate • Device certificate • Device private key	–
User name	–	Enter user name.	–	–
WLAN password	–	Enter WLAN password.	–	–
WLAN IP address	–	Enter IP address of the device WLAN interface.	4 octet: 0 to 255 (in the particular octet)	–

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
WLAN passphrase	The **WPA2-PSK** option is selected in the **Security type** parameter.	Enter the network key (8 to 32 characters). ⓘ The network key supplied with the device should be changed during commissioning for security reasons.	8 to 32-digit character string comprising numbers, letters and special characters (without spaces)	Serial number of the measuring device (e.g. L100A802000)
Assign SSID name	–	Select which name will be used for SSID: device tag or user-defined name.	• Device tag • User-defined	–
SSID name	• The **User-defined** option is selected in the **Assign SSID name** parameter. • The **WLAN access point** option is selected in the **WLAN mode** parameter.	Enter the user-defined SSID name (max. 32 characters). ⓘ The user-defined SSID name may only be assigned once. If the SSID name is assigned more than once, the devices can interfere with one another.	Max. 32-digit character string comprising numbers, letters and special characters	EH_device designation_last 7 digits of the serial number (e.g. EH_Promag_500_A 802000)
Connection state	–	Displays the connection status.	• Connected • Not connected	–
Received signal strength	–	Shows the received signal strength.	• Low • Medium • High	–

10.6.7 Configuration management

After commissioning, you can save the current device configurationor restore the previous device configuration. The device configuration is managed via the **Configuration management** parameter.

Navigation

"Setup" menu → Advanced setup → Configuration backup

▸ Configuration backup	
Operating time	→ 🖺 142
Last backup	→ 🖺 142
Configuration management	→ 🖺 142
Backup state	→ 🖺 142
Comparison result	→ 🖺 142

Parameter overview with brief description

Parameter	Description	User interface / Selection
Operating time	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)
Last backup	Shows when the last data backup was saved to HistoROM backup.	Days (d), hours (h), minutes (m) and seconds (s)
Configuration management	Select action for managing the device data in the HistoROM backup.	• Cancel • Execute backup • Restore • Compare • Clear backup data
Backup state	Shows the current status of data saving or restoring.	• None • Backup in progress • Restoring in progress • Delete in progress • Compare in progress • Restoring failed • Backup failed
Comparison result	Comparison of current device data with HistoROM backup.	• Settings identical • Settings not identical • No backup available • Backup settings corrupt • Check not done • Dataset incompatible

Function scope of the "Configuration management" parameter

Options	Description
Cancel	No action is executed and the user exits the parameter.
Execute backup	A backup copy of the current device configuration is saved from the HistoROM backup to the memory of the device. The backup copy includes the transmitter data of the device.
Restore	The last backup copy of the device configuration is restored from the device memory to the device's HistoROM backup. The backup copy includes the transmitter data of the device.
Compare	The device configuration saved in the device memory is compared with the current device configuration of the HistoROM backup.
Clear backup data	The backup copy of the device configuration is deleted from the memory of the device.

ℹ️ *HistoROM backup*
A HistoROM is a "non-volatile" device memory in the form of an EEPROM.

ℹ️ While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

10.6.8   Using parameters for device administration

The **Administration** submenu systematically guides the user through all the parameters that can be used for device administration purposes.

Navigation
"Setup" menu → Advanced setup → Administration

▶ Administration	
▶ Define access code	→ 🖹 143
▶ Reset access code	→ 🖹 143
Device reset	→ 🖹 144

Using the parameter to define the access code

Navigation
"Setup" menu → Advanced setup → Administration → Define access code

▶ Define access code	
Define access code	→ 🖹 143
Confirm access code	→ 🖹 143

Parameter overview with brief description

Parameter	Description	User entry
Define access code	Restrict write-access to parameters to protect the configuration of the device against unintentional changes.	Max. 16-digit character string comprising numbers, letters and special characters
Confirm access code	Confirm the entered access code.	Max. 16-digit character string comprising numbers, letters and special characters

Using the parameter to reset the access code

Navigation
"Setup" menu → Advanced setup → Administration → Reset access code

▶ Reset access code	
Operating time	→ 🖹 144
Reset access code	→ 🖹 144

Parameter overview with brief description

Parameter	Description	User interface / User entry
Operating time	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)
Reset access code	Reset access code to factory settings. ℹ️ For a reset code, contact your Endress+Hauser service organization. The reset code can only be entered via: • Web browser • DeviceCare, FieldCare (via CDI-RJ45 service interface) • Fieldbus	Character string comprising numbers, letters and special characters

Using the parameter to reset the device

Navigation
"Setup" menu → Advanced setup → Administration

Parameter overview with brief description

Parameter	Description	Selection
Device reset	Reset the device configuration - either entirely or in part - to a defined state.	• Cancel • To delivery settings • Restart device • Restore S-DAT backup

10.7 Simulation

Via the **Simulation** submenu, it is possible to simulate various process variables in the process and the device alarm mode and verify downstream signal chains (switching valves or closed-control loops). The simulation can be performed without a real measurement (no flow of medium through the device).

Navigation
"Diagnostics" menu → Simulation

▶ Simulation	
Assign simulation process variable	→ 🖺 145
Process variable value	→ 🖺 145
Status input simulation	→ 🖺 146
Input signal level	→ 🖺 146
Current input 1 to n simulation	→ 🖺 146
Value current input 1 to n	→ 🖺 146
Current output 1 to n simulation	→ 🖺 145

Value current output 1 to n		→ 🖺 145
Frequency output simulation 1 to n		→ 🖺 145
Frequency value 1 to n		→ 🖺 145
Pulse output simulation 1 to n		→ 🖺 146
Pulse value 1 to n		→ 🖺 146
Switch output simulation 1 to n		→ 🖺 146
Switch status 1 to n		→ 🖺 146
Relay output 1 to n simulation		→ 🖺 146
Switch status 1 to n		→ 🖺 146
Device alarm simulation		→ 🖺 146
Diagnostic event category		→ 🖺 146
Diagnostic event simulation		→ 🖺 146

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry
Assign simulation process variable	–	Select a process variable for the simulation process that is activated.	• Off • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity * • Corrected conductivity * • Temperature *
Process variable value	A process variable is selected in the **Assign simulation process variable** parameter (→ 🖺 145).	Enter the simulation value for the selected process variable.	Depends on the process variable selected
Current output 1 to n simulation	–	Switch the simulation of the current output on and off.	• Off • On
Value current output 1 to n	In the **Current output 1 to n simulation** parameter, the **On** option is selected.	Enter the current value for simulation.	3.59 to 22.5 mA
Frequency output simulation 1 to n	In the **Operating mode** parameter, the **Frequency** option is selected.	Switch the simulation of the frequency output on and off.	• Off • On
Frequency value 1 to n	In the **Frequency output simulation 1 to n** parameter, the **On** option is selected.	Enter the frequency value for the simulation.	0.0 to 12 500.0 Hz

Parameter	Prerequisite	Description	Selection / User entry
Pulse output simulation 1 to n	In the **Operating mode** parameter, the **Pulse** option is selected.	Set and switch off the pulse output simulation. ℹ️ For **Fixed value** option: **Pulse width** parameter (→ 🗎 122) defines the pulse width of the pulses output.	• Off • Fixed value • Down-counting value
Pulse value 1 to n	In the **Pulse output simulation 1 to n** parameter, the **Down-counting value** option is selected.	Enter the number of pulses for simulation.	0 to 65 535
Switch output simulation 1 to n	In the **Operating mode** parameter, the **Switch** option is selected.	Switch the simulation of the switch output on and off.	• Off • On
Switch status 1 to n	–	Select the status of the status output for the simulation.	• Open • Closed
Relay output 1 to n simulation	–	Switch simulation of the relay output on and off.	• Off • On
Switch status 1 to n	The **On** option is selected in the **Switch output simulation 1 to n parameter** parameter.	Select status of the relay output for the simulation.	• Open • Closed
Device alarm simulation	–	Switch the device alarm on and off.	• Off • On
Diagnostic event category	–	Select a diagnostic event category.	• Sensor • Electronics • Configuration • Process
Diagnostic event simulation	–	Select a diagnostic event to simulate this event.	• Off • Diagnostic event picklist (depends on the category selected)
Current input 1 to n simulation	–	Switch simulation of the current input on and off.	• Off • On
Value current input 1 to n	In the **Current input 1 to n simulation** parameter, the **On** option is selected.	Enter the current value for simulation.	0 to 22.5 mA
Status input simulation	–	Switch simulation of the status input on and off.	• Off • On
Input signal level	In the **Status input simulation** parameter, the **On** option is selected.	Select the signal level for the simulation of the status input.	• High • Low

*   Visibility depends on order options or device settings

10.8   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 → 🗎 146
- Protect access to local operation via key locking → 🗎 85
- Protect access to measuring device via write protection switch → 🗎 148

10.8.1   Write protection via access code

The effects of the user-specific access code are as follows:
- Via local operation, the parameters for the measuring device configuration are write-protected and their values can no longer be changed.
- Device access is protected via the Web browser, as are the parameters for the measuring device configuration.
- Device access is protected via FieldCare or DeviceCare (via CDI-RJ45 service interface), as are the parameters for the measuring device configuration.

Defining the access code via the local display

1. Navigate to the **Define access code** parameter (→ 🖹 143).

2. Maximum of 16-digit character string comprising numbers, letters and special characters as the access code.

3. Enter the access code again in the **Confirm access code** parameter (→ 🖹 143) to confirm.
   ↳ The 🔒 symbol appears in front of all write-protected parameters.

🛈 • Disabling parameter write protection via access code → 🖹 84.
   • If the access code is lost: Resetting the access code → 🖹 148.
   • The user role with which the user is currently logged in is displayed in **Access status** parameter.
      • Navigation path: Operation → Access status
      • User roles and their access rights → 🖹 84

• The device automatically locks the write-protected parameters again if a key is not pressed for 10 minutes in the navigation and editing view.
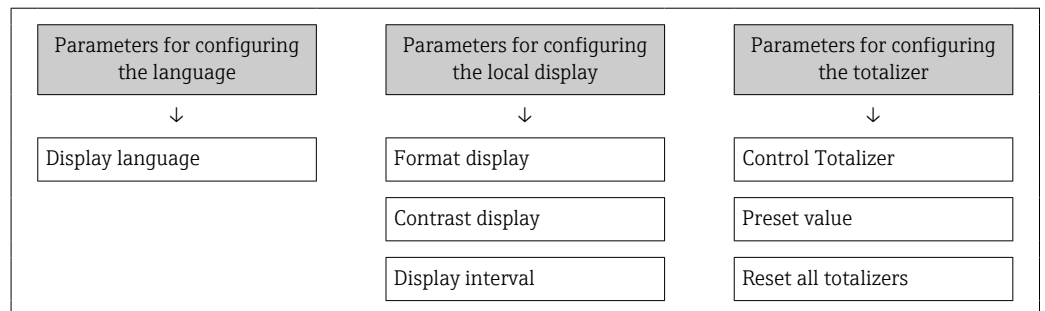• The device locks the write-protected parameters automatically after 60 s if the user skips back to the operational display mode from the navigation and editing view.

Parameters which can always be modified via the local display

Certain parameters that do not affect the measurement are excepted from parameter write protection via the local display. Despite the user-specific access code, they can always be modified, even if the other parameters are locked.

Parameters for configuring the language	Parameters for configuring the local display	Parameters for configuring the totalizer
↓	↓	↓
Display language	Format display	Control Totalizer
	Contrast display	Preset value
	Display interval	Reset all totalizers

Defining the access code via the web browser

1. Navigate to the **Define access code** parameter (→ 🖹 143).

2. Define a 16-digit (max.) numeric code as the access code.

3. Enter the access code again in the **Confirm access code** parameter (→ 🖹 143) to confirm.
   ↳ The web browser switches to the login page.

🛈 • Disabling parameter write protection via access code → 🖹 84.
   • If the access code is lost: Resetting the access code → 🖹 148.
   • The **Access status** parameter shows which user role the user is currently logged in with.
      • Navigation path: Operation → Access status
      • User roles and their access rights → 🖹 84

If no action is performed for 10 minutes, the web browser automatically returns to the login page.

Resetting the access code

If you misplace the user-specific access code, it is possible to reset the code to the factory setting. A reset code must be entered for this purpose. The user-specific access code can then be defined again afterwards.

Via Web browser, FieldCare, DeviceCare (via CDI-RJ45 service interface), fieldbus

ℹ You can only obtain a reset code from your local Endress+Hauser service organization. The code must be calculated explicitly for every device.

1. Note down the serial number of the device.

2. Read off the **Operating time** parameter.

3. Contact the local Endress+Hauser service organization and tell them the serial number and the operating time.
   ↳ Get the calculated reset code.

4. Enter the reset code in the **Reset access code** parameter (→ 🖺 144).
   ↳ The access code has been reset to the factory setting **0000**. It can be redefined → 🖺 147.

ℹ For IT security reasons, the calculated reset code is only valid for 96 hours from the specified operating time and for the specific serial number. If you cannot return to the device within 96 hours, you should either increase the operating time you read out by a few days or switch off the device.

10.8.2 Write protection via write protection switch

Unlike parameter write protection via a user-specific access code, this allows the user to lock write access to the entire operating menu - apart from the **"Contrast display" parameter**.

The parameter values are now read only and cannot be edited any more (exception **"Contrast display" parameter**):
• Via local display
• Via EtherNet/IP protocol

Proline 500 – digital

Enable/disable write protection
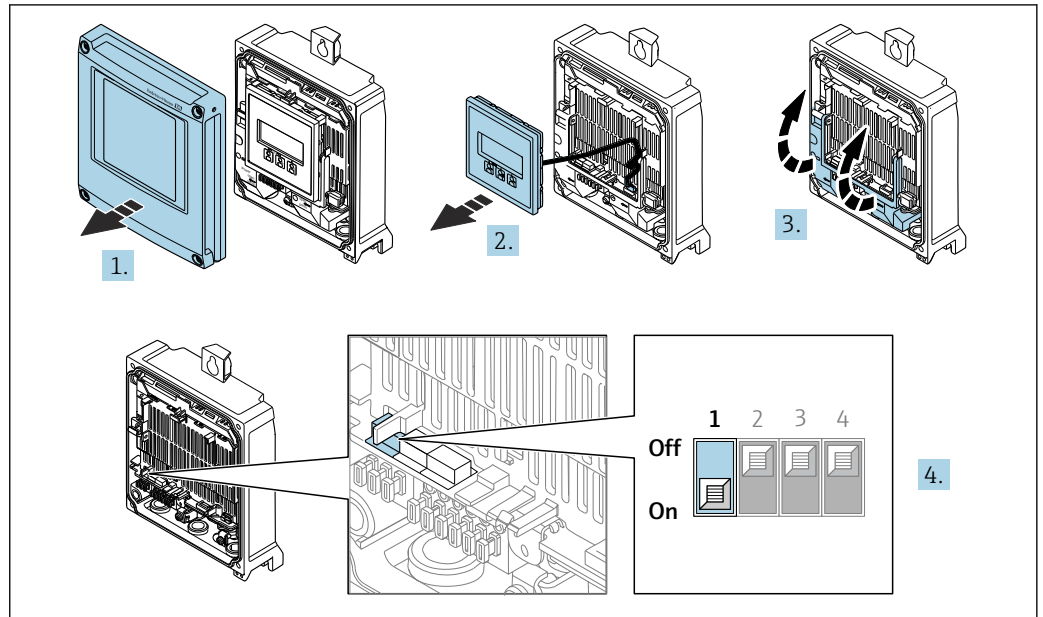
1. Open the housing cover.

2. Remove the display module.

3. Fold open the terminal cover.

4. **Enable or disable write protection:**

   Setting the write protection (WP) switch on the main electronics module to the **ON** position enables hardware write protection/setting to **OFF** (factory setting) disables hardware write protection.

   ↳ In the **Locking status** parameter, the **Hardware locked** option is displayed → 🖻 151. When hardware write protection is enabled, the 🖉 symbol appears in the header of the measured value display and in the navigation view in front of the parameters.
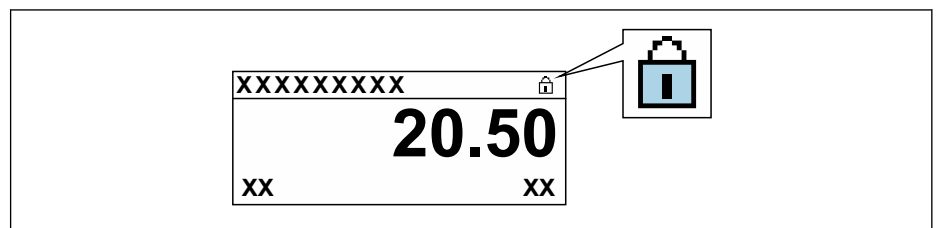
5. Insert the display module.

6. Close the housing cover.

7. **NOTICE**

   Excessive tightening torque applied to the fixing screws!
   Risk of damaging the plastic transmitter.
   ▶ Tighten the fixing screws as per the tightening torque: 2.5 Nm (1.8 lbf ft)

   Tighten the fixing screws.

Proline 500
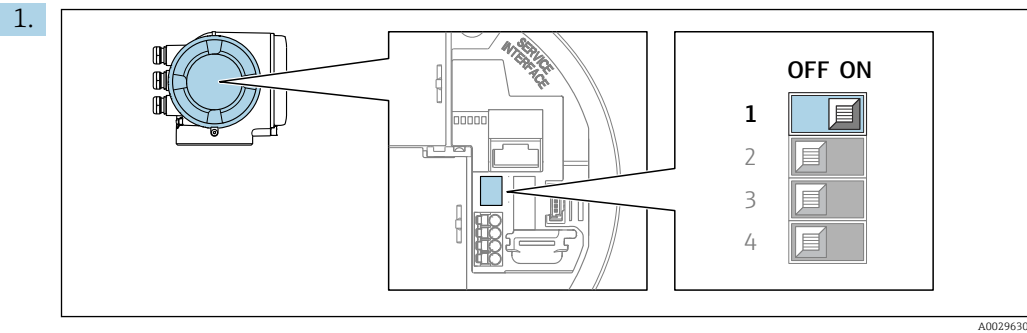
1.

A0029630

Setting the write protection (WP) switch on the main electronics module to the **ON** position enables hardware write protection.

↳ In the **Locking status** parameter, the **Hardware locked** option is displayed → 🖺 151. In addition, on the local display the 🔒 symbol appears in front of the parameters in the header of the operational display and in the navigation view.

A0029425
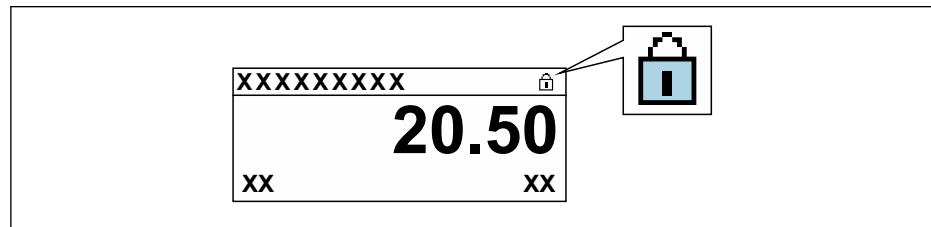
2. Setting the write protection (WP) switch on the main electronics module to the **OFF** position (factory setting) disables hardware write protection.

↳ No option is displayed in the **Locking status** parameter → 🖺 151. On the local display, the 🔒 symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

11   Operation

11.1   Reading off the device locking status

Device active write protection: **Locking status** parameter

Operation → Locking status

Function scope of the "Locking status" parameter

Options	Description
None	The access authorization displayed in the **Access status** parameter applies → 🖹 84. Only appears on local display.
Hardware locked	The DIP switch for hardware locking is activated on the PCB board. This locks write access to the parameters (e.g. via local display or operating tool) → 🖹 148.
Temporarily locked	Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset, etc.). Once the internal processing has been completed, the parameters can be changed once again.

11.2   Adjusting the operating language

🛈 Detailed information:
   • To configure the operating language → 🖹 110
   • For information on the operating languages supported by the measuring device → 🖹 218

11.3   Configuring the display

Detailed information:
• On the basic settings for the local display → 🖹 129
• On the advanced settings for the local display → 🖹 136

11.4   Reading off measured values

With the **Measured values** submenu, it is possible to read all the measured values.

Navigation
"Diagnostics" menu → Measured values

▶ Measured values	
▶ Process variables	→ 🖹 152
▶ Input values	→ 🖹 153
▶ Output values	→ 🖹 155
▶ Totalizer	→ 🖹 153

11.4.1   "Process variables" submenu

The **Process variables** submenu contains all the parameters needed to display the current measured values for each process variable.

Navigation
"Diagnostics" menu → Measured values → Process variables

▶ Process variables		
Volume flow	→ 🗎	152
Mass flow	→ 🗎	152
Corrected volume flow	→ 🗎	152
Flow velocity	→ 🗎	152
Conductivity	→ 🗎	152
Corrected conductivity	→ 🗎	153
Temperature	→ 🗎	153
Density	→ 🗎	153

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Volume flow	–	Displays the volume flow that is currently measured. *Dependency* The unit is taken from: **Volume flow unit** parameter (→ 🗎 113)	Signed floating-point number
Mass flow	–	Displays the mass flow that is currently calculated. *Dependency* The unit is taken from the **Mass flow unit** parameter (→ 🗎 113).	Signed floating-point number
Corrected volume flow	–	Displays the corrected volume flow that is currently calculated. *Dependency* The unit is taken from: **Corrected volume flow unit** parameter (→ 🗎 114)	Signed floating-point number
Flow velocity	–	Displays the flow velocity that is currently calculated.	Signed floating-point number
Conductivity	–	Displays the conductivity that is currently measured. *Dependency* The unit is taken from the **Conductivity unit** parameter (→ 🗎 113).	Signed floating-point number

Parameter	Prerequisite	Description	User interface
Corrected conductivity	One of the following conditions is met: • Order code for "Sensor option", option **CI** "Medium temperature measurement" or • The temperature is read into the flowmeter from an external device.	Displays the conductivity currently corrected. *Dependency* The unit is taken from: **Conductivity unit** parameter (→ 🖺 113)	Positive floating-point number
Temperature	One of the following conditions is met: • Order code for "Sensor option", option **CI** "Medium temperature measurement" or • The temperature is read into the flowmeter from an external device.	Displays the temperature that is currently calculated. *Dependency* The unit is taken from: **Temperature unit** parameter (→ 🖺 113)	Positive floating-point number
Density	–	Displays the current fixed density or density read in from an external device. *Dependency* The unit is taken from: **Density unit** parameter	Signed floating-point number

11.4.2 "Totalizer" submenu

The **Totalizer** submenu contains all the parameters needed to display the current measured values for every totalizer.

Navigation

"Diagnostics" menu → Measured values → Totalizer
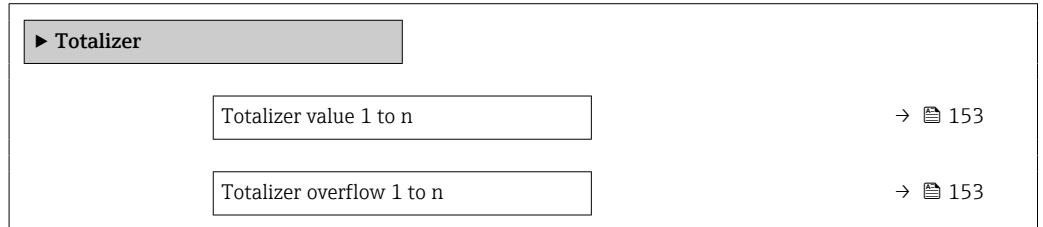
▶ Totalizer	
Totalizer value 1 to n	→ 🖺 153
Totalizer overflow 1 to n	→ 🖺 153

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Totalizer value 1 to n	A process variable is selected in the **Assign process variable** parameter (→ 🖺 135) of the **Totalizer 1 to n** submenu.	Displays the current totalizer counter value.	Signed floating-point number
Totalizer overflow 1 to n	A process variable is selected in the **Assign process variable** parameter (→ 🖺 135) of the **Totalizer 1 to n** submenu.	Displays the current totalizer overflow.	Integer with sign

11.4.3 "Input values" submenu

The **Input values** submenu guides you systematically to the individual input values.

```
▶ Input values

        ▶ Current input 1 to n              →  🗎 154

        ▶ Status input 1 to n               →  🗎 154
```
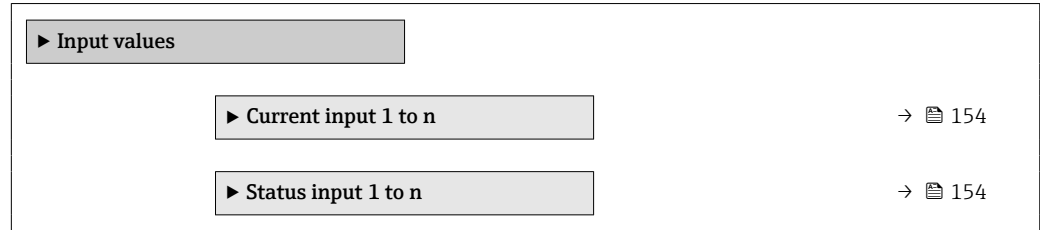
Input values of current input

The **Current input 1 to n** submenu contains all the parameters needed to display the current measured values for every current input.

```
▶ Current input 1 to n

        Measured values 1 to n              →  🗎 154

        Measured current 1 to n             →  🗎 154
```
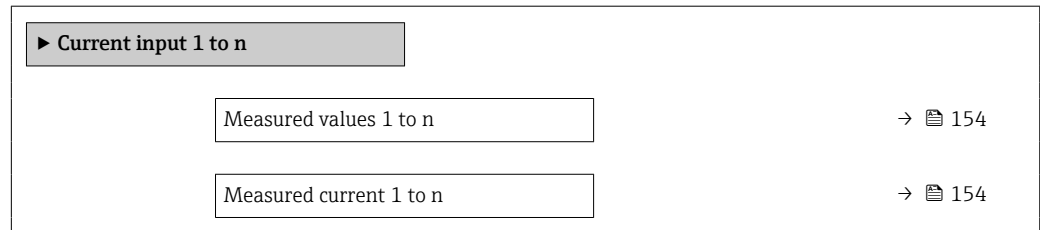
Parameter overview with brief description

Parameter	Description	User interface
Measured values 1 to n	Displays the current input value.	Signed floating-point number
Measured current 1 to n	Displays the current value of the current input.	0 to 22.5 mA

Input values of status input

The **Status input 1 to n** submenu contains all the parameters needed to display the current measured values for every status input.

```
▶ Status input 1 to n

        Value status input                  →  🗎 154
```
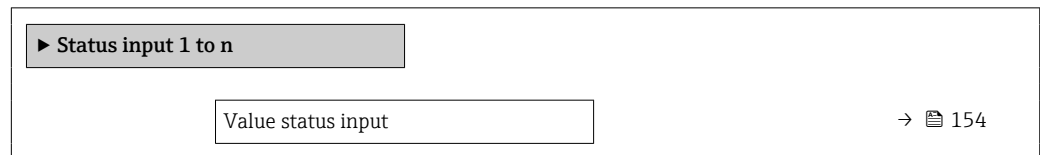
Parameter overview with brief description

Parameter	Description	User interface
Value status input	Shows the current input signal level.	• High • Low

11.4.4   Output values

The **Output values** submenu contains all the parameters needed to display the current measured values for every output.

Navigation

"Diagnostics" menu → Measured values → Output values

```
► Output values

            ► Current output 1 to n                          →  155

            ► Pulse/frequency/switch output                  →  155
              1 to n

            ► Relay output 1 to n                            →  156
```
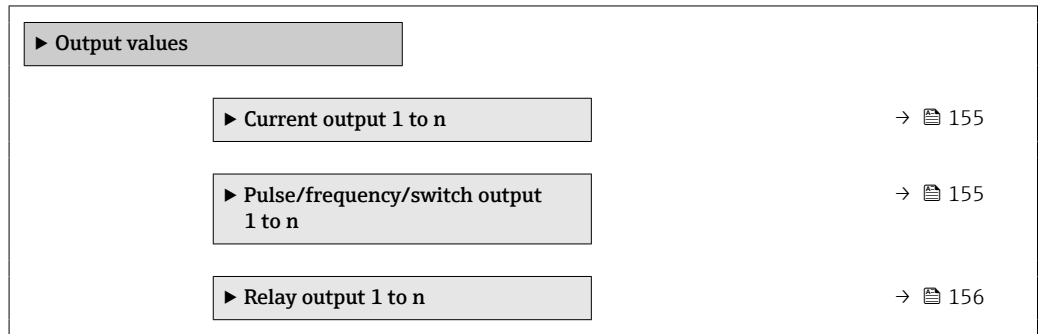
Output values of current output

The **Value current output** submenu contains all the parameters needed to display the current measured values for every current output.

Navigation

"Diagnostics" menu → Measured values → Output values → Value current output 1 to n
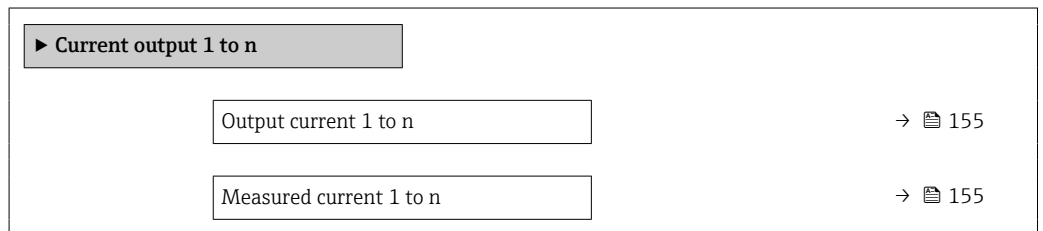
```
► Current output 1 to n

            Output current 1 to n                            →  155

            Measured current 1 to n                          →  155
```

Parameter overview with brief description

Parameter	Description	User interface
Output current 1	Displays the current value currently calculated for the current output.	3.59 to 22.5 mA
Measured current	Displays the current value currently measured for the current output.	0 to 30 mA

Output values for pulse/frequency/switch output

The **Pulse/frequency/switch output 1 to n** submenu contains all the parameters needed to display the current measured values for every pulse/frequency/switch output.

▶ Pulse/frequency/switch output 1 to n		
Output frequency 1 to n	→ 🖹	156
Pulse output 1 to n	→ 🖹	156
Switch status 1 to n	→ 🖹	156

Parameter overview with brief description

| Parameter	Prerequisite	Description	User interface
Output frequency 1 to n	In the **Operating mode** parameter, the **Frequency** option is selected.	Displays the value currently measured for the frequency output.	0.0 to 12 500.0 Hz
Pulse output 1 to n	The **Pulse** option is selected in the **Operating mode** parameter parameter.	Displays the pulse frequency currently output.	Positive floating-point number
Switch status 1 to n	The **Switch** option is selected in the **Operating mode** parameter.	Displays the current switch output status.	▪ Open ▪ Closed

Output values for relay output

The **Relay output 1 to n** submenu contains all the parameters needed to display the current measured values for every relay output.

▶ Relay output 1 to n		
Switch status	→ 🖹	156
Switch cycles	→ 🖹	156
Max. switch cycles number	→ 🖹	156

Parameter overview with brief description

Parameter	Description	User interface
Switch status	Shows the current relay switch status.	▪ Open ▪ Closed
Switch cycles	Shows number of all performed switch cycles.	Positive integer
Max. switch cycles number	Shows the maximal number of guaranteed switch cycles.	Positive integer

11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:
- Basic settings using the **Setup** menu (→ 🖺 111)
- Advanced settings using the **Advanced setup** submenu (→ 🖺 133)

11.6 Performing a totalizer reset

Navigation

"Operation" menu → Totalizer handling

► Totalizer handling		
Control Totalizer 1 to n		→ 🖺 157
Preset value 1 to n		→ 🖺 157
Totalizer value 1 to n		→ 🖺 157
Reset all totalizers		→ 🖺 157

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface
Control Totalizer 1 to n	A process variable is selected in the **Assign process variable** parameter (→ 🖺 135) of the **Totalizer 1 to n** submenu.	Control totalizer value.	• Totalize • Reset + hold • Preset + hold • Reset + totalize • Preset + totalize • Hold
Preset value 1 to n	A process variable is selected in the **Assign process variable** parameter (→ 🖺 135) of the **Totalizer 1 to n** submenu.	Specify start value for totalizer. *Dependency* ℹ️ The unit of the selected process variable is defined in the **Unit totalizer** parameter (→ 🖺 135) for the totalizer.	Signed floating-point number
Totalizer value	A process variable is selected in the **Assign process variable** parameter (→ 🖺 135) of the **Totalizer 1 to n** submenu.	Displays the current totalizer counter value.	Signed floating-point number
Reset all totalizers	–	Reset all totalizers to 0 and start.	• Cancel • Reset + totalize

11.6.1 Function scope of "Control Totalizer" parameter

Options	Description
Totalize	The totalizer is started or continues running.
Reset + hold	The totaling process is stopped and the totalizer is reset to 0.

Options	Description
Preset + hold [1]	The totaling process is stopped and the totalizer is set to its defined start value from the **Preset value** parameter.
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.
Preset + totalize [1]	The totalizer is set to the defined start value in the **Preset value** parameter and the totaling process is restarted.
Hold	Totalizing is stopped.

1)   Visible depending on the order options or device settings

11.6.2   Function range of "Reset all totalizers" parameter

Options	Description
Cancel	No action is executed and the user exits the parameter.
Reset + totalize	Resets all totalizers to 0 and restarts the totaling process. This deletes all the previously aggregated flow values.

11.7   Displaying the measured value history

The **Extended HistoROM** application package must be enabled in the device (order option) for the **Data logging** submenu to appear. This contains all the parameters for the measured value history.

Data logging is also available via:
- Plant Asset Management Tool FieldCare → 🖹 97.
- Web browser

Function range
- A total of 1000 measured values can be stored
- 4 logging channels
- Adjustable logging interval for data logging
- Measured value trend for each logging channel displayed in the form of a chart
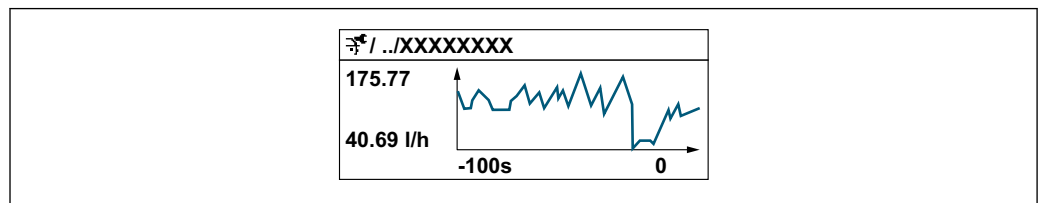
- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

If the length of the logging interval or the assignment of the process variables to the channels is changed, the content of the data logging is deleted.

Navigation
"Diagnostics" menu → Data logging

▶ Data logging		
	Assign channel 1	→ 🖹 159
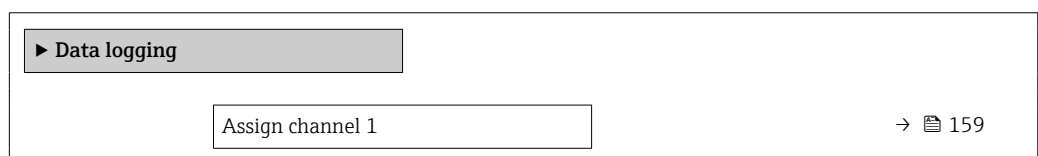
Assign channel 2	→ 🖹 159
Assign channel 3	→ 🖹 160
Assign channel 4	→ 🖹 160
Logging interval	→ 🖹 160
Clear logging data	→ 🖹 160
Data logging	→ 🖹 160
Logging delay	→ 🖹 160
Data logging control	→ 🖹 160
Data logging status	→ 🖹 160
Entire logging duration	→ 🖹 160
▶ Display channel 1	
▶ Display channel 2	
▶ Display channel 3	
▶ Display channel 4	

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface
Assign channel 1	The **Extended HistoROM** application package is available.	Assign process variable to logging channel.	• Off • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity[*] • Corrected conductivity[*] • Current output 1 • Current output 2[*] • Current output 3[*] • Current output 4[*] • Temperature[*] • Electronic temperature
Assign channel 2	The **Extended HistoROM** application package is available. ℹ The software options currently enabled are displayed in the **Software option overview** parameter.	Assign a process variable to logging channel.	For the picklist, see **Assign channel 1** parameter (→ 🖹 159)

Parameter	Prerequisite	Description	Selection / User entry / User interface
Assign channel 3	The **Extended HistoROM** application package is available. ⊡ The software options currently enabled are displayed in the **Software option overview** parameter.	Assign a process variable to logging channel.	For the picklist, see **Assign channel 1** parameter (→ 🖹 159)
Assign channel 4	The **Extended HistoROM** application package is available. ⊡ The software options currently enabled are displayed in the **Software option overview** parameter.	Assign a process variable to logging channel.	For the picklist, see **Assign channel 1** parameter (→ 🖹 159)
Logging interval	The **Extended HistoROM** application package is available.	Define the logging interval for data logging. This value defines the time interval between the individual data points in the memory.	0.1 to 3 600.0 s
Clear logging data	The **Extended HistoROM** application package is available.	Clear the entire logging data.	• Cancel • Clear data
Data logging	–	Select the type of data logging.	• Overwriting • Not overwriting
Logging delay	In the **Data logging** parameter, the **Not overwriting** option is selected.	Enter the time delay for measured value logging.	0 to 999 h
Data logging control	In the **Data logging** parameter, the **Not overwriting** option is selected.	Start and stop measured value logging.	• None • Delete + start • Stop
Data logging status	In the **Data logging** parameter, the **Not overwriting** option is selected.	Displays the measured value logging status.	• Done • Delay active • Active • Stopped
Entire logging duration	In the **Data logging** parameter, the **Not overwriting** option is selected.	Displays the total logging duration.	Positive floating-point number

*   Visibility depends on order options or device settings

12 Diagnostics and troubleshooting

12.1 General troubleshooting

For local display

Error	Possible causes	Remedial action
Local display is dark, but signal output is within the valid range	The cable of the display module is not plugged in correctly.	Insert the plug correctly into the main electronics module and display module.
Local display dark and no output signals	Supply voltage does not match the voltage specified on the nameplate.	Apply the correct supply voltage .
Local display dark and no output signals	Supply voltage has incorrect polarity.	Reverse polarity of supply voltage.
Local display dark and no output signals	No contact between connecting cables and terminals.	Ensure electrical contact between the cable and the terminal.
Local display dark and no output signals	• Terminals are not plugged into the I/O electronics module correctly. • Terminals are not plugged into the main electronics module correctly.	Check terminals.
Local display dark and no output signals	• I/O electronics module is defective. • Main electronics module is defective.	Order spare part → 🖹 192.
Local display dark and no output signals	The connector between the main electronics module and display module is not plugged in correctly.	Check the connection and correct if necessary.
Local display dark and no output signals	The connecting cable is not plugged in correctly.	1. Check the connection of the electrode cable and correct if necessary. 2. Check the connection of the coil current cable and correct if necessary.
Local display cannot be read, but signal output is within the valid range	Display is set too bright or too dark.	• Set the display brighter by simultaneously pressing ⊞ + 🄴. • Set the display darker by simultaneously pressing ⊟ + 🄴.
Local display is dark, but signal output is within the valid range	Display module is defective.	Order spare part → 🖹 192.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures → 🖹 172
Text on local display appears in a language that cannot be understood.	The selected operating language cannot be understood.	1. Press ⊟ + ⊞ for 2 s ("home position"). 2. Press 🄴. 3. Configure the required language in the **Display language** parameter (→ 🖹 138).
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	• Check the cable and the connector between the main electronics module and display module. • Order spare part → 🖹 192.

For output signals

Error	Possible causes	Remedial action
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 🖹 192.
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Parameter configuration error	Check and adjust parameter configuration.
Device measures incorrectly.	Configuration error or device is operated outside the application.	1. Check and correct parameter configuration. 2. Observe limit values specified in the "Technical Data".

For access

Error	Possible causes	Remedial action
Write access to parameter not possible.	Hardware write protection is enabled.	Set the write protection switch on the main electronics module to the **OFF** position → 🖺 148.
Write access to parameter not possible.	Current user role has limited access authorization.	1. Check user role → 🖺 84. 2. Enter correct customer-specific access code → 🖺 84.
Connection via EtherNet/IP is not possible.	Device plug is connected incorrectly.	Check the pin assignment of the device plugs .
Connection to the web server is not possible.	Web server is disabled.	Use the "FieldCare" or "DeviceCare" operating tool to check if the web server of the device is enabled and enable if necessary → 🖺 92.
	The Ethernet interface is incorrectly configured on the PC.	▶ Check the properties of the Internet protocol (TCP/IP) → 🖺 87. ▶ Check the network settings with the IT manager.
Connection to the web server is not possible.	• The IP address is incorrectly configured on the PC. • IP address is not known.	▶ If addressing via hardware: open the transmitter and check the configured IP address (last octet). ▶ Check the IP address of the device with the IT specialist. ▶ If the IP address is not known, set DIP switch no. 10 on the I/O electronics module to ON, restart the device and enter the factory IP address 192.168.1.212. 🔧 EtherNet/IP communication is interrupted by enabling the DIP switch.
	The web browser setting "Use a proxy server for LAN" is enabled on the PC.	Disable the use of the proxy server in the LAN settings. Using the example of MS Internet Explorer: ▶ Under *Control Panel* open *Internet options*. ▶ Select the *Connections* tab. ▶ Double-click *LAN Settings*. ▶ Disable the use of the proxy server in the *LAN settings*. ▶ Press *OK* to confirm.
	Apart from the active network connection to the measuring device, other network connections are also being used.	• Make sure that no other network connections are established by the computer (also no WLAN) and close other programs with network access to the computer. • If using a docking station for notebooks, make sure that a network connection to another network is not active.
Connection to the web server is not possible.	WLAN access data are incorrect.	• Check WLAN network status. • Log on to the device again using WLAN access data. • Check that WLAN is enabled for the device and operating device → 🖺 87.
	WLAN communication is disabled.	–
It is not possible to connect to the web server, FieldCare or DeviceCare.	WLAN network is not available.	• Check whether WLAN reception is available: LED on the display module lights up in blue. • Check if the WLAN connection is enabled: LED on display module flashes blue. • Switch on instrument function.
No network connection or unstable network connection.	WLAN network is weak.	• Operating device outside of receiving range: Check the network status on the operating device. • To improve network performance, use an external WLAN antenna.

Error	Possible causes	Remedial action
	Parallel WLAN and Ethernet communication.	• Check network settings. • Temporarily enable only the WLAN as an interface.
Web browser is frozen and no further operation possible.	Data transfer is active.	Wait until data transfer or current action is finished.
	Connection lost	▸ Check cable connection and power supply. ▸ Refresh web browser and restart if necessary.
The web browser contents are difficult to read or incomplete.	The web browser version used is not the best option.	▸ Use correct web browser version → 🖺 86. ▸ Empty the web browser cache. ▸ Restart the web browser.
	Unsuitable view settings.	Change the font size/display ratio of the Web browser.
No contents displayed in the web browser or contents incomplete.	• JavaScript is not enabled. • JavaScript cannot be enabled.	▸ Enable JavaScript. ▸ Enter http://XXX.XXX.X.X.XX/servlet/basic.html as the IP address.
Operation with FieldCare or DeviceCare not possible via CDI-RJ45 service interface (port 8000).	Firewall of the PC or network prevents communication.	Depending on the settings of the firewall used on the PC or in the network, the firewall must be disabled or adjusted for FieldCare/DeviceCare access.
Flashing of firmware with FieldCare or DeviceCare not possible via CDI-RJ45 service interface (port 8000 or TFTP ports).	Firewall of the PC or network prevents communication.	Depending on the settings of the firewall used on the PC or in the network, the firewall must be disabled or adjusted for FieldCare/DeviceCare access.

12.2 Diagnostic information via light emitting diodes

12.2.1 Transmitter

Proline 500 – digital

Different LEDs in the transmitter provide information on the device status.
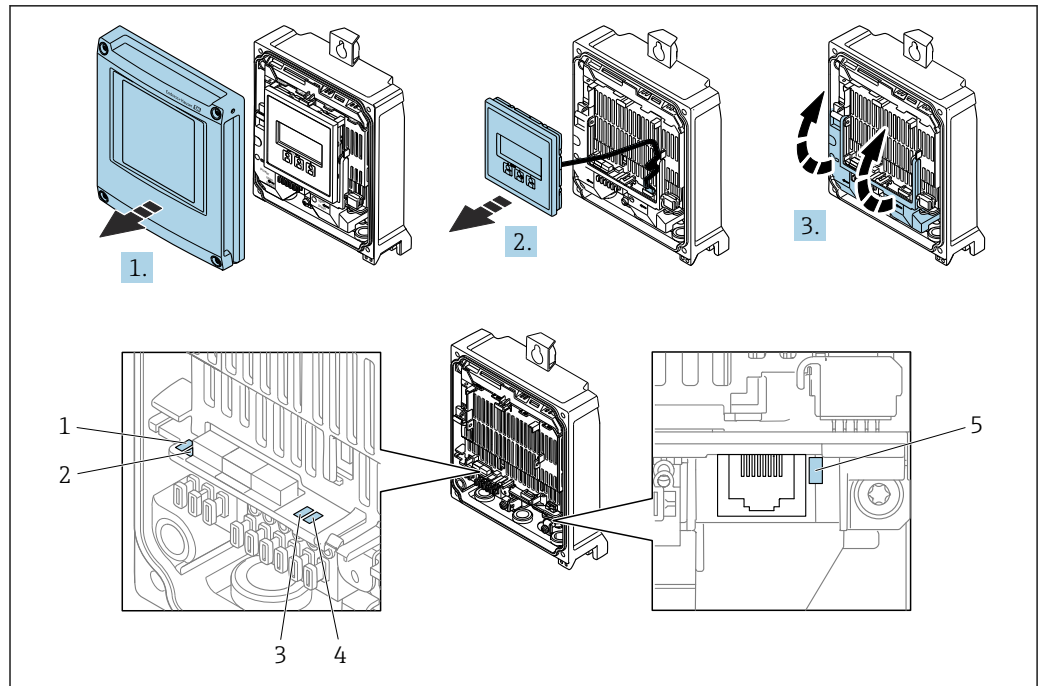
A0029689

1   Supply voltage
2   Device status
3   network status
4   Port 1 active: EtherNet/IP
5   Port 2 active: EtherNet/IP and service interface (CDI)

1. Open the housing cover.

2. Remove the display module.

3. Fold open the terminal cover.

LED		Color	Meaning
1	Supply voltage	Off	Supply voltage is off or too low.
		Green	Supply voltage is OK.
2	Device status/module status (normal operation)	Off	Firmware error
		Green	Device status is OK.
		Flashing green	Device is not configured.
		Flashing red	A diagnostic event with "Warning" diagnostic behavior has occurred.
		Red	A diagnostic event with "Alarm" diagnostic behavior has occurred.
		Flashing red/green	The device restarts/self-test.
2	Device status/module status (during start-up)	Flashes red slowly	If > 30 seconds: problem with the boot loader.
		Flashes red quickly	If > 30 seconds: compatibility problem when reading the firmware.
3	Network status	Off	The device does not have an EtherNet/IP address.
		Green	EtherNet/IP connection is active.
		Flashing green	The device has an Ethernet/IP address but no EtherNet/IP connection is active.
		Red	The EtherNet/IP address of the device has been assigned twice.
		Flashing red	EtherNet/IP connection is in the "time out" mode.
		Flashing red/green	The device restarts/self-test.

LED		Color	Meaning
4	Port 1 active: Ethernet/IP	Off	Not connected or no connection established.
		White	Connected and connection established.
		Flashing white	Communication not active.
5	Port 2 active: Ethernet/IP and service interface (CDI)	Off	Not connected or no connection established.
		Yellow	Connected and connection established.
		Flashing yellow	Communication not active.

Proline 500

Different LEDs in the transmitter provide information on the device status.

A0029629

1   Supply voltage
2   Device status
3   network status
4   Port 1 active: EtherNet/IP
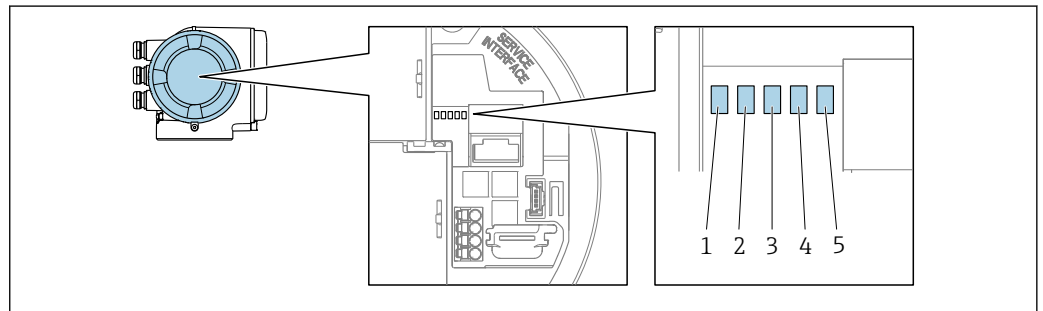*5   Port 2 active: EtherNet/IP and service interface (CDI)*

LED		Color	Meaning
1	Supply voltage	Off	Supply voltage is off or too low.
		Green	Supply voltage is OK.
2	Device status/module status (normal operation)	Off	Firmware error.
		Green	Device status is OK.
		Flashing green	Device is not configured.
		Flashing red	A diagnostic event with "Warning" diagnostic behavior has occurred.
		Red	A diagnostic event with "Alarm" diagnostic behavior has occurred.
		Flashing red/green	The device restarts/self-test.
2	Device status/module status (during start-up)	Flashes red slowly	If > 30 seconds: problem with the boot loader.
		Flashes red quickly	If > 30 seconds: compatibility problem when reading the firmware.
3	Network status	Off	The device does not have an EtherNet/IP address.
		Green	EtherNet/IP connection is active.
		Flashing green	The device has an Ethernet/IP address but no EtherNet/IP connection is active.
		Red	The EtherNet/IP address of the device has been assigned twice.
		Flashing red	EtherNet/IP connection is in the "time out" mode.
		Flashing red/green	The device restarts/self-test.

LED		Color	Meaning
4	Port 1 active: Ethernet/IP	Off	Not connected or no connection established.
		White	Connected and connection established.
		Flashing white	Communication not active.
5	Port 2 active: Ethernet/IP and service interface (CDI)	Off	Not connected or no connection established.
		Yellow	Connected and connection established.
		Flashing yellow	Communication not active.

12.2.2   Sensor connection housing

Proline 500 – digital

Various light emitting diodes (LED) on the ISEM electronics unit (intelligent sensor electronics module) in the sensor connection housing provide information about the device status.

A0029699
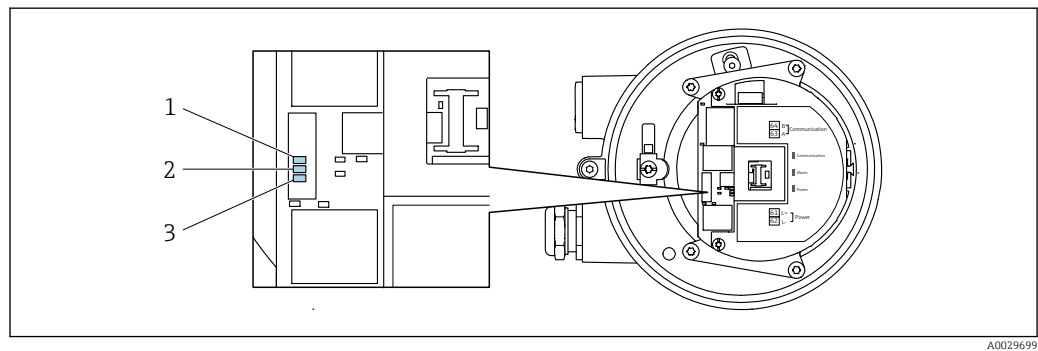
1   Communication
2   Device status
3   Supply voltage

LED		Color	Meaning
1	Communication	White	Communication active.
2	Device status (normal operation)	Red	Error
		Flashing red	Warning
2	Device status (during start-up)	Flashes red slowly	If > 30 seconds: problem with the boot loader.
		Flashes red quickly	If > 30 seconds: compatibility problem when reading the firmware.
3	Supply voltage	Green	Supply voltage is ok.
		Off	Supply voltage is off or too low.

12.3   Diagnostic information on local display

12.3.1   Diagnostic message

Faults detected by the self-monitoring system of the measuring device are displayed as a diagnostic message in alternation with the operational display.

Operational display in alarm condition	Diagnostic message

1 Status signal
2 Diagnostic behavior
3 Diagnostic behavior with diagnostic code
4 Short text
5 Operating elements
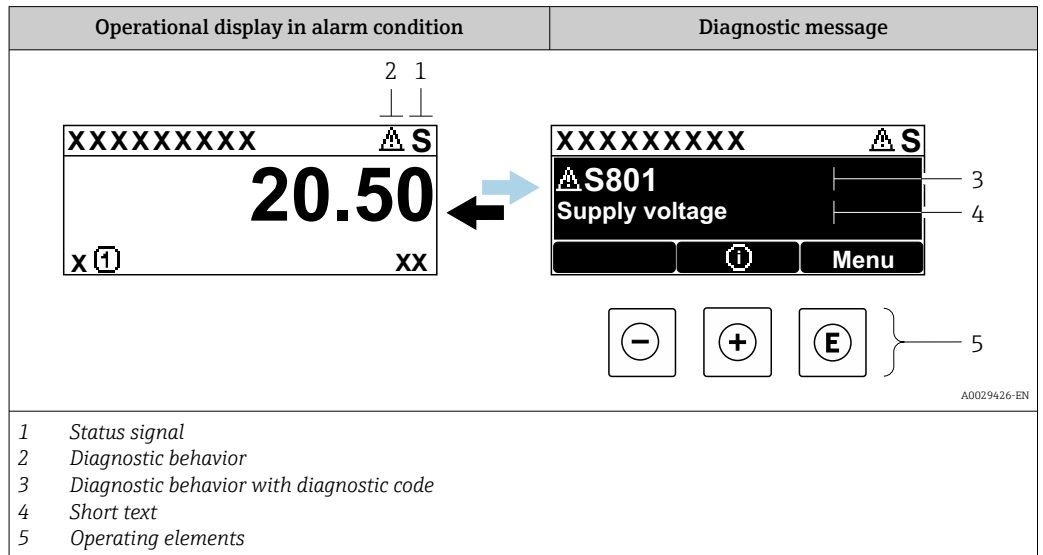
If two or more diagnostic events are pending simultaneously, only the message of the diagnostic event with the highest priority is shown.

Other diagnostic events that have occurred can be displayed in the **Diagnostics** menu:
- Via parameter → 🖺 185
- Via submenus → 🖺 185

Status signals

The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

The status signals are categorized according to VDI/VDE 2650 and NAMUR Recommendation NE 107: F = Failure, C = Function Check, S = Out of Specification, M = Maintenance Required

Symbol	Meaning
F	**Failure** A device error has occurred. The measured value is no longer valid.
C	**Function check** The device is in service mode (e.g. during a simulation).
S	**Out of specification** The device is being operated: Outside its technical specification limits (e.g. outside the process temperature range)
M	**Maintenance required** Maintenance is required. The measured value remains valid.

Diagnostic behavior

Symbol	Meaning
	Alarm • Measurement is interrupted. • Signal outputs and totalizers assume the defined alarm condition. • A diagnostic message is generated.
	Warning • Measurement is resumed. • The signal outputs and totalizers are not affected. • A diagnostic message is generated.

Diagnostic information

The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.
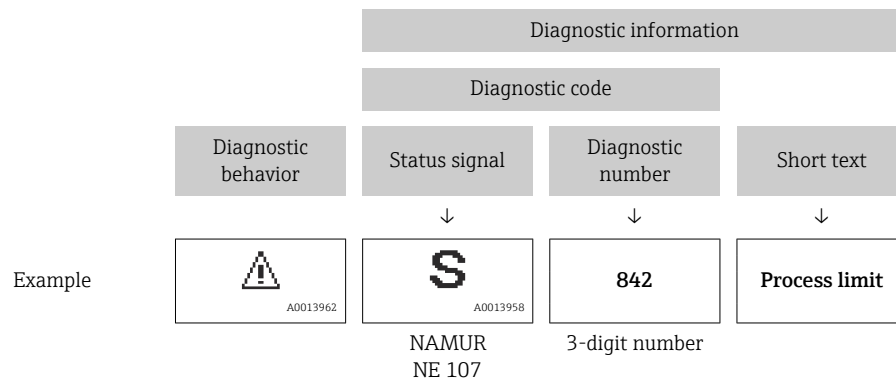
Operating elements

Operating key	Meaning
⊕	**Plus key** *In menu, submenu* Opens the message about the remedial measures.
E	**Enter key** *In menu, submenu* Opens the operating menu.

12.3.2 Calling up remedial measures
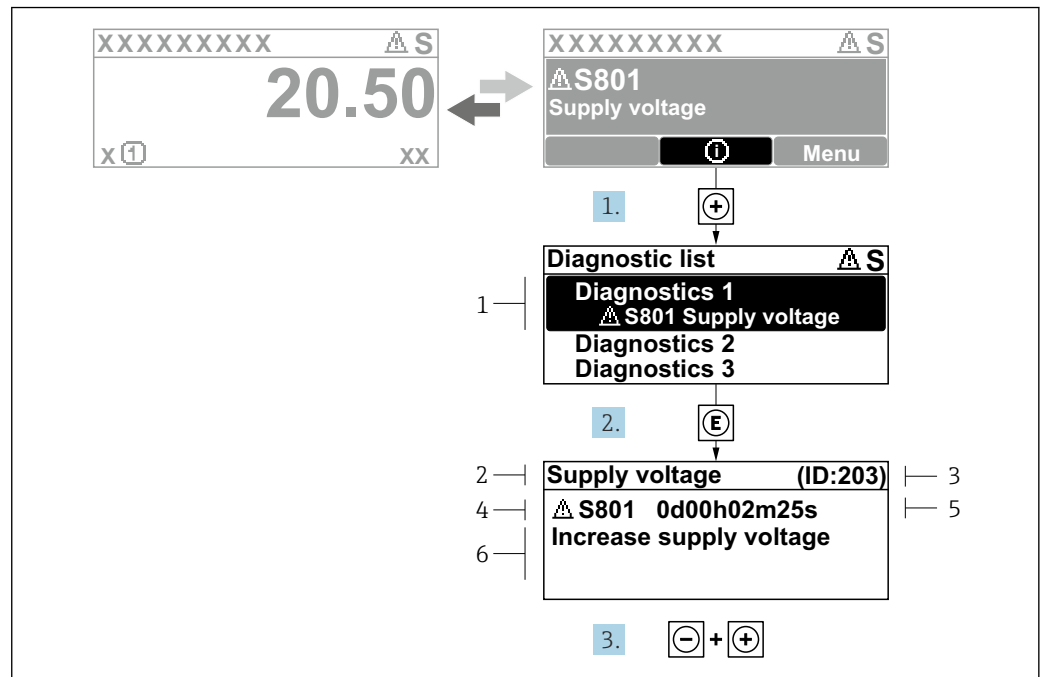
⧉ 37   Message for remedial measures

1   Diagnostic information
2   Short text
3   Service ID
4   Diagnostic behavior with diagnostic code
5   Operation time when error occurred
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.

The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or **Previous diagnostics** parameter.

1. Press Ⓔ.
   ↳ The message for the remedial measures for the selected diagnostic event opens.

2. Press ⊟ + ⊞ simultaneously.
   ↳ The message for the remedial measures closes.

12.4 Diagnostic information in the web browser

12.4.1 Diagnostic options

Any faults detected by the measuring device are displayed in the Web browser on the home page once the user has logged on.

1   Status area with status signal
2   Diagnostic information
3   Remedial measures with service ID

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
- Via parameter → 🖺 185
- Via submenu → 🖺 185

Status signals

The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

Symbol	Meaning
⊗	**Failure** A device error has occurred. The measured value is no longer valid.
▽	**Function check** The device is in service mode (e.g. during a simulation).
⚠?	**Out of specification** The device is being operated: Outside its technical specification limits (e.g. outside the process temperature range)
◇	**Maintenance required** Maintenance is required. The measured value remains valid.

The status signals are categorized in accordance with VDI/VDE 2650 and NAMUR Recommendation NE 107.

12.4.2   Calling up remedy information

Remedy information is provided for every diagnostic event to ensure that problems can be rectified quickly. These measures are displayed in red along with the diagnostic event and the related diagnostic information.

12.5   Diagnostic information in FieldCare or DeviceCare

12.5.1   Diagnostic options

Any faults detected by the measuring device are displayed on the home page of the operating tool once the connection has been established.
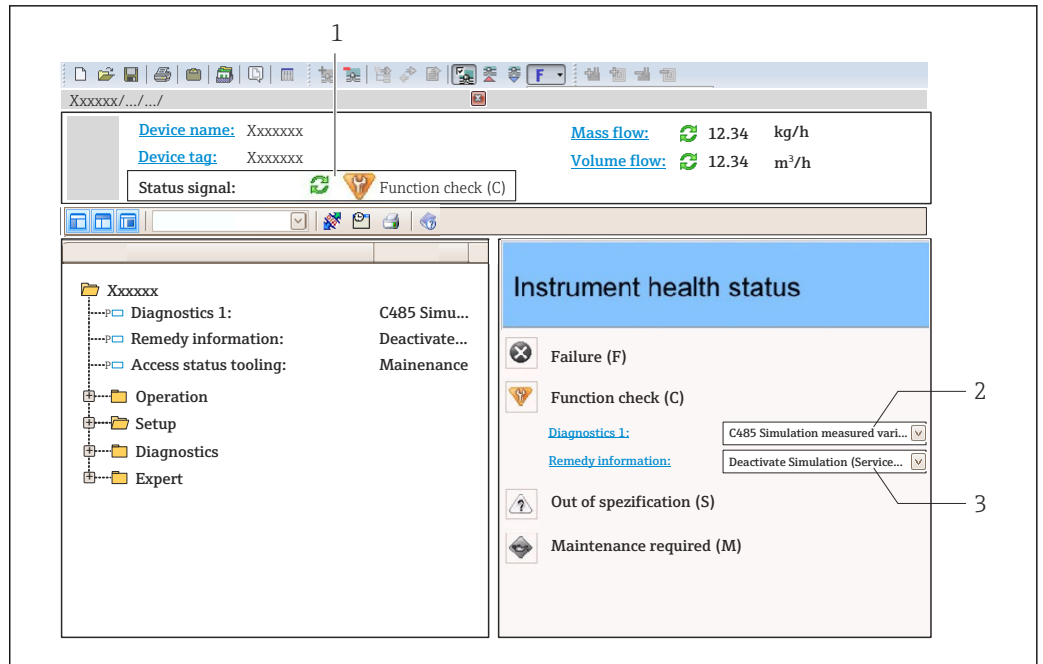
1 Status area with status signal → 🖩 167
2 Diagnostic information → 🖩 168
3 Remedial measures with service ID

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
• Via parameter → 🖩 185
• Via submenu → 🖩 185

Diagnostic information

The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.
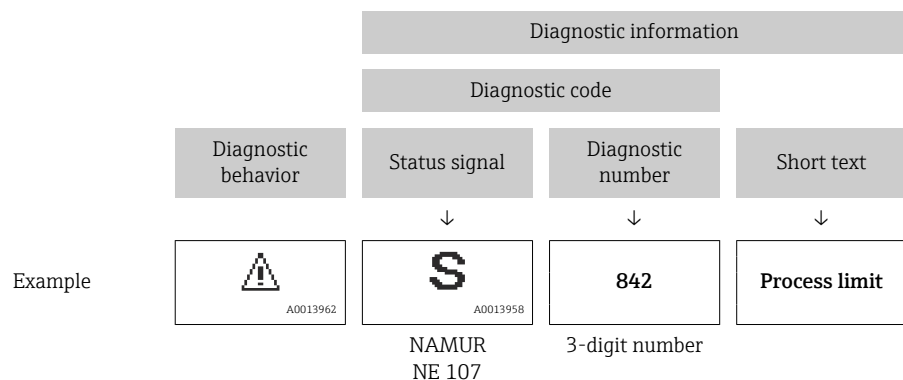
12.5.2 Calling up remedy information

Remedy information is provided for every diagnostic event to ensure that problems can be rectified quickly:
• On the home page
  Remedy information is displayed in a separate field below the diagnostics information.
• In the **Diagnostics** menu
  Remedy information can be called up in the working area of the user interface.

The user is in the **Diagnostics** menu.

1. Call up the desired parameter.

2. On the right in the working area, mouse over the parameter.
   ↳ A tool tip with remedy information for the diagnostic event appears.

## 12.6   Diagnostic information via communication interface

12.6.1   Reading out diagnostic information

The current diagnostic event and associated diagnostic information can be read out: **Input Assembly Fix**

Input Fix Assembly byte 1 to 8							
1	2	3	4	5	6	7	8
File header (not visible)				Diagnostic number		Status signal	–

12.7   Adapting the diagnostic information

12.7.1   Adapting the diagnostic behavior

Each item of diagnostic information is assigned a specific diagnostic behavior at the factory. The user can change this assignment for specific diagnostic information in the **Diagnostic behavior** submenu.

Expert → System → Diagnostic handling → Diagnostic behavior

You can assign the following options to the diagnostic number as the diagnostic behavior:

Options	Description
Alarm	The device stops measurement. The totalizers assume the defined alarm condition. A diagnostic message is generated. The background lighting changes to red.
Warning	The device continues to measure. The totalizers are not affected. A diagnostic message is generated.
Logbook entry only	The device continues to measure. The diagnostic message is only displayed in the **Event logbook** submenu (**Event list** submenu) and is not displayed in alternating sequence with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

12.8   Overview of diagnostic information

ℹ️ The amount of diagnostic information and the number of measured variables affected increase if the measuring device has one or more application packages.

ℹ️ In the case of some items of diagnostic information, the diagnostic behavior can be changed. Adapting the diagnostic information → 🕮 172

12.8.1 Diagnostic of sensor

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
043	Sensor short circuit	1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor	0x8000153
	Status signal	S	
	Diagnostic behavior [from the factory] [1]	Warning	

1)   Diagnostic behavior can be changed.

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
082	Data storage	1. Check module connections 2. Contact service	0x10000E7
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
083	Memory content	1. Restart device 2. Restore HistoROM S-DAT backup ('Device reset' parameter) 3. Replace HistoROM S-DAT	0x10000A0
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
169	Conductivity measurement failed	1. Check grounding conditions 2. Deactivate conductivity measurement	0x400038A
	Status signal	M	
	Diagnostic behavior	Warning	

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
170	Coil resistance	Check ambient and process temperature	• 0x10002D8 • 0x10002D9
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
180	Temperature sensor defective	1. Check sensor connections 2. Replace sensor cable or sensor 3. Turn off temperature measurement	• 0x10000D5 • 0x10000D6
	Status signal	F	
	Diagnostic behavior	Warning	

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
181	Sensor connection		1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor	• 0x100011C • 0x10002E0
	Status signal	F		
	Diagnostic behavior	Alarm		

12.8.2   Diagnostic of electronic

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
201	Device failure		1. Restart device 2. Contact service	0x100014B
	Status signal	F		
	Diagnostic behavior	Alarm		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
242	Software incompatible		1. Check software 2. Flash or change main electronics module	0x1000067
	Status signal	F		
	Diagnostic behavior	Alarm		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
252	Modules incompatible		1. Check electronic modules 2. Change electronic modules	0x100006B
	Status signal	F		
	Diagnostic behavior	Alarm		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
252	Modules incompatible		1. Check if correct electronic modul is plugged 2. Replace electronic module	0x10002C0
	Status signal	F		
	Diagnostic behavior	Alarm		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
262	Sensor electronic connection faulty		1. Check or replace connection cable between sensor electronic module (ISEM) and main electronics 2. Check or replace ISEM or main electronics	0x1000149
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
270	Main electronic failure	Change main electronic module	• 0x1000078 • 0x100007C • 0x1000080 • 0x100009F • 0x10002D7
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
271	Main electronic failure	1. Restart device 2. Change main electronic module	0x100007D
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
272	Main electronic failure	1. Restart device 2. Contact service	0x1000079
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
273	Main electronic failure	Change electronic	• 0x1000098 • 0x10000E5
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
275	I/O module 1 to n defective	Change I/O module	0x100007A
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
276	I/O module 1 to n faulty	1. Restart device 2. Change I/O module	• 0x100007B • 0x1000081
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
283	Memory content	1. Reset device 2. Contact service	• 0x10000E1 • 0x100016F
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
302	Device verification active	Device verification active, please wait.	0x20001EE
	Status signal	C		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
311	Electronic failure	1. Do not reset device 2. Contact service	0x40000E2
	Status signal	M		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
332	Writing in HistoROM backup failed	Replace user interface board Ex d/XP: replace transmitter	0x10002C7
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
361	I/O module 1 to n faulty	1. Restart device 2. Check electronic modules 3. Change I/O Modul or main electronics	0x1000095
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
372	Sensor electronic (ISEM) faulty	1. Restart device 2. Check if failure recurs 3. Replace sensor electronic module (ISEM)	• 0x10002CB • 0x10002CC • 0x10002CD • 0x10002CE • 0x10002CF • 0x10002D0
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
373	Sensor electronic (ISEM) faulty	1. Transfer data or reset device 2. Contact service	0x10002D1
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
375	I/O- 1 to n communication failed	1. Restart device 2. Check if failure recurs 3. Replace module rack inclusive electronic modules	0x1000107
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
376	Sensor electronic (ISEM) faulty	1. Replace sensor electronic module (ISEM) 2. Turn off diagnostic message	• 0x8000119 • 0x800016A • 0x80002DA • 0x80002DB • 0x80002DC • 0x80002DD • 0x80002DF
	Status signal	S		
	Diagnostic behavior [from the factory] [1]	Warning		

1) Diagnostic behavior can be changed.

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
377	Sensor electronic (ISEM) faulty	1. Check sensor cable and sensor 2. Perform Heartbeat Verification 3. Replace sensor cable or sensor	0x80002DE
	Status signal	S		
	Diagnostic behavior [from the factory] [1]	Warning		

1) Diagnostic behavior can be changed.

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
382	Data storage	1. Insert T-DAT 2. Replace T-DAT	0x100016D
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
383	Memory content	1. Restart device 2. Delete T-DAT via 'Reset device' parameter 3. Replace T-DAT	0x100016E
	Status signal	F		
	Diagnostic behavior	Alarm		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
	Short text			
387	HistoROM backup failed		Contact service organization	0x1000288
	Status signal	F		
	Diagnostic behavior	Alarm		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
	Short text			
512	Sensor electronic (ISEM) faulty		1. Check ECC recovery time 2. Turn off ECC	0x1000120
	Status signal	F		
	Diagnostic behavior	Alarm		

12.8.3 Diagnostic of configuration

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
	Short text			
303	I/O 1 to n configuration changed		1. Apply I/O module configuration (parameter 'Apply I/O configuration') 2. Afterwards reload device description and check wiring	0x400026C
	Status signal	M		
	Diagnostic behavior	Warning		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
	Short text			
330	Flash file invalid		1. Update firmware of device 2. Restart device	0x40002C9
	Status signal	M		
	Diagnostic behavior	Warning		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
	Short text			
331	Firmware update failed		1. Update firmware of device 2. Restart device	0x10002CA
	Status signal	F		
	Diagnostic behavior	Warning		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
	Short text			
410	Data transfer		1. Check connection 2. Retry data transfer	0x100008B
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
412	Processing download	Download active, please wait	0x2000204
	Status signal	C		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
431	Trim 1 to n	Carry out trim	0x2000004
	Status signal	C		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
437	Configuration incompatible	1. Restart device 2. Contact service	0x1000060
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
438	Dataset	1. Check data set file 2. Check device configuration 3. Up- and download new configuration	0x400006A
	Status signal	M		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
441	Current output 1 to n	1. Check process 2. Check current output settings	• 0x8000099 • 0x80000B6
	Status signal	S		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
442	Frequency output 1 to n	1. Check process 2. Check frequency output settings	• 0x800008A • 0x8000122
	Status signal	S		
	Diagnostic behavior	Warning		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
443	Pulse output 1 to n		1. Check process 2. Check pulse output settings	• 0x800008C • 0x8000121
	Status signal	S		
	Diagnostic behavior	Warning		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
444	Current input 1 to n		1. Check process 2. Check current input settings	0x80001EB
	Status signal	S		
	Diagnostic behavior	Warning		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
453	Flow override		Deactivate flow override	0x2000094
	Status signal	C		
	Diagnostic behavior	Warning		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
484	Failure mode simulation		Deactivate simulation	0x2000090
	Status signal	C		
	Diagnostic behavior	Alarm		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
485	Measured variable simulation		Deactivate simulation	0x2000093
	Status signal	C		
	Diagnostic behavior	Warning		

No.	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
		Short text		
486	Current input 1 to n simulation		Deactivate simulation	0x20001EC
	Status signal	C		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.		Short text		
491	Current output 1 to n simulation		Deactivate simulation	0x200000E
	Status signal	C		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.		Short text		
492	Simulation frequency output 1 to n		Deactivate simulation frequency output	0x200008D
	Status signal	C		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.		Short text		
493	Simulation pulse output 1 to n		Deactivate simulation pulse output	0x200008E
	Status signal	C		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.		Short text		
494	Switch output simulation 1 to n		Deactivate simulation switch output	0x200008F
	Status signal	C		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.		Short text		
495	Diagnostic event simulation		Deactivate simulation	0x200015E
	Status signal	C		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.		Short text		
496	Status input simulation		Deactivate simulation status input	0x2000170
	Status signal	C		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
511	ISEM settings faulty	1. Check measuring period and integration time 2. Check sensor properties	0x200031C
	Status signal	C		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
520	I/O 1 to n hardware configuration invalid	1. Check I/O hardware configuration 2. Replace wrong I/O module 3. Plug the module of double pulse output on correct slot	0x1000276
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
530	Electrode cleaning is running	Turn off ECC	0x200015A
	Status signal	C		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
531	Empty pipe adjustment faulty	Execute EPD adjustment	0x800016B
	Status signal	S		
	Diagnostic behavior [from the factory] [1]	Warning		

1) Diagnostic behavior can be changed.

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
537	Configuration	1. Check IP addresses in network 2. Change IP address	0x100014A
	Status signal	F		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
594	Relay output simulation	Deactivate simulation switch output	0x20002BA
	Status signal	C		
	Diagnostic behavior	Warning		

12.8.4   Diagnostic of process

No.	Diagnostic information Short text		Remedy instructions	Coding of diagnostic information (hex)
803	Current loop		1. Check wiring 2. Change I/O module	0x10000AD
	Status signal	F		
	Diagnostic behavior	Alarm		

No.	Diagnostic information Short text		Remedy instructions	Coding of diagnostic information (hex)
832	Electronic temperature too high		Reduce ambient temperature	• 0x80000C3 • 0x80002D4
	Status signal	S		
	Diagnostic behavior [from the factory] [1]	Warning		

1)   Diagnostic behavior can be changed.

No.	Diagnostic information Short text		Remedy instructions	Coding of diagnostic information (hex)
833	Electronic temperature too low		Increase ambient temperature	• 0x80000C1 • 0x80002D3
	Status signal	S		
	Diagnostic behavior [from the factory] [1]	Warning		

1)   Diagnostic behavior can be changed.

No.	Diagnostic information Short text		Remedy instructions	Coding of diagnostic information (hex)
834	Process temperature too high		Reduce process temperature	0x80000C5
	Status signal	S		
	Diagnostic behavior [from the factory] [1]	Warning		

1)   Diagnostic behavior can be changed.

No.	Diagnostic information Short text		Remedy instructions	Coding of diagnostic information (hex)
835	Process temperature too low		Increase process temperature	0x80000C6
	Status signal	S		
	Diagnostic behavior [from the factory] [1]	Warning		

1)   Diagnostic behavior can be changed.

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
842	Process limit	Low flow cut off active! 1. Check low flow cut off configuration	0x8000091
	Status signal	S	
	Diagnostic behavior	Warning	

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
882	Input signal	1. Check input configuration 2. Check external device or process conditions	0x1000031
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
937	Sensor symmetry	1. Eliminate external magnetic field near sensor 2. Turn off diagnostic message	0x8000154
	Status signal	S	
	Diagnostic behavior [from the factory] [1]	Warning	

1) Diagnostic behavior can be changed.

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
938	EMC interference	1. Check ambient conditions regarding EMC influence 2. Turn off diagnostic message	0x100011B
	Status signal	F	
	Diagnostic behavior [from the factory] [1]	Alarm	

1) Diagnostic behavior can be changed.

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
961	Electrode potential out of specification	1. Check process conditions 2. Check ambient conditions	0x8000155
	Status signal	S	
	Diagnostic behavior	Warning	

Diagnostic information		Remedy instructions	Coding of diagnostic information (hex)
No.	Short text		
962	Pipe empty	1. Perform full pipe adjustment 2. Perform empty pipe adjustment 3. Turn off empty pipe detection	0x8000092
	Status signal	S	
	Diagnostic behavior [from the factory] [1]	Warning	

1) Diagnostic behavior can be changed.

12.9   Pending diagnostic events

The **Diagnostics** menu allows the user to view the current diagnostic event and the previous diagnostic event separately.

To call up the measures to rectify a diagnostic event:
- Via local display → 🖺 169
- Via web browser → 🖺 170
- Via "FieldCare" operating tool → 🖺 171
- Via "DeviceCare" operating tool → 🖺 171

Other pending diagnostic events can be displayed in the **Diagnostic list** submenu → 🖺 185.

Navigation
"Diagnostics" menu

⟲ **Diagnostics**	
Actual diagnostics	→ 🖺 185
Previous diagnostics	→ 🖺 185
Operating time from restart	→ 🖺 185
Operating time	→ 🖺 185

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Actual diagnostics	A diagnostic event has occurred.	Shows the current occured diagnostic event along with its diagnostic information. If two or more messages occur simultaneously, the message with the highest priority is shown on the display.	Symbol for diagnostic behavior, diagnostic code and short message.
Previous diagnostics	Two diagnostic events have already occurred.	Shows the diagnostic event that occurred prior to the current diagnostic event along with its diagnostic information.	Symbol for diagnostic behavior, diagnostic code and short message.
Operating time from restart	–	Shows the time the device has been in operation since the last device restart.	Days (d), hours (h), minutes (m) and seconds (s)
Operating time	–	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)

12.10   Diagnostics list

Up to 5 currently pending diagnostic events can be displayed in the **Diagnostic list** submenu along with the associated diagnostic information. If more than 5 diagnostic events are pending, the events with the highest priority are shown on the display.

Navigation path
Diagnostics → Diagnostic list
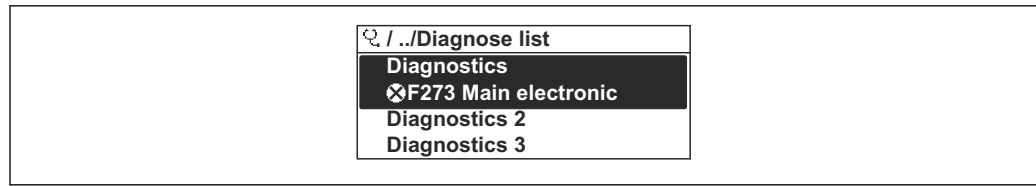
⊠ 38   Using the example of the local display

To call up the measures to rectify a diagnostic event:
- Via local display → 🖥 169
- Via web browser → 🖥 170
- Via "FieldCare" operating tool → 🖥 171
- Via "DeviceCare" operating tool → 🖥 171

12.11 Event logbook

12.11.1 Reading out the event logbook

A chronological overview of the event messages that have occurred is provided in the **Events list** submenu.

Navigation path
Diagnostics menu → **Event logbook** submenu → Events list
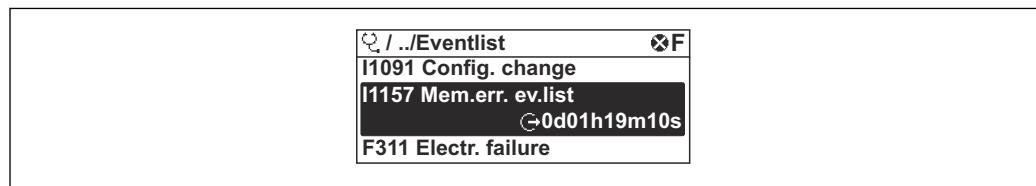
⊠ 39   Using the example of the local display

- A maximum of 20 event messages can be displayed in chronological order.
- If the **Extended HistoROM** application package (order option) is enabled in the device, the event list can contain up to 100 entries.

The event history includes entries for:
- Diagnostic events → 🖥 172
- Information events → 🖥 187

In addition to the operating time when the event occurred, each event is also assigned a symbol that indicates whether the event has occurred or is finished:
- Diagnostics event
  - ⊕: Occurrence of the event
  - ⊖: End of the event
- Information event
  ⊕: Occurrence of the event

To call up the measures to rectify a diagnostic event:
- Via local display → 🖥 169
- Via web browser → 🖥 170
- Via "FieldCare" operating tool → 🖥 171
- Via "DeviceCare" operating tool → 🖥 171

For filtering the displayed event messages → 🖥 187

12.11.2 Filtering the event logbook

Using the **Filter options** parameter you can define which category of event message is displayed in the **Events list** submenu.

Navigation path

Diagnostics → Event logbook → Filter options

Filter categories
- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information (I)

12.11.3 Overview of information events

Unlike a diagnostic event, an information event is displayed in the event logbook only and not in the diagnostic list.

Info number	Info name
I1000	--------(Device ok)
I1079	Sensor changed
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed
I1092	HistoROM backup deleted
I1137	Electronic changed
I1151	History reset
I1155	Reset electronic temperature
I1156	Memory error trend
I1157	Memory error event list
I1184	Display connected
I1256	Display: access status changed
I1278	I/O module reset detected
I1335	Firmware changed
I1351	Empty pipe detection adjustment failure
I1353	Empty pipe detection adjustment ok
I1361	Web server: login failed
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1443	Coating thickness not determined
I1444	Device verification passed
I1445	Device verification failed
I1457	Measured error verification failed
I1459	I/O module verification failed
I1461	Sensor verification failed
I1462	Sensor electronic module verific. failed
I1512	Download started

Info number	Info name
I1513	Download finished
I1514	Upload started
I1515	Upload finished
I1618	I/O module 2 replaced
I1619	I/O module 3 replaced
I1621	I/O module 4 replaced
I1622	Calibration changed
I1624	Reset all totalizers
I1625	Write protection activated
I1626	Write protection deactivated
I1627	Web server: login successful
I1628	Display: login successful
I1629	CDI: login successful
I1631	Web server access changed
I1632	Display: login failed
I1633	CDI: login failed
I1634	Reset to factory settings
I1635	Reset to delivery settings
I1639	Max. switch cycles number reached
I1649	Hardware write protection activated
I1650	Hardware write protection deactivated
I1712	New flash file received
I1725	Sensor electronic module (ISEM) changed
I1726	Configuration backup failed

12.12   Resetting the measuring device

The entire device configuration or some of the configuration can be reset to a defined state with the **Device reset** parameter (→ 🖻 144).

12.12.1 Function range of "Device reset" parameter

Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to the customer-specific value. All other parameters are reset to the factory setting.
Restart device	The restart resets every parameter with data stored in volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.
Restore S-DAT backup	Restores the data that is saved on the S-DAT. Additional information: This function can be used to resolve the memory issue "083 Memory content inconsistent" or to restore the S-DAT data when a new S-DAT has been installed. ℹ️ This option is displayed only in an alarm condition.

12.13   Device information

The **Device information** submenu contains all parameters that display different information for device identification.

Navigation
"Diagnostics" menu → Device information

▶ **Device information**		
	Device tag	→ 🗎 189
	Serial number	→ 🗎 189
	Firmware version	→ 🗎 189
	Device name	
	Order code	→ 🗎 189
	Extended order code 1	→ 🗎 189
	Extended order code 2	→ 🗎 190
	Extended order code 3	→ 🗎 190
	ENP version	→ 🗎 190

Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Device tag	Shows name of measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).	–
Serial number	Shows the serial number of the measuring device.	Max. 11-digit character string comprising letters and numbers.	–
Firmware version	Shows the device firmware version installed.	Character string in the format xx.yy.zz	–
Device name		Max. 32 characters such as letters or numbers.	–
Order code	Shows the device order code. ⓘ The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field.	Character string composed of letters, numbers and certain punctuation marks (e.g. /).	–
Extended order code 1	Shows the 1st part of the extended order code. ⓘ The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–

Parameter	Description	User interface	Factory setting
Extended order code 2	Shows the 2nd part of the extended order code. ℹ️ The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–
Extended order code 3	Shows the 3rd part of the extended order code. ℹ️ The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–
ENP version	Shows the version of the electronic nameplate (ENP).	Character string	–

12.14 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware Changes	Documentation type	Documentation
10.2017	01.00.zz	Option **77**	Original firmware	Operating Instructions	BA01720D

ℹ️ It is possible to flash the firmware to the current version or the previous version using the service interface.

📖 For the compatibility of the firmware version with the previous version, the installed device description files and operating tools, observe the information about the device in the "Manufacturer's information" document.

ℹ️ The manufacturer's information is available:
- In the Download Area of the Endress+Hauser web site: www.endress.com → Downloads
- Specify the following details:
  - Product root: e.g. 5H5B
    The product root is the first part of the order code: see the nameplate on the device.
  - Text search: Manufacturer's information
  - Media type: Documentation – Technical Documentation

13   Maintenance

13.1   Maintenance work

No special maintenance work is required.

13.1.1   Exterior cleaning

When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing or the gaskets.

13.1.2   Interior cleaning

Cleaning with pigs

It is essential to take the internal diameters of the measuring tube and process connection into account when cleaning with pigs. All the dimensions and lengths of the sensor and transmitter are provided in the separate "Technical Information" document.

13.1.3   Replacing seals

The sensor's seals (particularly aseptic molded seals) must be replaced periodically.

The interval between changes depends on the frequency of the cleaning cycles, the cleaning temperature and the medium temperature.

Replacement seals (accessory part) → 🖥 225

13.2   Measuring and test equipment

Endress+Hauser offers a variety of measuring and testing equipment, such as Netilion or device tests.

🛈 Your Endress+Hauser Sales Center can provide detailed information on the services.

List of some of the measuring and testing equipment: → 🖥 196

13.3   Endress+Hauser services

Endress+Hauser offers a wide variety of services for maintenance such as recalibration, maintenance service or device tests.

🛈 Your Endress+Hauser Sales Center can provide detailed information on the services.

14   Repair

14.1   General notes

14.1.1   Repair and conversion concept

The Endress+Hauser repair and conversion concept provides for the following:
• The measuring devices have a modular design.
• Spare parts are grouped into logical kits with the associated Installation Instructions.
• Repairs are carried out by Endress+Hauser Service or by appropriately trained customers.
• Certified devices can only be converted to other certified devices by Endress+Hauser Service or at the factory.

14.1.2   Notes for repair and conversion

For repair and conversion of a measuring device, observe the following notes:
▶ Use only original Endress+Hauser spare parts.
▶ Carry out the repair according to the Installation Instructions.
▶ Observe the applicable standards, federal/national regulations, Ex documentation (XA) and certificates.
▶ Document all repairs and conversions and enter the details in Netilion Analytics.

14.2   Spare parts

Device Viewer (www.endress.com/deviceviewer):
All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.

ℹ️ Measuring device serial number:
   • Is located on the nameplate of the device.
   • Can be read out via the **Serial number** parameter (→ 🔖 189) in the **Device information** submenu.

14.3   Endress+Hauser services

Endress+Hauser offers a wide range of services.

ℹ️ Your Endress+Hauser Sales Center can provide detailed information on the services.

14.4   Return

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

1. Refer to the web page for information:
   https://www.endress.com/support/return-material
   ↳ Select the region.

2. If returning the device, pack the device in such a way that it is reliably protected against impact and external influences. The original packaging offers the best protection.

14.5   Disposal

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

14.5.1   Removing the measuring device

1. Switch off the device.

⚠ WARNING

Danger to persons from process conditions!
▸ Beware of hazardous process conditions such as pressure in the measuring device, high temperatures or aggressive media.

2. Carry out the mounting and connection steps from the "Mounting the measuring device" and "Connecting the measuring device" sections in reverse order. Observe the safety instructions.

14.5.2   Disposing of the measuring device

⚠ WARNING

Danger to personnel and environment from fluids that are hazardous to health.
▸ Ensure that the measuring device and all cavities are free of fluid residues that are hazardous to health or the environment, e.g. substances that have permeated into crevices or diffused through plastic.

Observe the following notes during disposal:
▸ Observe valid federal/national regulations.
▸ Ensure proper separation and reuse of the device components.

15   Accessories

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

15.1   Device-specific accessories

15.1.1   For the transmitter

Accessories	Description
Transmitter • Proline 500 – digital • Proline 500	Transmitter for replacement or storage. Use the order code to define the following specifications: • Approvals • Output • Input • Display/operation • Housing • Software ⓘ • Proline 500 – digital transmitter: 　　Order number: 5X5BXX-*********A 　• Proline 500 transmitter: 　　Order number: 5X5BXX-*********B ⓘ Proline 500 transmitter for replacement: It is essential to specify the serial number of the current transmitter when ordering. On the basis of the serial number, the device-specific data (e.g. calibration factors) of the replaced device can be used for the new transmitter. 📖 • Proline 500 – digital transmitter: Installation Instructions EA01151D 　• Proline 500 transmitter: Installation Instructions EA01152D
External WLAN antenna	External WLAN antenna with 1.5 m (59.1 in) connecting cable and two angle brackets. Order code for "Accessory enclosed", option P8 "Wireless antenna wide area". ⓘ • The external WLAN antenna is not suitable for use in hygienic applications. 　• Additional information regarding the WLAN interface → 🖺 95. ⓘ Order number: 71351317 📖 Installation Instructions EA01238D
Pipe mounting set	Pipe mounting set for transmitter. ⓘ Proline 500 – digital transmitter Order number: 71346427 📖 Installation Instructions EA01195D ⓘ Proline 500 transmitter Order number: 71346428
Weather protection cover Transmitter • Proline 500 – digital • Proline 500	Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight. ⓘ • Proline 500 – digital transmitter 　　Order number: 71343504 　• Proline 500 transmitter 　　Order number: 71343505 📖 Installation Instructions EA01191D

Display guard Proline 500 – digital	Is used to protect the display against impact or scoring, for example from sand in desert areas. ℹ️ Order number: 71228792 📖 Installation Instructions EA01093D
Connecting cable Proline 500 – digital Sensor – Transmitter	The connecting cable can be ordered directly with the measuring device (order code for "Cable, sensor connection) or as an accessory (order number DK5012). The following cable lengths are available: order code for "Cable, sensor connection" • Option B: 20 m (65 ft) • Option E: User-configurable up to max. 50 m • Option F: User-configurable up to max. 165 ft ℹ️ Maximum possible cable length for a Proline 500 – digital connecting cable: 300 m (1 000 ft)
Connecting cables Proline 500 Sensor – Transmitter	The connecting cable can be ordered directly with the measuring device (order code for "Cable, sensor connection") or as an accessory (order number DK5012). The following cable lengths are available: order code for "Cable, sensor connection" • Option 1: 5 m (16 ft) • Option 2: 10 m (32 ft) • Option 3: 20 m (65 ft) • Option 4: User-configurable cable length (m) • Option 5: User-configurable cable length (ft) ℹ️ Possible cable length for a Proline 500 connecting cable: depending on the medium conductivity, max. 200 m (660 ft)

15.1.2 For the sensor

Accessories	Description
Adapter set	Adapter connections for installing a Promag H instead of a Promag 30/33 A or Promag 30/33 H (DN 25). Consists of: • 2 process connections • Screws • Seals
Seal set	For the regular replacement of seals for the sensor.
Spacer	If replacing a DN 80/100 sensor in an existing installation, a spacer is needed if the new sensor is shorter.
Welding jig	Welding socket as process connection: welding jig for installation in pipe.
Grounding rings	Are used to ground the medium in lined measuring tubes to ensure proper measurement. ℹ️ Grounding rings can be ordered via the device order structure or configured and ordered as an accessory via the DK5HR order structure.
Ground disks	Are used to ground the medium in lined measuring tubes to ensure proper measurement. 📖 For details, see Installation Instructions EA00070D
Mounting kit	Consists of: • 2 process connections • Screws • Seals
Wall mounting kit	Wall mounting kit for measuring device (only DN 2 to 25 (1/12 to 1"))

15.2   Communication-specific accessories

Accessories	Description
Fieldgate FXA42	Transmission of the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices • Technical Information TI01297S • Operating Instructions BA01778S • Product page: www.endress.com/fxa42
Field Xpert SMT50	The Field Xpert SMT50 table PC for device configuration enables mobile plant asset management. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle. • Technical Information TI01555S • Operating Instructions BA02053S • Product page: www.endress.com/smt50
Field Xpert SMT70	The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle. • Technical Information TI01342S • Operating Instructions BA01709S • Product page: www.endress.com/smt70
Field Xpert SMT77	The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1. • Technical Information TI01418S • Operating Instructions BA01923S • Product page: www.endress.com/smt77

15.3   Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: • Choice of measuring devices for industrial requirements • Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy. • Graphic illustration of the calculation results • Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: • Via the Internet: https://portal.endress.com/webapp/applicator • As a downloadable DVD for local PC installation.
Netilion	lloT ecosystem: Unlock knowledge Endress+Hauser 's Netilion lloT ecosystem enables you to optimize your plant performance, digitize workflows, share knowledge and improve collaboration. Based on decades of experience in process automation, Endress+Hauser offers the process industry an lloT ecosystem that enables you to gain useful insights from data. This knowledge can be used to optimize processes, leading to higher plant availability, efficiency and reliability, and ultimately to a more profitable plant. www.netilion.endress.com

Accessories	Description
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. 📖 Operating Instructions BA00027S and BA00059S
DeviceCare	Tool to connect and configure Endress+Hauser field devices. 📖 Innovation brochure IN01047S

15.4   System components

Accessories	Description
Memograph M graphic data manager	The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick. 📖 ▪ Technical Information TI00133R ▪ Operating Instructions BA00247R
iTEMP	The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature. 📖 "Fields of Activity" document FA00006T

16 Technical data

16.1 Application

The measuring device is intended only for the flow measurement of liquids with a minimum conductivity of 5 µS/cm.

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

To ensure that the device remains in proper operating condition for its service life, use the measuring device only for media against which the process-wetted materials are sufficiently resistant.

16.2 Function and system design

Measuring principle	Electromagnetic flow measurement on the basis of *Faraday's law of magnetic induction.*
Measuring system	The measuring system consists of a transmitter and a sensor. The transmitter and sensor are mounted in physically separate locations. They are interconnected by connecting cables. For information on the structure of the measuring instrument → 🕮 13

16.3 Input

Measured variable

Direct measured variables

- Volume flow (proportional to induced voltage)
- Temperature [2]
- Electrical conductivity

Calculated measured variables

- Mass flow
- Corrected volume flow
- Corrected electrical conductivity [2]

Measuring range

Typically v = 0.01 to 10 m/s (0.03 to 33 ft/s) with the specified accuracy

Flow characteristic values in SI units: DN 2 to 125 ($\frac{1}{12}$ to 5")

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[dm³/min]	[dm³/min]	[dm³]	[dm³/min]
2	$\frac{1}{12}$	0.06 to 1.8	0.5	0.005	0.01
4	$\frac{5}{32}$	0.25 to 7	2	0.025	0.05

---

[2] Available only for nominal diameters DN 15 to 150 (½ to 6") and with the order code for "Sensor option", option CI "Medium temperature measurement".

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[dm³/min]	[dm³/min]	[dm³]	[dm³/min]
8	5/16	1 to 30	8	0.1	0.1
15	½	4 to 100	25	0.2	0.5
25 [1]	1	9 to 300	75	0.5	1
40	1 ½	25 to 700	200	1.5	3
50	2	35 to 1 100	300	2.5	5
65	–	60 to 2 000	500	5	8
80	3	90 to 3 000	750	5	12
100	4	145 to 4 700	1200	10	20
125	5	220 to 7 500	1850	15	30

[1]   The values apply for the product version: 5HxB26

Flow characteristic values in SI units: DN 150 (6")

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[m³/h]	[m³/h]	[m³]	[m³/h]
150	6	20 to 600	150	0.03	2.5

Flow characteristic values in US units: 1/12 - 6" (DN 2 - 150)

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/min]
1/12	2	0.015 to 0.5	0.1	0.001	0.002
1/32	4	0.07 to 2	0.5	0.005	0.008
5/16	8	0.25 to 8	2	0.02	0.025
½	15	1 to 27	6	0.05	0.1
1 [1]	25	2.5 to 80	18	0.2	0.25
1 ½	40	7 to 190	50	0.5	0.75
2	50	10 to 300	75	0.5	1.25
3	80	24 to 800	200	2	2.5
4	100	40 to 1 250	300	2	4

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/ min]
5	125	60 to 1950	450	5	7
6	150	90 to 2650	600	5	12

1) The values apply for the product version: 5HxB26

Recommended measuring range

Flow limit → 🛈 213

For custody transfer, the applicable approval determines the permitted measuring range, the pulse value and the low flow cut off.

Operable flow range

Over 1000 : 1

For custody transfer, the operable flow range is 100 : 1 to 630 : 1, depending on the nominal diameter. Further details are specified by the applicable approval.

Input signal

External measured values

To increase the measurement accuracy of certain measured variables or to calculate the mass flow, the automation system can continuously write different measured values to the measuring instrument:
- Medium temperature enables temperature-compensated conductivity measurement (e.g. iTEMP)
- Reference density for calculating the mass flow

Various pressure and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section → 🛈 197

It is recommended to read in external measured values to calculate the corrected volume flow.

Current input

The measured values are written from the automation system to the measuring device via the current input → 🛈 200.

Digital communication

The measured values are written by the automation system via Ethernet/IP.

Current input 0/4 to 20 mA

Current input	0/4 to 20 mA (active/passive)
Current span	• 4 to 20 mA (active) • 0/4 to 20 mA (passive)
Resolution	1 µA
Voltage drop	Typically: 0.6 to 2 V for 3.6 to 22 mA (passive)
Maximum input voltage	≤ 30 V (passive)

Open-circuit voltage	≤ 28.8 V (active)
Possible input variables	• Temperature • Density

Status input

Maximum input values	• DC −3 to 30 V • If status input is active (ON): R_i >3 kΩ
Response time	Configurable: 5 to 200 ms
Input signal level	• Low signal: DC −3 to +5 V • High signal: DC 12 to 30 V
Assignable functions	• Off • Reset the individual totalizers separately • Reset all totalizers • Flow override

16.4   Output

Output signal   **EtherNet/IP**

Standards	In accordance with IEEE 802.3

Current output 4 to 20 mA

Signal mode	Can be set to: • Active • Passive
Current range	Can be set to: • 4 to 20 mA NAMUR • 4 to 20 mA US • 4 to 20 mA • 0 to 20 mA (only if the signal mode is active) • Fixed current
Maximum output values	22.5 mA
Open-circuit voltage	DC 28.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	0 to 700 Ω
Resolution	0.38 µA
Damping	Configurable: 0 to 999.9 s
Assignable measured variables	• Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity • Corrected conductivity • Temperature • Electronics temperature

Current output 4 to 20 mA Ex i passive

Order code	"Output; input 2" (21), "Output; input 3" (022): Option C: current output 4 to 20 mA Ex i passive
Signal mode	Passive
Current range	Can be set to: • 4 to 20 mA NAMUR • 4 to 20 mA US • 4 to 20 mA • Fixed current
Maximum output values	22.5 mA
Maximum input voltage	DC 30 V
Load	0 to 700 Ω
Resolution	0.38 µA

Damping	Configurable: 0 to 999 s
Assignable measured variables	• Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity • Corrected conductivity • Temperature • Electronics temperature

Pulse/frequency/switch output

Function	Can be configured as pulse, frequency or switch output
Version	Open collector Can be set to: • Active • Passive • Passive NAMUR ⓘ Ex-i, passive
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Voltage drop	For 22.5 mA: ≤ DC 2 V
Pulse output	
Maximum input values	DC 30 V, 250 mA (passive)
Maximum output current	22.5 mA (active)
Open-circuit voltage	DC 28.8 V (active)
Pulse width	Configurable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Configurable
Assignable measured variables	• Volume flow • Mass flow • Corrected volume flow
Frequency output	
Maximum input values	DC 30 V, 250 mA (passive)
Maximum output current	22.5 mA (active)
Open-circuit voltage	DC 28.8 V (active)
Output frequency	Configurable: end value frequency 2 to 10 000 Hz (f_{max} = 12 500 Hz)
Damping	Configurable: 0 to 999.9 s
Pulse/pause ratio	1:1
Assignable measured variables	• Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity • Corrected conductivity • Temperature • Electronics temperature
Switch output	
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Switching behavior	Binary, conductive or non-conductive

Switching delay	Configurable: 0 to 100 s
Number of switching cycles	Unlimited

Assignable functions	• Disable
	• On
	• Diagnostic behavior
	• Limit value:
	  • Disable
	  • Volume flow
	  • Mass flow
	  • Corrected volume flow
	  • Flow velocity
	  • Conductivity
	  • Corrected conductivity
	  • Totalizer 1-3
	  • Temperature
	  • Electronics temperature
	• Flow direction monitoring
	• Status
	  • Empty pipe detection
	  • Buildup index
	  • HBSI limit value exceeded
	  • Low flow cut off

Relay output

Function	Switch output
Version	Relay output, galvanically isolated
Switching behavior	Can be set to: • NO (normally open), factory setting • NC (normally closed)
Maximum switching capacity (passive)	• DC 30 V, 0.1 A • AC 30 V, 0.5 A

Assignable functions	• Disable
	• On
	• Diagnostic behavior
	• Limit value:
	  • Disable
	  • Volume flow
	  • Mass flow
	  • Corrected volume flow
	  • Flow velocity
	  • Conductivity
	  • Corrected conductivity
	  • Totalizer 1-3
	  • Temperature
	  • Electronics temperature
	• Flow direction monitoring
	• Status
	  • Empty pipe detection
	  • Buildup index
	  • HBSI limit value exceeded
	  • Low flow cut off

User-configurable input/output

One specific input or output is assigned to a user-configurable input/output (configurable I/O) during device commissioning.

The following inputs and outputs are available for assignment:
• Choice of current output: 4 to 20 mA (active), 0/4 to 20 mA (passive)
• Pulse/frequency/switch output
• Choice of current input: 4 to 20 mA (active), 0/4 to 20 mA (passive)
• Status input

Signal on alarm	Depending on the interface, failure information is displayed as follows:

EtherNet/IP

Device diagnostics	Device condition can be read out in Input Assembly

Current output 0/4 to 20 mA

4 to 20 mA

Failure mode	Choose from: • 4 to 20 mA in accordance with NAMUR recommendation NE 43 • 4 to 20 mA in accordance with US • Min. value: 3.59 mA • Max. value: 22.5 mA • Definable value between: 3.59 to 22.5 mA • Actual value • Last valid value

0 to 20 mA

Failure mode	Choose from: • Maximum alarm: 22 mA • Definable value between: 0 to 20.5 mA

Pulse/frequency/switch output

Pulse output	
Fault mode	Choose from: • Actual value • No pulses
Frequency output	
Fault mode	Choose from: • Actual value • 0 Hz • Definable value between: 2 to 12 500 Hz
Switch output	
Fault mode	Choose from: • Current status • Open • Closed

Relay output

Failure mode	Choose from: • Current status • Open • Closed

Local display

Plain text display	With information on cause and remedial measures
Backlight	Red lighting indicates a device error.

ℹ Status signal as per NAMUR recommendation NE 107

Interface/protocol

- Via digital communication:
  EtherNet/IP
- Via service interface
  - CDI-RJ45 service interface
  - WLAN interface

Plain text display	With information on cause and remedial measures

Web browser

Plain text display	With information on cause and remedial measures

Light emitting diodes (LED)

Status information	Status indicated by various light emitting diodes
	The following information is displayed depending on the device version: • Supply voltage active • Data transmission active • Device alarm/error has occurred • EtherNet/IP network available • EtherNet/IP connection established **ℹ** Diagnostic information via light emitting diodes → 🖺 163

Low flow cut off	The switch points for low flow cut off are user-selectable.

Galvanic isolation	The outputs are galvanically isolated: • from the power supply • from one another • from the potential equalization (PE) terminal

Protocol-specific data		
	Protocol	• The CIP Networks Library Volume 1: Common Industrial Protocol • The CIP Networks Library Volume 2: EtherNet/IP Adaptation of CIP
	Communication type	• 10Base-T • 100Base-TX
	Device profile	Generic device (product type: 0x2B)
	Manufacturer ID	0x000049E
	Device type ID	0x103C
	Baud rates	Automatic $^{10}/_{100}$ Mbit with half-duplex and full-duplex detection
	Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
	Supported CIP connections	Max. 3 connections
	Explicit connections	Max. 6 connections

I/O connections	Max. 6 connections (scanner)
Configuration options for measuring device	• DIP switches on the electronics module for IP addressing • Manufacturer-specific software (FieldCare) • Add-on Profile Level 3 for Rockwell Automation control systems • Web browser • Electronic Data Sheet (EDS) integrated in the measuring device
Configuration of the EtherNet interface	• Speed: 10 MBit, 100 MBit, auto (factory setting) • Duplex: half-duplex, full-duplex, auto (factory setting)
Configuration of the device address	• DIP switches on the electronics module for IP addressing (last octet) • DHCP • Manufacturer-specific software (FieldCare) • Add-on Profile Level 3 for Rockwell Automation control systems • Web browser • EtherNet/IP tools, e.g. RSLinx (Rockwell Automation)
Device Level Ring (DLR)	Yes
System integration	Information regarding system integration → 🕮 100. • Cyclic data transmission • Block model • Input and output groups

16.5 Power supply

Terminal assignment → 🕮 40

Available device plugs → 🕮 41

Supply voltage

Order code "Power supply"	Terminal voltage		Frequency range
Option **D**	DC 24 V	±20%	–
Option **E**	AC 100 to 240 V	−15...+10%	50/60 Hz, ±4 Hz
Option **I**	DC 24 V	±20%	–
	AC 100 to 240 V	−15...+10%	50/60 Hz, ±4 Hz

Power consumption

Transmitter

Max. 10 W (active power)

switch-on current	Max. 36 A (<5 ms) as per NAMUR Recommendation NE 21

Current consumption

Transmitter

• Max. 400 mA (24 V)
• Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz)

Power supply failure

• Totalizers stop at the last value measured.
• Depending on the device version, the configuration is retained in the device memory or in the pluggable data memory (HistoROM DAT).
• Error messages (incl. total operated hours) are stored.

Overcurrent protection element	The device must be operated with a dedicated circuit breaker, as it does not have an ON/OFF switch of its own. • The circuit breaker must be easy to reach and labeled accordingly. • Permitted nominal current of the circuit breaker: 2 A up to maximum 10 A.
Electrical connection	• → 🖹 44 • → 🖹 54
Potential equalization	
Terminals	Spring-loaded terminals: Suitable for strands and strands with ferrules. Conductor cross-section 0.2 to 2.5 mm² (24 to 12 AWG).

Cable entries	• Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
	• Thread for cable entry:
	  • NPT ½"
	  • G ½"
	  • M20
	• Device plug for digital communication: M12
	• Device plug for connecting cable: M12
	  A device plug is always used for the device version with the order code for "Sensor connection housing", option **C** "Ultra-compact, hygienic, stainless".

Cable specification	→ 🖹 36

Overvoltage protection	Mains voltage fluctuations	→ 🖹 207
	Overvoltage category	Overvoltage category II
	Short-term, temporary overvoltage	Between cable and ground up to 1200 V, for max. 5 s
	Long-term, temporary overvoltage	Between cable and ground up to 500 V

16.6   Performance characteristics

Reference operating conditions	• Error limits following DIN EN 29104, in future ISO 20456 • Water, typically: +15 to +45 ℃ (+59 to +113 ℉); 0.5 to 7 bar (73 to 101 psi) • Data as indicated in the calibration protocol • Accuracy based on accredited calibration rigs according to ISO 17025 • Reference temperature for conductivity measurement: 25 ℃ (77 ℉)
Maximum measurement error	o.r. = of reading **Maximum permissible error under reference operating conditions** *Volume flow* • ±0.5 % o.r. ± 1 mm/s (0.04 in/s) • Optional: ±0.2 % o.r. ± 2 mm/s (0.08 in/s) ℹ️ Fluctuations in the supply voltage do not have any effect within the specified range.
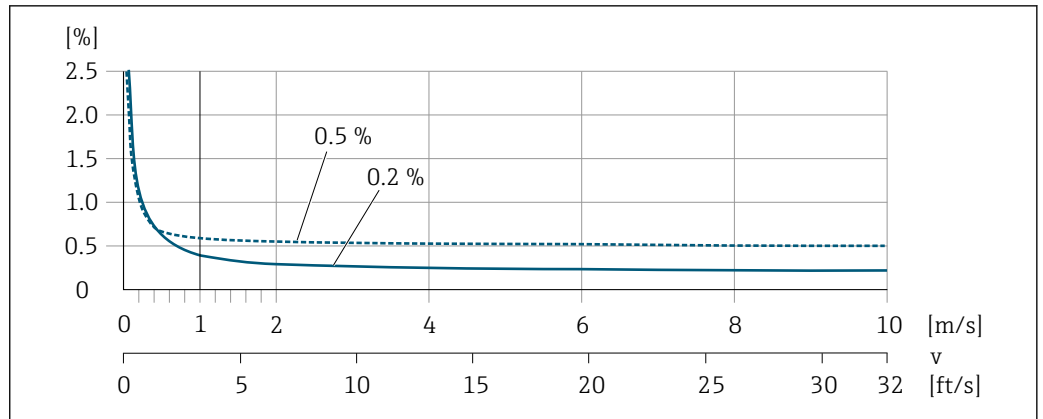
40   Maximum measured error in % o.r.

Temperature

±3 ℃ (±5.4 ℉)

Electrical conductivity

The values apply for:
• Devices with stainless steel process connections
• Proline 500 – digital device version
• Measurements at a reference temperature of 25 ℃ (77 ℉). At different temperatures,
  attention must be paid to the temperature coefficient of the medium (typically 2.1 %/K)

Conductivity [µS/cm]	Nominal diameter		Measurement error [%] of reading
	[mm]	[in]	
5 to 20	15...150	½...6	± 20%
> 20 to 50	15...150	½...6	± 10%
> 50 to 10 000	2...8	$\frac{1}{12}$ to $\frac{5}{16}$	± 10%
	15...150	½...6	• Standard: ± 10% • Optional [1]: ± 5%
> 10 000 to 20 000	2...150	$\frac{1}{12}$ to 6	± 10%
> 20 000 to 100 000	2...150	$\frac{1}{12}$ to 6	± 20%

1)   Order code for "Calibrated conductivity measurement", option CW
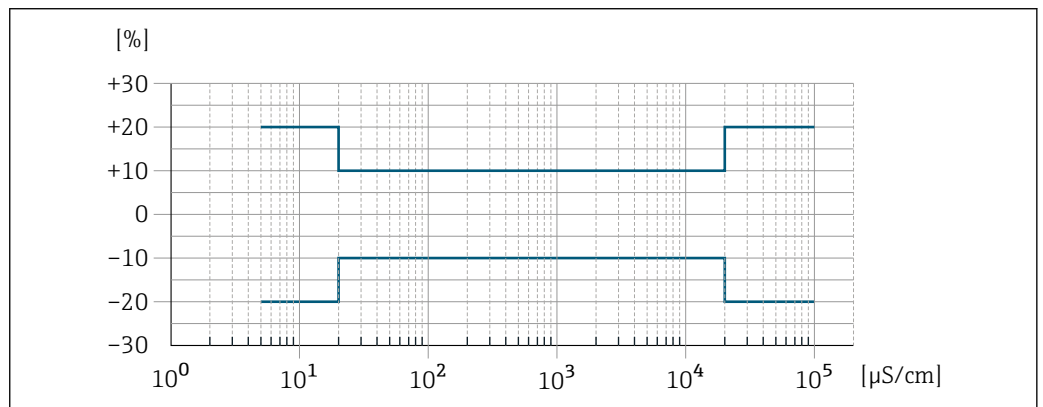
41   Measurement error (standard)
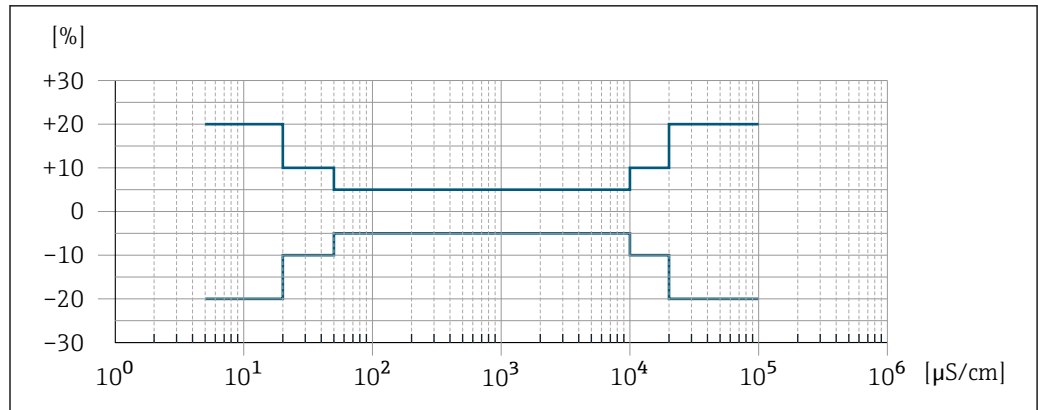
42   Measurement error (optional: order code for "Calibrated conductivity measurement", option CW)

| Repeatability | o.r. = of reading |
| | |

o.r. = of reading

Volume flow
Max. ±0.1 % o.r. ± 0.5 mm/s (0.02 in/s)

Temperature
±0.5 ℃ (±0.9 ℉)

Electrical conductivity
- Max. ±5 % o.r.
- Max. ±1 % o.r. for DN 15 to 150 in conjunction with process connections made of stainless steel 1.4404 (F316L)

| Temperature measurement response time | T_{90} < 15 s |

| Influence of ambient temperature | **Current output** |

Current output

Temperature coefficient	Max. 1 µA/℃

Pulse/frequency output

Temperature coefficient	No additional effect. Included in accuracy.

16.7   Mounting

| Mounting requirements | → 🖹 21 |

16.8   Environment

| Ambient temperature range | → 🖹 26 |

Temperature tables

ℹ️   Observe the interdependencies between the permitted ambient and fluid temperatures when operating the device in hazardous areas.

📖   For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.

Storage temperature	The storage temperature corresponds to the operating temperature range of the transmitter and the sensor → 🔲 26. • Protect the measuring device against direct sunlight during storage in order to avoid unacceptably high surface temperatures. • Select a storage location where moisture cannot collect in the measuring device as fungus or bacteria infestation can damage the liner. • If protection caps or protective covers are mounted these should never be removed before installing the measuring device.
Atmosphere	Additional protection against condensation and moisture: the sensor housing is potted with a gel. Order code for "Sensor option", option CF "Harsh environment".
Relative humidity	The device is suitable for use outdoors and indoors with a relative humidity of 4 to 95 %.
Operating height	According to EN 61010-1 • ≤ 2 000 m (6 562 ft) • > 2 000 m (6 562 ft) with additional overvoltage protection (e.g. Endress+Hauser HAW Series)
Degree of protection	**Transmitter** • IP66/67, Type 4X enclosure, suitable for pollution degree 4 • When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2 • Display module: IP20, Type 1 enclosure, suitable for pollution degree 2 **Sensor** • IP66/67, Type 4X enclosure, suitable for pollution degree 4 • When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2 **External WLAN antenna** IP67
Vibration-resistance and shock-resistance	**Vibration sinusoidal, in accordance with IEC 60068-2-6** • 2 to 8.4 Hz, 7.5 mm peak • 8.4 to 2 000 Hz, 2 g peak **Vibration broad-band random, according to IEC 60068-2-64** • 10 to 200 Hz, 0.01 g^2/Hz • 200 to 2 000 Hz, 0.003 g^2/Hz • Total: 2.70 g rms **Shock half-sine, according to IEC 60068-2-27** 6 ms 50 g

Rough handling shocks according to IEC 60068-2-31

Internal cleaning	• CIP cleaning • SIP cleaning
Mechanical load	Transmitter housing and sensor connection housing: • Protect against mechanical effects, such as shock or impact • Do not use as a ladder or climbing aid
Electromagnetic compatibility (EMC)	• As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21) • As per IEC/EN 61000-6-2 and IEC/EN 61000-6-4

📖 Details are provided in the Declaration of Conformity.

ℹ️ This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.

16.9   Process

Medium temperature range   −20 to +150 °C (−4 to +302 °F)
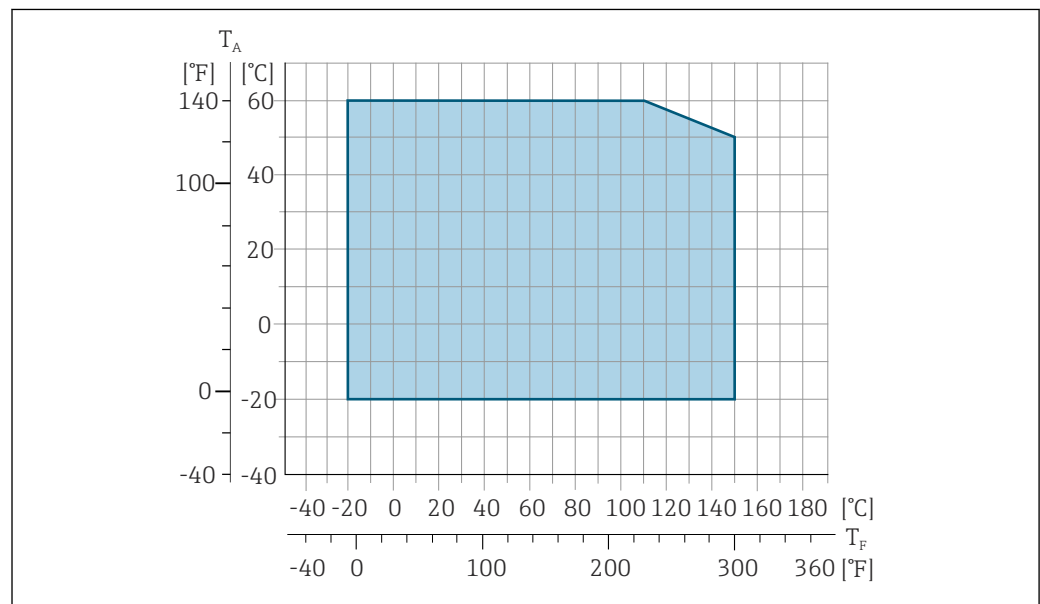
🖾 *43   Promag 500 – digital*

T_A *Ambient temperature range*

T_F *Fluid temperature*
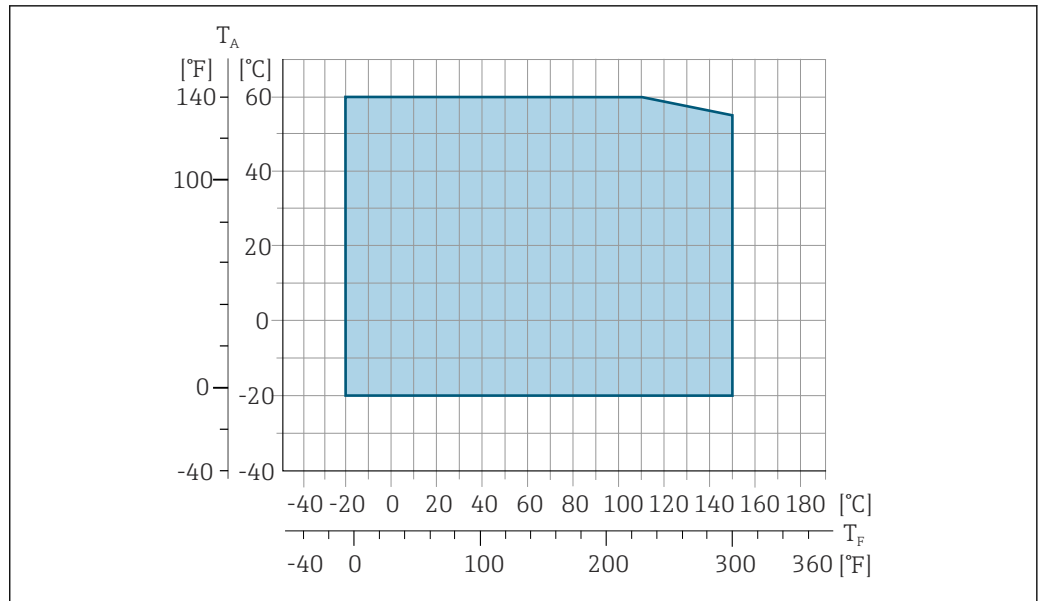
44 Promag 500

T_A   Ambient temperature range
T_F   Fluid temperature

ℹ️ The permitted fluid temperature in custody transfer is 0 to +50 ℃ (+32 to +122 ℉).

Conductivity	≥5 µS/cm for liquids in general. ℹ️ Proline 500 The necessary minimum conductivity also depends on the length of the connecting cable → 🔲 27.
Pressure-temperature ratings	📖 For an overview of the pressure-temperature ratings for the process connections, see the Technical Information

Pressure tightness

Liner: PFA

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:				
[mm]	[in]	+25 ℃ (+77 ℉)	+80 ℃ (+176 ℉)	+100 ℃ (+212 ℉)	+130 ℃ (+266 ℉)	+150 ℃ (+302 ℉)
2 to 150	¹⁄₁₂ to 6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Flow limit

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 to 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the medium:
- v < 2 m/s (6.56 ft/s): for low conductivity values
- v > 2 m/s (6.56 ft/s): for media producing buildup (e.g. milk with a high fat content)

ℹ️
- A necessary increase in the flow velocity can be achieved by reducing the sensor nominal diameter.
- In the case of media with a high solids content, a sensor with a nominal diameter > DN 8 (3/8") can improve the signal stability and cleanability due to the larger electrodes.

Pressure loss	• No pressure loss occurs as of nominal diameter DN 8 (5/16") if the sensor is installed in a pipe with the same nominal diameter. • Pressure losses for configurations incorporating adapters according to DIN EN 545 → 🖹 26

System pressure	→ 🖹 26

Vibrations	→ 🖹 26

16.10 Mechanical construction

Design, dimensions	📖 For the dimensions and installation lengths of the device, see the "Technical Information" document, "Mechanical construction" section

Weight	All values (weight exclusive of packaging material) refer to devices with flanges of the standard pressure rating. The weight may be lower than indicated depending on the pressure rating and design. **Transmitter** • Proline 500 – digital polycarbonate: 1.4 kg (3.1 lbs) • Proline 500 – digital aluminum: 2.4 kg (5.3 lbs) • Proline 500 aluminum: 6.5 kg (14.3 lbs) **Sensor** Sensor with aluminum connection housing version:

Nominal diameter		Weight	
[mm]	[in]	[kg]	[lbs]
2	1/12	2.00	4.41
4	5/32	2.00	4.41
8	5/16	2.00	4.41
15	½	1.90	4.19
25	1	2.80	6.17
40	1 ½	4.10	9.04
50	2	4.60	10.1
65	–	5.40	11.9
80	3	6.00	13.2
100	4	7.30	16.1
125	5	12.7	28.0
150	6	15.1	33.3

Measuring tube specification		Nominal diameter		Pressure rating [1]	Process connection internal diameter	
				EN (DIN)	PFA	
		[mm]	[in]	[bar]	[mm]	[in]
		2	1/12	PN 16/40	2.25	0.09
		4	5/32	PN 16/40	4.5	0.18
		8	5/16	PN 16/40	9.0	0.35

Nominal diameter		Pressure rating [1]	Process connection internal diameter	
		EN (DIN)	PFA	
[mm]	[in]	[bar]	[mm]	[in]
15	½	PN 16/40	16.0	0.63
–	1	PN 16/40	22.6 [2]	0.89 [2]
25	–	PN 16/40	26.0 [3]	1.02 [3]
40	1 ½	PN 16/25/40	35.3	1.39
50	2	PN 16/25	48.1	1.89
65	–	PN 16/25	59.9	2.36
80	3	PN 16/25	72.6	2.86
100	4	PN 16/25	97.5	3.84
125	5	PN 10/16	120.0	4.72
150	6	PN 10/16	146.5	5.77

1)   Depending on process connection and seals used
2)   Order code 5H**22
3)   Order code 5H**26

Materials   **Transmitter housing**

Housing of Proline 500 – digital transmitter

Order code for "Transmitter housing":
• Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
• Option **D** "Polycarbonate": polycarbonate

Housing of Proline 500 transmitter

Order code for "Transmitter housing":
Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated

Window material

Order code for "Transmitter housing":
• Option **A** "Aluminum, coated": glass
• Option **D** "Polycarbonate": plastic

Sensor connection housing

Order code for "Sensor connection housing":
• Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
• Option **B** "Stainless, hygienic":
  Stainless steel 1.4301 (304)
• Option **C** "Ultra-compact hygienic, stainless":
  Stainless steel 1.4301 (304)

Cable entries/cable glands

Cable entries and adapters	Material
Cable gland M20 × 1.5	Plastic

• Adapter for cable entry with female thread G ½"
• Adapter for cable entry with female thread NPT ½"
 	
ℹ Only available for certain device versions:
 • Order code for "Transmitter housing":
  • Option A "Aluminum, coated"
  • Option D "Polycarbonate"
 • Order code for "Sensor connection housing":
  • Proline 500 – digital:
   Option A "Aluminum coated"
   Option B "Stainless"
  • Proline 500:
   Option A "Aluminum coated"
   Option C "Stainless, hygienic"
	Nickel-plated brass

Connecting cables

ℹ UV rays can impair the cable outer sheath. Protect the cable from exposure to sun as much as possible.

Connecting cable for sensor - Proline 500 – digital transmitter

PVC cable with copper shield

Connecting cable for sensor - Proline 500 transmitter

PVC cable with copper shield

Sensor housing

Stainless steel 1.4301 (304)

Measuring tubes

Stainless steel 1.4301 (304)

Liner

PFA (USP Class VI, FDA 21 CFR 177.2600)

Process connections

• Stainless steel, 1.4404 (F316L)
• PVDF
• PVC adhesive sleeve

Electrodes

Standard: 1.4435 (316L)

Seals

• O-ring seal, DN 2 to 25 (1/12 to 1"): EPDM, FKM [3], Kalrez
• Aseptic [4] gasket seal, DN 2 to 150 (1/12 to 6"): EPDM, FKM [3], VMQ (silicone)

Accessories

Protective cover

Stainless steel, 1.4404 (316L)

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3) USP Class VI, FDA 21 CFR 177.2600, 3A
4) In this context, aseptic means hygienic design

External WLAN antenna

- Antenna: ASA plastic (acrylonitrile styrene acrylate) and nickel-plated brass
- Adapter: Stainless steel and nickel-plated brass
- Cable: Polyethylene
- Plug: Nickel-plated brass
- Angle bracket: Stainless steel

Grounding rings

- Standard: 1.4435 (316L)
- Optional: Alloy C22, tantalum

Wall mounting kit

Stainless steel, 1.4301 (304) [5]

Centering star

1.4435 (F316L)

Fitted electrodes	• 2 measuring electrodes for signal detection • 1 empty pipe detection electrode for empty pipe detection/temperature measurement (only DN 15 to 150 (½ to 6"))
Process connections	With O-ring seal: • Welding nipple (DIN EN ISO 1127, ODT/SMS, ISO 2037) • Flange (EN (DIN), ASME, JIS) • Flange from PVDF (EN (DIN), ASME, JIS) • Male thread • Female thread • Hose connection • PVC adhesive sleeve With aseptic gasket seal: • Coupling (DIN 11851, DIN 11864-1, ISO 2853, SMS 1145) • Flange DIN 11864-2 For information on the different materials used in the process connections → 🖺 216
Surface roughness	Electrodes: • Stainless steel, 1.4435 (316L) electropolished ≤ 0.5 µm (19.7 µin) • Alloy C22, 2.4602 (UNSN06022); tantalum ≤ 0.5 µm (19.7 µin) (All data refer to parts in contact with the medium) Liner with PFA: ≤ 0.4 µm (15.7 µin) (All data refer to parts in contact with the medium) Stainless steel process connections: • With O-ring seal: ≤ 1.6 µm (63 µin) • With aseptic seal: Ra_{max} = 0.76 µm (31.5 µin) Optional: Ra_{max} = 0.38 µm (15 µin) electropolished (All data refer to parts in contact with the medium)

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5)   Does not meet the hygienic design installation guidelines.

16.11 Operability

Languages	Can be operated in the following languages: • Via local operation English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Vietnamese, Czech, Swedish • Via web browser English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Vietnamese, Czech, Swedish • Via "FieldCare", "DeviceCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese

Onsite operation	**Via display module** Features: • Order code for "Display; operation", option F "4-line, illuminated, graphic display; touch control'" • Order code for "Display; operation", option G "4-line, illuminated, graphic display; touch control + WLAN" ℹ Information about WLAN interface → 🖺 95
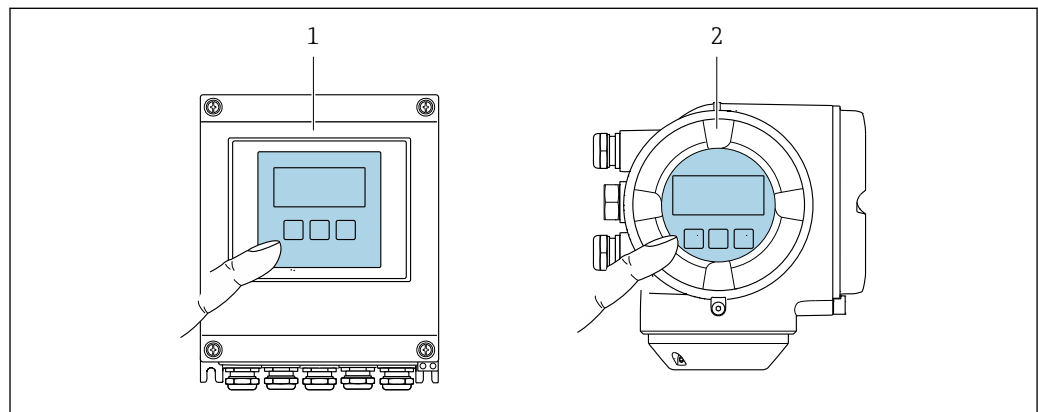
🖾 45 Operation with touch control

1 Proline 500 – digital
2 Proline 500

Display elements

- 4-line, illuminated, graphic display
- White background lighting; switches to red in event of device errors
- Format for displaying measured variables and status variables can be individually configured

Operating elements

- External operation via touch control (3 optical keys) without opening the housing: ⊞, ⊟, 𝔼
- Operating elements also accessible in the various zones of the hazardous area

Remote operation	→ 🖺 93

Service interface	→ 🖺 94

| Supported operating tools | | Different operating tools can be used for local or remote access to the measuring device. Depending on the operating tool used, access is possible with different operating units and via a variety of interfaces. |

Supported operating tools

Different operating tools can be used for local or remote access to the measuring device. Depending on the operating tool used, access is possible with different operating units and via a variety of interfaces.

Supported operating tools	Operating unit	Interface	Additional information
Web browser	Notebook, PC or tablet with Web browser	• CDI-RJ45 service interface • WLAN interface • Ethernet-based fieldbus (EtherNet/IP, PROFINET)	Special Documentation for device
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	• CDI-RJ45 service interface • WLAN interface • Fieldbus protocol	→ 🖹 196
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	• CDI-RJ45 service interface • WLAN interface • Fieldbus protocol	→ 🖹 196
Field Xpert	SMT70/77/50	• All fieldbus protocols • WLAN interface • Bluetooth • CDI-RJ45 service interface	Operating Instructions BA01202S Device description files: Use update function of handheld terminal
SmartBlue app	Smartphone or tablet with iOs or Android	WLAN	→ 🖹 196

ℹ️ Other operating tools based on FDT technology with a device driver such as DTM/ iDTM or DD/EDD can be used for device operation. These operating tools are available from the individual manufacturers. Integration into the following operating tools, among others, is supported:

- Field Device Manager (FDM) from Honeywell → www.process.honeywell.com
- FieldMate from Yokogawa → www.yokogawa.com
- PACTWare → www.pactware.com

The related device description files are available: www.endress.com → Download Area

Web server

With the integrated web server, the device can be operated and configured via a web browser and via the service interface (CDI-RJ45) or WLAN interface. The structure of the operating menu is the same as for the local display. In addition to the measured values, status information on the device is displayed and can be used to monitor device health. Furthermore the device data can be managed and the network parameters can be configured.

A device that has a WLAN interface (can be ordered as an option) is required for the WLAN connection: order code for "Display; operation", option G "4-line, illuminated; touch control + WLAN". The device acts as an Access Point and enables communication by computer or a mobile handheld terminal.

Supported functions
Data exchange between the operating unit (such as a notebook, for example,) and measuring device:
- Upload the configuration from the measuring device (XML format, configuration backup)
- Save the configuration to the measuring device (XML format, restore configuration)
- Export event list (.csv file)

- Export parameter settings (.csv file or PDF file, document the measuring point configuration)
- Export the Heartbeat verification report (PDF file, only available with the **Heartbeat Verification** → 🕮 224 application package)
- Flash firmware version for device firmware upgrade, for example
- Download driver for system integration
- Visualize up to 1000 saved measured values (only available with the **Extended HistoROM** application package→ 🕮 224)

HistoROM data management	The measuring device features HistoROM data management. HistoROM data management comprises both the storage and import/export of key device and process data, making operation and servicing far more reliable, secure and efficient.

When the device is delivered, the factory settings of the configuration data are stored as a backup in the device memory. This memory can be overwritten with an updated data record, for example after commissioning.

Additional information on the data storage concept

There are different types of data storage units in which device data are stored and used by the device:

	HistoROM backup	T-DAT	S-DAT
Available data	• Event logbook, e.g. diagnostic events • Parameter data record backup • Device firmware package • Driver for system integration for exporting via web server, e.g.: EDS for EtherNet/IP	• Measured value logging ("Extended HistoROM" order option) • Current parameter data record (used by firmware at run time) • Indicator (minimum/maximum values) • Totalizer value	• Sensor data: e.g. nominal diameter • Serial number • Calibration data • Device configuration (e.g. SW options, fixed I/O or multi I/O)
Storage location	Fixed on the user interface PC board in the connection compartment	Can be plugged into the user interface PC board in the connection compartment	In the sensor plug in the transmitter neck part

Data backup

Automatic
- The most important device data (sensor and transmitter) are automatically saved in the DAT modules
- If the transmitter or measuring device is replaced: once the T-DAT containing the previous device data has been exchanged, the new measuring device is ready for operation again immediately without any errors
- If the sensor is replaced: once the sensor has been replaced, new sensor data are transferred from the S-DAT in the measuring device and the measuring device is ready for operation again immediately without any errors
- If exchanging the electronics module (e.g. I/O electronics module): Once the electronics module has been replaced, the software of the module is compared against the current device firmware. The module software is upgraded or downgraded where necessary. The electronics module is available for use immediately afterwards and no compatibility problems occur.

Manual
Additional parameter data record (complete parameter settings) in the integrated device memory HistoROM backup for:
- Data backup function
  Backup and subsequent restoration of a device configuration in the device memory HistoROM backup
- Data comparison function
  Comparison of the current device configuration with the device configuration saved in the device memory HistoROM backup

Data transmission

Manual
- Transfer of a device configuration to another device using the export function of the specific operating tool, e.g. with FieldCare, DeviceCare or Web server: to duplicate the configuration or to store in an archive (e.g. for backup purposes)
- Transmission of the drivers for system integration via Web server, e.g.:
  EDS for EtherNet/IP

Event list

Automatic
- Chronological display of up to 20 event messages in the events list
- If the **Extended HistoROM** application package (order option) is enabled: up to 100 event messages are displayed in the events list along with a time stamp, plain text description and remedial measures
- The events list can be exported and displayed via a variety of interfaces and operating tools e.g. DeviceCare, FieldCare or Web server

Data logging

Manual
If the **Extended HistoROM** application package (order option) is enabled:
- Recording of 1 to 4 channels of up to 1 000 measured values (up to 250 measured values per channel)
- User configurable recording interval
- Export the measured value log via a variety of interfaces and operating tools e.g. FieldCare, DeviceCare or web server

16.12   Certificates and approvals

Current certificates and approvals for the product are available at 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**.

CE mark	The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.
	Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
UKCA marking	The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.
	Contact address Endress+Hauser UK: Endress+Hauser Ltd. Floats Road Manchester M23 9NF United Kingdom www.uk.endress.com
RCM marking	The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Ex-approval	The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.

Sanitary compatibility	• 3-A SSI 28-06 or more recent
	  • Confirmation by affixing the 3-A logo for measuring devices with the order code for "Additional approval", option LP "3-A".
	  • The 3-A approval refers to the measuring device.
	  • When installing the measuring device, ensure that no liquid can accumulate on the outside of the measuring device.
	    Remote transmitters must be installed in accordance with the 3-A Standard.
	  • Accessories (e.g. weather protection cover, wall holder unit) must be installed in accordance with the 3-A Standard.
	    Each accessory can be cleaned. Disassembly may be necessary under certain circumstances.
	• EHEDG Type EL Class I
	  • Confirmation by affixing the EHEDG symbol for measuring devices with the order code for "Additional approval", option LT "EHEDG".
	  • EPDM is not a suitable seal material for fluids with a fat content > 8 %.
	  • To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy Cleanable Pipe Couplings and Process Connections" (www.ehedg.org).
	• FDA 21 CFR 177
	• Food Contact Materials Regulation (EC) 1935/2004
	• Food Contact Materials Regulation China GB 4806
	• Pasteurized Milk Ordinance (PMO)

Pharmaceutical compatibility	• FDA 21 CFR 177 • USP <87> • USP <88> Class VI 121 °C • TSE/BSE Certificate of Suitability • cGMP Devices with the order code for "Test, certificate", option JG "Conformity with cGMP-derived requirements, declaration" comply with the requirements of cGMP with regard to the surfaces of parts in contact with the medium, design, FDA 21 CFR material conformity, USP Class VI tests and TSE/BSE conformity. A serial number-specific declaration is generated.

EtherNet/IP certification	The measuring device is certified and registered by the ODVA (Open Device Vendor Association). The measuring system meets all the requirements of the following specifications: • Certified in accordance with the ODVA Conformance Test • EtherNet/IP Performance Test • EtherNet/IP PlugFest compliance • The device can also be operated with certified devices of other manufacturers (interoperability)

Radio approval	The measuring device has radio approval. For detailed information on the radio approval, see the Special Documentation

Pressure Equipment Directive	• With the marking a) PED/G1/x (x = category) or b) PESR/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements" a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or b) Schedule 2 of Statutory Instruments 2016 No. 1105. • Devices not bearing this marking (without PED or PESR) are designed and manufactured according to sound engineering practice. They meet the requirements of a) Art. 4 Para. 3 of the Pressure Equipment Directive 2014/68/EU or b) Part 1, Para. 8 of Statutory Instruments 2016 No. 1105. The scope of application is indicated a) in diagrams 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU or b) Schedule 3, Para. 2 of Statutory Instruments 2016 No. 1105.
Additional certification	**PWIS-free** PWIS = paint-wetting impairment substances Order code for "Service": • Option **HC**: PWIS-free (version A) • Option **HD**: PWIS-free (version B) • Option **HE**: PWIS-free (version C) 🛈 For more information on PWIS-free certification, see "Test specification" document TS01028D
External standards and guidelines	• EN 60529 Degrees of protection provided by enclosures (IP code) • EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements • EN 61326-1/-2-3 EMC requirements for electrical equipment for measurement, control and laboratory use • NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment • NAMUR NE 32 Data retention in the event of a power failure in field and control instruments with microprocessors • NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal. • NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics • NAMUR NE 105 Specifications for integrating fieldbus devices in engineering tools for field devices • NAMUR NE 107 Self-monitoring and diagnosis of field devices • NAMUR NE 131 Requirements for field devices for standard applications • ETSI EN 300 328 Guidelines for 2.4 GHz radio components. • EN 301489 Electromagnetic compatibility and radio spectrum matters (ERM).

16.13   Application packages

Many different application packages are available to enhance the functionality of the device. Such packages might be needed to address safety aspects or specific application requirements.

The application packages can be ordered with the device or subsequently from Endress+Hauser. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Diagnostic functionality	Order code for "Application package", option EA "Extended HistoROM"

Comprises extended functions concerning the event log and the activation of the measured value memory.

Event log:
Memory volume is extended from 20 message entries (standard version) to up to 100 entries.

Data logging (line recorder):
• Memory capacity for up to 1000 measured values is activated.
• 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user.
• Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server.

For detailed information, see the Operating Instructions for the device.

Heartbeat Technology	Order code for "Application package", option EB "Heartbeat Verification + Monitoring"

Heartbeat Verification
Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".
• Functional testing in the installed state without interrupting the process.
• Traceable verification results on request, including a report.
• Simple testing process via local operation or other operating interfaces.
• Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.
• Extension of calibration intervals according to operator's risk assessment.

Heartbeat Monitoring
Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:
• Draw conclusions - using these data and other information - about the impact process influences (e.g. buildup, interference from the magnetic field) have on the measuring performance over time.
• Schedule servicing in time.
• Monitor the process or product quality .

For detailed information, see the Special Documentation for the device.

Cleaning	Order code for "Application package", option EC "ECC electrode cleaning "

The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite (Fe_3O_4) deposits frequently occur (e.g. hot water). Since magnetite is highly conductive this build up leads to measuring errors and ultimately to

the loss of signal. The application package is designed to avoid build-up of very conductive matter and thin layers (typical of magnetite).

📖 For detailed information, see the Operating Instructions for the device.

16.14 Accessories

📖 Overview of accessories available to order → 🖹 194

16.15 Supplementary documentation

ℹ️ For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (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.

Standard documentation   **Brief Operating Instructions**

Brief Operating Instructions for the sensor

Measuring device	Documentation code
Proline Promag H	KA01289D

Brief Operating Instructions for the transmitter

Measuring device	Documentation code
Proline 500 – digital	KA01343D
Proline 500	KA01342D

Technical Information

Measuring device	Documentation code
Promag H 500	TI01225D

Description of Device Parameters

Measuring device	Documentation code
Promag 500	GP01118D

Supplementary device-dependent documentation   **Safety instructions**

Safety instructions for electrical equipment for hazardous areas.

Contents	Documentation code
ATEX/IECEx Ex i	XA01522D
ATEX/IECEx Ex ec	XA01523D
cCSAus IS	XA01524D
cCSAus Ex e ia/Ex d ia	XA01525D

Contents	Documentation code
cCSAus Ex nA	XA01526D
INMETRO Ex i	XA01527D
INMETRO Ex ec	XA01528D
NEPSI Ex i	XA01529D
NEPSI Ex nA	XA01530D
EAC Ex i	XA01658D
EAC Ex nA	XA01659D
JPN	XA01776D

Special Documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Radio approvals for WLAN interface for A309/A310 display module	SD01793D
Web server	SD01978D

Contents	Documentation code
Heartbeat Technology	SD01981D
Web server	SD01978D

Installation instructions

Contents	Note
Installation instructions for spare part sets and accessories	• Access the overview of all the available spare part sets via *Device Viewer* → 🖹 192 • Accessories available for order with Installation Instructions → 🖹 194

Index

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