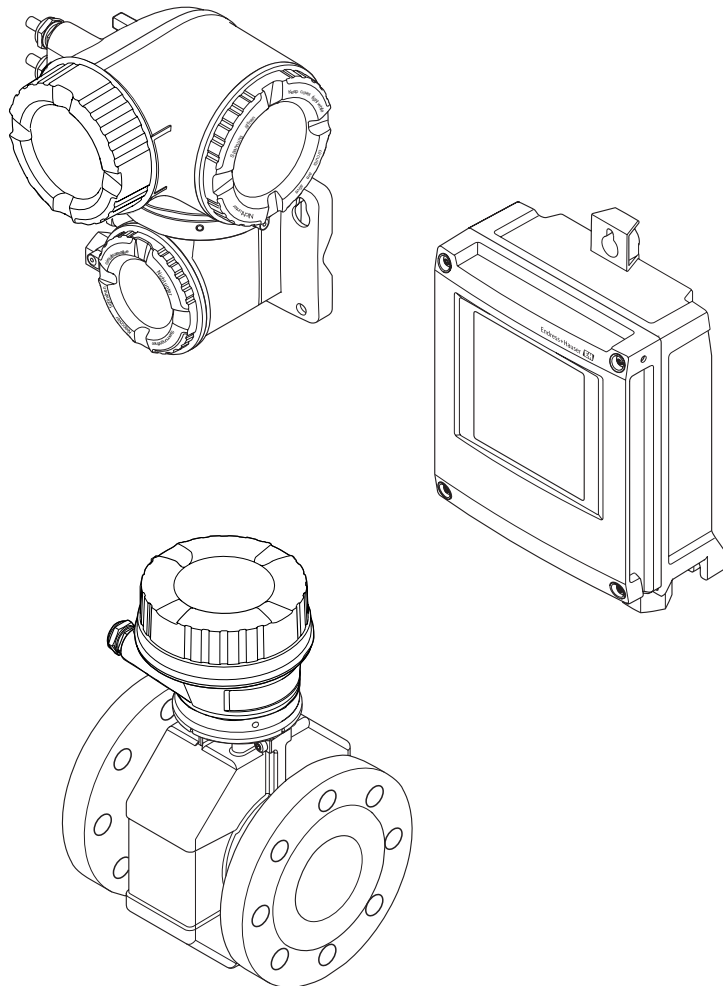


Operating Instructions Proline Promag P 500 HART

Electromagnetic flowmeter



-
- 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 Center will supply you with current information and updates to these instructions.

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1 Document information

1.1 Document function







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

1.2 Symbols used



1.2.1 Safety symbols




Symbol	Meaning
	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
	NOTE! This symbol contains information on procedures and other facts which do not result in personal injury.

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.
	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.
	Equipotential connection A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

1.2.3 Communication symbols













Symbol	Meaning
	Wireless Local Area Network (WLAN) Communication via a wireless, local network.
	Bluetooth Wireless data transmission between devices over a short distance.

Symbol	Meaning
	LED Light emitting diode is off.
	LED Light emitting diode is on.
	LED Light emitting diode is flashing.




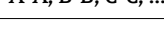
1.2.4 Tool symbols




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
	Series of steps
	Result of a step
	Help in the event of a problem
	Visual inspection

1.2.6 Symbols in graphics



Symbol	Meaning
	Item numbers
	Series of steps
	Views
	Sections

Symbol	Meaning
	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:

- The *W@M 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 2-D matrix code (QR code) on the nameplate.

 For a detailed list of the individual documents along with the documentation code
→  197

1.3.1 Standard documentation

Document type	Purpose and content of the document
Technical Information	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.
Sensor Brief Operating Instructions	Guides you quickly to the 1st measured value - Part 1 The Sensor Brief Operating Instructions are aimed at specialists with responsibility for installing the measuring device. <ul style="list-style-type: none"> ▪ Incoming acceptance and product identification ▪ Storage and transport ▪ Installation
Transmitter Brief Operating Instructions	Guides you quickly to the 1st measured value - Part 2 The Transmitter Brief Operating Instructions are aimed at specialists with responsibility for commissioning, configuring and parameterizing the measuring device (until the first measured value). <ul style="list-style-type: none"> ▪ Product description ▪ Installation ▪ Electrical connection ▪ Operation options ▪ System integration ▪ Commissioning ▪ Diagnostic information
Description of Device Parameters	Reference for your parameters The document provides a detailed explanation of each individual parameter in the Expert operating menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

1.3.2 Supplementary device-dependent documentation

Additional documents are supplied depending on the device version ordered: Always comply strictly with the instructions in the supplementary documentation. The supplementary documentation is an integral part of the device documentation.

1.4 Registered trademarks

HART®

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

Applicator®, FieldCare®, DeviceCare®, Field Xpert™, HistoROM®, Heartbeat Technology™

Registered or registration-pending trademarks of the Endress+Hauser Group

2 Basic safety instructions

2.1 Requirements for 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 Designated use


Application and media

The measuring device described in this manual is intended only for flow measurement of liquids with a minimum conductivity of 5 $\mu\text{S}/\text{cm}$.

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

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

To ensure that the measuring device remains in proper condition for the operation time:

- ▶ Only use the measuring device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- ▶ Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area (e.g. explosion protection, pressure vessel safety).
- ▶ Use the measuring device only for media to which the process-wetted materials are sufficiently resistant.
- ▶ If the measuring device is not operated at atmospheric temperature, compliance with the relevant basic conditions specified in the associated device documentation is absolutely essential: "Documentation" section. →  8.
- ▶ Protect the measuring device permanently against corrosion from environmental influences.

Incorrect use

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

WARNING

Danger of breakage due to corrosive or abrasive fluids!

- ▶ Verify the compatibility of the process fluid with the sensor material.
- ▶ Ensure the resistance of all fluid-wetted materials in the process.
- ▶ Keep within the specified pressure and temperature range.

NOTICE**Verification for borderline cases:**

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

Residual risks**⚠ WARNING**

The electronics and the medium may cause the surfaces to heat up. This presents a burn hazard!

- ▶ For elevated fluid temperatures, ensure protection against contact to prevent burns.

2.3 Workplace safety

For work on and with the device:

- ▶ Wear the required personal protective equipment according to federal/national regulations.

For welding work on the piping:

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

If working on and with the device with wet hands:

- ▶ Due to the increased risk of electric shock, gloves must be worn.

2.4 Operational safety

Risk of injury.

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

Conversions to the device

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

- ▶ If, despite this, modifications are required, consult with Endress+Hauser.

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 repair of an electrical device.
- ▶ Use original spare parts and accessories from Endress+Hauser only.

2.5 Product safety

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

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

2.6 IT security

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


IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

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. An overview of the most important functions is provided in the following section.

2.7.1 Protecting access via hardware write protection

Write access to the device parameters 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 motherboard). When hardware write protection is enabled, only read access to the parameters is possible.


Hardware write protection is disabled when the device is delivered →  131.

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). Is equivalent to hardware write protection in terms of functionality.
- **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.


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 (→  130).

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

WLAN passphrase

A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface (→  82) which can be ordered as an option 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 →  123.

General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning.
- Follow the general rules for generating a secure password when defining and managing the access code or network key.
- The user is responsible for the management and careful handling of the access code and network key.


2.7.3 Access via fieldbus

When communicating via fieldbus, access to the device parameters can be restricted to "Read only" access. The option can be changed in the **Fieldbus writing access** parameter.

This does not affect cyclic measured value transmission to the higher-order system, which is always guaranteed.

 Additional information: "Description of Device Parameters" document pertaining to the device →  198.

2.7.4 Access via Web server

The device can be operated and configured via a Web browser with the integrated Web server (→  75). The connection is via the service interface (CDI-RJ45) or the WLAN interface.

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

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

 Additional information: "Description of Device Parameters" document pertaining to the device →  198.

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 one or two connecting cable(s).

3.1 Product design

Two versions of the transmitter are available.

3.1.1 Proline 500 – digital

Signal transmission: digital

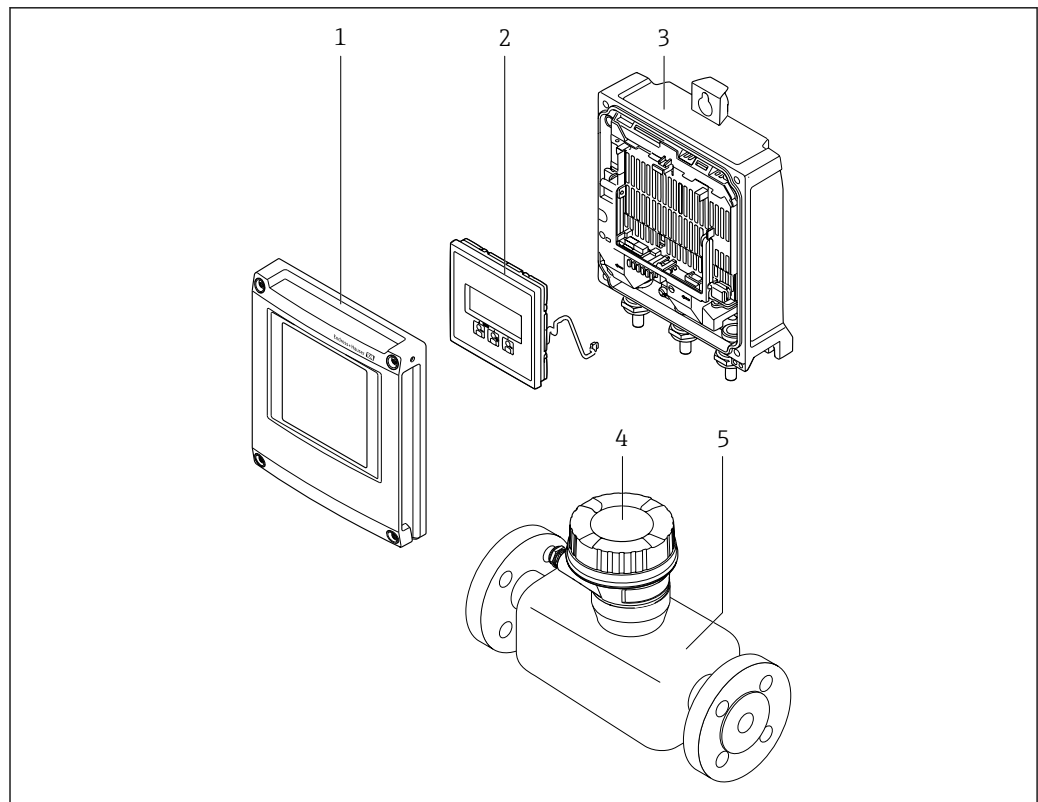
Order code for "Integrated ISEM electronics", option **A** "Sensor"

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.



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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

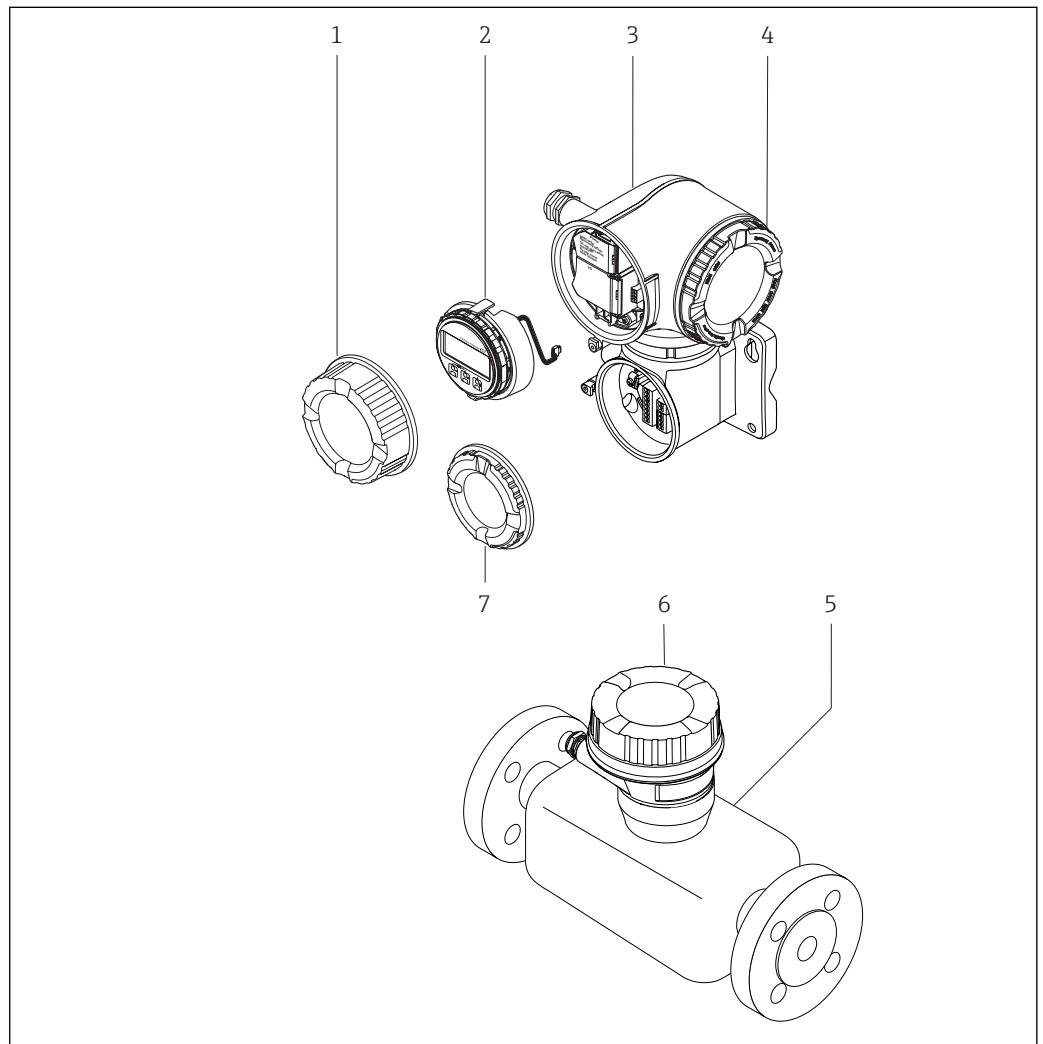
Signal transmission: analog

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.



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2 Important components of a measuring device

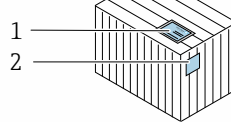
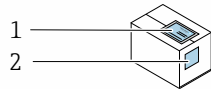
- 1 Connection compartment cover
- 2 Display module
- 3 Transmitter housing with integrated ISEM electronics
- 4 Electronics compartment cover
- 5 Sensor
- 6 Sensor connection housing: connecting cable connection
- 7 Connection compartment cover: connecting cable connection

4 Incoming acceptance and product identification

4.1 Incoming acceptance

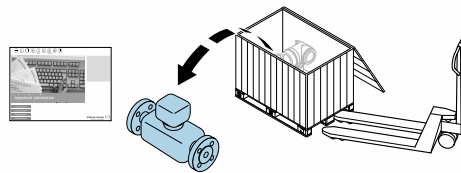


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Are the order codes on the delivery note (1) and the product sticker (2) identical?

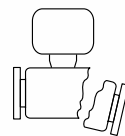
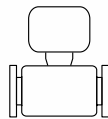
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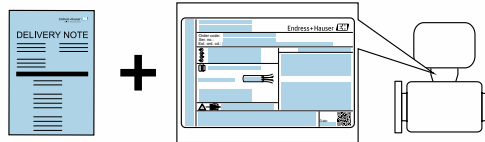


Are the goods undamaged?

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Do the nameplate data match the ordering information on the delivery note?

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Is the CD-ROM with the Technical Documentation (depends on device version) and documents present?

A0029318



- i** ■ If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.
- Depending on the device version, the CD-ROM might not be part of the delivery! The Technical Documentation is available via the Internet or via the *Endress+Hauser Operations App*, see the "Product identification" section → 17.

4.2 Product identification

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

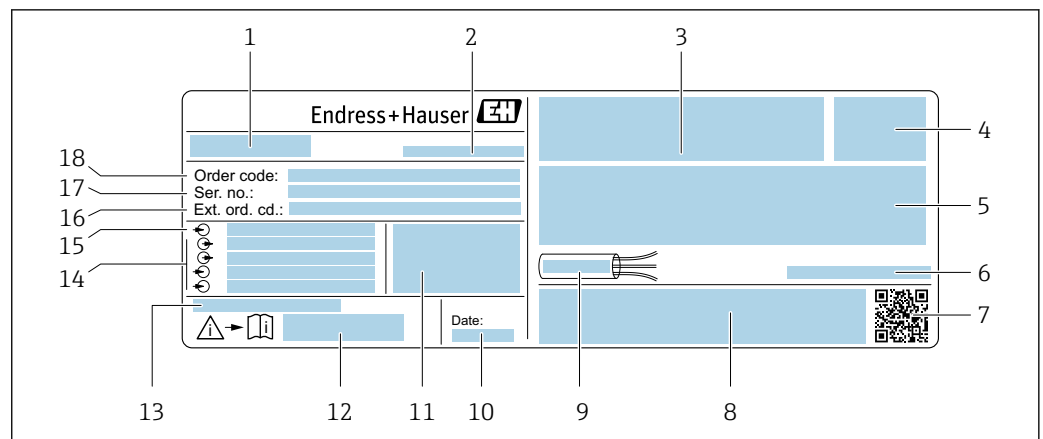
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer): All information about the measuring device is displayed.
- Enter the serial number from the nameplates into the *Endress+Hauser Operations App* or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*: all the information for the measuring device is displayed.

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


- The chapters "Additional standard documentation on the device" →  8 and "Supplementary device-dependent documentation" →  8
- The *W@M 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 2-D matrix code (QR code) on the nameplate.

4.2.1 Transmitter nameplate

Proline 500 – digital

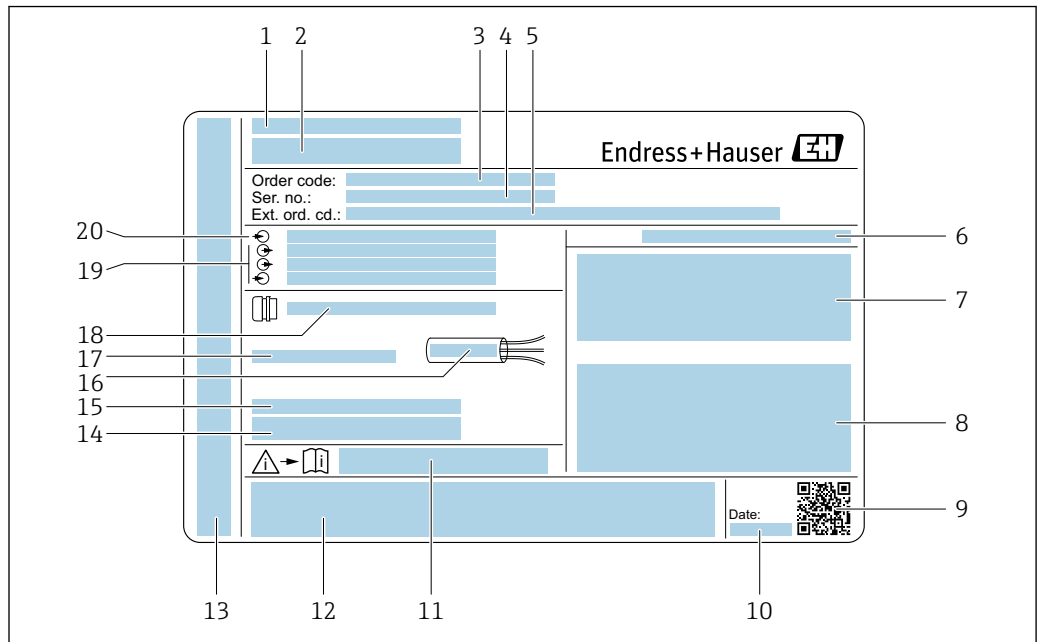


A0029194

 3 Example of a transmitter nameplate

- 1 Name of the transmitter
- 2 Manufacturing location
- 3 Space for approvals: use in hazardous areas
- 4 Degree of protection
- 5 Electrical connection data: available inputs and outputs
- 6 Permitted ambient temperature (T_a)
- 7 2-D matrix code
- 8 Space for approvals and certificates: e.g. CE mark, C-Tick
- 9 Permitted temperature range for cable
- 10 Manufacturing date: 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

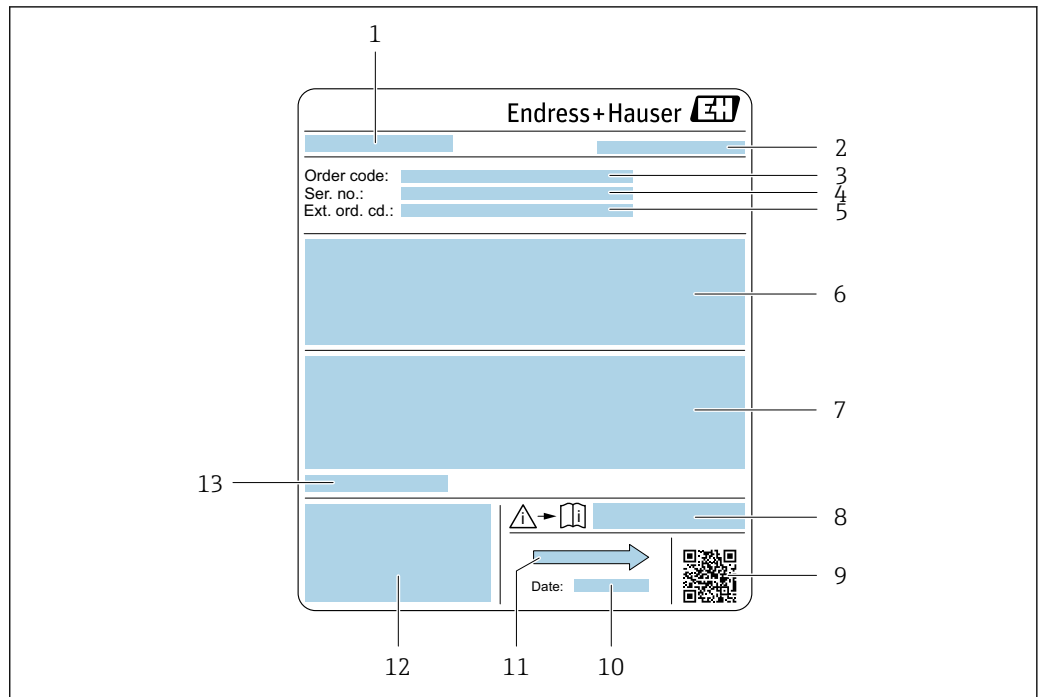


A0029192

4 Example of a transmitter nameplate

- 1 Manufacturing location
- 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 Manufacturing date: year-month
- 11 Document number of safety-related supplementary documentation
- 12 Space for approvals and certificates: e.g. CE mark, C-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 Permitted 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



A0029205

5 Example of sensor nameplate

- 1 Name of the sensor
- 2 Manufacturing location
- 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; system pressure; fluid temperature range; material of liner and electrodes
- 7 Approval information for explosion protection, Pressure Equipment Directive and degree of protection
- 8 Document number of safety-related supplementary documentation → 198
- 9 2-D matrix code
- 10 Manufacturing date: year-month
- 11 Flow direction
- 12 CE mark, C-Tick
- 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 measuring device

Symbol	Meaning
	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	Reference to documentation Refers to the corresponding device documentation.
	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.

5 Storage and transport

5.1 Storage conditions

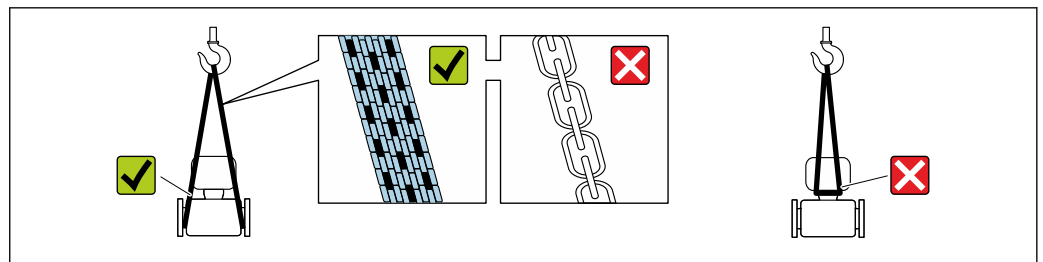
Observe the following notes for storage:

- 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 to avoid unacceptably high surface temperatures.
- Select a storage location where moisture cannot collect in the measuring device as fungus and bacteria infestation can damage the lining.
- Store in a dry and dust-free place.
- Do not store outdoors.


Storage temperature →  183

5.2 Transporting the product

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



A0029252

-  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.

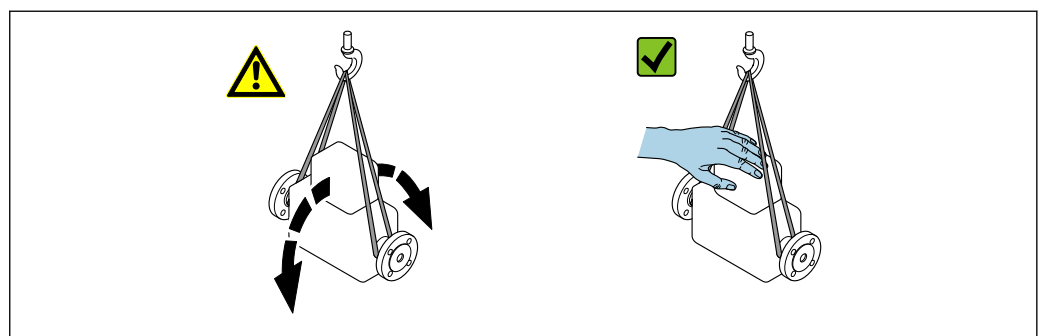
5.2.1 Measuring devices without lifting lugs

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.

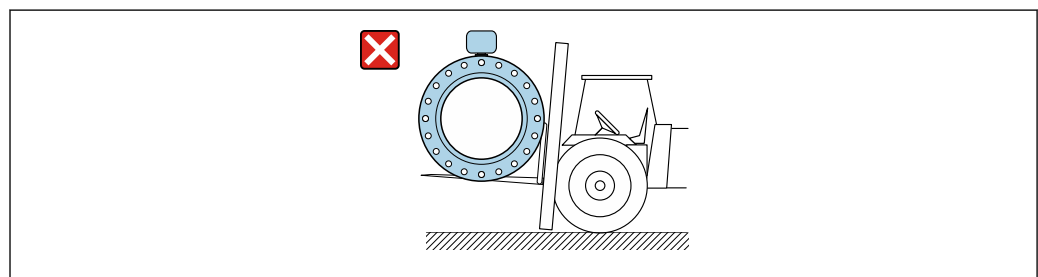
5.2.3 Transporting with a fork lift

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.



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5.3 Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:

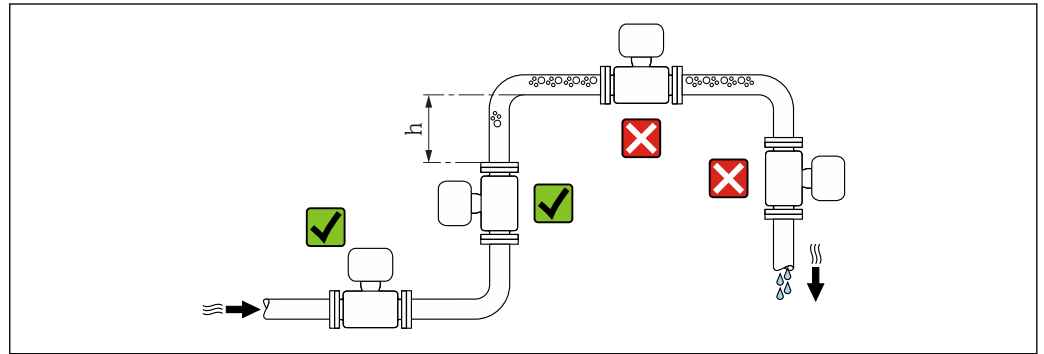
- Measuring device secondary packaging: polymer stretch film that conforms to EC Directive 2002/95/EC (RoHS).
- Packaging:
 - Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
 - or
 - Carton in accordance with European Packaging Directive 94/62EC; recyclability is confirmed by the affixed RESY symbol.
- Seaworthy packaging (optional): Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
- Carrying and mounting hardware:
 - Disposable plastic pallet
 - Plastic straps
 - Plastic adhesive strips
- Dunnage: Paper cushion

6 Installation

6.1 Installation conditions

6.1.1 Mounting position

Mounting location



A0029343


Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow: $h \geq 2 \times DN$

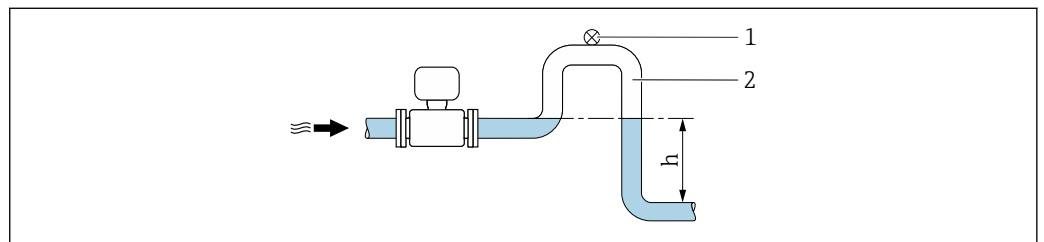
To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:

- Highest point of a pipeline.
- Directly upstream of a free pipe outlet in a down pipe.

Installation in down pipes

Install a siphon with a vent valve downstream of the sensor in down pipes whose length $h \geq 5 \text{ m}$ (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the measuring tube. This measure also prevents the system losing prime.

 For information on the liner's resistance to partial vacuum



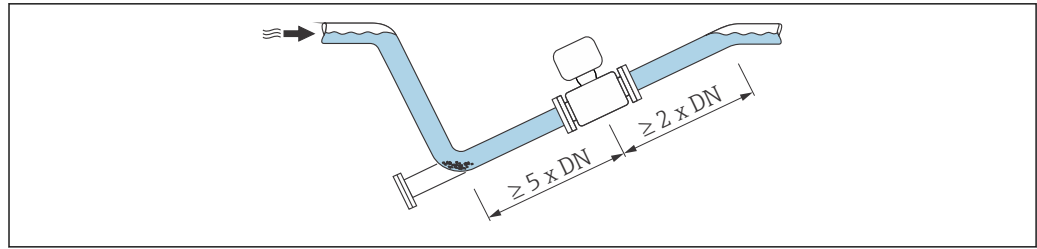
A0028981

6 Installation in a down pipe

- 1 Vent valve
- 2 Pipe siphon
- h Length of down pipe

Installation in partially filled pipes

A partially filled pipe with a gradient necessitates a drain-type configuration. The empty pipe detection (EPD) function offers additional protection by detecting empty or partially filled pipes.



A0029257

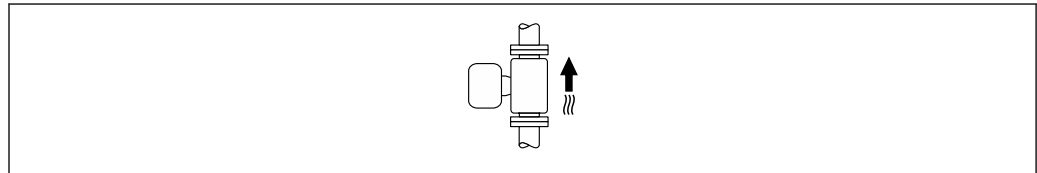
Orientation

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

An optimum orientation position helps avoid gas and air accumulations and deposits in the measuring tube.

The measuring device also offers the empty pipe detection function to detect partially filled measuring pipes in the event of outgassing fluids or variable process pressures.

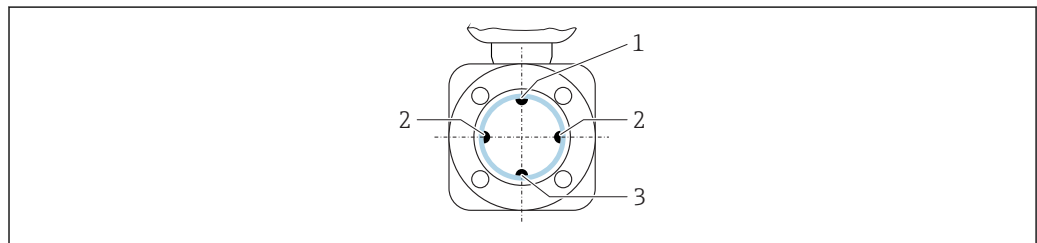
Vertical



A0015591

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

Horizontal



A0029344

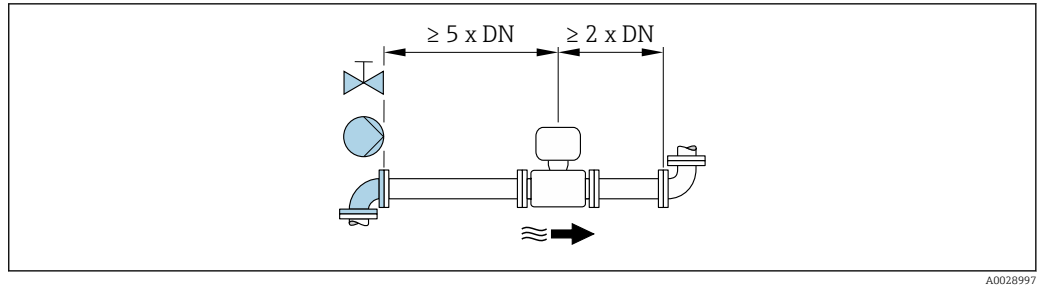
- 1 EPD electrode for empty pipe detection
- 2 Measuring electrodes for signal detection
- 3 Reference electrode for potential equalization

- i** ■ Ideally, the measuring electrode plane should be horizontal. This prevents brief insulation of the two 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.

Inlet and outlet runs

If possible, install the sensor upstream from fittings such as valves, T-pieces or elbows.

Observe the following inlet and outlet runs to comply with accuracy specifications:



A0028997

Installation dimensions



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

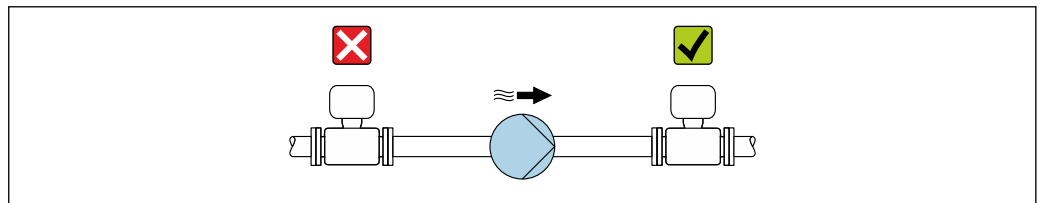
6.1.2 Requirements from environment and process

Ambient temperature range

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



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Never install the sensor on the pump suction side in order to avoid the risk of low pressure, and thus damage to the liner.



Furthermore, install pulse dampers if reciprocating, diaphragm or peristaltic pumps are used.



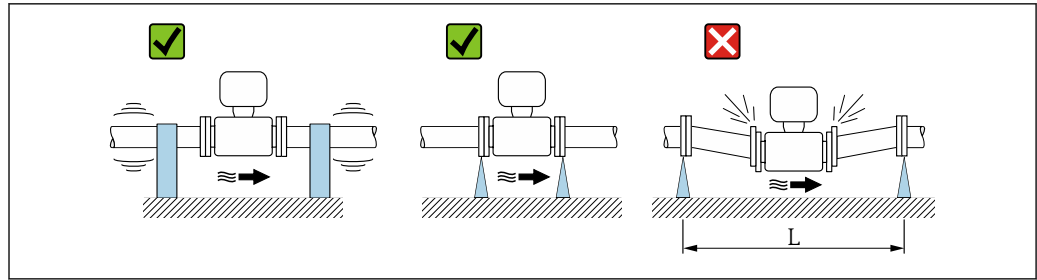
- For information on the liner's resistance to partial vacuum
- For information on the shock resistance of the measuring system
- For information on the vibration resistance of the measuring system

Vibrations

In the event of very strong vibrations, the pipe and sensor must be supported and fixed.



- For information on the shock resistance of the measuring system
- For information on the vibration resistance of the measuring system



7 Measures to avoid device vibrations ($L > 10\text{ m (33 ft)}$)

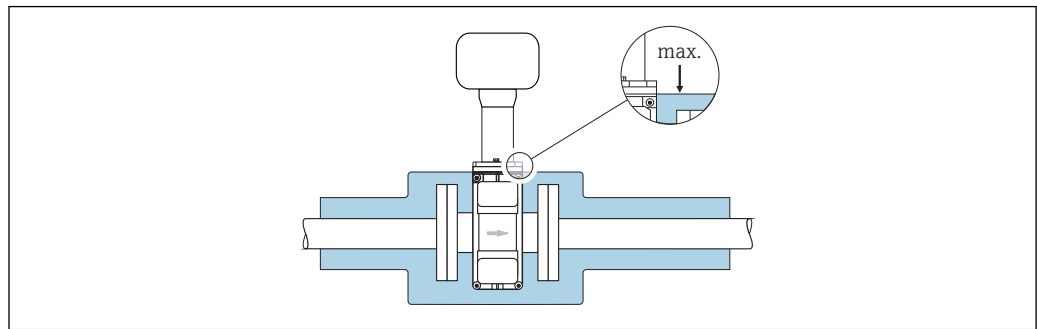
Thermal insulation

Pipes generally have to be insulated if they carry very hot fluids to avoid energy losses and prevent accidental contact with pipes at temperatures that could cause injury. Guidelines regulating the insulation of pipes have to be taken into account.

WARNING

Electronics overheating on account of thermal insulation!

- ▶ The housing support dissipates heat and its entire surface area must remain uncovered. Make sure that the sensor insulation does not extend past the top of the two sensor half-shells.

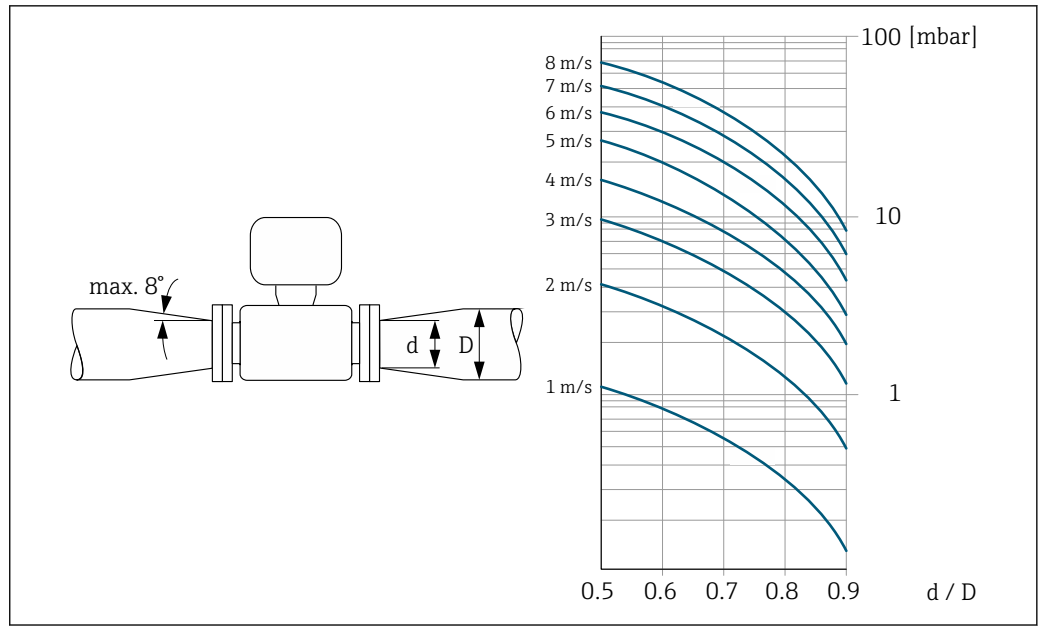


Adapters

Suitable adapters to DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes. 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.

i The nomogram only applies to liquids with a viscosity similar to that of water.

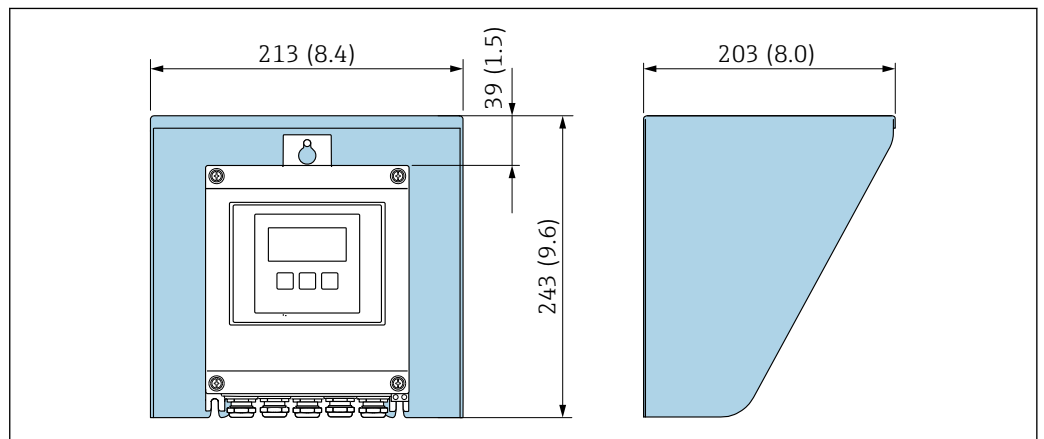
1. Calculate the ratio of the diameters d/D .
2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.



A0029002

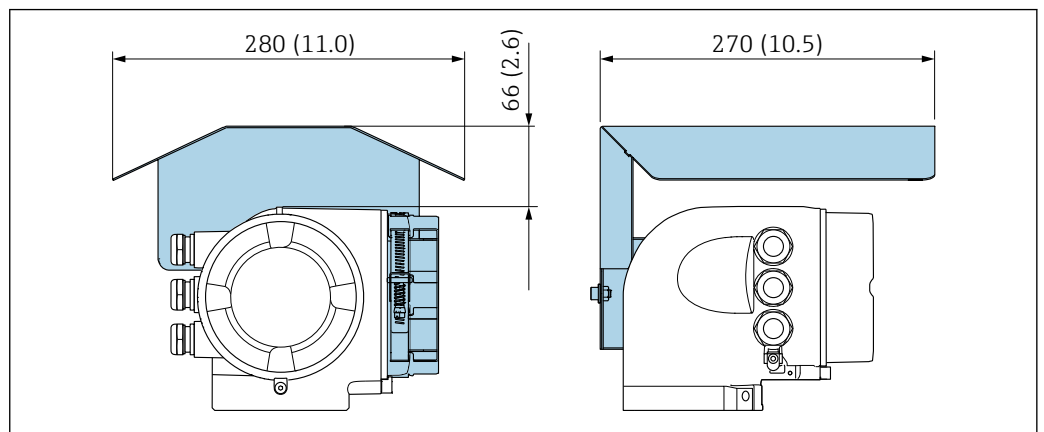
6.1.3 Special mounting instructions

Protective cover



A0029552

8 Weather protection cover for Proline 500 – digital



A0029553

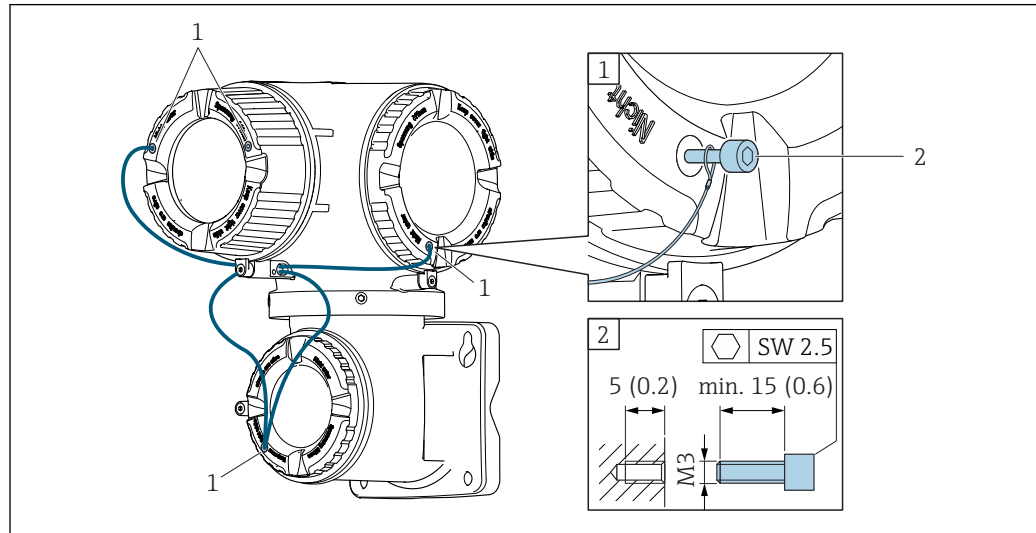
9 Weather protection cover for Proline 500

Cover locking: Proline 500**NOTICE**

Order code for "Housing", option L "Cast, stainless": The covers of the transmitter housing are provided with a borehole to lock the cover.

The cover can be locked using screws and a chain or cable provided by the customer.

- ▶ It is recommended to use stainless steel cables or chains.
- ▶ If a protective coating is applied, it is recommended to use a heat shrink tube to protect the housing paint.



- 1 Cover borehole for the securing screw
2 Securing screw to lock the cover

6.2 Mounting the measuring device

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 \varnothing 6.0 mm

For sensor

For flanges and other process connections:

- Screws, nuts, seals etc. are not included in the scope of supply and must be provided by the customer.
- Appropriate mounting tools

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.

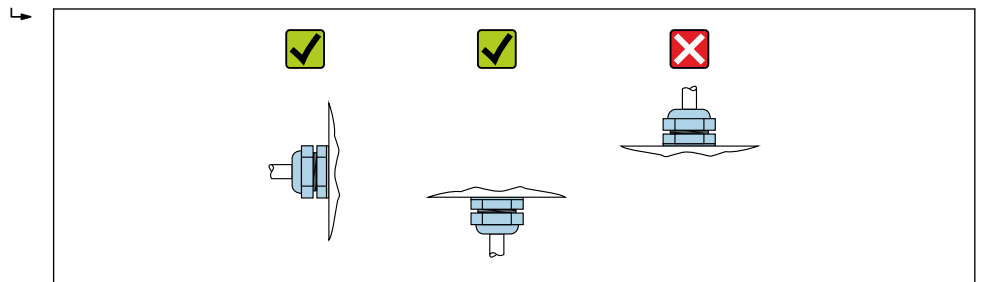
3. Remove stick-on label on the electronics compartment cover.

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 gaskets are clean and undamaged.
 - ▶ Install the gaskets 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. If using ground disks, comply with the Installation Instructions provided.
 4. Observe required screw tightening torques →  29.
 5. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.



A0029263

Mounting the seals

⚠ CAUTION

An electrically conductive layer could form on the inside of the measuring tube!

Risk of measuring signal short circuit.

- ▶ Do not use electrically conductive sealing compounds such as graphite.

Comply with the following instructions when installing seals:

1. For DIN flanges: only use seals according to DIN EN 1514-1.
2. For "PFA" lining: generally additional seals are **not** required.
3. For "PTFE" lining: generally additional seals are **not** required.

Mounting the ground cable/ground disks

Comply with the information on potential equalization and detailed mounting instructions for the use of ground cables/ground disks .

Screw tightening torques

Please note the following:

- The screw tightening torques listed below apply only to lubricated threads and to pipes not subjected to tensile stress.
- Tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.

Screw tightening torques for EN 1092-1 (DIN 2501), PN 40/25

Nominal diameter [mm]	Pressure rating [bar]	Threaded fasteners [mm]	Max. screw tightening torque [Nm]	
			PTFE	PFA
15	PN 40	4 × M12	11	–
25	PN 40	4 × M12	26	20
32	PN 40	4 × M16	41	35
40	PN 40	4 × M16	52	47
50	PN 40	4 × M16	65	59
65 ¹⁾	PN 16	8 × M16	43	40
65	PN 40	8 × M16	43	40
80	PN 16	8 × M16	53	48
80	PN 40	8 × M16	53	48
100	PN 16	8 × M16	57	51
100	PN 40	8 × M20	78	70
125	PN 16	8 × M16	75	67
125	PN 40	8 × M24	111	99
150	PN 16	8 × M20	99	85
150	PN 40	8 × M24	136	120
200	PN 10	8 × M20	141	101
200	PN 16	12 × M20	94	67
200	PN 25	12 × M24	138	105
250	PN 10	12 × M20	110	–
250	PN 16	12 × M24	131	–
250	PN 25	12 × M27	200	–
300	PN 10	12 × M20	125	–
300	PN 16	12 × M24	179	–
300	PN 25	16 × M27	204	–
350	PN 10	16 × M20	188	–
350	PN 16	16 × M24	254	–
350	PN 25	16 × M30	380	–
400	PN 10	16 × M24	260	–
400	PN 16	16 × M27	330	–
400	PN 25	16 × M33	488	–
450	PN 10	20 × M24	235	–
450	PN 16	20 × M27	300	–
450	PN 25	20 × M33	385	–
500	PN 10	20 × M24	265	–
500	PN 16	20 × M30	448	–
500	PN 25	20 × M33	533	–
600	PN 10	20 × M27	345	–
600 ¹⁾	PN 16	20 × M33	658	–
600	PN 25	20 × M36	731	–

1) Designed acc. to EN 1092-1 (not to DIN 2501)

Screw tightening torques for ASME B16.5, Class 150/300

Nominal diameter		Pressure rating [psi]	Threaded fasteners [in]	Max. screw tightening torque [Nm] ([lbf · ft])	
[mm]	[in]			PTFE	PFA
15	½	Class 150	4 × ½	6 (4)	- (-)
15	½	Class 300	4 × ½	6 (4)	- (-)
25	1	Class 150	4 × ½	11 (8)	10 (7)
25	1	Class 300	4 × 5/8	14 (10)	12 (9)
40	1 ½	Class 150	4 × ½	24 (18)	21 (15)
40	1 ½	Class 300	4 × ¾	34 (25)	31 (23)
50	2	Class 150	4 × 5/8	47 (35)	44 (32)
50	2	Class 300	8 × 5/8	23 (17)	22 (16)
80	3	Class 150	4 × 5/8	79 (58)	67 (49)
80	3	Class 300	8 × ¾	47 (35)	42 (31)
100	4	Class 150	8 × 5/8	56 (41)	50 (37)
100	4	Class 300	8 × ¾	67 (49)	59 (44)
150	6	Class 150	8 × ¾	106 (78)	86 (63)
150	6	Class 300	12 × ¾	73 (54)	67 (49)
200	8	Class 150	8 × ¾	143 (105)	109 (80)
250	10	Class 150	12 × 7/8	135 (100)	- (-)
300	12	Class 150	12 × 7/8	178 (131)	- (-)
350	14	Class 150	12 × 1	260 (192)	- (-)
400	16	Class 150	16 × 1	246 (181)	- (-)
450	18	Class 150	16 × 1 1/8	371 (274)	- (-)
500	20	Class 150	20 × 1 1/8	341 (252)	- (-)
600	24	Class 150	20 × 1 ¼	477 (352)	- (-)

Screw tightening torques for JIS B2220, 10/20K

Nominal diameter [mm]	Pressure rating [bar]	Threaded fasteners [mm]	Max. screw tightening torque [Nm]	
			PTFE	PFA
25	10K	4 × M16	32	27
25	20K	4 × M16	32	27
32	10K	4 × M16	38	-
32	20K	4 × M16	38	-
40	10K	4 × M16	41	37
40	20K	4 × M16	41	37
50	10K	4 × M16	54	46
50	20K	8 × M16	27	23
65	10K	4 × M16	74	63
65	20K	8 × M16	37	31
80	10K	8 × M16	38	32
80	20K	8 × M20	57	46
100	10K	8 × M16	47	38
100	20K	8 × M20	75	58

Nominal diameter [mm]	Pressure rating [bar]	Threaded fasteners [mm]	Max. screw tightening torque [Nm]	
			PTFE	PFA
125	10K	8 × M20	80	66
125	20K	8 × M22	121	103
150	10K	8 × M20	99	81
150	20K	12 × M22	108	72
200	10K	12 × M20	82	54
200	20K	12 × M22	121	88
250	10K	12 × M22	133	–
250	20K	12 × M24	212	–
300	10K	16 × M22	99	–
300	20K	16 × M24	183	–

Screw tightening torques for AS 2129, Table E

Nominal diameter [mm]	Threaded fasteners [mm]	Max. screw tightening torque [Nm]
		PTFE
25	4 × M12	21
50	4 × M16	42

Screw tightening torques for AS 4087, PN 16

Nominal diameter [mm]	Threaded fasteners [mm]	Max. screw tightening torque [Nm]
		PTFE
50	4 × M16	42

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.
- ▶ 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

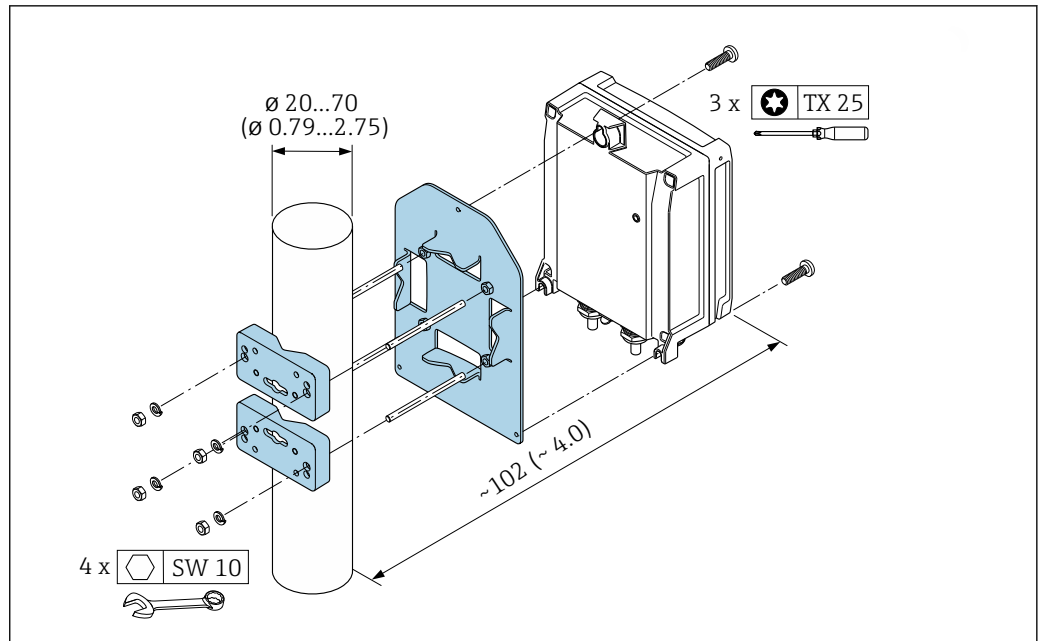
Post mounting

WARNING

Excessive tightening torque applied to the fixing screws!

Risk of damaging the plastic transmitter.

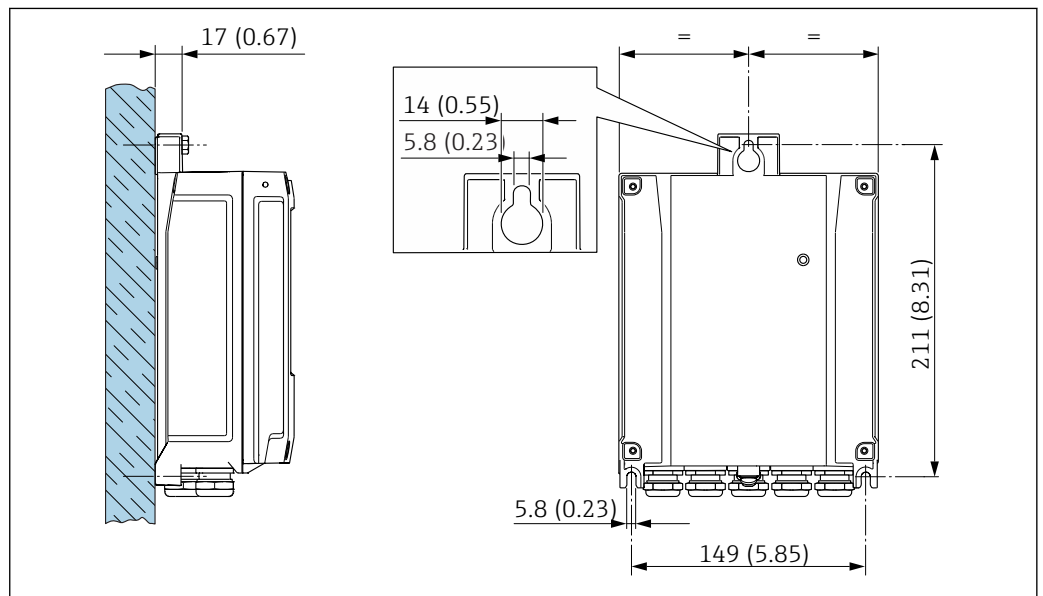
- ▶ Tighten the fixing screws as per the tightening torque: 2 Nm (1.5 lbf ft).



A0029051

10 Engineering unit mm (in)

Wall mounting



A0029054

11 Engineering unit mm (in)

1. Drill the holes.
2. Insert wall plugs into the drilled holes.
3. Screw in the securing screws slightly at first.
4. Fit the transmitter housing over the securing screws and mount in place.
5. Tighten the securing 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 .
- ▶ 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

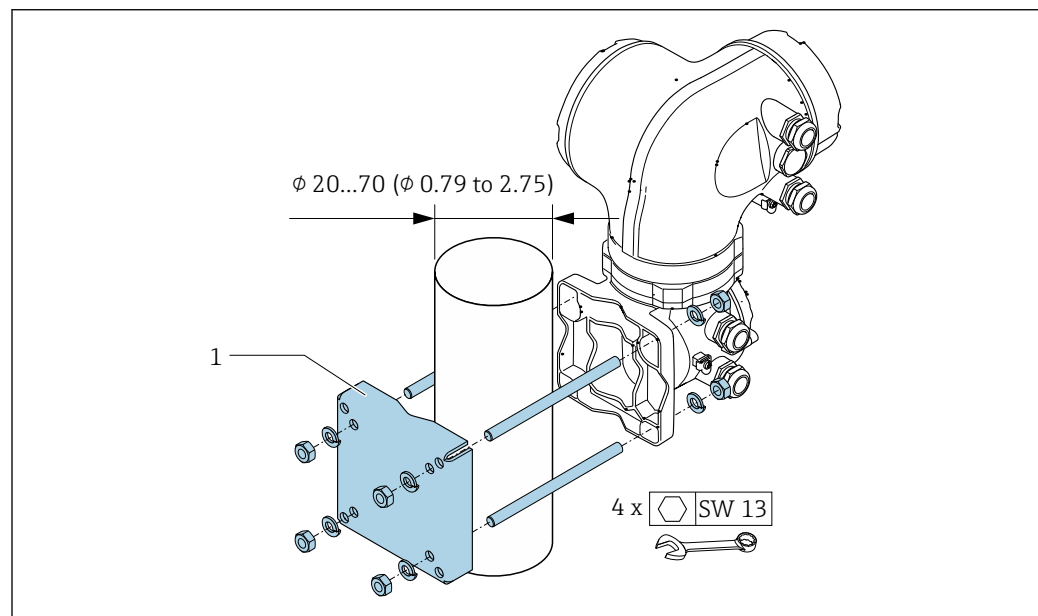
Post mounting

⚠ WARNING

Order code for "Transmitter housing", option L "Cast, stainless": cast transmitters are very heavy.

They are unstable if they are not mounted on a secure, fixed post.

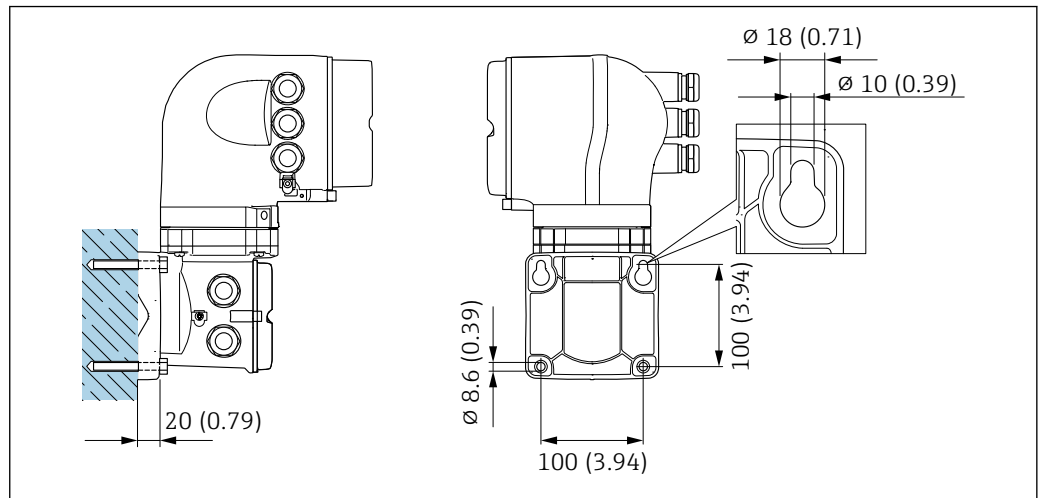
- ▶ Only mount the transmitter on a secure, fixed post on a stable surface.



A0029057

12 Engineering unit mm (in)

Wall mounting

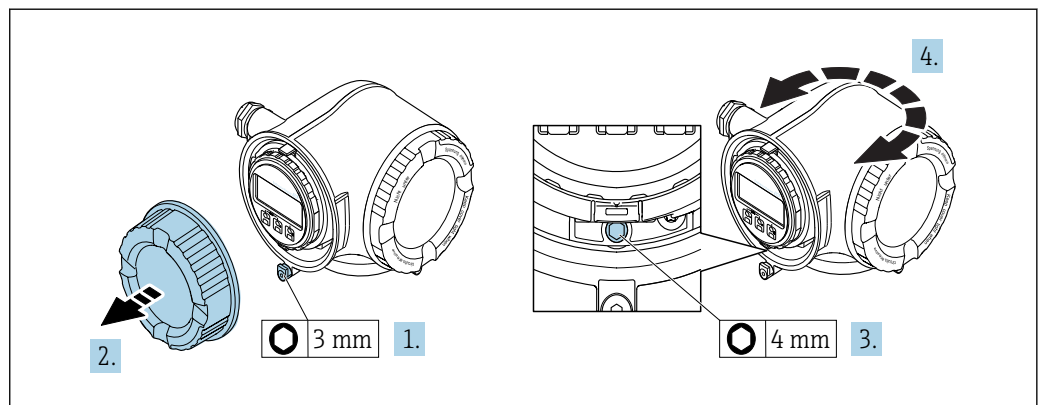


13 Engineering unit mm (in)

1. Drill the holes.
2. Insert wall plugs into the drilled holes.
3. Screw in the securing screws slightly at first.
4. Fit the transmitter housing over the securing screws and mount in place.
5. Tighten the securing screws.

6.2.6 Turning the transmitter housing: Proline 500

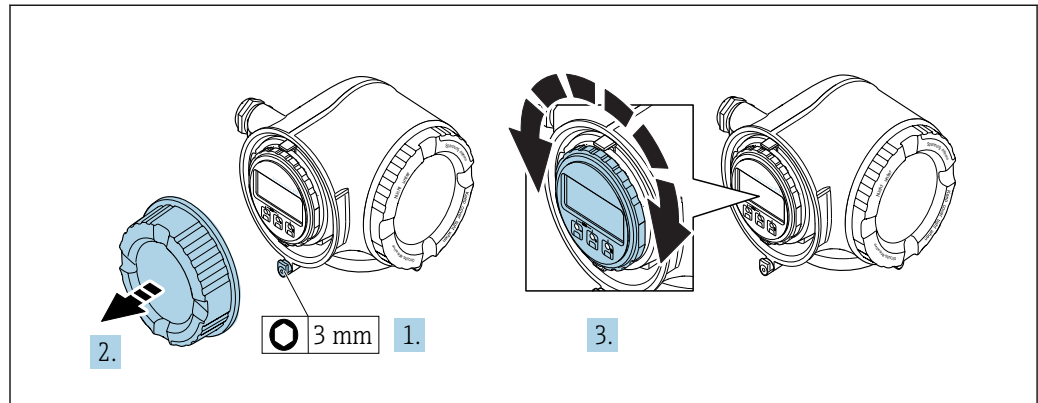
To provide easier access to the connection compartment or display module, the transmitter housing can be turned.



1. Loosen the securing clamp of the connection compartment cover.
2. Unscrew the connection compartment cover.
3. Release the fixing screw.
4. Turn the housing to the desired position.
5. Firmly tighten the securing screw.
6. Screw on the connection compartment cover
7. Fit the securing clamp of the connection compartment cover.

6.2.7 Turning the display module: Proline 500

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



A0030035

1. 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. $8 \times 45^\circ$ in every direction.
4. Screw on the connection compartment cover.
5. Fit the securing clamp of the connection compartment cover.

6.3 Post-installation check

Is the device undamaged (visual inspection)?	<input type="checkbox"/>
Does the measuring device conform to the measuring point specifications? For example: <ul style="list-style-type: none"> ▪ Process temperature ▪ Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document) ▪ Ambient temperature ▪ Measuring range 	<input type="checkbox"/>
Has the correct orientation for the sensor been selected ? <ul style="list-style-type: none"> ▪ According to sensor type ▪ According to medium temperature ▪ According to medium properties (outgassing, with entrained solids) 	<input type="checkbox"/>
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping ?	<input type="checkbox"/>
Are the measuring point identification and labeling correct (visual inspection)?	<input type="checkbox"/>
Is the device adequately protected from precipitation and direct sunlight?	<input type="checkbox"/>
Have the fixing screws been tightened with the correct tightening torque?	<input type="checkbox"/>

7 Electrical connection

NOTICE

The measuring device does not have an internal circuit breaker.

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

7.1 Connection conditions

7.1.1 Required tools

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

7.1.2 Requirements for connecting cable

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

Electrical safety

In accordance with applicable federal/national regulations.

Protective ground cable

Cable: 2.1 mm^2 (14 AWG)

The grounding impedance must be less than 1Ω .

Permitted temperature range

Minimum requirement: cable temperature range \geq ambient temperature $+20 \text{ K}$

Power supply cable

Standard installation cable is sufficient.

Signal cable

Current output 4 to 20 mA HART

A shielded cable is recommended. Observe grounding concept of the plant.

Current output 0/4 to 20 mA

Standard installation cable is sufficient.

Pulse/frequency/switch output

Standard installation cable is sufficient.

Double pulse output

Standard installation cable is sufficient.

Relay output

Standard installation cable is sufficient.

Current input 0/4 to 20 mA

Standard installation cable is sufficient.

Status input

Standard installation cable is sufficient.

Cable diameter

- Cable glands supplied:
M20 × 1.5 with cable \varnothing 6 to 12 mm (0.24 to 0.47 in)
- Spring terminals:
Conductor cross-section 0.2 to 2.5 mm² (24 to 12 AWG)

Connecting cable for sensor - transmitter: Proline 500 – digital

Standard cable

A standard cable can be used as the connecting cable.

Standard cable	4 cores (2 pairs); twisted pair with common shield
Shielding	Tin-plated copper-braid, optical cover \geq 85 %
Cable length	Maximum 300 m (1000 ft), see the following table.

Cross-section	Cable lengths for use in	
	Non-hazardous area, Ex Zone 2, Class I, Division 2	Hazardous area, Ex Zone 1, Class I, Division 1
0.34 mm ² (AWG 22)	80 m (270 ft)	50 m (165 ft)
0.50 mm ² (AWG 20)	120 m (400 ft)	60 m (200 ft)
0.75 mm ² (AWG 18)	180 m (600 ft)	90 m (300 ft)
1.00 mm ² (AWG 17)	240 m (800 ft)	120 m (400 ft)
1.50 mm ² (AWG 15)	300 m (1000 ft)	180 m (600 ft)
2.50 mm ² (AWG 13)	300 m (1000 ft)	300 m (1000 ft)

Optionally available connecting cable

Standard cable	2 × 2 × 0.34 mm ² (AWG 22) PVC cable with common shield (2 pairs, twisted pair)
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 \geq 85 %
Operating temperature	When mounted in a fixed position: -50 to +105 °C (-58 to +221 °F); when cable can move freely: -25 to +105 °C (-13 to +221 °F)
Available cable length	Fixed: 20 m (65 ft); variable: up to maximum 50 m (165 ft)

Connecting cable for sensor - Proline 500 transmitter

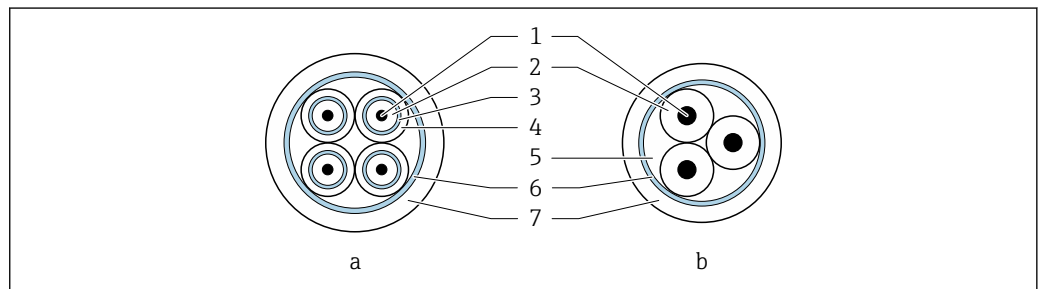
Signal cable

Standard cable	3 × 0.38 mm ² (20 AWG) with common, braided copper shield (\varnothing ~ 9.5 mm (0.37 in)) and individual shielded cores
Conductor resistance	\leq 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 (32 ft), 20 m (65 ft) or variable length up to max. 200 m (656 ft)
Operating temperature	-20 to +80 °C (-68 to +176 °F)

Coil current cable

Standard cable	3 × 0.75 mm ² (18 AWG) with common, braided copper shield (∅ ~ 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 (32 ft), 20 m (65 ft) or variable length up to max. 200 m (656 ft)
Operating temperature	-20 to +80 °C (-68 to +176 °F)
Test voltage for cable insulation	≤ AC 1433 V rms 50/60 Hz or ≥ DC 2026 V



A0029151

14 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

Reinforced connecting cables

Reinforced connecting cables with an additional, reinforcing metal braid should be used for:

- When laying the cable directly in the ground
- Where there is a risk of damage from rodents

Operation in zones of severe electrical interference

The measuring system meets the general safety requirements → 196 and EMC specifications → 184.

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.

7.1.3 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 (-)	26 (+)	27 (-)	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 →  43
- Proline 500 →  48

7.1.4 Preparing the measuring device

Carry out the steps in the following order:


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

NOTICE

Insufficient sealing of the housing!

Operational reliability of the measuring device could be compromised.

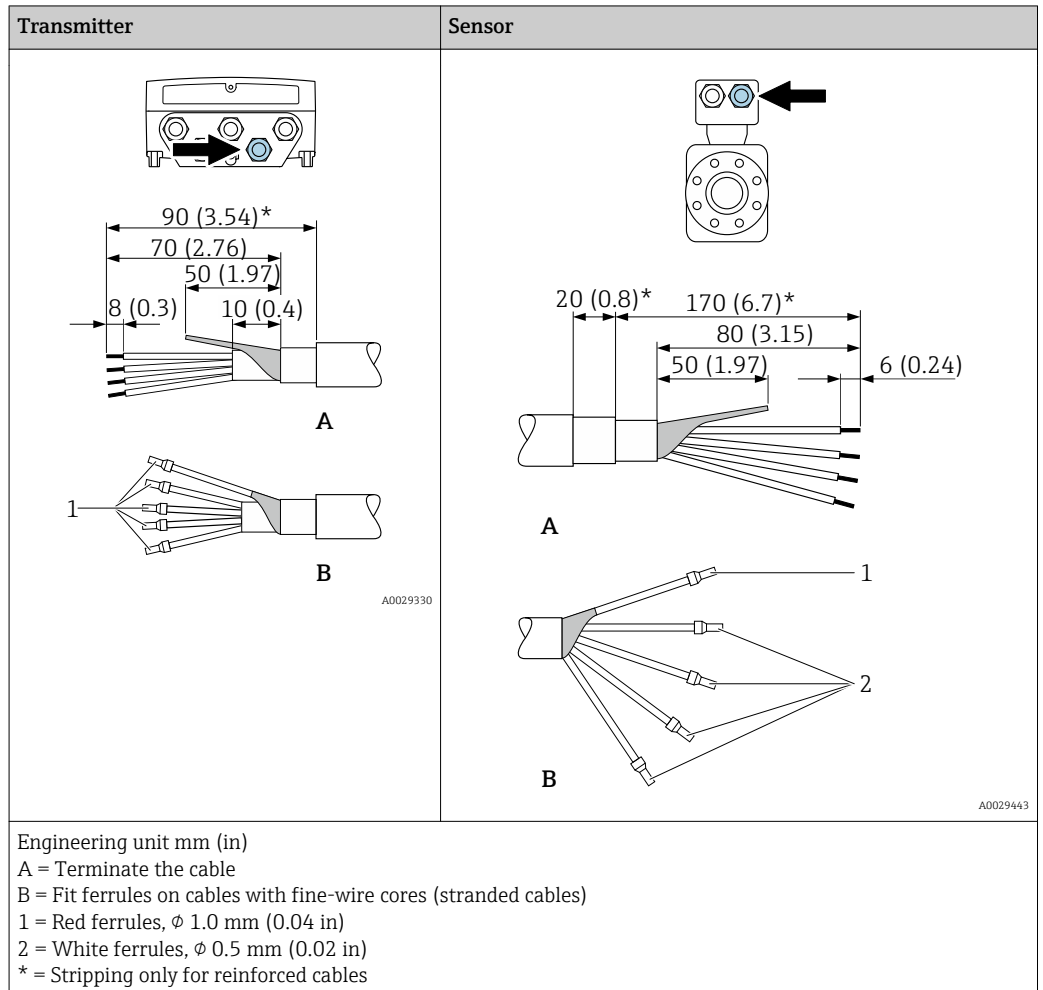
- ▶ Use suitable cable glands corresponding to the degree of protection.

1. Remove dummy plug if present.
2. If the measuring device is supplied without cable glands:
Provide suitable cable gland for corresponding connecting cable.
3. If the measuring device is supplied with cable glands:
Observe requirements for connecting cables →  37.

7.1.5 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.



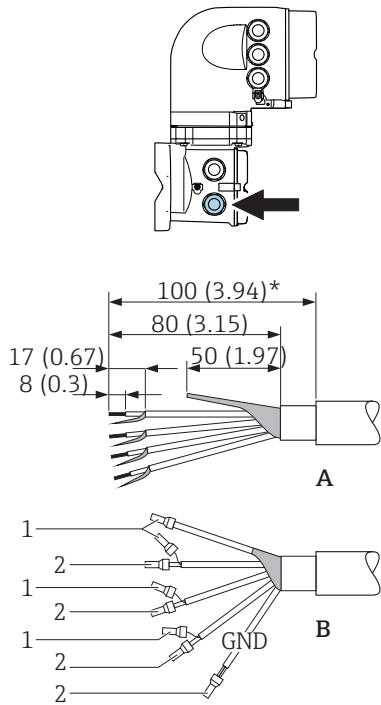
7.1.6 Preparing the connecting cable: Proline 500

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.

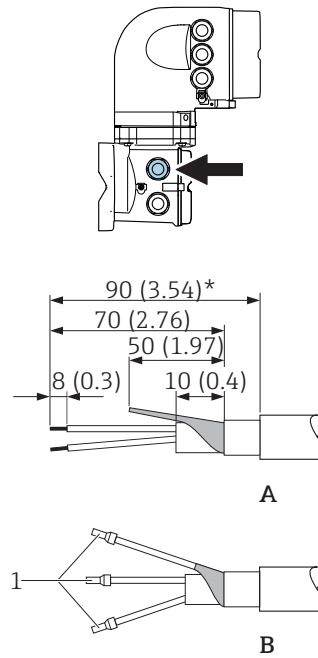
Transmitter

Electrode cable



A0029326

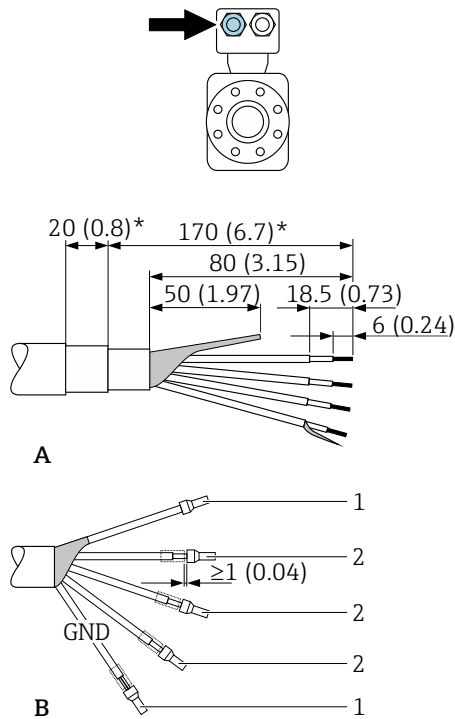
Coil current cable



A0029329

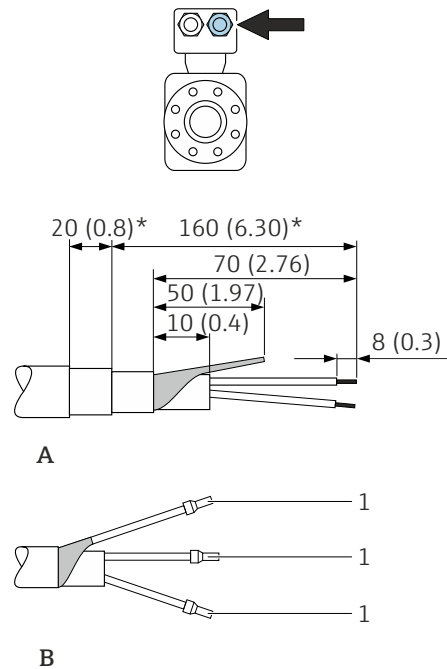
Sensor

Electrode cable



A0029336

Coil current cable



A0029337

Engineering unit mm (in)

A = Terminate the cable

B = Fit ferrules on cables with fine-wire cores (stranded cables)

1 = Red ferrules, ϕ 1.0 mm (0.04 in)

2 = White ferrules, ϕ 0.5 mm (0.02 in)

* = Stripping only for reinforced cables

7.2 Connecting the measuring device: Proline 500 – digital

NOTICE

Limitation of electrical safety due to incorrect connection!

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

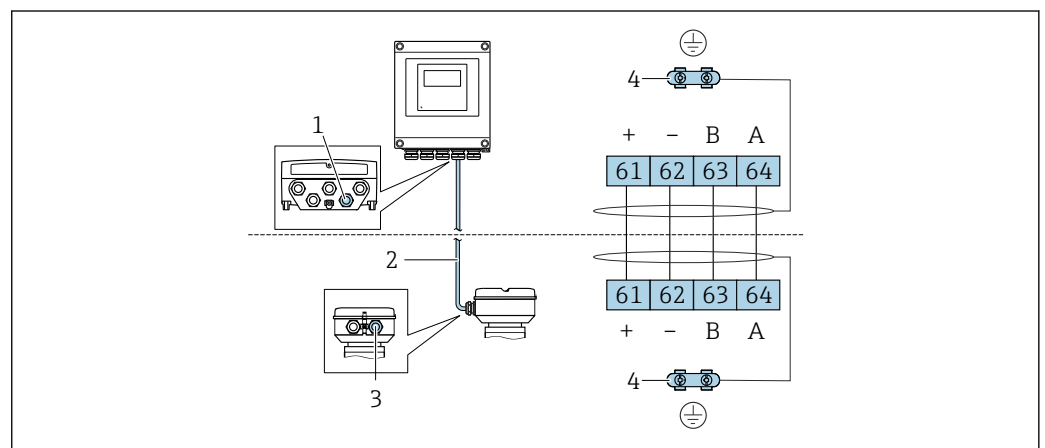
7.2.1 Connecting the connecting cable

⚠ WARNING

Risk of damaging the electronic components!

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

Terminal assignment



A0028198

- 1 Cable entry for connecting cable on transmitter housing
- 2 Connecting cable ISEM communication
- 3 Cable entry for connecting cable or connector on sensor connection housing
- 4 Grounding via cable strain relief

Connecting the connecting cable to the sensor connection housing

Connection via terminals with order code for "Sensor connection housing":

- Option **A** "Aluminum, coated" → 📄 44
- Option **L** "Cast, stainless" → 📄 44

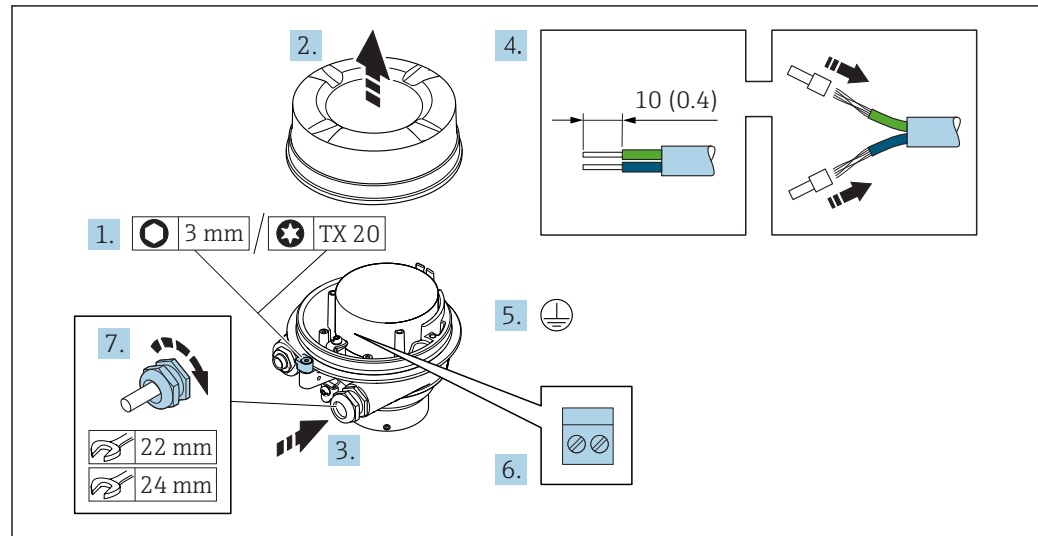
Connecting the connecting cable to the transmitter

The cable is connected to the transmitter via terminals → 📄 45.

Connecting the sensor connection housing via terminals

For the device version with the order code for "Sensor connection housing":

- Option A "Aluminum coated"
- Option L "Cast, stainless"



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 terminal assignment → 43.
7. Firmly tighten the cable glands.
 - ↳ This concludes the process for connecting the connecting cable.

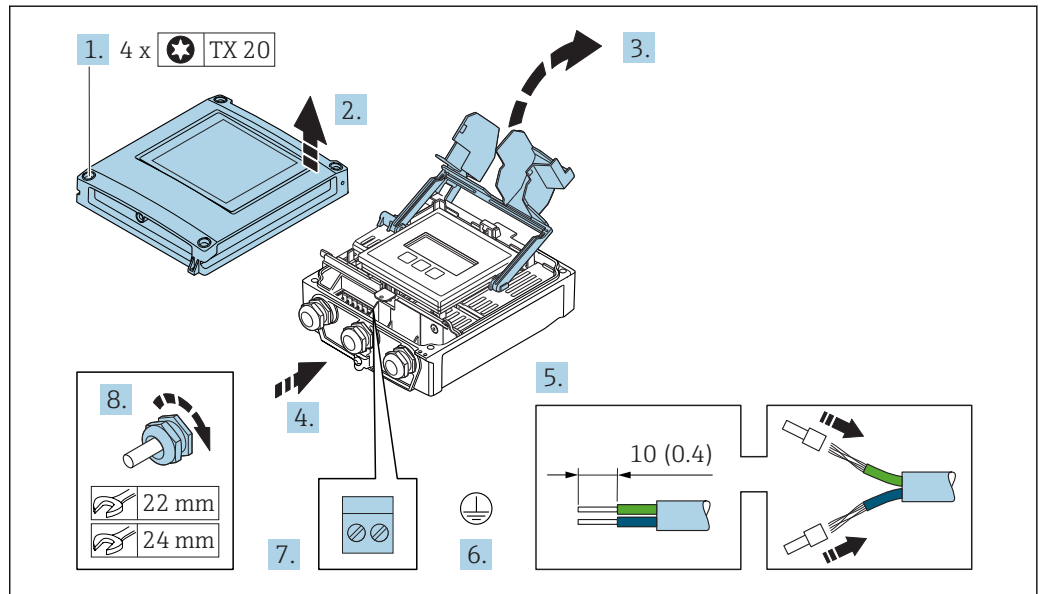
⚠ WARNING

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.

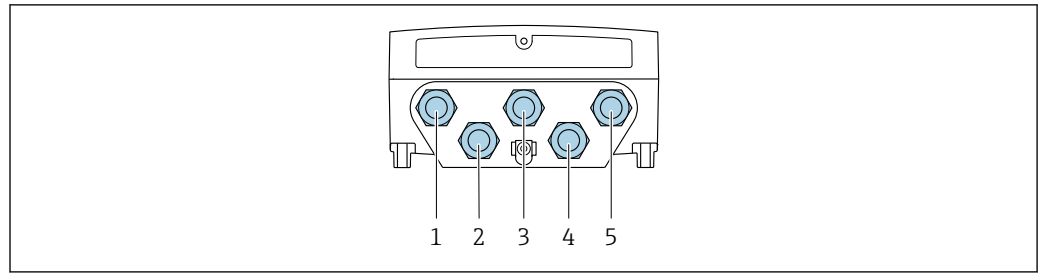
Connecting the connecting cable to the transmitter



A0029597

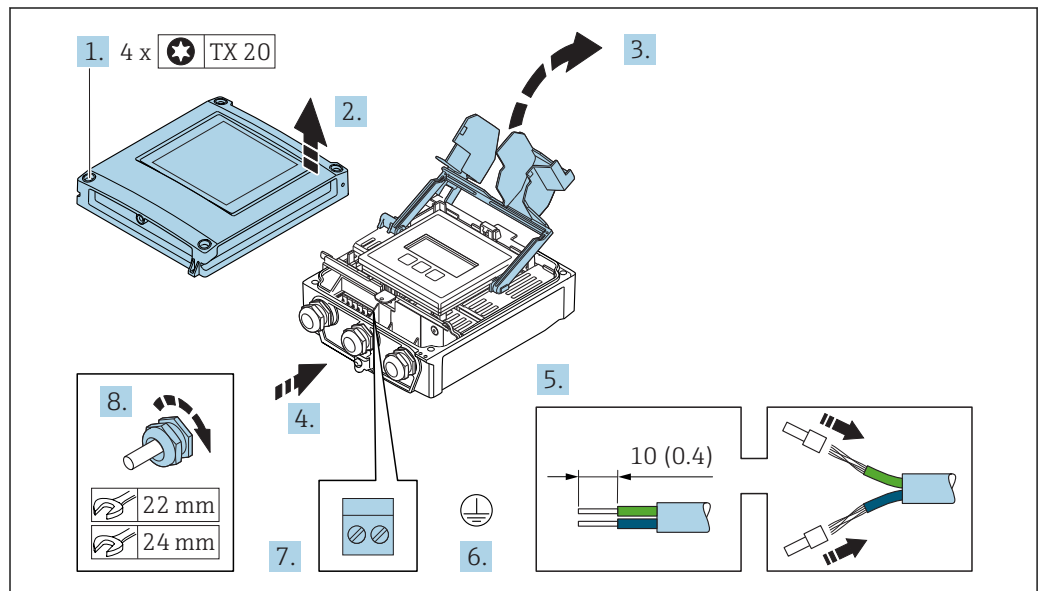
1. Loosen the 4 fixing screws on the housing cover.
2. Open the housing cover.
3. Fold open the terminal cover.
4. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
5. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
6. Connect the protective ground.
7. Connect the cable in accordance with the terminal assignment → 43.
8. Firmly tighten the cable glands.
 - ↳ This concludes the process for connecting the connecting cable.
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 → 46.

7.2.2 Connecting the signal cable and the supply voltage cable



A0028200

- 1 Cable entry for supply voltage
- 2 Cable entry for cable or connection of device plug for signal transmission
- 3 Cable entry for cable or connection of device plug for signal transmission
- 4 Cable entry for sensor - transmitter connecting cable
- 5 Cable entry for cable or connection of device plug for signal transmission, optional: connection of external WLAN antenna or service connector



A0029597

1. Loosen the 4 fixing screws on the housing cover.
2. Open the housing cover.
3. Fold open the terminal cover.
4. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
5. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
6. Connect the protective ground.
7. Connect the cable in accordance with the terminal assignment .
 - ↳ **Signal cable terminal assignment:** The device-specific terminal assignment is documented on an adhesive label in the terminal cover.
 - Supply voltage terminal assignment:** Adhesive label in the terminal cover or → 40.
8. Firmly tighten the cable glands.
 - ↳ This concludes the cable connection process.
9. Close the terminal cover.
10. Close the housing cover.

⚠ WARNING

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

- ▶ Screw in the screw without using any lubricant.

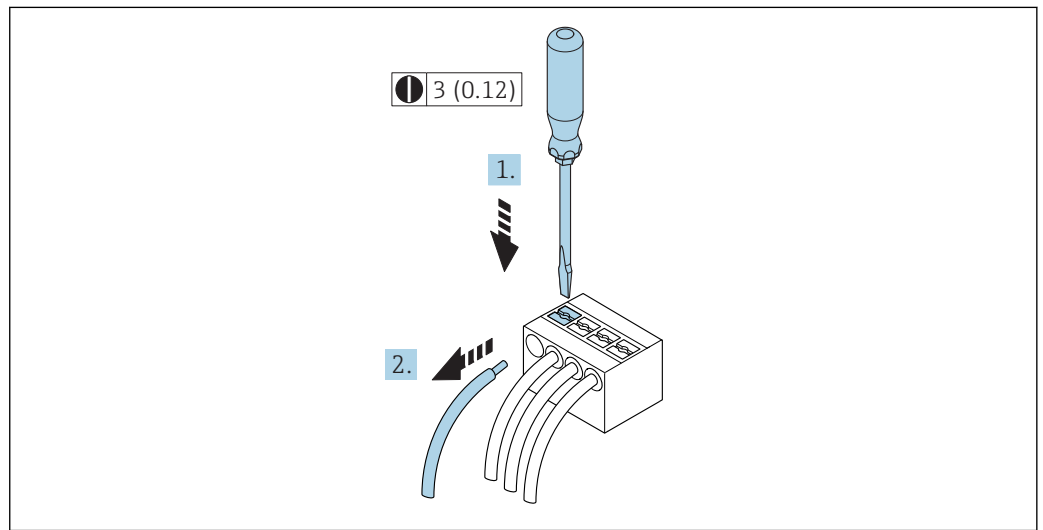
⚠ WARNING

Excessive tightening torque applied to the fixing screws!

Risk of damaging the plastic transmitter.

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

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

Removing a cable

15 Engineering unit mm (in)

1. To remove a cable from the terminal, use a flat-blade screwdriver to push the slot between the two terminal holes
2. while simultaneously pulling the cable end out of the terminal.

7.3 Connecting the measuring device: Proline 500

NOTICE

Limitation of electrical safety due to incorrect connection!

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

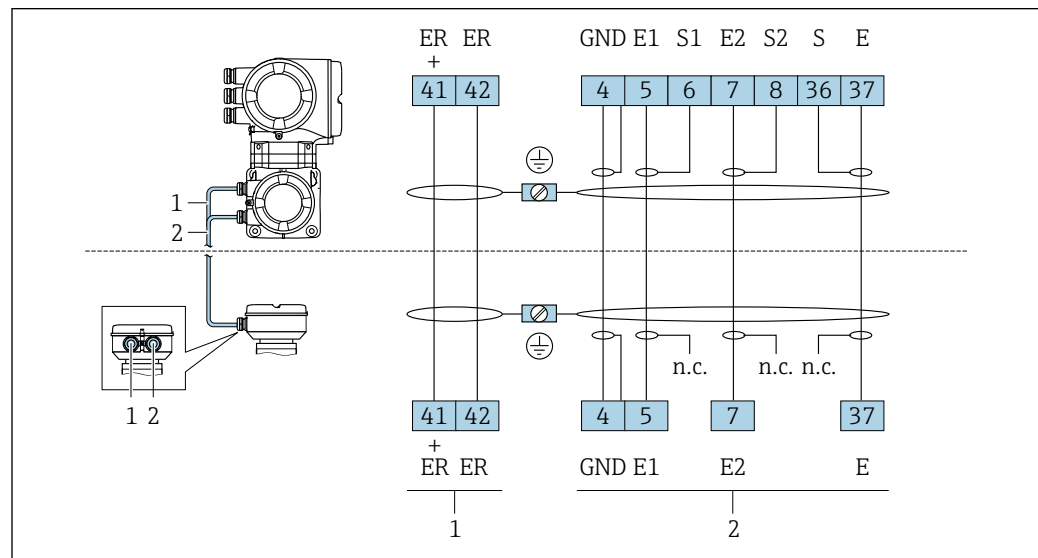
7.3.1 Connecting the connecting cable

⚠ WARNING

Risk of damaging the electronic components!

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

Terminal assignment



- 1 Coil current cable
2 Signal cable

Connecting the connecting cable to the sensor connection housing

Connection via terminals with order code for "Housing":
Option A "Aluminum coated" → 49

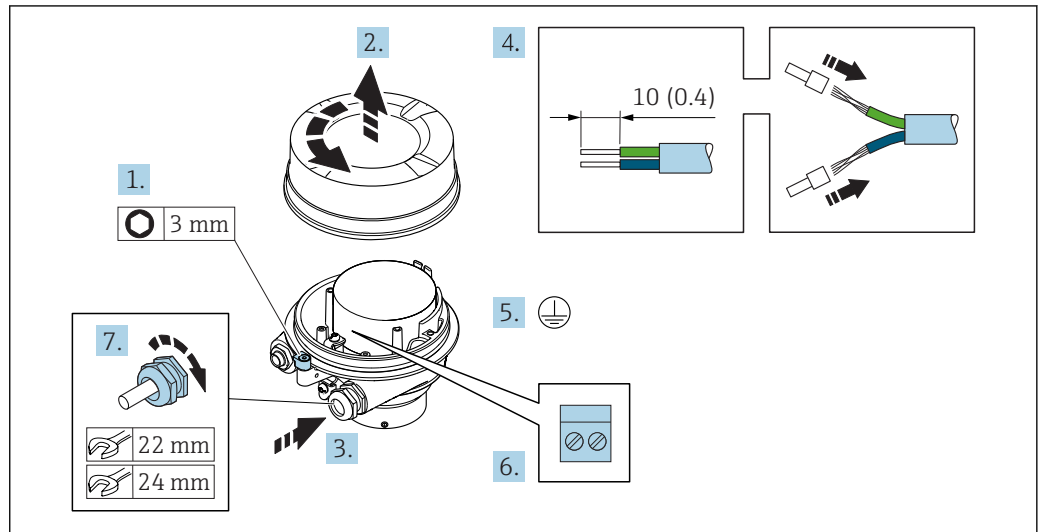
Connecting the connecting cable to the transmitter

The cable is connected to the transmitter via terminals → 50.

Connecting the sensor connection housing via terminals

For the device version with the order code for "Housing":

- Option **A** "Aluminum coated"
- Option **L** "Cast, stainless"



A0029612

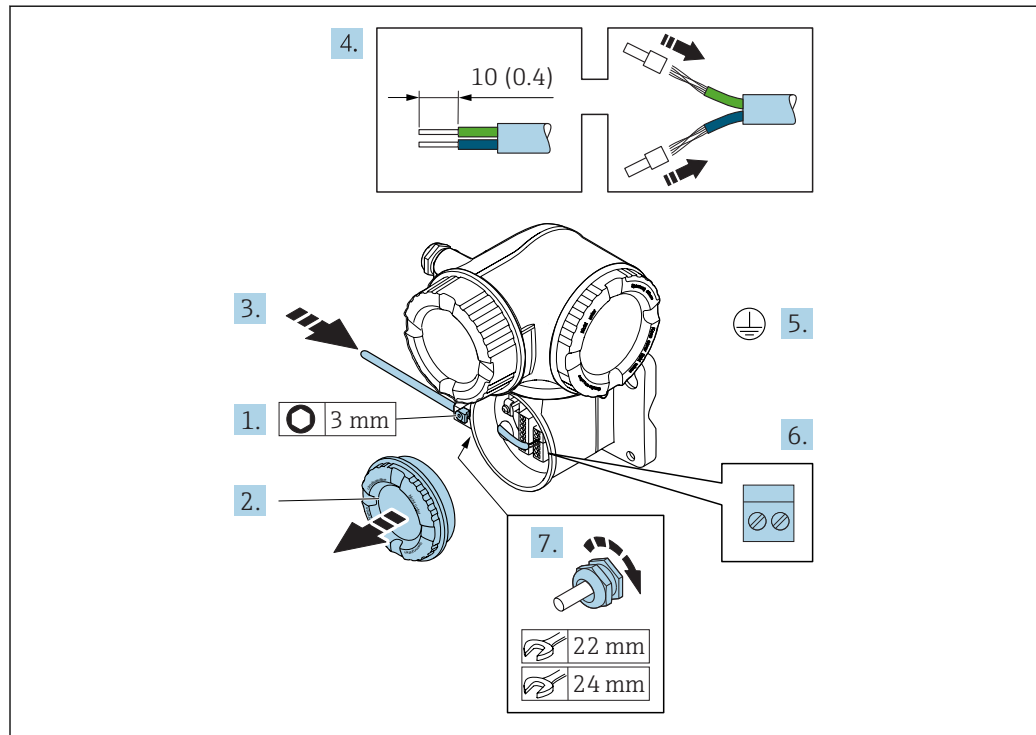
1. Loosen the securing clamp of the housing cover.
2. Unscrew the housing cover.
3. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
4. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
5. Connect the protective ground.
6. Connect the cable in accordance with the terminal assignment → 48.
7. Firmly tighten the cable glands.
 - ↳ This concludes the process for connecting the connecting cables.

⚠ 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.

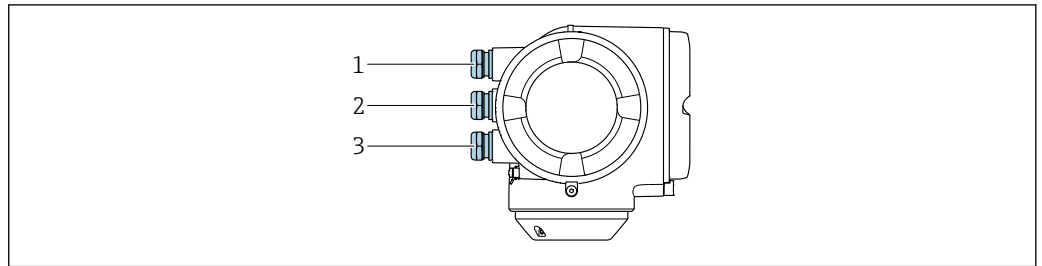
Connecting the connecting cable to the transmitter



A0029592

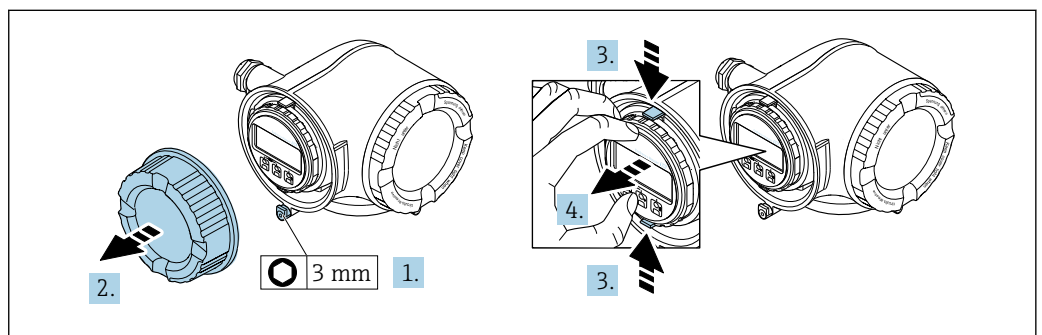
1. Loosen the securing clamp of the connection compartment cover.
2. Unscrew the connection compartment cover.
3. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
4. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.
5. Connect the protective ground.
6. Connect the cable in accordance with the terminal assignment → 48.
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 → 51.

7.3.2 Connecting the signal cable and the supply voltage cable



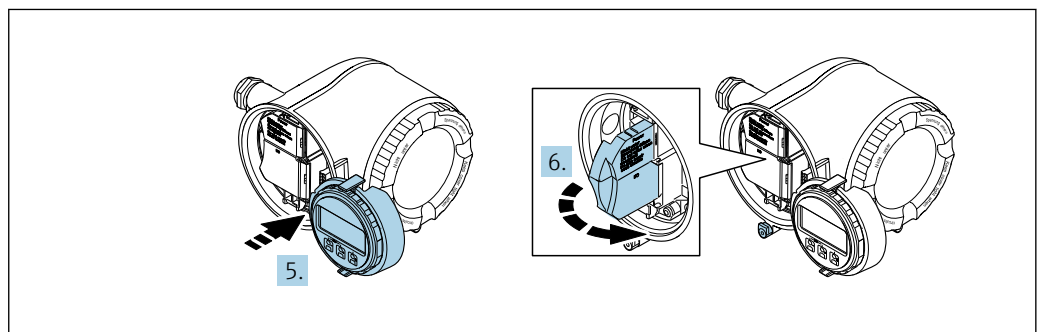
A0026781

- 1 Cable entry for supply voltage
- 2 Cable entry for signal transmission, input/output 1 and 2
- 3 Cable entry for input/output signal transmission; Optional: connection of external WLAN antenna or service plug



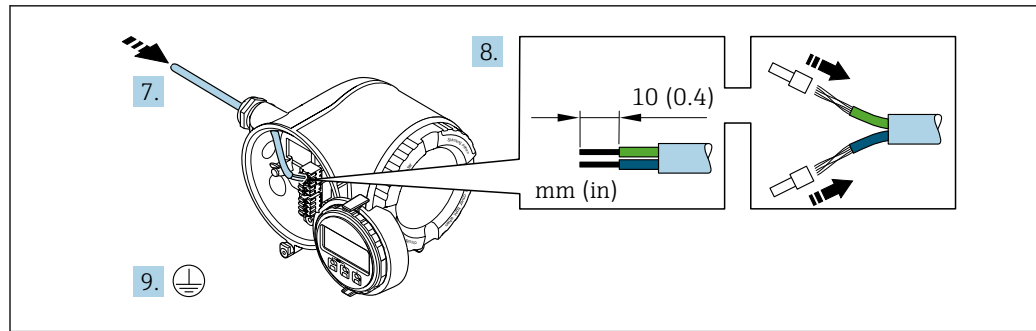
A0029813

- 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.



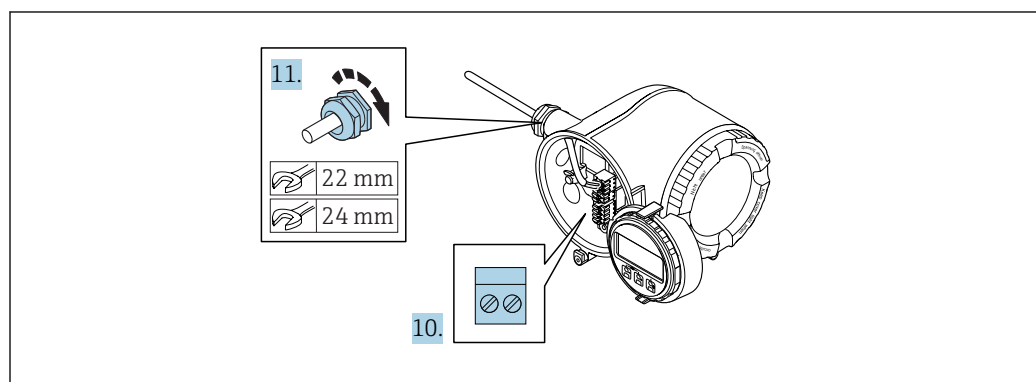
A0029814

- 5. Attach the holder to the edge of the electronics compartment.
- 6. Open the terminal cover.



A0029815

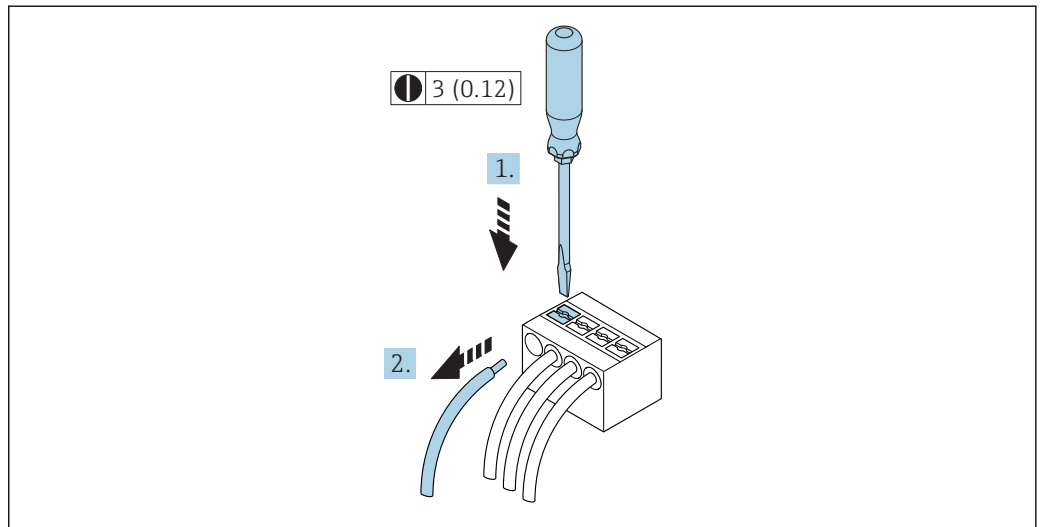
7. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
8. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.
9. Connect the protective ground.



A0029816

10. Connect the cable in accordance with the terminal assignment .
 - ↳ **Signal cable terminal assignment:** The device-specific terminal assignment is documented on an adhesive label in the terminal cover.
 - Supply voltage terminal assignment:** Adhesive label in the terminal cover or → 40.
11. Firmly tighten the cable glands.
 - ↳ This concludes the cable connection process.
12. Close the terminal cover.
13. Fit the display module holder in the electronics compartment.
14. Screw on the connection compartment cover.
15. Secure the securing clamp of the connection compartment cover.

Removing a cable



16 Engineering unit mm (in)

A0029598

1. To remove a cable from the terminal, use a flat-blade screwdriver to push the slot between the two terminal holes
2. while simultaneously pulling the cable end out of the terminal.

7.4 Ensure potential equalization

7.4.1 Requirements

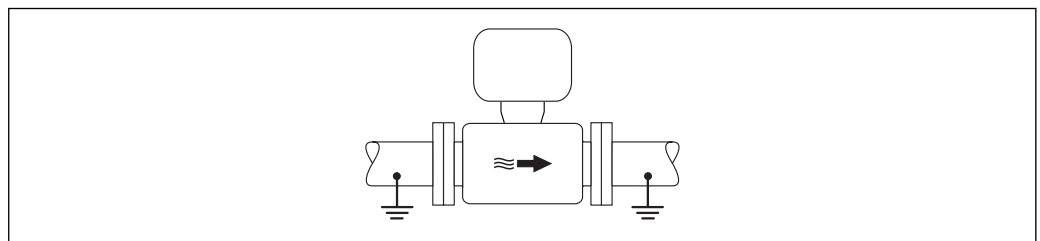
CAUTION

Electrode damage can result in the complete failure of the device!

- ▶ Same electrical potential for the fluid and sensor
- ▶ Company-internal grounding concepts
- ▶ Pipe material and grounding

7.4.2 Connection example, standard scenario

Metal, grounded pipe



17 Potential equalization via measuring tube

A0016315

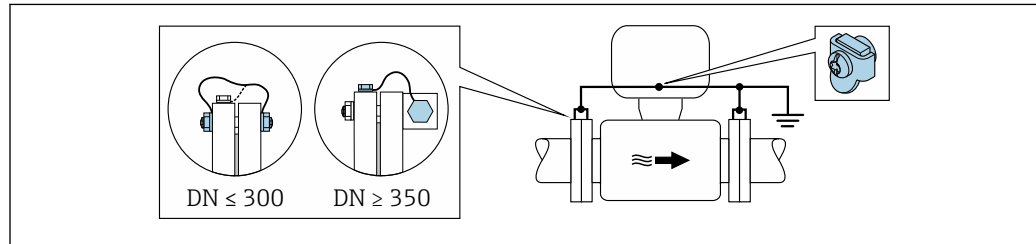
7.4.3 Connection example in special situations

Unlined and ungrounded metal pipe

This connection method also applies in situations where:

- The customary potential equalization is not used
- Equalizing currents are present

Ground cable	Copper wire, at least 6 mm ² (0.0093 in ²)
---------------------	---



A0029338

18 Potential equalization via ground terminal and pipe flanges

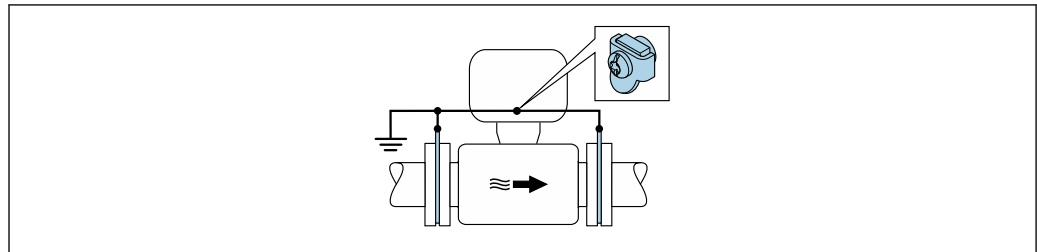
1. Connect both sensor flanges to the pipe flange via a ground cable and ground them.
2. If DN ≤ 300 (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.
3. If DN ≥ 350 (14"): Mount the ground cable directly on the metal transport bracket. Observe screw tightening torques: see the Sensor Brief Operating Instructions.
4. Connect the connection housing of the transmitter or sensor to ground potential by means of the ground terminal provided for the purpose.

Plastic pipe or pipe with insulating liner

This connection method also applies in situations where:

- The customary potential equalization is not used
- Equalizing currents are present

Ground cable	Copper wire, at least 6 mm ² (0.0093 in ²)
---------------------	---



A0029339

19 Potential equalization via ground terminal and ground disks

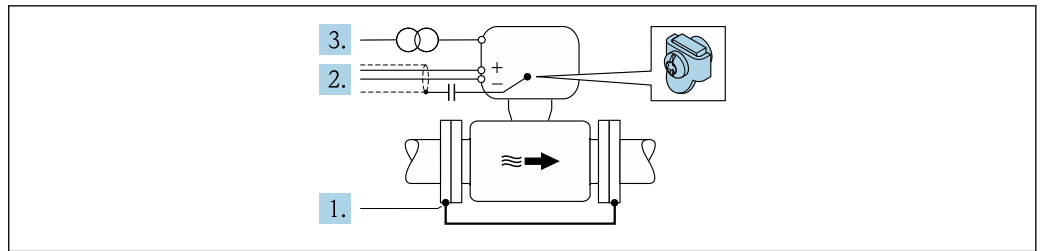
1. Connect the ground disks to the ground terminal via the ground cable.
2. Connect the ground disks to ground potential.

Pipe with a cathodic protection unit

This connection method is only used if the following two conditions are met:

- Metal pipe without liner or pipe with electrically conductive liner
- Cathodic protection is integrated in the personal protection equipment

Ground cable	Copper wire, at least 6 mm ² (0.0093 in ²)
---------------------	---



A0029340

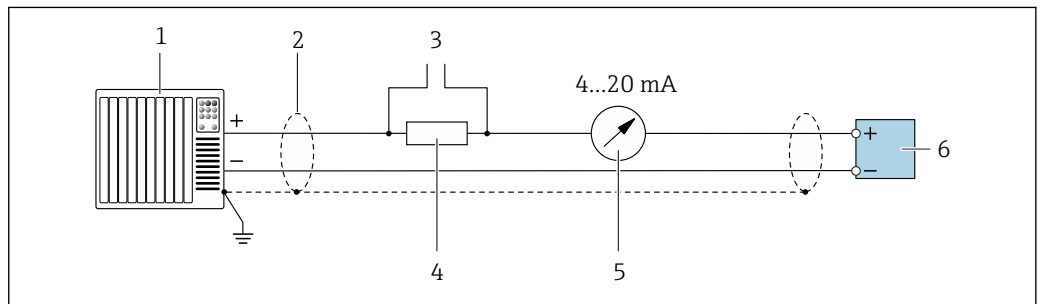
Prerequisite: The sensor is installed in the pipe in a way that provides electrical insulation.

1. Connect the two flanges of the pipe to one another via a ground cable.
2. Guide the shield of the signal lines through a capacitor.
3. Connect the measuring device to the power supply such that it is floating in relation to the protective ground (isolation transformer).

7.5 Special connection instructions

7.5.1 Connection examples

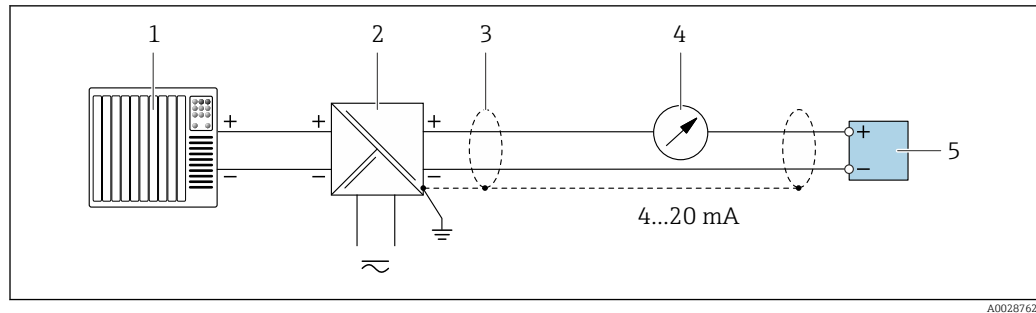
Current output 4 to 20 mA HART



A0029055

20 Connection example for 4 to 20 mA HART current output (active)

- 1 Automation system with current input (e.g. PLC)
- 2 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 3 Connection for HART operating devices → 81
- 4 Resistor for HART communication ($\geq 250 \Omega$): observe maximum load → 176
- 5 Analog display unit: observe maximum load → 176
- 6 Transmitter

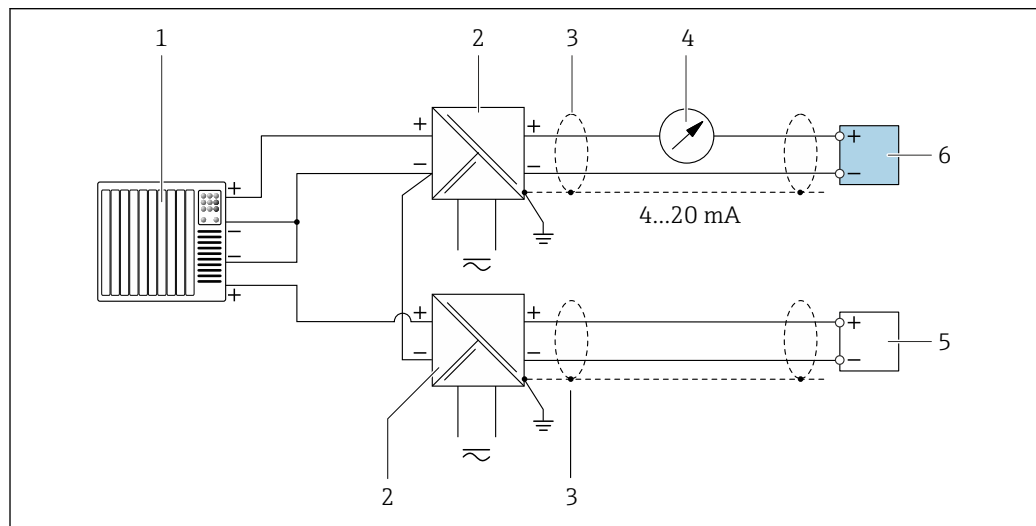


A0028762

21 Connection example for 4 to 20 mA HART current output (passive)

- 1 Automation system with current input (e.g. PLC)
- 2 Power supply
- 3 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 Analog display unit: observe maximum load → 176
- 5 Transmitter

HART input

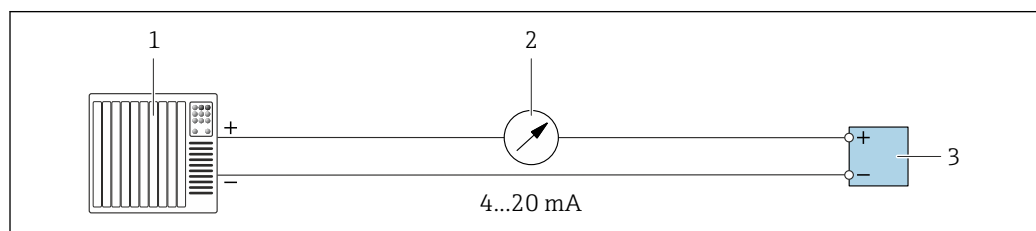


A0028763

22 Connection example for HART input with a common negative (passive)

- 1 Automation system with HART output (e.g. PLC)
- 2 Active barrier for power supply (e.g. RN221N)
- 3 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 Analog display unit: observe maximum load
- 5 Pressure transmitter (e.g. Cerabar M, Cerabar S): see requirements
- 6 Transmitter

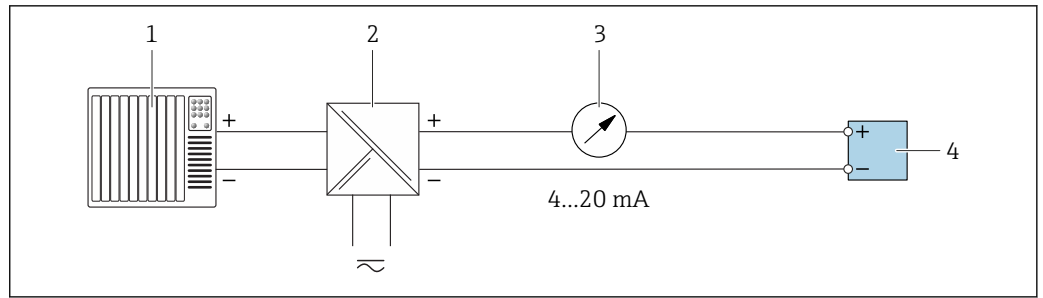
Current output 4-20 mA



A0028758

23 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

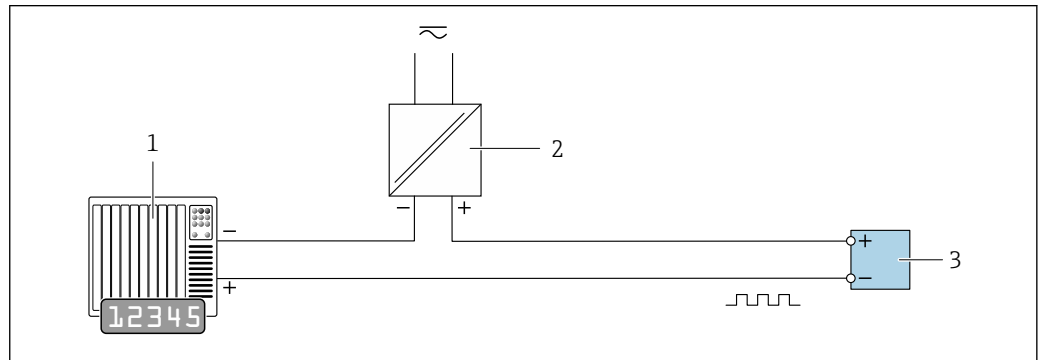


A0028759

24 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

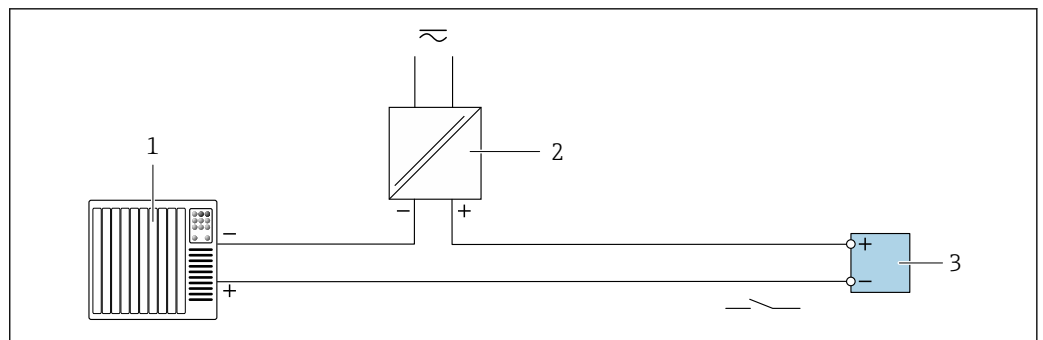


A0028761

25 Connection example for pulse/frequency output (passive)

- 1 Automation system with pulse/frequency input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values → 176

Switch output

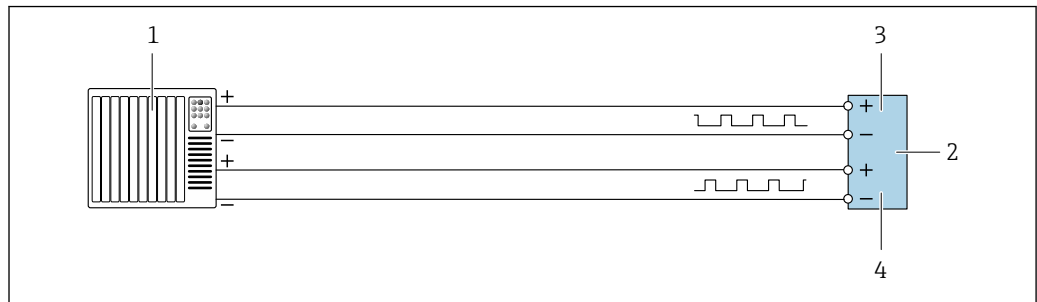


A0028760

26 Connection example for switch output (passive)

- 1 Automation system with switch input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values → 176

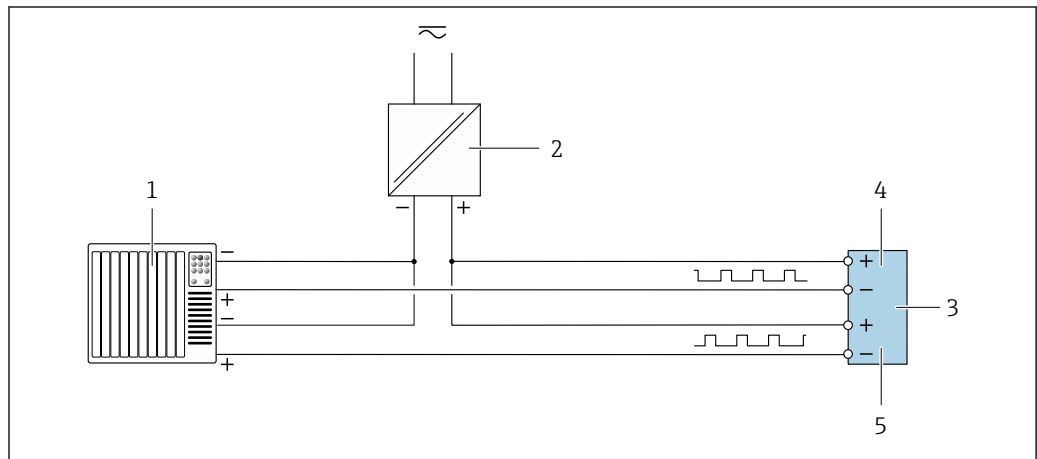
Double pulse output



A0029280

27 Connection example for double pulse output (active)

- 1 Automation system with double pulse input (e.g. PLC)
- 2 Transmitter: Observe input values → 178
- 3 Double pulse output
- 4 Double pulse output (slave), phase-shifted

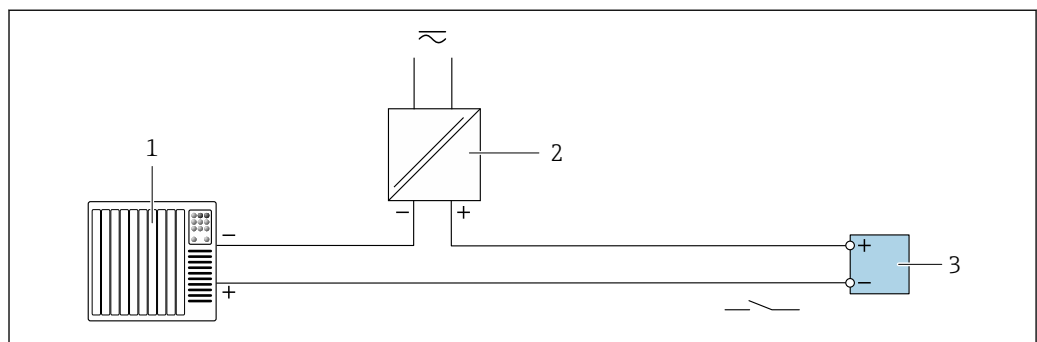


A0029279

28 Connection example for double pulse output (passive)

- 1 Automation system with double pulse input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values → 178
- 4 Double pulse output
- 5 Double pulse output (slave), phase-shifted

Relay output

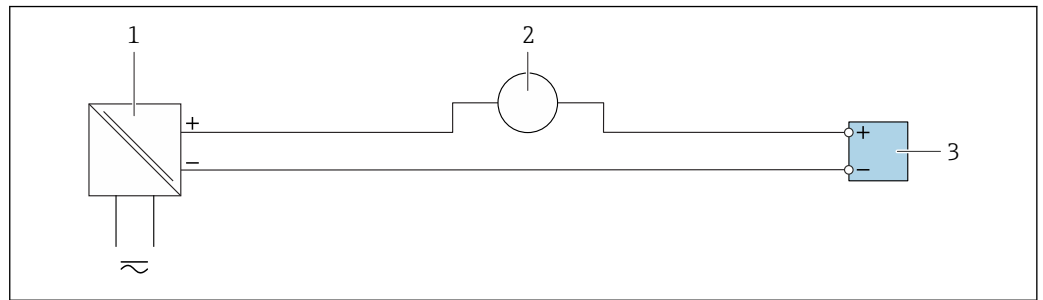


A0028760

29 Connection example for relay output (passive)

- 1 Automation system with relay input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values → 178

Current input

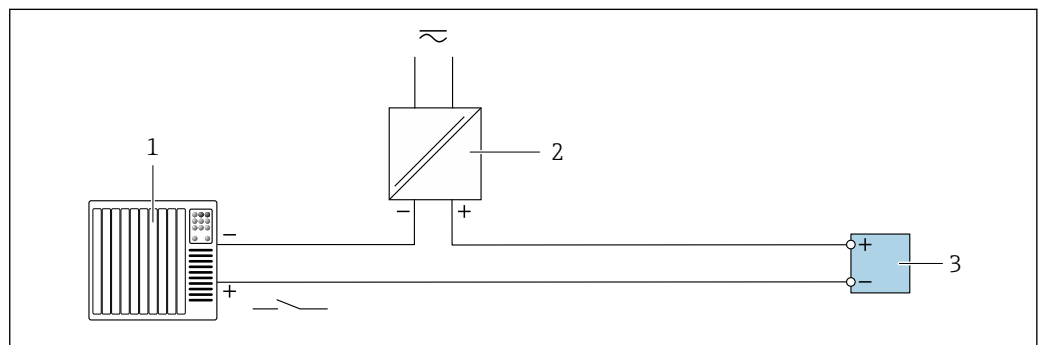


A0028915

30 Connection example for 4 to 20 mA current input

- 1 Power supply
- 2 External measuring device (for reading in pressure or temperature, for instance)
- 3 Transmitter: Observe input values

Status input



A0028764

31 Connection example for status input

- 1 Automation system with status output (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values

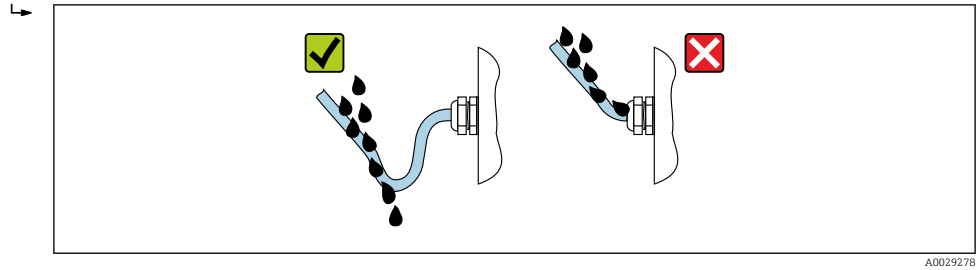
7.6 Ensuring the degree of protection

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

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

1. Check that the housing seals are clean and fitted correctly.
2. Dry, clean or replace the seals if necessary.
3. Tighten all housing screws and screw covers.
4. Firmly tighten the cable glands.

- 5. To ensure that moisture does not enter the cable entry:
Route the cable so that it loops down before the cable entry ("water trap").



A0029278

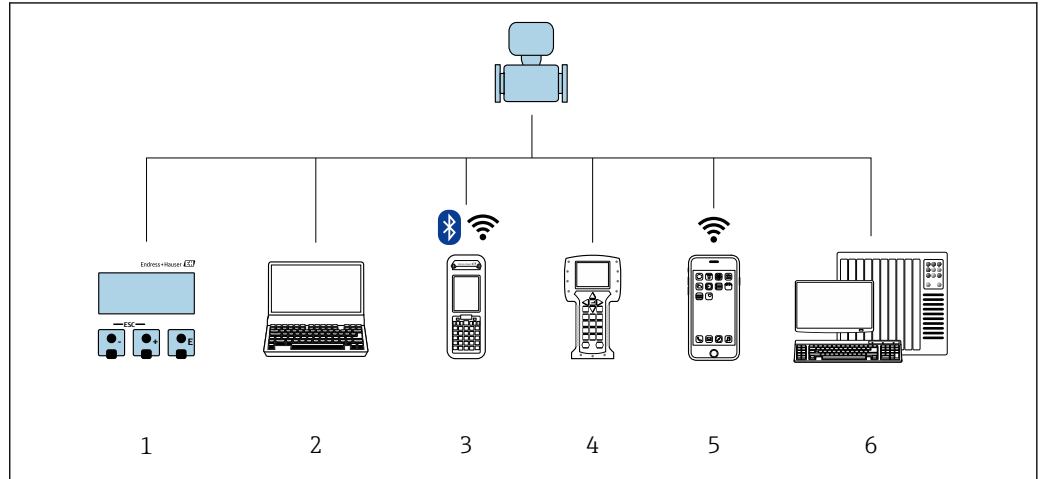
- 6. Insert dummy plugs into unused cable entries.

7.7 Post-connection check

Are cables or the device undamaged (visual inspection)?	<input type="checkbox"/>
Do the cables used meet the requirements?	<input type="checkbox"/>
Do the cables have adequate strain relief?	<input type="checkbox"/>
Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" → 59 ?	<input type="checkbox"/>
Is the potential equalization established correctly ?	<input type="checkbox"/>

8 Operation options

8.1 Overview of operation options





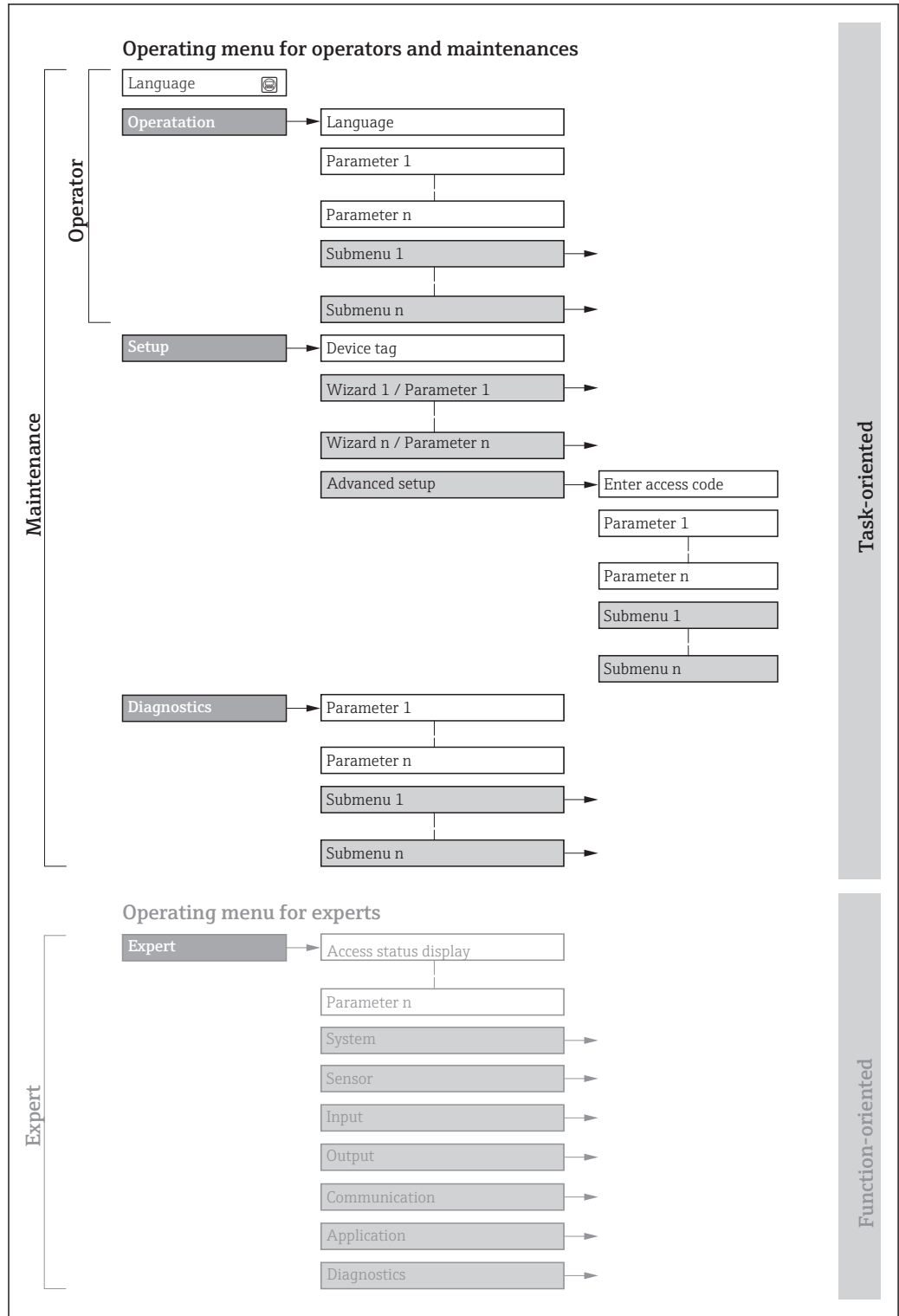
A0029295


- 1 Local operation via display module
- 2 Computer with Web browser (e.g. Internet Explorer) or with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM)
- 3 Field Xpert SFX350 or SFX370
- 4 Field Communicator 475
- 5 Mobile handheld terminal
- 6 Control 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: "Description of Device Parameters" document supplied with the device →  198



 32 Schematic structure of the operating menu

A0018237-EN

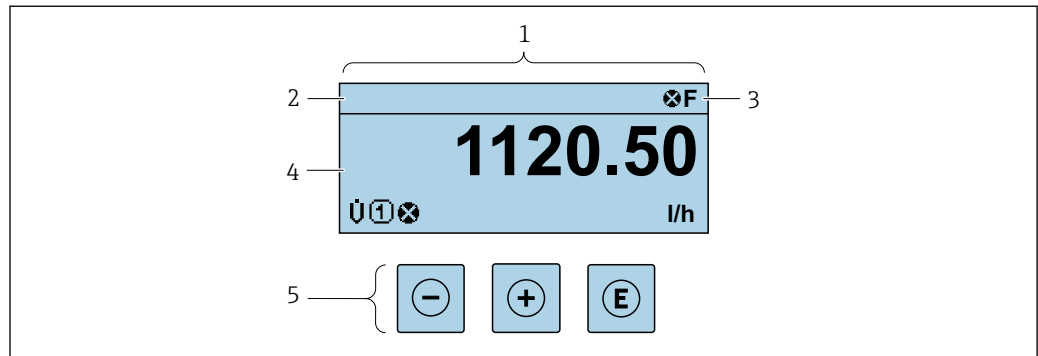
8.2.2 Operating philosophy

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

Menu/parameter		User role and tasks	Content/meaning
Language	task-oriented	Role "Operator", "Maintenance" Tasks during operation: <ul style="list-style-type: none"> Configuring the operational display Reading measured values 	<ul style="list-style-type: none"> Defining the operating language Defining the Web server operating language Resetting and controlling totalizers
Operation			<ul style="list-style-type: none"> Configuring the operational display (e.g. display format, display contrast) Resetting and controlling totalizers
Setup		"Maintenance" role Commissioning: <ul style="list-style-type: none"> Configuration of the measurement Configuration of the inputs and outputs Configuration of the communication interface 	Wizards for fast commissioning: <ul style="list-style-type: none"> Set the system units Display I/O/configuration Configure the inputs Configure the outputs Configuring the operational display Define the output conditioning Set the low flow cut off Configure empty pipe detection Advanced setup <ul style="list-style-type: none"> For more customized configuration of the measurement (adaptation to special measuring conditions) Configuration of totalizers Configuration of electrode cleaning (optional) Configure the WLAN settings Administration (define access code, reset measuring device)
Diagnostics	"Maintenance" role Fault elimination: <ul style="list-style-type: none"> Diagnostics and elimination of process and device errors Measured value simulation 	Contains all parameters for error detection and analyzing process and device errors: <ul style="list-style-type: none"> Diagnostics 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 "Extended HistoROM" order option Storage and visualization of measured values Heartbeat The functionality of the device is checked on demand and the verification results are documented. Simulation Is used to simulate measured values or output values. 	
Expert	function-oriented	Tasks that require detailed knowledge of the function of the device: <ul style="list-style-type: none"> 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 the parameters of the device and makes it possible to access these parameters directly using an access code. The structure of this menu is based on the function blocks of the device: <ul style="list-style-type: none"> System Contains all higher-order device parameters which do not concern the measurement or the communication interface. Sensor Configuration of the measurement. Input Configuring the status input. Output Configuring 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 Configure 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 the operating menu via the local display

8.3.1 Operational display



A0029346

- 1 Operational display
- 2 Device tag → 94
- 3 Status area
- 4 Display area for measured values (4-line)
- 5 Operating elements → 69

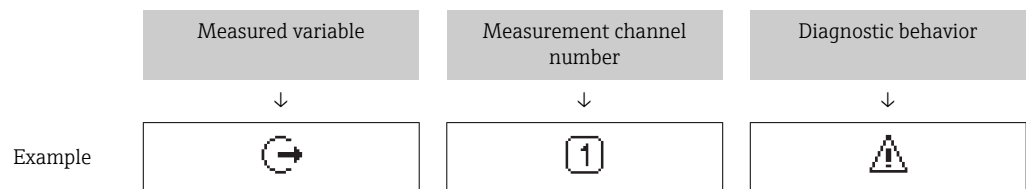
Status area

The following symbols appear in the status area of the operational display at the top right:

- Status signals → 150
 - **F**: Failure
 - **C**: Function check
 - **S**: Out of specification
 - **M**: Maintenance required
- Diagnostic behavior → 151
 - **⊗**: 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:



Appears only if a diagnostics event is present for this measured variable.

Measured values

Symbol	Meaning
Û	Volume flow
G	Conductivity

	Mass flow
	Totalizer The measurement channel number indicates which of the three totalizers is displayed.
	Output The measurement channel number indicates which of the outputs is displayed.
	Status input

Measurement channel numbers

Symbol	Meaning
	Measurement channel 1 to 4
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

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable. For information on the symbols → 151

The number and display format of the measured values can be configured via the "Format display" parameter → 107. Operation → Display → Format display

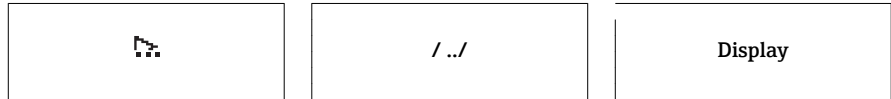
8.3.2 Navigation view



In the submenu	In the wizard
<p>Diagram showing a submenu with a navigation path (1) at the top, a status area (3) with '0091-1', a display area (4) with 'Access stat.disp' and 'Operator', and operating elements (5) at the bottom: minus, plus, and E buttons.</p>	<p>Diagram showing a wizard with a navigation path (1) at the top, a status area (3) with 'S', a display area (4) with 'Curr. output 1' and 'Volume flow', and operating elements (5) at the bottom: minus, plus, and E buttons.</p>
<p>1 Navigation view 2 Navigation path to current position 3 Status area 4 Display area for navigation 5 Operating elements → 69</p>	

Navigation path

The navigation path - displayed at the top left in the navigation view - consists of the following elements:

	<ul style="list-style-type: none"> In the submenu: Display symbol for menu In the wizard: Display symbol for wizard 	Omission symbol for operating menu levels in between	Name of current <ul style="list-style-type: none"> Submenu Wizard Parameters
	↓	↓	↓
Examples		/ .. /	Display






 For more information about the icons in the menu, refer to the "Display area" section →  66

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 for the parameter you are navigating to (e.g. 0022-1)
 - If a diagnostic event is present, the diagnostic behavior and status signal
- In the wizard
 - If a diagnostic event is present, the diagnostic behavior and status signal





-  ▪ For information on the diagnostic behavior and status signal →  150
- For information on the function and entry of the direct access code →  71

Display area


Menus

Symbol	Meaning
	Operation Appears: <ul style="list-style-type: none"> ▪ In the menu next to the "Operation" selection ▪ At the left in the navigation path in the Operation menu
	Setup Appears: <ul style="list-style-type: none"> ▪ In the menu next to the "Setup" selection ▪ At the left in the navigation path in the Setup menu
	Diagnostics Appears: <ul style="list-style-type: none"> ▪ In the menu next to the "Diagnostics" selection ▪ At the left in the navigation path in the Diagnostics menu
	Expert Appears: <ul style="list-style-type: none"> ▪ 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
	Wizard
	Parameters within a wizard  No display symbol exists for parameters in submenus.

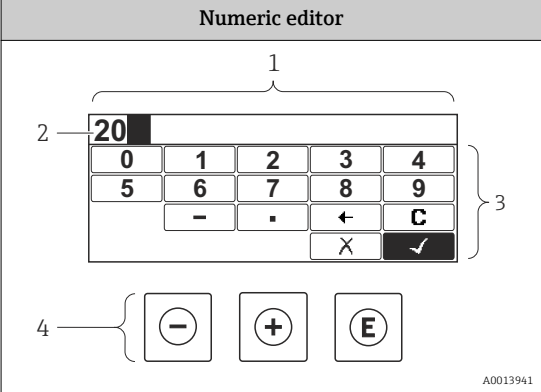
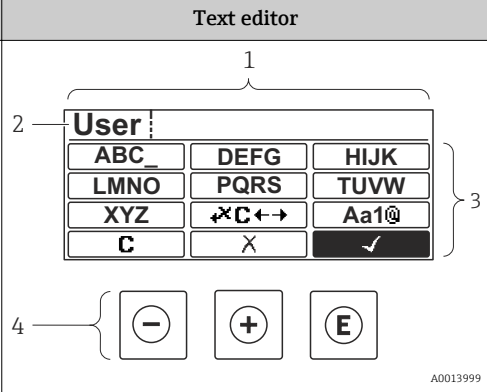

Locking

Symbol	Meaning
	Parameter locked When displayed in front of a parameter name, indicates that the parameter is locked. <ul style="list-style-type: none"> ▪ By a user-specific access code ▪ By the hardware write protection switch

Wizard operation

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


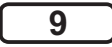



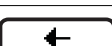
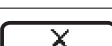

8.3.3 Editing view

Numeric editor	Text editor
	
<p>1 Editing view 2 Display area of the entered values 3 Input mask 4 Operating elements →  69</p>	












Input mask


The following input symbols are available in the input mask of the numeric and text editor:





Numeric editor

Symbol	Meaning
 ... 	Selection of numbers from 0 to 9.
	Inserts decimal separator at the input position.
	Inserts minus sign at the input position.
	Confirms selection.
	Moves the input position one position to the left.
	Exits the input without applying the changes.
	Clears all entered characters.








Text editor

Symbol	Meaning
	Toggle <ul style="list-style-type: none"> ▪ Between upper-case and lower-case letters ▪ For entering numbers ▪ For entering special characters
 ... 	Selection of letters from A to Z.
 ... 	Selection of letters from a to z.
 ... 	Selection of special characters.
	Confirms selection.
	Switches to the selection of the correction tools.
	Exits the input without applying the changes.
	Clears all entered characters.

Correction symbols under 

Symbol	Meaning
	Clears all entered characters.
	Moves the input position one position to the right.
	Moves the input position one position to the left.
	Deletes one character immediately to the left of the input position.

8.3.4 Operating elements

Key	Meaning
	<p>Minus key</p> <p><i>In a menu, submenu</i> Moves the selection bar upwards in a choose list.</p> <p><i>With a Wizard</i> Confirms the parameter value and goes to the previous parameter.</p> <p><i>With a text and numeric editor</i> In the input mask, moves the selection bar to the left (backwards).</p>
	<p>Plus key</p> <p><i>In a menu, submenu</i> Moves the selection bar downwards in a choose list.</p> <p><i>With a Wizard</i> Confirms the parameter value and goes to the next parameter.</p> <p><i>With a text and numeric editor</i> Moves the selection bar to the right (forwards) in an input screen.</p>
	<p>Enter key</p> <p><i>For operational display</i></p> <ul style="list-style-type: none"> ▪ Pressing the key briefly opens the operating menu. ▪ Pressing the key for 2 s opens the context menu. <p><i>In a menu, submenu</i></p> <ul style="list-style-type: none"> ▪ Pressing the key briefly: <ul style="list-style-type: none"> - 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 for parameter: <ul style="list-style-type: none"> - If present, opens the help text for the function of the parameter. <p><i>With a Wizard</i> Opens the editing view of the parameter.</p> <p><i>With a text and numeric editor</i></p> <ul style="list-style-type: none"> ▪ Pressing the key briefly: <ul style="list-style-type: none"> - Opens the selected group. - Carries out the selected action. ▪ Pressing the key for 2 s confirms the edited parameter value.
	<p>Escape key combination (press keys simultaneously)</p> <p><i>In a menu, submenu</i></p> <ul style="list-style-type: none"> ▪ Pressing the key briefly: <ul style="list-style-type: none"> - 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"). <p><i>With a Wizard</i> Exits the wizard and takes you to the next higher level.</p> <p><i>With a text and numeric editor</i> Closes the text or numeric editor without applying changes.</p>
	<p>Minus/Enter key combination (press the keys simultaneously)</p> <p>Reduces the contrast (brighter setting).</p>
	<p>Plus/Enter key combination (press and hold down the keys simultaneously)</p> <p>Increases the contrast (darker setting).</p>
	<p>Minus/Plus/Enter key combination (press the keys simultaneously)</p> <p><i>For operational display</i> Enables or disables the keypad lock (only SD02 display module).</p>

8.3.5 Opening the context menu

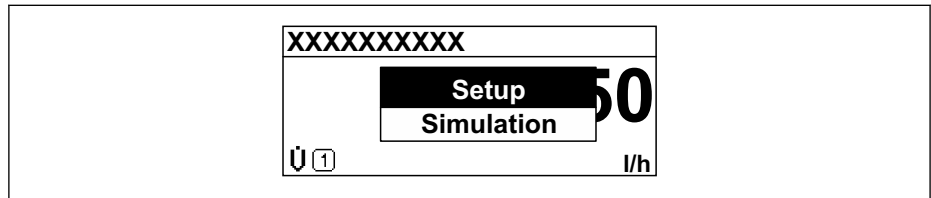
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Data backup
- Simulation

Calling up and closing the context menu

The user is in the operational display.

1. Press \square for 2 s.
 - ↳ The context menu opens.



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2. Press \square + \oplus simultaneously.
 - ↳ The context menu is closed and the operational display appears.

Calling up the menu via the context menu

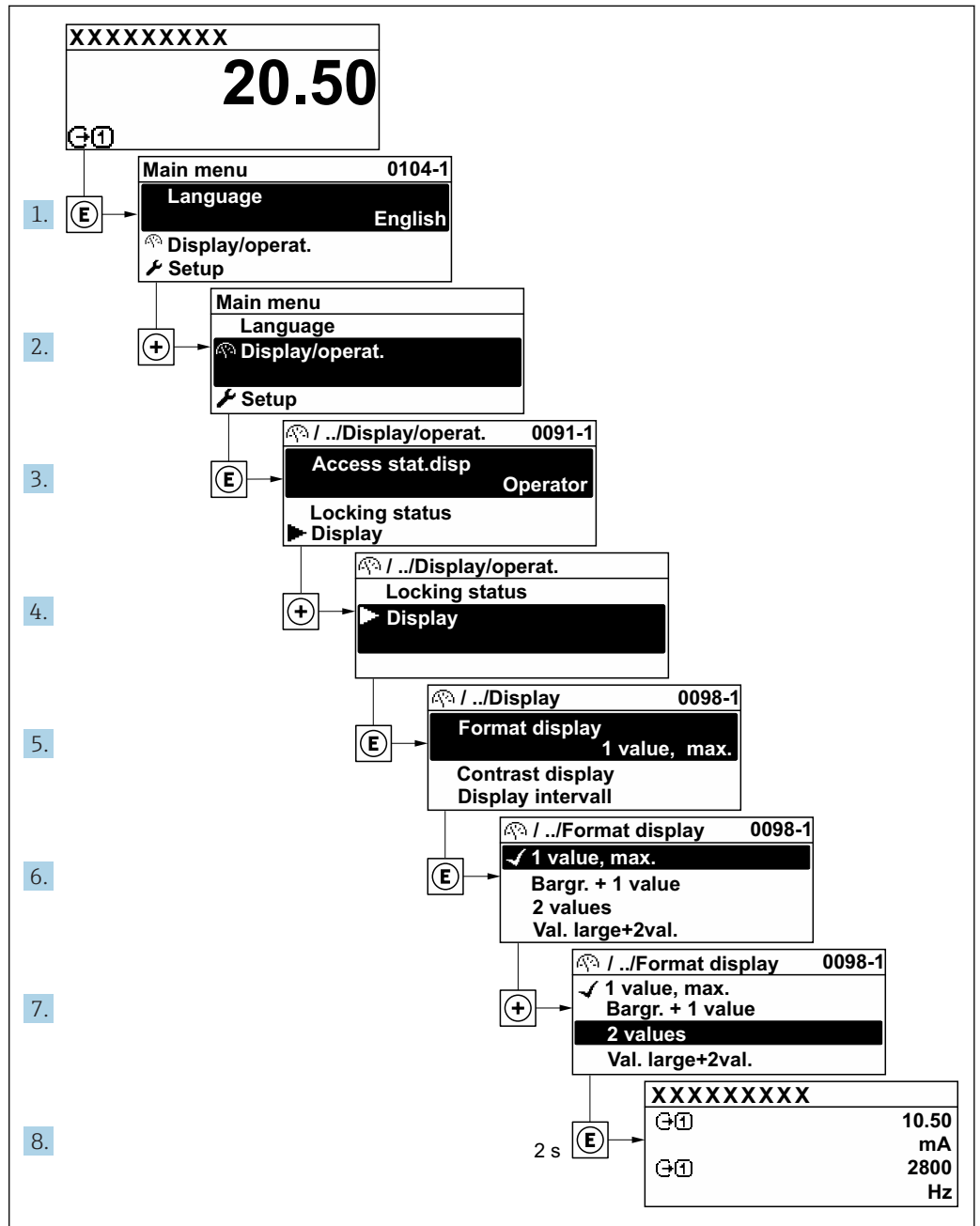
1. Open the context menu.
2. Press \oplus to navigate to the desired menu.
3. Press \square to confirm the selection.
 - ↳ The selected menu opens.

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.

i For an explanation of the navigation view with symbols and operating elements → 65

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



A0029562-EN

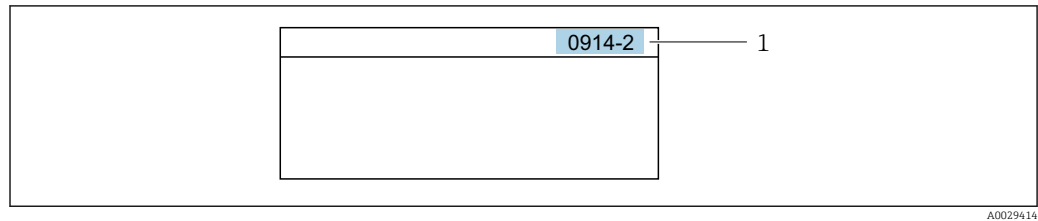
8.3.7 Calling the parameter directly

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 4-digit number and the channel number, which identifies the channel of a process variable: e.g. 0914-1. 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: Input of "914" instead of "0914"
- If no channel number is entered, channel 1 is jumped to automatically.
Example: Enter 0914 → **Assign process variable** parameter
- If a different channel is jumped to: Enter the direct access code with the corresponding channel number.
Example: Enter 0914-2 → **Assign process variable** parameter

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

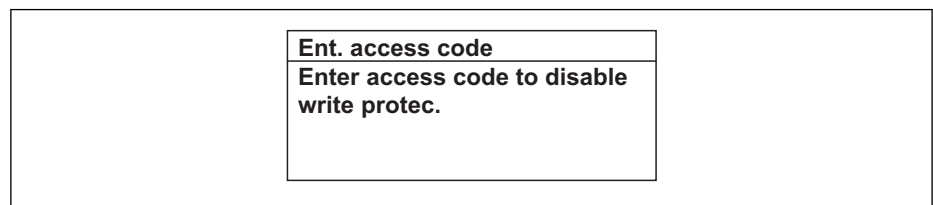
8.3.8 Calling up help text


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.



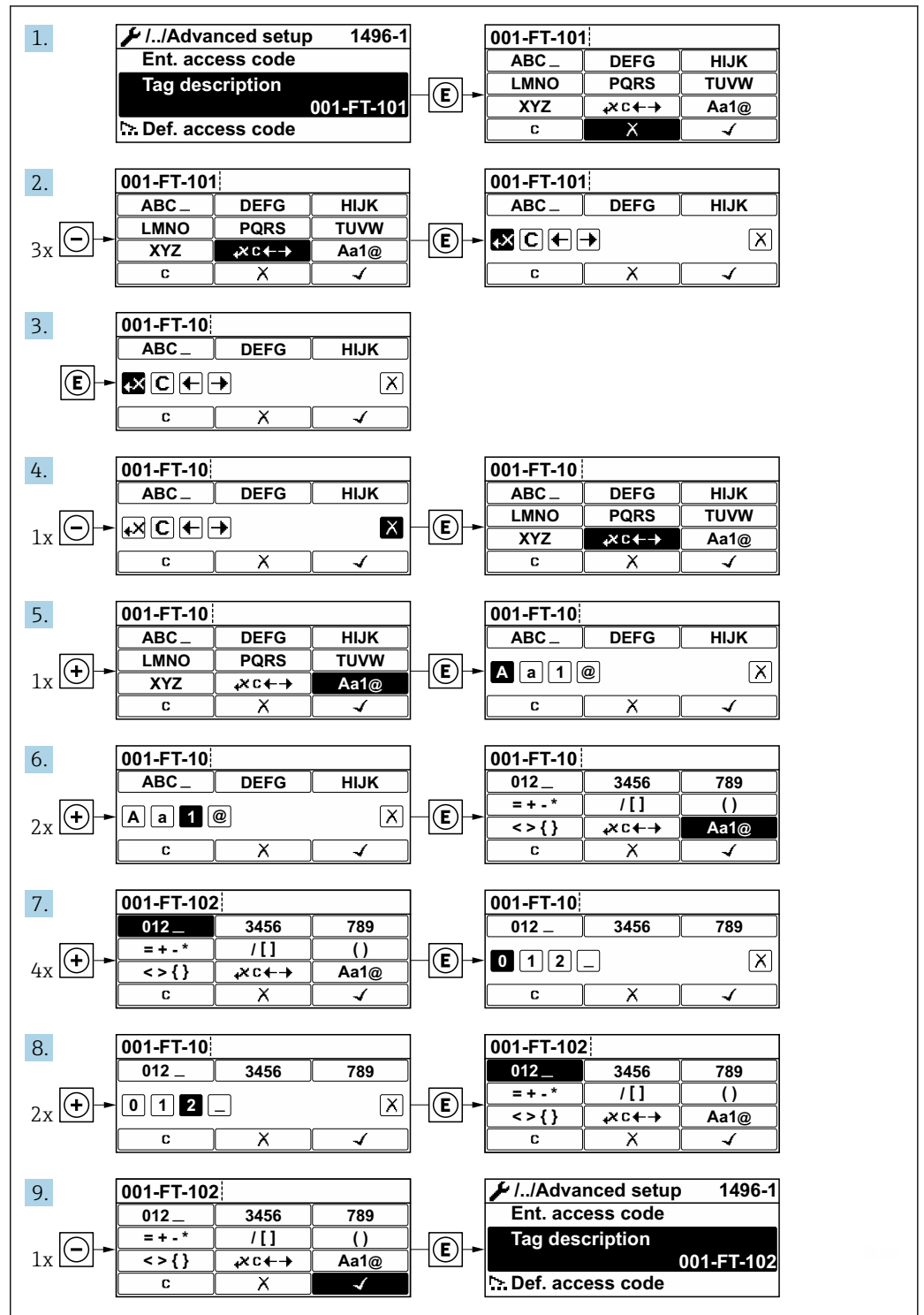
 33 Example: Help text for parameter "Enter access code"

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

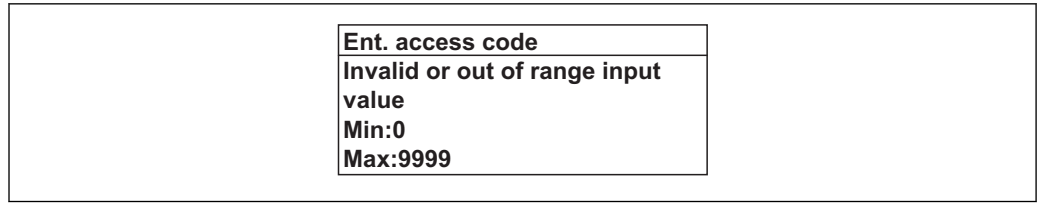
8.3.9 Changing the parameters

i For a description of the editing display - consisting of text editor and numeric editor - with symbols → 67, for a description of the operating elements → 69

Example: Changing the tag name in the "Tag description" parameter from 001-FT-101 to 001-FT-102



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



A0014049-EN

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 → 130.

Access authorization to parameters: "Operator" 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) Despite the defined access code, certain parameters can always be modified and thus are excepted from the write protection, as they do not affect the measurement. Refer to the "Write protection via access code" section

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) If an incorrect access code is entered, the user obtains the access rights of the "Operator" user role.

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 → 130.

Parameter write protection via local operation can be disabled by entering the user-specific access code in the **Enter access code** parameter 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.


Local operation with touch control

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

Switching on the keypad lock


The keypad lock is switched on automatically:

- Each time the device is restarted.
- If the device has not been operated for longer than one minute in the measured value display.

1. The device is in the measured value display.
Press  for at least 2 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 message **Keylock on** appears.



Switching off the keypad lock

1. The keypad lock is switched on.
Press  for at least 2 seconds.
↳ A context menu appears.
2. In the context menu, select the **Keylock off** option.
↳ The keypad lock is switched off.

8.4 Access to the operating menu via the Web browser

8.4.1 Function range

Thanks to the integrated Web server, the device can be operated and configured via a Web browser and via a service interface (CDI-RJ45) or a 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 also displayed and allows the user to monitor the status of the device. Furthermore the measuring device data can be managed and the network parameters can be configured. The WLAN connection requires a device that acts as an access point to enable communication via a computer or mobile handheld terminal.


 For additional information on the Web server, refer to the Special Documentation for the device →  198

8.4.2 Prerequisites



Computer hardware

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

Computer software





Software	Interface	
	CDI-RJ45	WLAN
Recommended operating systems	<ul style="list-style-type: none"> ▪ Microsoft Windows 7 or higher. ▪ Mobile operating systems: <ul style="list-style-type: none"> - iOS - Android <p> Microsoft Windows XP is supported.</p>	
Web browsers supported	<ul style="list-style-type: none"> ▪ 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 (for adjusting the IP address, subnet mask etc.).	
Proxy server settings of the Web browser	The Web browser setting <i>Use a Proxy Server for Your LAN</i> must be deselected .	
JavaScript	<p>JavaScript must be enabled.</p> <p> If JavaScript cannot be enabled: enter <code>http://192.168.1.212/basic.html</code> in the address line of the Web browser. A fully functional but simplified version of the operating menu structure starts in the Web browser.</p> <p> When installing a new firmware version: To enable correct data display, clear the temporary memory (cache) of the Web browser under Internet options.</p>	
Network connections	Only the active network connections to the measuring device should be used.	
	Switch off all other network connections such as WLAN.	Switch off all other network connections.

 In the event of connection problems: →  145

Measuring device

Device	Interface	
	CDI-RJ45	WLAN
Measuring device	The measuring device has an RJ45 interface.	<p>The measuring device has a WLAN antenna:</p> <ul style="list-style-type: none"> ▪ Transmitter with integrated WLAN antenna ▪ Transmitter with external WLAN antenna
Web server	<p>Web server must be enabled; factory setting: ON</p> <p> For information on enabling the Web server →  80</p>	<p>Web server and WLAN must be enabled; factory setting: ON</p> <p> For information on enabling the Web server →  80</p>


8.4.3 Establishing a connection

Via service interface (CDI-RJ45)

Configuring the Internet protocol of the computer

The following information refers to the default Ethernet settings of the device.

IP address of the device: 192.168.1.212 (factory setting)

1. Switch on the measuring device.
2. Connect to the computer using a cable →  82.
3. 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.
4. Close any open Internet browsers.
5. 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 operating unit

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

In principle, avoid simultaneous access to the measuring device via the service interface (CDI-RJ45) and the WLAN interface from the same operating unit. This could cause a network conflict.


- ▶ Only activate one service interface (CDI-RJ45 service interface 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).

Preparation

- ▶ Enable WLAN reception on the operating unit.

Establishing a connection

1. 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).
 - ↳ LED on display module flashes: it is now possible to operate the measuring device with the Web browser, FieldCare or DeviceCare.

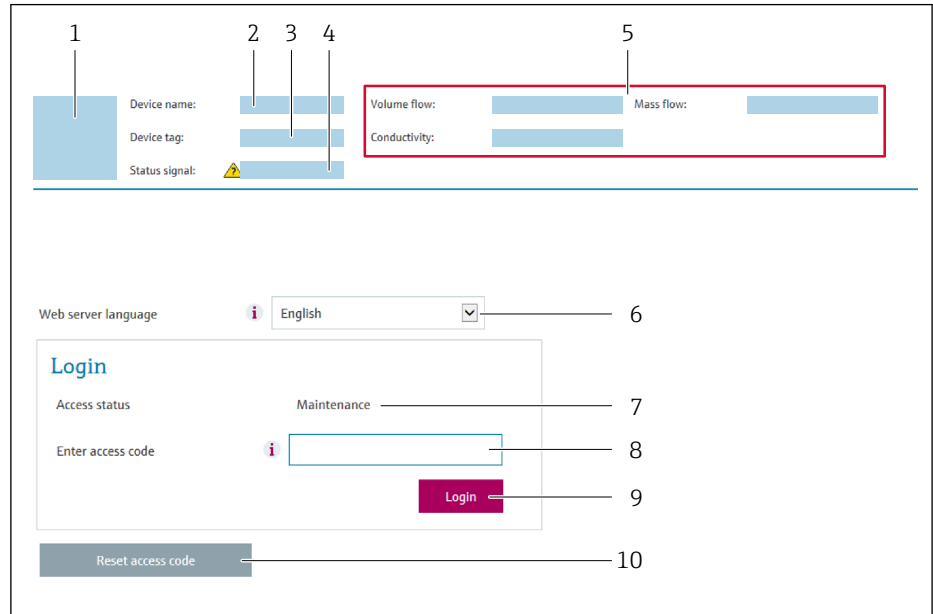
 The serial number can be found on the nameplate.

Disconnecting

- ▶ Once the configuration is completed, disconnect the WLAN connection between the operating unit and the 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.



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- 1 Picture of device
- 2 Device name
- 3 Device tag (→ ⓘ 94)
- 4 Status signal
- 5 Current measured values
- 6 Operating language
- 7 User role
- 8 Access code
- 9 Login
- 10 Reset access code (→ ⓘ 126)

i If a login page does not appear, or if the page is incomplete → ⓘ 145

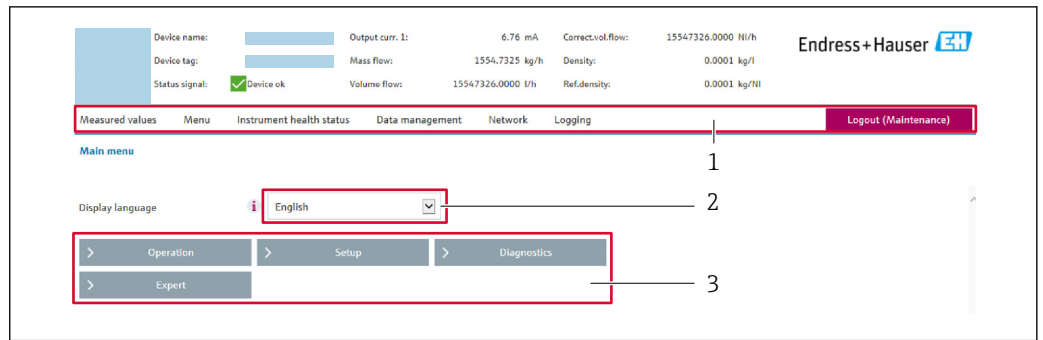
8.4.4 Logging on

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
--------------------	--

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

8.4.5 User interface



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- 1 Function row
- 2 Operating language
- 3 Navigation area

Header

The following information appears in the header:

- Device tag
- Device status with status signal → 153
- Current measured values

Function row

Functions	Meaning
Measured values	Displays the measured values of the measuring device
Menu	<ul style="list-style-type: none"> ■ Access to the operating menu from the measuring device ■ The structure of the operating menu is the same as for the local display  For detailed information on the structure of the operating menu, see the Operating Instructions for the measuring device
Device status	Displays the diagnostic messages currently pending, listed in order of priority
Data management	<ul style="list-style-type: none"> ■ Data exchange between PC and measuring device: <ul style="list-style-type: none"> - Load the configuration from the measuring device (XML format, save configuration) - Save the configuration to the measuring device (XML format, restore configuration) - Export the event list (.csv file) - Export parameter settings (.csv file, create documentation of the measuring point configuration) - Export the Heartbeat verification log (PDF file, only available with the "Heartbeat Verification" application package) ■ If using fieldbuses, upload device drivers for system integration from the measuring device: <ul style="list-style-type: none"> HART: DD file ■ Flashing a firmware version
Network configuration	Configuration and checking of all the parameters required for establishing the connection to the measuring device: <ul style="list-style-type: none"> ■ 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

If a function is selected in the function bar, the submenus of the function open in the navigation area. The user can now navigate through the menu structure.

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	Factory setting
Web server functionality	Switch the Web server on and off.	<ul style="list-style-type: none"> ▪ Off ▪ On 	On

Function scope of the "Web server functionality" parameter


Option	Description
Off	<ul style="list-style-type: none"> ▪ The web server is completely disabled. ▪ Port 80 is locked.
On	<ul style="list-style-type: none"> ▪ The complete functionality of the web server 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. Reset the modified properties of the Internet protocol (TCP/IP) if they are no longer needed →  77.

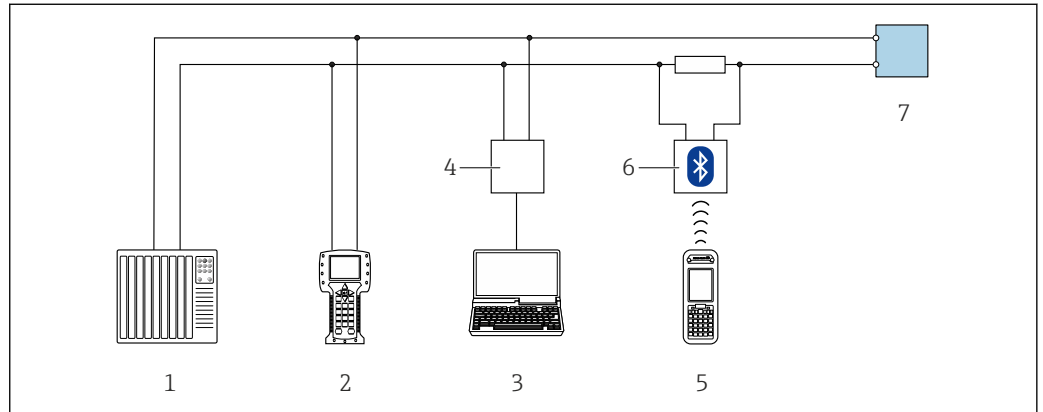
8.5 Access to the operating menu via the operating tool

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 HART protocol

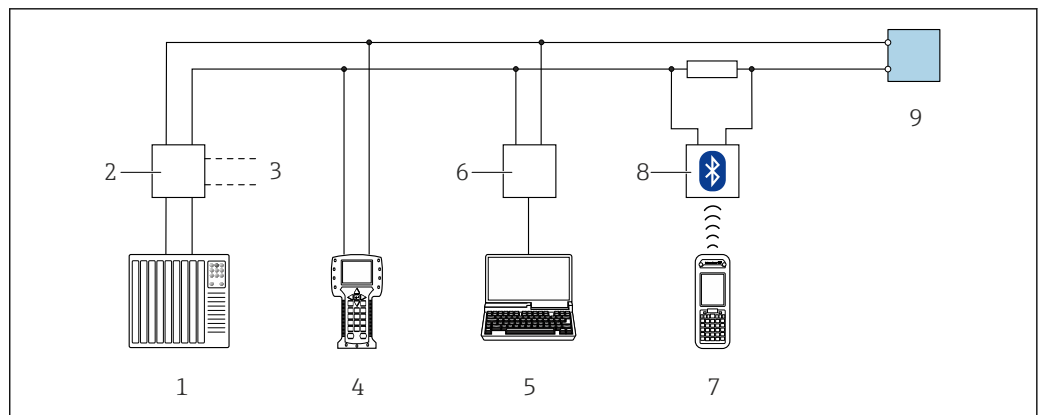
This communication interface is available in device versions with a HART output.



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34 Options for remote operation via HART protocol (active)

- 1 Control system (e.g. PLC)
- 2 Field Communicator 475
- 3 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
- 4 Commubox FXA195 (USB)
- 5 Field Xpert SFX350 or SFX370
- 6 VIATOR Bluetooth modem with connecting cable
- 7 Transmitter



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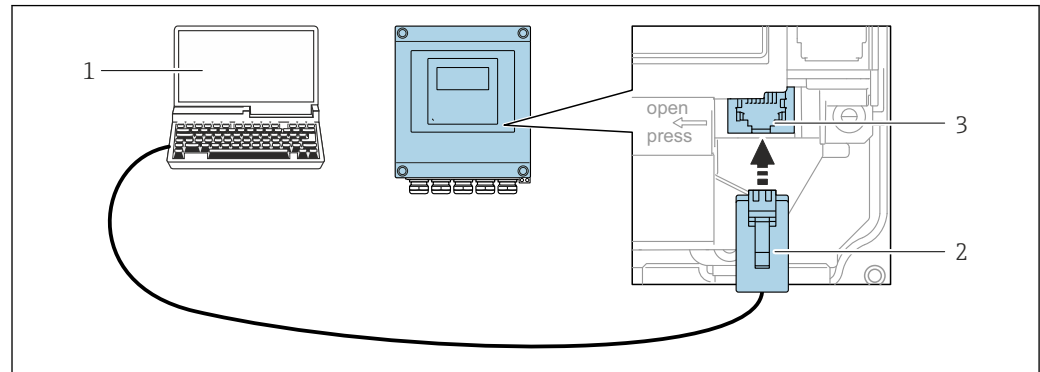
35 Options for remote operation via HART protocol (passive)

- 1 Control system (e.g. PLC)
- 2 Transmitter power supply unit, e.g. RN221N (with communication resistor)
- 3 Connection for Commubox FXA195 and Field Communicator 475
- 4 Field Communicator 475
- 5 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
- 6 Commubox FXA195 (USB)
- 7 Field Xpert SFX350 or SFX370
- 8 VIATOR Bluetooth modem with connecting cable
- 9 Transmitter

Service interface

Via service interface (CDI-RJ45)

Proline 500 – digital transmitter

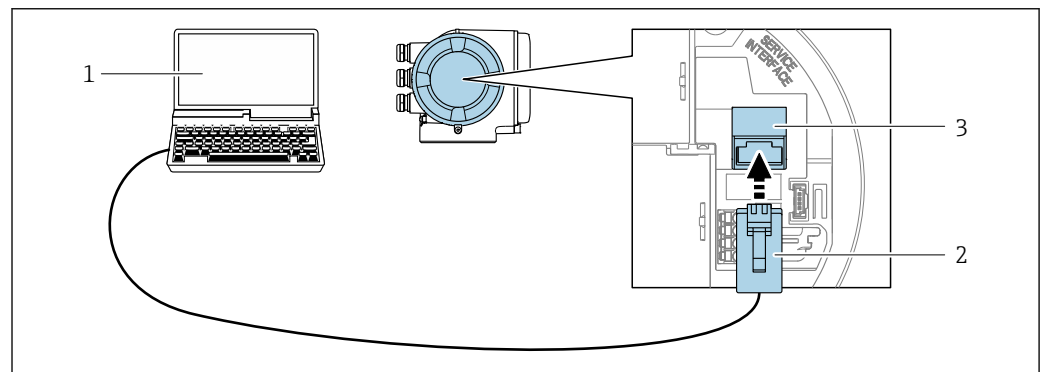


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36 Connection via service interface (CDI-RJ45)

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

Proline 500 transmitter



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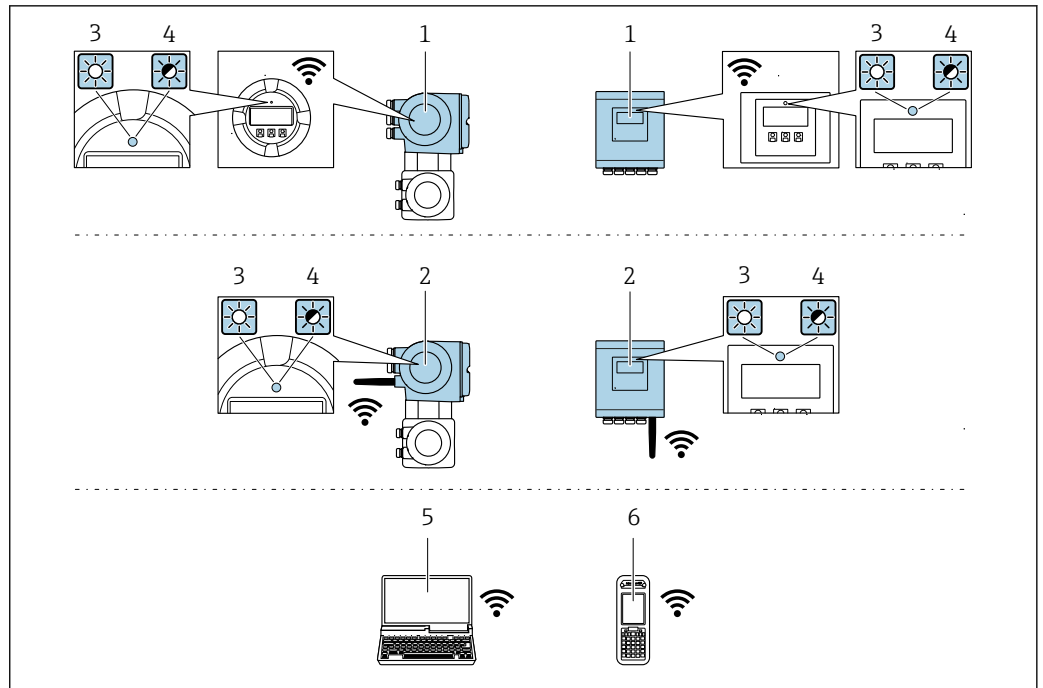
37 Connection via service interface (CDI-RJ45)

- 1 Computer with Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device Web server or with "FieldCare", "DeviceCare" operating tool with COM DTM "CDI Communication TCP/IP"
- 2 Standard Ethernet connecting cable with RJ45 connector
- 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, backlit, graphic display; touch control + WLAN"



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- 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)

Wireless LAN	IEEE 802.11 b/g (2.4 GHz) WLAN
Encryption	WPA2 PSK/TKIP AES-128
Configurable channels	1 to 11
Function	Access point with DHCP
Range with integrated antenna	Max. 10 m (32 ft)
Range with external antenna	Max. 50 m (164 ft)

Configuring the Internet protocol of the operating unit

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

In principle, avoid simultaneous access to the measuring device via the service interface (CDI-RJ45) and the WLAN interface from the same operating unit. This could cause a network conflict.
 ► Only activate one service interface (CDI-RJ45 service interface 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).

Preparation

- Enable WLAN reception on the operating unit.

Establishing a connection

1. 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).
 - ↳ LED on 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.

Disconnecting

- ▶ Once the configuration is completed, disconnect the WLAN connection between the operating unit and the measuring device.

8.5.2 Field Xpert SFX350, SFX370**Function scope**

Field Xpert SFX350 and Field Xpert SFX370 are mobile computers for commissioning and maintenance. They enable efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the **non-Ex area** (SFX350, SFX370) and the **Ex area** (SFX370).



For details, see Operating Instructions BA01202S

Source for device description files

See data → 87

8.5.3 FieldCare**Function scope**

FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field devices 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:

- HART protocol
- CDI-RJ45 service interface → 82
- WLAN interface → 82

Typical functions:

- Configuring parameters of transmitters
- Loading and saving device data (upload/download)
- Documentation of the measuring point
- Visualization of the measured value memory (line recorder) and event logbook



For additional information about FieldCare, see Operating Instructions BA00027S and BA00059S


Source for device description files

See information → 87

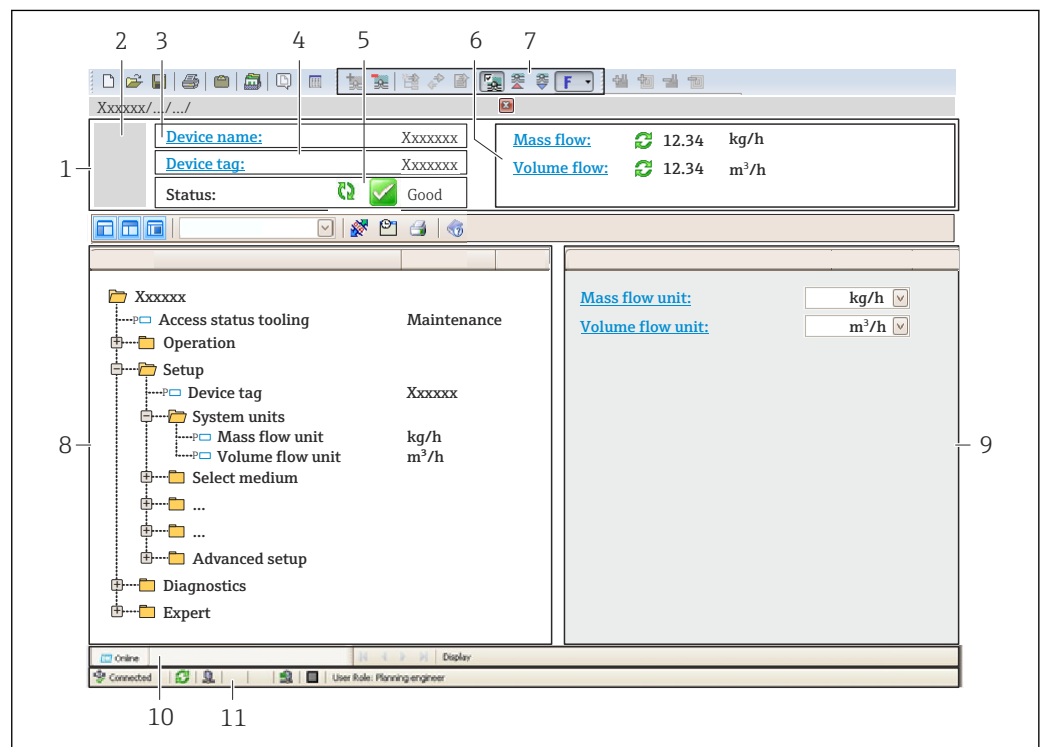
Establishing a connection


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.

 For additional information, see Operating Instructions BA00027S and BA00059S

User interface



- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Tag name
- 5 Status area with status signal →  153
- 6 Display area for current measured values
- 7 Edit toolbar with additional functions such as save/restore, event list and create documentation
- 8 Navigation area with operating menu structure
- 9 Working area
- 10 Range of action
- 11 Status area

8.5.4 DeviceCare

Function scope

Tool to connect and configure 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.



For details, see Innovation Brochure IN01047S

Source for device description files


See information →  87

8.5.5 AMS Device Manager

Function scope

Program from Emerson Process Management for operating and configuring measuring devices via HART protocol.

Source for device description files


See data →  87

8.5.6 SIMATIC PDM

Function scope

SIMATIC PDM is a standardized, manufacturer-independent program from Siemens for the operation, configuration, maintenance and diagnosis of intelligent field devices via HART protocol.

Source for device description files


See data →  87

8.5.7 Field Communicator 475

Function scope

Industrial handheld terminal from Emerson Process Management for remote configuration and measured value display via HART protocol.

Source for device description files

See data →  87

9 System integration

9.1 Overview of device description files

9.1.1 Current version data for the device

Firmware version	01.00.zz	<ul style="list-style-type: none"> ▪ On the title page of the Operating instructions ▪ On the transmitter nameplate ▪ Firmware version Diagnostics → Device information → Firmware version
Release date of firmware version	08.2016	---
Manufacturer ID	0x11	Manufacturer ID Diagnostics → Device information → Manufacturer ID
Device type ID	0x3C	Device type Diagnostics → Device information → Device type
HART protocol revision	7	---
Device revision	1	<ul style="list-style-type: none"> ▪ On the transmitter nameplate ▪ Device revision Diagnostics → Device information → Device revision

 For an overview of the different firmware versions for the device →  166

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 HART protocol	Sources for obtaining device descriptions
FieldCare	<ul style="list-style-type: none"> ▪ www.endress.com → Download Area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)
DeviceCare	<ul style="list-style-type: none"> ▪ www.endress.com → Download Area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)
<ul style="list-style-type: none"> ▪ Field Xpert SFX350 ▪ Field Xpert SFX370 	Use update function of handheld terminal
AMS Device Manager (Emerson Process Management)	www.endress.com → Download Area
SIMATIC PDM (Siemens)	www.endress.com → Download Area
Field Communicator 475 (Emerson Process Management)	Use update function of handheld terminal

9.2 Measured variables via HART protocol

The following measured variables (HART device variables) are assigned to the dynamic variables at the factory:

Dynamic variables	Measured variables (HART device variables)
Primary dynamic variable (PV)	Volume flow
Secondary dynamic variable (SV)	Totalizer 1
Tertiary dynamic variable (TV)	Totalizer 2
Quaternary dynamic variable (QV)	Totalizer 3

The assignment of the measured variables to the dynamic variables can be modified and assigned as desired via local operation and the operating tool using the following parameters:

- Expert → Communication → HART output → Output → Assign PV
- Expert → Communication → HART output → Output → Assign SV
- Expert → Communication → HART output → Output → Assign TV
- Expert → Communication → HART output → Output → Assign QV

The following measured variables can be assigned to the dynamic variables:

Measured variables for PV (primary dynamic variable)

- Off
- Volume flow
- Mass flow
- Corrected volume flow
- Flow velocity
- Conductivity ¹⁾
- Electronic temperature

Measured variables for SV, TV, QV (secondary, tertiary and quaternary dynamic variable)

- Volume flow
- Mass flow
- Corrected volume flow
- Flow velocity
- Conductivity ²⁾
- Electronic temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3



The range of options increases if the measuring device has one or more application packages.

Device variables

The device variables are permanently assigned. A maximum of 8 device variables can be transmitted:

- 0 = volume flow
- 1 = mass flow
- 2 = corrected volume flow
- 3 = flow velocity
- 4 = conductivity
- 7 = electronic temperature
- 8 = totalizer 1
- 9 = totalizer 2
- 10 = totalizer 3

1) Visibility depends on order options or device settings

2) Visibility depends on order options or device settings

9.3 Other settings

9.3.1 Burst mode functionality in accordance with HART 7 Specification

Navigation

"Expert" menu → Communication → HART output → Burst configuration → Burst configuration 1 to n

► Burst configuration	
► Burst configuration 1 to n	
Burst mode 1 to n	→ 90
Burst command 1 to n	→ 90
Burst variable 0	→ 90
Burst variable 1	→ 90
Burst variable 2	→ 90
Burst variable 3	→ 90
Burst variable 4	→ 90
Burst variable 5	→ 90
Burst variable 6	→ 90
Burst variable 7	→ 90
Burst trigger mode	→ 90
Burst trigger level	→ 90
Min. update period	→ 91
Max. update period	→ 91

Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Burst mode 1 to n	Activate the HART burst mode for burst message X.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Burst command 1 to n	Select the HART command that is sent to the HART master.	<ul style="list-style-type: none"> ■ Command 1 ■ Command 2 ■ Command 3 ■ Command 9 ■ Command 33 ■ Command 48 	Command 2
Burst variable 0	For HART command 9 and 33, assign a HART device variable or process variable to burst variable.	<ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity* ■ Conductivity* ■ Electronic temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Density ■ HART input ■ Percent of range ■ Measured current ■ Primary variable (PV) ■ Secondary variable (SV) ■ Tertiary variable (TV) ■ Quaternary variable (QV) ■ Not used 	Volume flow
Burst variable 1	For HART command 9 and 33, assign a HART device variable or process variable to burst variable.	See the Burst variable 0 parameter.	Not used
Burst variable 2	For HART command 9 and 33, assign a HART device variable or process variable to burst variable.	See the Burst variable 0 parameter.	Not used
Burst variable 3	For HART command 9 and 33, assign a HART device variable or process variable to burst variable.	See the Burst variable 0 parameter.	Not used
Burst variable 4	For HART command 33, assign a HART device variable or process variable to burst variable.	See the Burst variable 0 parameter.	Not used
Burst variable 5	For HART command 33, assign a HART device variable or process variable to burst variable.	See the Burst variable 0 parameter.	Not used
Burst variable 6	For HART command 33, assign a HART device variable or process variable to burst variable.	See the Burst variable 0 parameter.	Not used
Burst variable 7	For HART command 33, assign a HART device variable or process variable to burst variable.	See the Burst variable 0 parameter.	Not used
Burst trigger mode	Select the event that triggers burst message X.	<ul style="list-style-type: none"> ■ Continuous ■ Window ■ Rising ■ Falling ■ On change 	Continuous
Burst trigger level	Enter the burst trigger value. Together with the option selected in the Burst trigger mode parameter the burst trigger value determines the time of burst message X.	Positive floating-point number	–



Parameter	Description	Selection / User entry	Factory setting
Min. update period	Enter the minimum time span between two burst responses of one burst message.	Positive integer	1 000 ms
Max. update period	Enter the maximum time span between two burst responses of one burst message.	Positive integer	2 000 ms

* Visibility depends on order options or device settings

10 Commissioning



10.1 Function check

Before commissioning the measuring device:

- ▶ Make sure that the post-installation and post-connection checks have been performed.
 - "Post-installation check" checklist →  36
 - "Post-connection check" checklist →  60

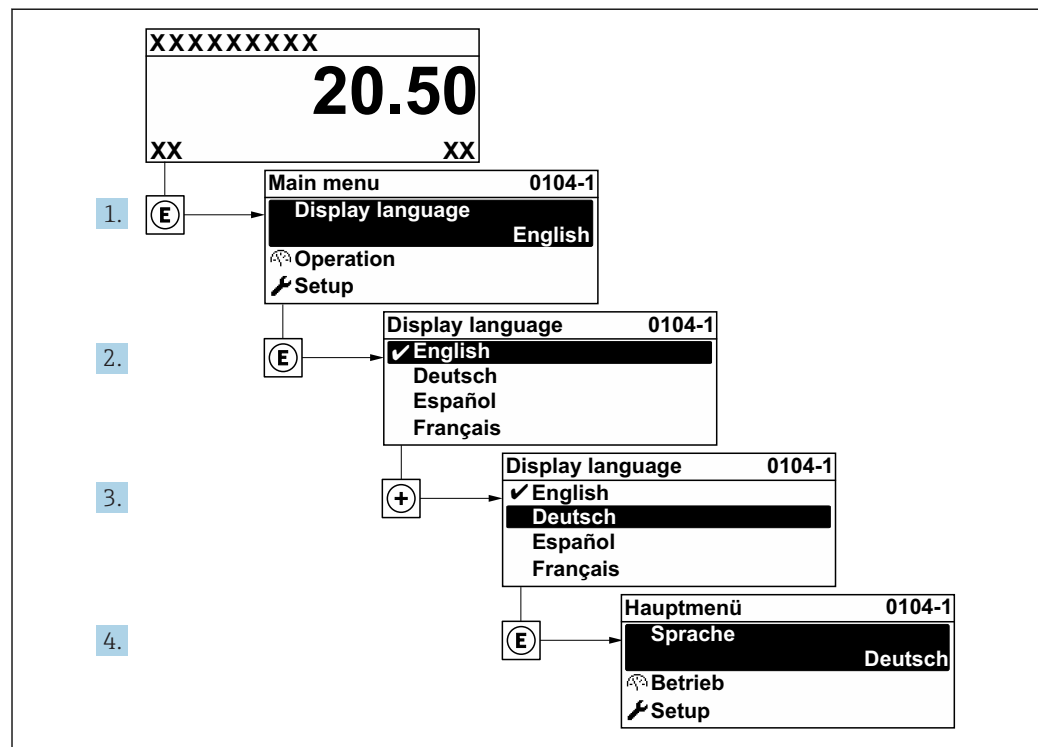
10.2 Switching on the measuring device


- ▶ After a successful function check, switch on the measuring device.
 - ↳ After a successful startup, the local display switches automatically from the startup display to the operational display.

 If nothing appears on the local display or a diagnostic message is displayed, refer to the section on "Diagnostics and troubleshooting" →  144.

10.3 Setting the operating language

Factory setting: English or ordered local language

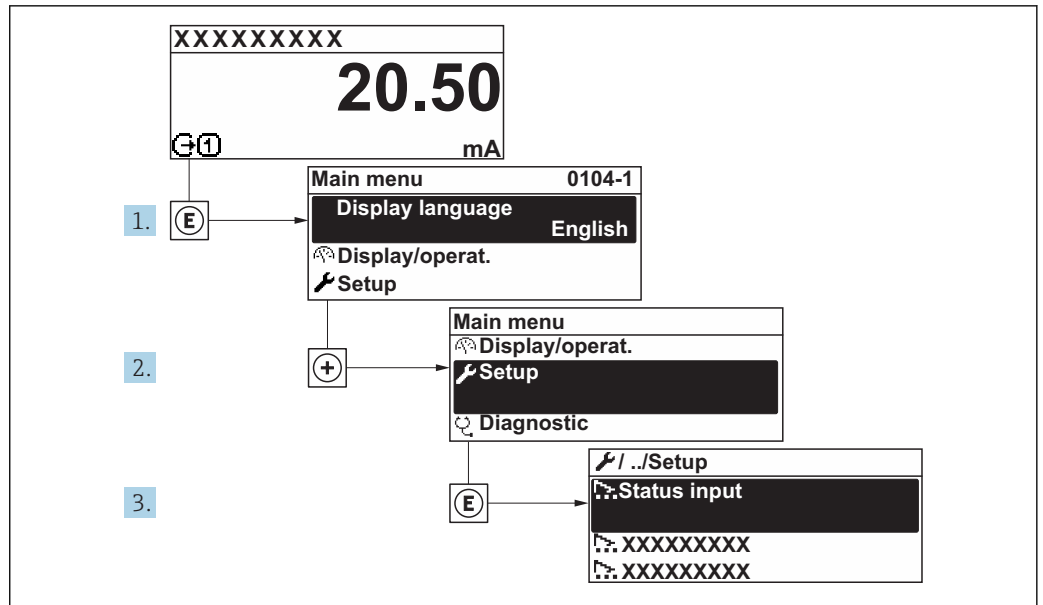


 38 Taking the example of the local display

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10.4 Configuring the measuring device

- The **Setup** menu with its guided wizards contains all the parameters needed for standard operation.
- Navigation to the **Setup** menu



A0029700-EN

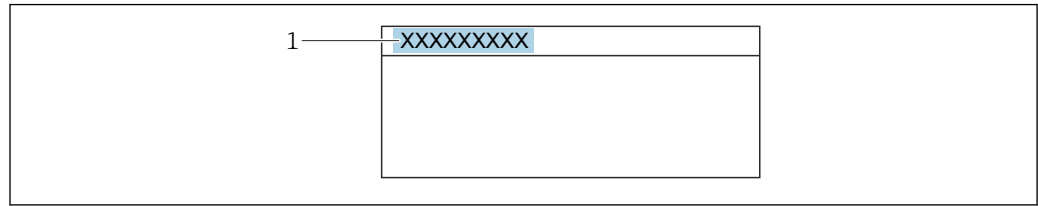
39 Taking the example of the local display

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

Setup	
Device tag	→ 94
▶ System units	→ 94
▶ I/O configuration	→ 96
▶ Current input 1 to n	→ 97
▶ Status input 1 to n	→ 96
▶ Current output 1 to n	→ 98
▶ Pulse/frequency/switch output 1 to n	→ 101
▶ Relay output 1 to n	→ 112
▶ Double pulse output	→ 114
▶ Display	→ 107
▶ Low flow cut off	→ 109
▶ Empty pipe detection	→ 110
▶ Advanced setup	→ 116

10.4.1 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.



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40 Header of the operational display with tag name

1 Tag name

i Enter the tag name in the "FieldCare" operating tool → 85

Navigation

"Setup" menu → Device tag

Parameter overview with brief description

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

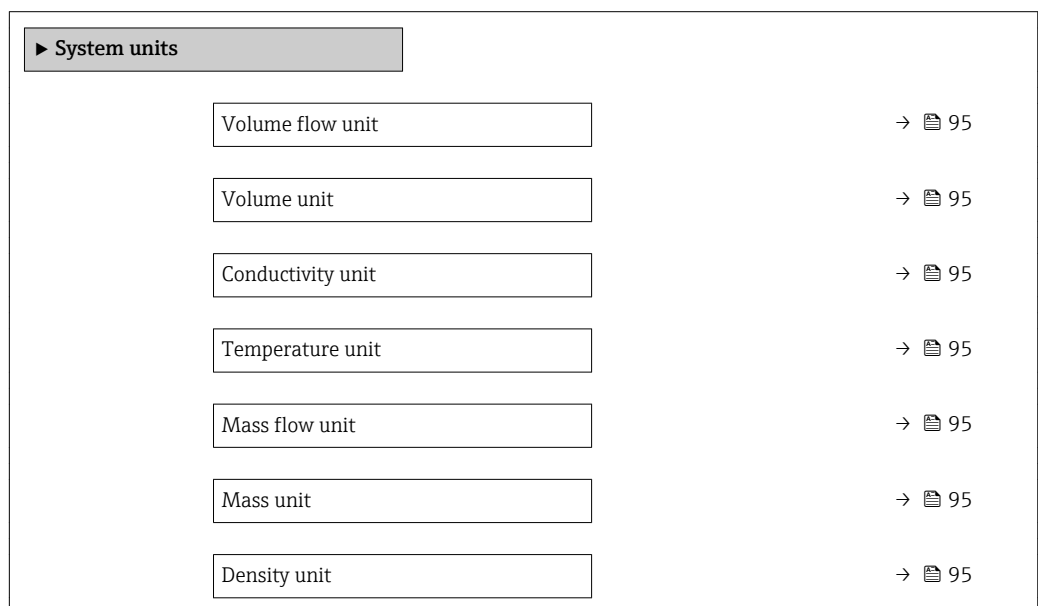
10.4.2 Setting the system units



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

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


Navigation

"Setup" menu → System units



Corrected volume flow unit	→  95
Corrected volume unit	→  95

Parameter overview with brief description

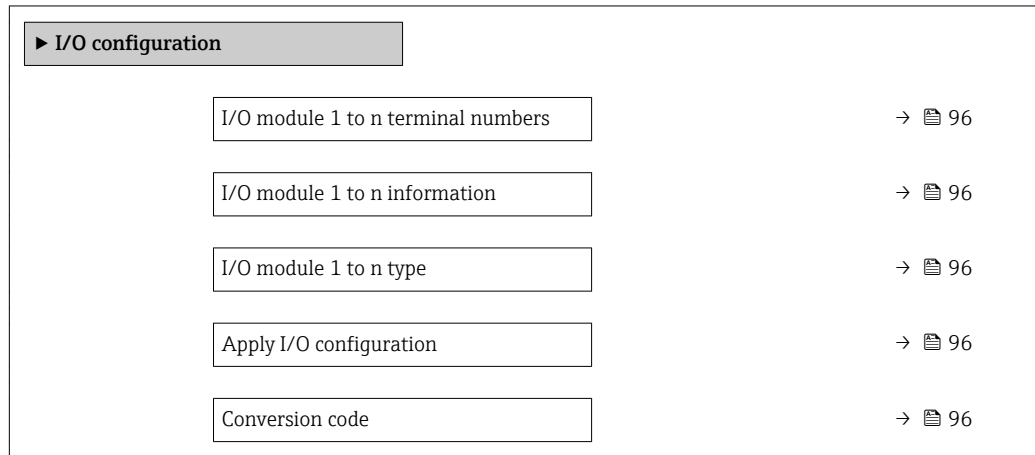
Parameter	Prerequisite	Description	Selection	Factory setting
Volume flow unit	–	Select volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ▪ Output ▪ Low flow cut off ▪ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ l/h ▪ gal/min (us)
Volume unit	–	Select volume unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ m³ ▪ gal (us)
Conductivity unit	The On option is selected in the Conductivity measurement parameter parameter.	Select conductivity unit. <i>Effect</i> The selected unit applies for: <ul style="list-style-type: none"> ▪ Current output ▪ Frequency output ▪ Switch output ▪ Simulation process variable 	Unit choose list	µS/cm
Temperature unit	–	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ▪ Temperature parameter ▪ Maximum value parameter ▪ Minimum value parameter ▪ External temperature parameter ▪ Maximum value parameter ▪ Minimum value parameter 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ °C ▪ °F
Mass flow unit	–	Select mass flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ▪ Output ▪ Low flow cut off ▪ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ kg/h ▪ lb/min
Mass unit	–	Select mass unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ kg ▪ lb
Density unit	–	Select density unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ▪ Output ▪ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ kg/l ▪ lb/ft³
Corrected volume flow unit	–	Select corrected volume flow unit. <i>Result</i> The selected unit applies for: Corrected volume flow parameter (→  135)	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ NI/h ▪ Sft³/h
Corrected volume unit	–	Select corrected volume unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ Nm³ ▪ Sft³

10.4.3 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



Parameter overview with brief description

Parameter	Description	User interface / Selection / User entry	Factory setting
I/O module 1 to n terminal numbers	Shows the terminal numbers used by the I/O module.	<ul style="list-style-type: none"> ■ 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.	<ul style="list-style-type: none"> ■ Not plugged ■ Invalid ■ Not configurable ■ Configurable ■ Fieldbus 	–
I/O module 1 to n type	Shows the I/O module type.	<ul style="list-style-type: none"> ■ Off ■ Current output * ■ Current input * ■ Status input * ■ Pulse/frequency/switch output * 	Off
Apply I/O configuration	Apply parameterization of the freely configurable I/O module.	<ul style="list-style-type: none"> ■ No ■ Yes 	No
Conversion code	Enter the code in order to change the I/O configuration.	Positive integer	0

* Visibility depends on order options or device settings

10.4.4 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

▶ **Status input 1 to n**

Assign status input	→ ⓘ 97
Terminal number	→ ⓘ 97
Active level	→ ⓘ 97
Terminal number	→ ⓘ 97
Response time status input	→ ⓘ 97
Terminal number	→ ⓘ 97

Parameter overview with brief description

Parameter	Description	User interface / Selection / User entry	Factory setting
Terminal number	Shows the terminal numbers used by the status input module.	<ul style="list-style-type: none"> ▪ Not used ▪ 24-25 (I/O 2) ▪ 22-23 (I/O 3) ▪ 20-21 (I/O 4)* 	-
Assign status input	Select function for the status input.	<ul style="list-style-type: none"> ▪ Off ▪ Reset totalizer 1 ▪ Reset totalizer 2 ▪ Reset totalizer 3 ▪ Reset all totalizers ▪ Flow override 	Off
Active level	Define input signal level at which the assigned function is triggered.	<ul style="list-style-type: none"> ▪ High ▪ Low 	High
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	50 ms

* Visibility depends on order options or device settings

10.4.5 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	→ ⓘ 98
Signal mode	→ ⓘ 98

0/4 mA value	→ ⓘ 98
20 mA value	→ ⓘ 98
Current span	→ ⓘ 98
Failure mode	→ ⓘ 98
Failure value	→ ⓘ 98

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.	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ Passive ▪ Active 	Passive
0/4 mA value	-	Enter 4 mA value.	Signed floating-point number	0
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.	<ul style="list-style-type: none"> ▪ 4...20 mA ▪ 4...20 mA NAMUR ▪ 4...20 mA US ▪ 0...20 mA 	Country-specific: <ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US
Failure mode	-	Define input behavior in alarm condition.	<ul style="list-style-type: none"> ▪ Alarm ▪ Last valid value ▪ Defined value 	Alarm
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	0

* Visibility depends on order options or device settings

10.4.6 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	→ ⓘ 99

Signal mode	→ 99
Assign current output 1 to n	→ 99
Current span	→ 99
0/4 mA value	→ 99
20 mA value	→ 99
Fixed current	→ 100
Failure mode	→ 100
Failure current	→ 100

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Assign current output 1 to n	–	Select process variable for current output.	<ul style="list-style-type: none"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity* ▪ Electronic temperature 	Volume flow
Terminal number	–	Shows the terminal numbers used by the current output module.	<ul style="list-style-type: none"> ▪ Not used ▪ 26-27 (I/O 1) ▪ 24-25 (I/O 2) ▪ 22-23 (I/O 3) ▪ 20-21 (I/O 4)* 	–
Current span	–	Select current range for process value output and upper/lower level for alarm signal.	<ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US ▪ 4...20 mA ▪ 0...20 mA ▪ Fixed current 	Country-specific: <ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US
Signal mode	–	Select the signal mode for the current output.	<ul style="list-style-type: none"> ▪ Passive ▪ Active 	Passive
0/4 mA value	One of the following options is selected in the Current span parameter (→ 99): <ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US ▪ 4...20 mA ▪ 0...20 mA 	Enter 4 mA value.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ▪ 0 l/h ▪ 0 gal/min (us)
20 mA value	One of the following options is selected in the Current span parameter (→ 99): <ul style="list-style-type: none"> ▪ 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

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Fixed current	In the Current span parameter (→ 99), the Fixed current option is selected.	Defines the fixed output current.	0 to 22.5 mA	22.5 mA
Failure mode	<p>One of the following options is selected in the Assign current output parameter (→ 99):</p> <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity* ▪ Electronic temperature <p>One of the following options is selected in the Current span parameter (→ 99):</p> <ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US ▪ 4...20 mA ▪ 0...20 mA 	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ▪ Min. ▪ Max. ▪ Last valid value ▪ Actual value ▪ Defined value 	Max.
Failure current	In the Failure mode parameter, the Defined value option is selected.	Enter current output value in alarm condition.	0 to 22.5 mA	22.5 mA

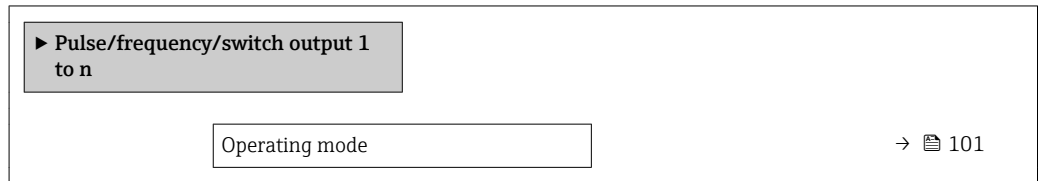
* Visibility depends on order options or device settings

10.4.7 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



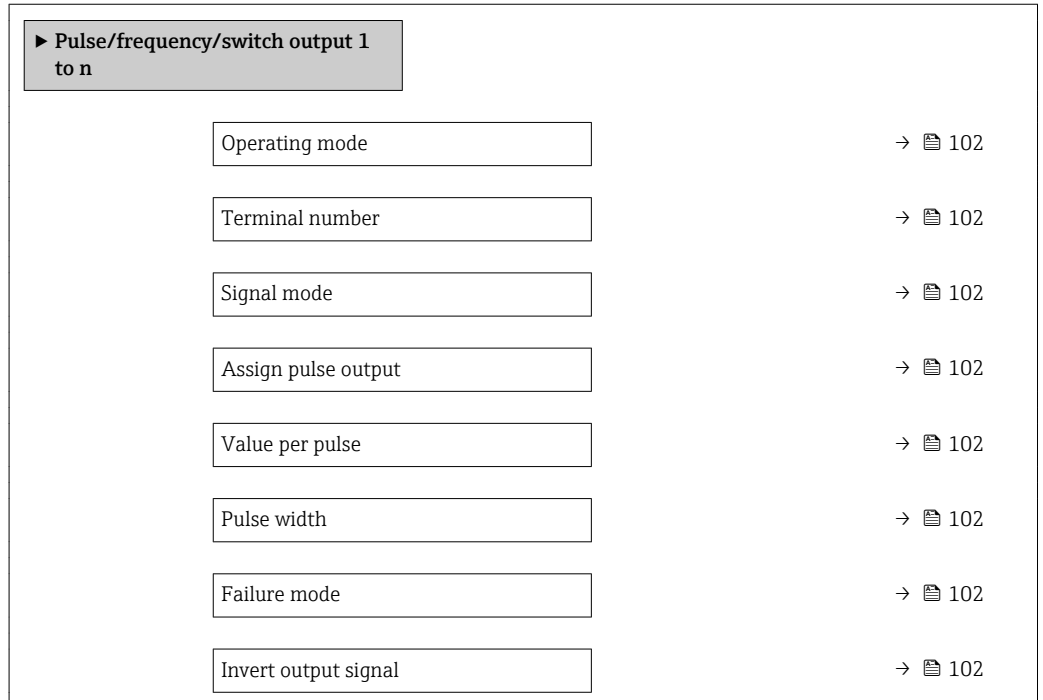
Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Operating mode	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> ■ Pulse ■ Frequency ■ Switch 	Pulse




Configuring the pulse output

Navigation

"Setup" menu → Pulse/frequency/switch output



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.	<ul style="list-style-type: none"> ▪ Pulse ▪ Frequency ▪ Switch 	Pulse
Terminal number	–	Shows the terminal numbers used by the PFS output module.	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ Passive ▪ Active 	Passive
Assign pulse output 1 to n	In the Operating mode parameter, the Pulse option is selected.	Select process variable for pulse output.	<ul style="list-style-type: none"> ▪ Off ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow 	Off
Value per pulse	In the Operating mode parameter, the Pulse option is selected and one of the following options is selected in the Assign pulse output parameter (→  102): <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow 	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	In the Operating mode parameter, the Pulse option is selected and one of the following options is selected in the Assign pulse output parameter (→  102): <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow 	Define time width of the output pulse.	0.05 to 2 000 ms	100 ms
Failure mode	In the Operating mode parameter, the Pulse option is selected and one of the following options is selected in the Assign pulse output parameter (→  102): <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow 	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ▪ Actual value ▪ No pulses 	No pulses
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> ▪ No ▪ Yes 	No

* 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

→  103

Terminal number	→  103
Signal mode	→  103
Assign frequency output	→  103
Minimum frequency value	→  103
Maximum frequency value	→  104
Measuring value at minimum frequency	→  104
Measuring value at maximum frequency	→  104
Failure mode	→  104
Failure frequency	→  104
Invert output signal	→  104

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.	<ul style="list-style-type: none"> ■ Pulse ■ Frequency ■ Switch 	Pulse
Terminal number	–	Shows the terminal numbers used by the PFS output module.	<ul style="list-style-type: none"> ■ 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.	<ul style="list-style-type: none"> ■ Passive ■ Active 	Passive
Assign frequency output	In the Operating mode parameter (→  101), the Frequency option is selected.	Select process variable for frequency output.	<ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity * ■ Conductivity * ■ Electronic temperature 	Off
Minimum frequency value	One of the following options is selected in the Assign current output parameter (→  99): <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity * ■ Electronic temperature 	Enter minimum frequency.	0.0 to 10 000.0 Hz	0.0 Hz

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Maximum frequency value	One of the following options is selected in the Assign current output parameter (→  99): <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity* ▪ Electronic temperature 	Enter maximum frequency.	0.0 to 10 000.0 Hz	10000.0 Hz
Measuring value at minimum frequency	One of the following options is selected in the Assign current output parameter (→  99): <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity* ▪ Electronic temperature 	Enter measured value for minimum frequency.	Signed floating-point number	Depends on country and nominal diameter
Measuring value at maximum frequency	One of the following options is selected in the Assign current output parameter (→  99): <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity* ▪ Electronic temperature 	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	One of the following options is selected in the Assign current output parameter (→  99): <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity* ▪ Electronic temperature 	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ▪ Actual value ▪ Defined value ▪ 0 Hz 	0 Hz
Failure frequency	One of the following options is selected in the Assign current output parameter (→  99): <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity* ▪ Electronic temperature 	Enter frequency output value in alarm condition.	0.0 to 12 500.0 Hz	0.0 Hz
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> ▪ No ▪ Yes 	No

* 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		→ 105
Terminal number		→ 105
Signal mode		→ 105
Switch output function		→ 106
Assign diagnostic behavior		→ 106
Assign limit		→ 106
Assign flow direction check		→ 106
Assign status		→ 106
Switch-on value		→ 106
Switch-off value		→ 106
Switch-on delay		→ 106
Switch-off delay		→ 107
Failure mode		→ 107
Invert output signal		→ 107

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.	<ul style="list-style-type: none"> ■ Pulse ■ Frequency ■ Switch 	Pulse
Terminal number	–	Shows the terminal numbers used by the PFS output module.	<ul style="list-style-type: none"> ■ 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.	<ul style="list-style-type: none"> ■ Passive ■ Active 	Passive

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch output function	In the Operating mode parameter the Switch option is selected.	Select function for switch output.	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ Diagnostic behavior ▪ Limit ▪ Flow direction check ▪ Status 	Off
Assign diagnostic behavior	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ Alarm ▪ Alarm or warning ▪ Warning 	Alarm
Assign limit	<ul style="list-style-type: none"> ▪ In the Operating mode parameter, the Switch option is selected. ▪ In the Switch output function parameter, the Limit option is selected. 	Select process variable for limit function.	<ul style="list-style-type: none"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity* ▪ Conductivity* ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3 ▪ Electronic temperature 	Volume flow
Assign flow direction check	<ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow 	Volume flow
Assign status	<ul style="list-style-type: none"> ▪ The Switch option is selected in the Operating mode parameter. ▪ The Status option is selected in the Switch output function parameter. 	Select device status for switch output.	<ul style="list-style-type: none"> ▪ Empty pipe detection ▪ Low flow cut off 	Empty pipe detection
Switch-on value	<ul style="list-style-type: none"> ▪ In the Operating mode parameter, the Switch option is selected. ▪ In the Switch output function parameter, the Limit option is selected. 	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ▪ 0 l/h ▪ 0 gal/min (us)
Switch-off value	<ul style="list-style-type: none"> ▪ In the Operating mode parameter, the Switch option is selected. ▪ In the Switch output function parameter, the Limit option is selected. 	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ▪ 0 l/h ▪ 0 gal/min (us)
Switch-on delay	<ul style="list-style-type: none"> ▪ 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	0.0 s

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch-off delay	<ul style="list-style-type: none"> ▪ 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	0.0 s
Failure mode	–	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ▪ Actual status ▪ Open ▪ Closed 	Open
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> ▪ No ▪ Yes 	No

* Visibility depends on order options or device settings

10.4.8 Configuring the local display

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



Navigation

"Setup" menu → Display

▶ Display

Format display	→ ⓘ 108
Value 1 display	→ ⓘ 108
0% bargraph value 1	→ ⓘ 108
100% bargraph value 1	→ ⓘ 108
Value 2 display	→ ⓘ 108
Value 3 display	→ ⓘ 108
0% bargraph value 3	→ ⓘ 108
100% bargraph value 3	→ ⓘ 108
Value 4 display	→ ⓘ 108

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.	<ul style="list-style-type: none"> ■ 1 value, max. size ■ 1 bargraph + 1 value ■ 2 values ■ 1 value large + 2 values ■ 4 values 	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Electronic temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current output 1 ■ Current output 2 * ■ Current output 3 * ■ Current output 4 * 	Volume flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ■ 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.	<ul style="list-style-type: none"> ■ None ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity * ■ Electronic temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current output 1 ■ Current output 2 * ■ Current output 3 * ■ Current output 4 * 	None
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 2 display parameter (→  108)	None
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: <ul style="list-style-type: none"> ■ 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	0
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 2 display parameter (→  108)	None

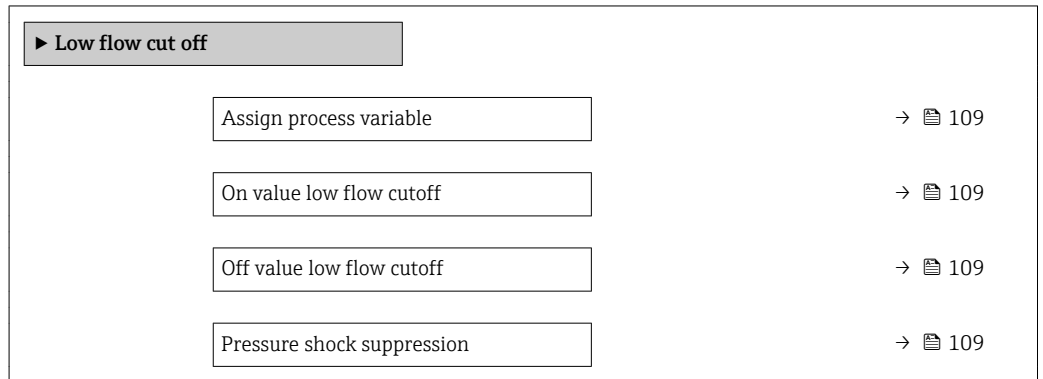
* Visibility depends on order options or device settings

10.4.9 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



Parameter overview with brief description

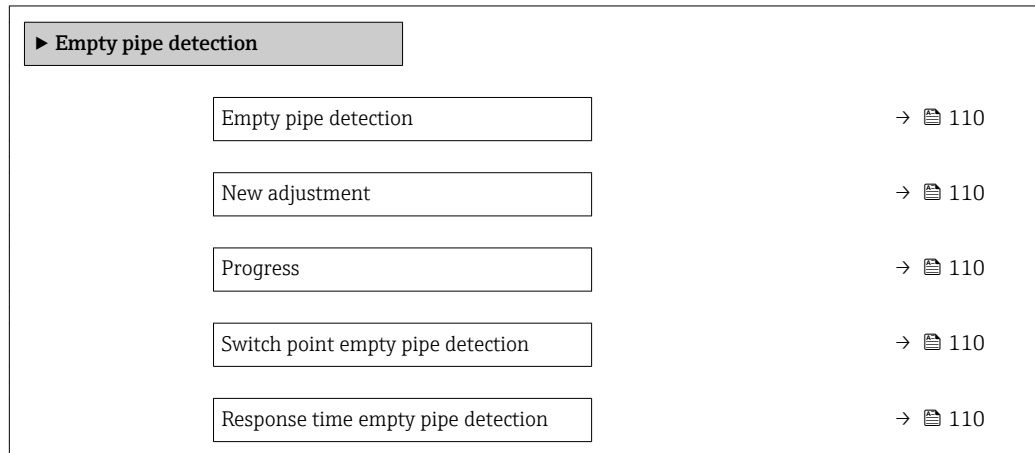
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for low flow cut off.	<ul style="list-style-type: none"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow 	Volume flow
On value low flow cutoff	One of the following options is selected in the Assign process variable parameter (→ 109): <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow 	Enter on value for low flow cut off.	Positive floating-point number	Depends on country and nominal diameter
Off value low flow cutoff	One of the following options is selected in the Assign process variable parameter (→ 109): <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow 	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	One of the following options is selected in the Assign process variable parameter (→ 109): <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow 	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

10.4.10 Configuring empty pipe detection

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

Navigation

"Setup" menu → Empty pipe detection



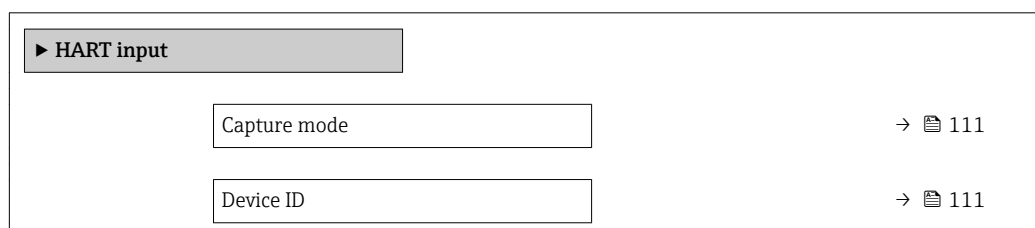
Parameter overview with brief description








Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Empty pipe detection	–	Switch empty pipe detection on and off.	<ul style="list-style-type: none"> ▪ Off ▪ On 	Off
New adjustment	The On option is selected in the Empty pipe detection parameter.	Select type of adjustment.	<ul style="list-style-type: none"> ▪ Cancel ▪ Empty pipe adjust ▪ Full pipe adjust 	Cancel
Progress	The On option is selected in the Empty pipe detection parameter.	Shows the progress.	<ul style="list-style-type: none"> ▪ 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 be detected as empty.	0 to 100 %	10 %
Response time empty pipe detection	In the Empty pipe detection parameter (→ 110), the On option is selected.	Enter the time before diagnostic message S862 'Pipe empty' is displayed for empty pipe detection.	0 to 100 s	1 s

10.4.11 Configuring the HART input

Navigation

"Setup" menu → HART input



Device type	→  111
Manufacturer ID	→  111
Burst command	→  111
Slot number	→  111
Timeout	→  112
Failure mode	→  112
Failure value	→  112


"Configuration" submenu

Navigation

"Expert" menu → Communication → HART input → Configuration

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Capture mode	–	Select capture mode via burst or master communication.	<ul style="list-style-type: none"> ▪ Off ▪ Burst network ▪ Master network 	Off
Device ID	The Master network option is selected in the Capture mode parameter.	Enter device ID of external device.	6-digit value: <ul style="list-style-type: none"> ▪ Via local operation: enter as hexadecimal or decimal number ▪ Via operating tool: enter as decimal number 	0
Device type	In the Capture mode parameter, the Master network option is selected.	Enter device type of external device.	2-digit hexadecimal number	0x00
Manufacturer ID	The Master network option is selected in the Capture mode parameter.	Enter manufacture ID of external device.	2-digit value: <ul style="list-style-type: none"> ▪ Via local operation: enter as hexadecimal or decimal number ▪ Via operating tool: enter as decimal number 	0
Burst command	The Burst network option or the Master network option are selected in the Capture mode parameter.	Select command to read in external process variable.	<ul style="list-style-type: none"> ▪ Command 1 ▪ Command 3 ▪ Command 9 ▪ Command 33 	Command 1
Slot number	The Burst network option or the Master network option is selected in the Capture mode parameter.	Define position of external process variable in burst command.	1 to 8	1

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Timeout	The Burst network option or the Master network option is selected in the Capture mode parameter.	Enter deadline for process variable of external device.  If the waiting time is exceeded, the diagnostic message F410 Data transfer is displayed.	1 to 120 s	5 s
Failure mode	In the Capture mode parameter, the Burst network option or Master network option is selected.	Define behavior if external process variable is missed.	<ul style="list-style-type: none"> ▪ Alarm ▪ Last valid value ▪ Defined value 	Alarm
Failure value	The following conditions are met: <ul style="list-style-type: none"> ▪ In the Capture mode parameter, the Burst network option or Master network option is selected. ▪ 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	0

"Input" submenu

Navigation

"Expert" menu → Communication → HART input → Input

Parameter overview with brief description

Parameter	Description	User interface
Value		Signed floating-point number
Status		<ul style="list-style-type: none"> ▪ Manual/Fixed ▪ Good ▪ Poor accuracy ▪ Bad






10.4.12 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

► RelaisOutput 1 to n

Switch output function	→  113
Assign flow direction check	→  113
Assign limit	→  113
Assign diagnostic behavior	→  113
Assign status	→  113

Switch-off value	→ ⓘ 113
Switch-on value	→ ⓘ 113
Failure mode	→ ⓘ 114

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Relay output function	–	Select the function for the relay output.	<ul style="list-style-type: none"> ■ Closed ■ Open ■ Diagnostic behavior ■ Limit ■ Flow direction check ■ Digital Output 	Closed
Terminal number	–	Shows the terminal numbers used by the relay output module.	<ul style="list-style-type: none"> ■ Not used ■ 24-25 (I/O 2) ■ 22-23 (I/O 3) ■ 20-21 (I/O 4) 	–
Assign flow direction check	In the Relay output function parameter, the Flow direction check option is selected.	Select process variable for flow direction monitoring.	<ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow 	Volume flow
Assign limit	In the Relay output function parameter, the Limit option is selected.	Select process variable for limit function.	<ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity* ■ Conductivity* ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Electronic temperature 	Volume flow
Assign diagnostic behavior	In the Relay output function parameter, the Diagnostic behavior option is selected.	Select diagnostic behavior for switch output.	<ul style="list-style-type: none"> ■ Alarm ■ Alarm or warning ■ Warning 	Alarm
Assign status	In the Relay output function parameter, the Digital Output option is selected.	Select device status for switch output.	<ul style="list-style-type: none"> ■ Partially filled pipe detection ■ Low flow cut off 	Partially filled pipe detection
Switch-off value	In the Relay output function parameter, the Limit option is selected.	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ■ 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	0.0 s
Switch-on value	In the Relay output function parameter, the Limit option is selected.	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ■ 0 l/h ■ 0 gal(us)/min

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
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	0.0 s
Failure mode	–	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ▪ Actual status ▪ Open ▪ Closed 	Open

* Visibility depends on order options or device settings

10.4.13 Configuring the double pulse output

The **Double pulse output** submenu guides the user systematically through all the parameters that have to be set for configuring the double pulse output.

Navigation

"Setup" menu → Double pulse output

► Double pulse output	
Master terminal number	→ 114
Slave terminal number	→ 114
Signal mode	→ 114
Assign pulse output 1	→ 115
Measuring mode	→ 115
Value per pulse	→ 115
Pulse width	→ 115
Failure mode	→ 115
Invert output signal	→ 115

Parameter overview with brief description

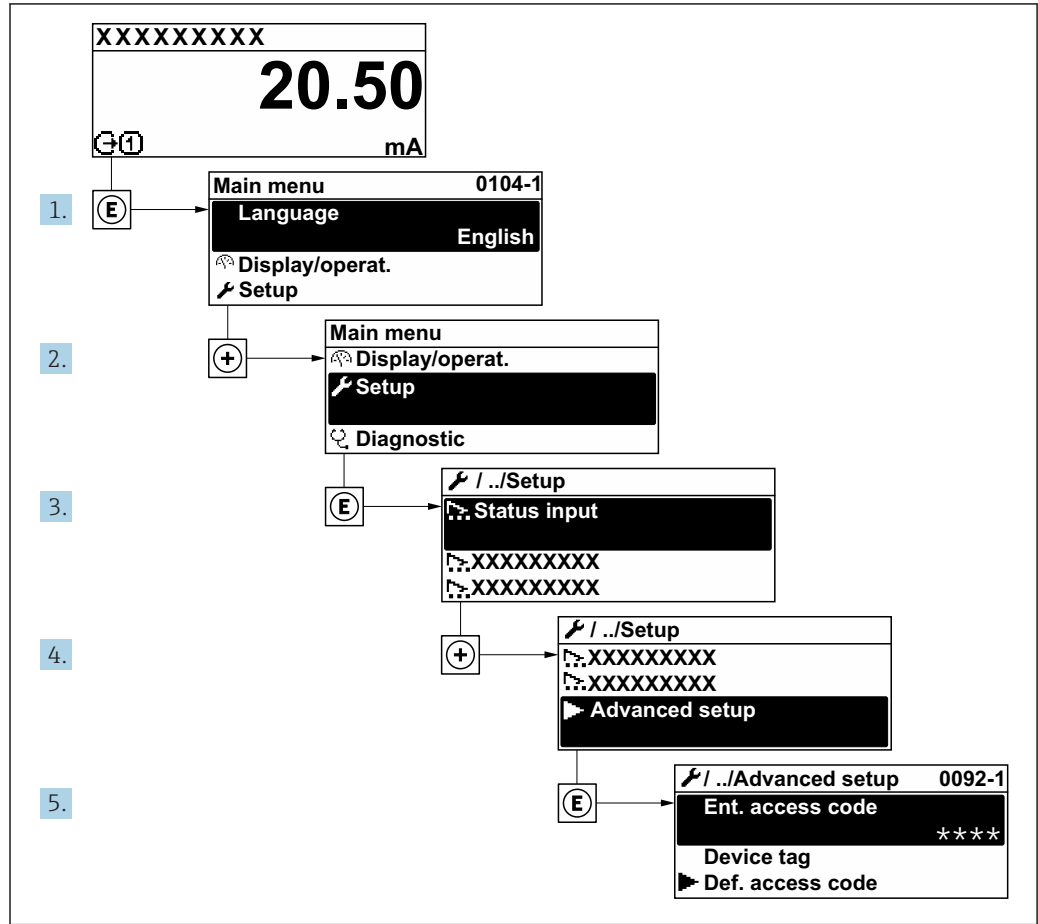
Parameter	Description	Selection / User interface / User entry	Factory setting
Signal mode	Select the signal mode for the double pulse output.	<ul style="list-style-type: none"> ▪ Passive ▪ Active ▪ Passive NAMUR 	Passive
Master terminal number	Shows the terminal numbers used by the master of the double pulse output module.	<ul style="list-style-type: none"> ▪ Not used ▪ 24-25 (I/O 2) ▪ 22-23 (I/O 3) 	–
Slave terminal number		<ul style="list-style-type: none"> ▪ Not used ▪ 24-25 (I/O 2) ▪ 22-23 (I/O 3) 	–

Parameter	Description	Selection / User interface / User entry	Factory setting
Assign pulse output 1	Select process variable for pulse output.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow 	Off
Measuring mode	Select measuring mode for pulse output.	<ul style="list-style-type: none"> ■ Forward flow ■ Forward/Reverse flow ■ Reverse flow ■ Reverse flow compensation 	Forward flow
Value per pulse	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	Define time width of the output pulse.	0.5 to 2 000 ms	0.5 ms
Failure mode	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ■ Actual value ■ No pulses 	No pulses
Invert output signal	Invert the output signal.	<ul style="list-style-type: none"> ■ No ■ Yes 	No

10.5 Advanced settings

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

Navigation to the "Advanced setup" submenu

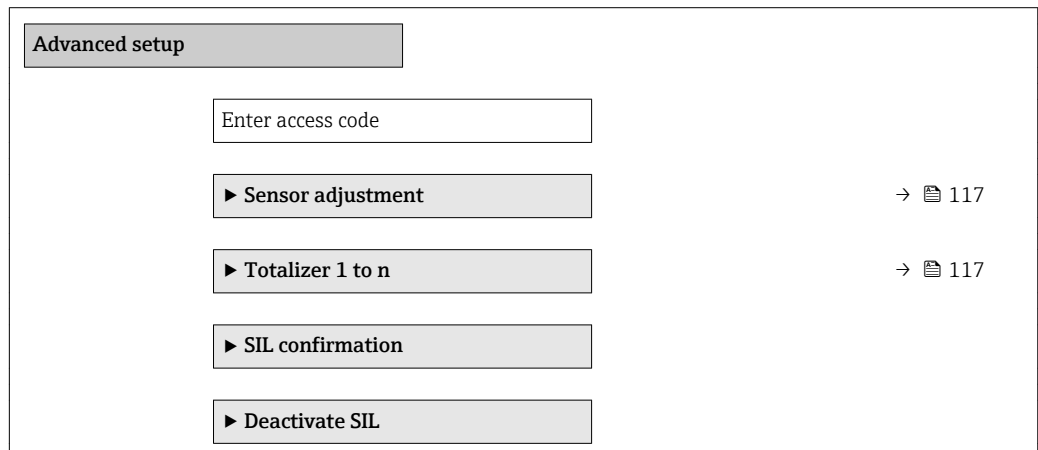


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i The number of submenus can vary depending on the device version. Some submenus are not dealt with in the Operating Instructions. These submenus and the parameters they contain are explained in the Special Documentation for the device.

Navigation

"Setup" menu → Advanced setup



▶ Display	→ 119
▶ Electrode cleaning circuit	→ 122
▶ WLAN settings	→ 123
▶ Heartbeat setup	
▶ Configuration backup	→ 124
▶ Administration	→ 125

10.5.1 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	→ 117

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Installation direction	Set sign of flow direction to match the direction of the arrow on the sensor.	<ul style="list-style-type: none"> ▪ Flow in arrow direction ▪ Flow against arrow direction 	Flow in arrow direction

10.5.2 Configuring the totalizer

In the "**Totalizer 1 to n**" submenu the individual totalizer can be configured.

Navigation

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

▶ Totalizer 1 to n	
Assign process variable	→ 118
Unit totalizer 1 to n	→ 118
Totalizer operation mode	→ 118
Failure mode	→ 118

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Assign process variable	Select process variable for totalizer.	<ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow 	Volume flow
Unit totalizer 1 to n	Select process variable totalizer unit.	Unit choose list	1
Totalizer operation mode	Select totalizer calculation mode.	<ul style="list-style-type: none"> ■ Net flow total ■ Forward flow total ■ Reverse flow total 	Net flow total
Failure mode	Define totalizer behavior in alarm condition.	<ul style="list-style-type: none"> ■ Stop ■ Actual value ■ Last valid value 	Stop

10.5.3 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	→ 120
Value 1 display	→ 120
0% bargraph value 1	→ 120
100% bargraph value 1	→ 120
Decimal places 1	→ 120
Value 2 display	→ 120
Decimal places 2	→ 120
Value 3 display	→ 120
0% bargraph value 3	→ 120
100% bargraph value 3	→ 121
Decimal places 3	→ 121
Value 4 display	→ 121
Decimal places 4	→ 121
Display language	→ 121
Display interval	→ 121
Display damping	→ 121
Header	→ 121
Header text	→ 121
Separator	→ 122
Backlight	→ 122

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.	<ul style="list-style-type: none"> ▪ 1 value, max. size ▪ 1 bargraph + 1 value ▪ 2 values ▪ 1 value large + 2 values ▪ 4 values 	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Electronic temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3 ▪ Current output 1 ▪ Current output 2 * ▪ Current output 3 * ▪ Current output 4 * 	Volume flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx 	x.xx
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> ▪ None ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity * ▪ Electronic temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3 ▪ Current output 1 ▪ Current output 2 * ▪ Current output 3 * ▪ Current output 4 * 	None
Decimal places 2	A measured value is specified in the Value 2 display parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> ▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx 	x.xx
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 2 display parameter (→  108)	None
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: <ul style="list-style-type: none"> ▪ 0 l/h ▪ 0 gal/min (us)

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
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	0
Decimal places 3	A measured value is specified in the Value 3 display parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	x.xx
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 2 display parameter (→ 108)	None
Decimal places 4	A measured value is specified in the Value 4 display parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	x.xx
Display language	A local display is provided.	Set display language.	<ul style="list-style-type: none"> ■ English ■ Deutsch * ■ Français * ■ Español * ■ Italiano * ■ Nederlands * ■ Portuguesa * ■ Polski * ■ русский язык (Russian) * ■ Svenska * ■ Türkçe * ■ 中文 (Chinese) * ■ 日本語 (Japanese) * ■ 한국어 (Korean) * ■ العربية (Arabic) * ■ Bahasa Indonesia * ■ ภาษาไทย (Thai) * ■ 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	5 s
Display damping	A local display is provided.	Set display reaction time to fluctuations in the measured value.	0.0 to 999.9 s	0.0 s
Header	A local display is provided.	Select header contents on local display.	<ul style="list-style-type: none"> ■ Device tag ■ Free text 	Device tag
Header text	In the Header parameter, the Free text option is selected.	Enter display header text.	Max. 12 characters such as letters, numbers or special characters (e.g. @, %, /)	-----

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Separator	A local display is provided.	Select decimal separator for displaying numerical values.	<ul style="list-style-type: none"> ▪ . (point) ▪ , (comma) 	. (point)
Backlight	One of the following conditions is met: <ul style="list-style-type: none"> ▪ 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.	<ul style="list-style-type: none"> ▪ Disable ▪ Enable 	Enable

* Visibility depends on order options or device settings






10.5.4 Performing electrode cleaning

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

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

Navigation

"Setup" menu → Advanced setup → Electrode cleaning circuit

▶ Electrode cleaning circuit	
Electrode cleaning circuit	→  122
ECC duration	→  122
ECC recovery time	→  122
ECC cleaning cycle	→  123
ECC Polarity	→  123

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.	<ul style="list-style-type: none"> ▪ Off ▪ On 	Off
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	2 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	60 s

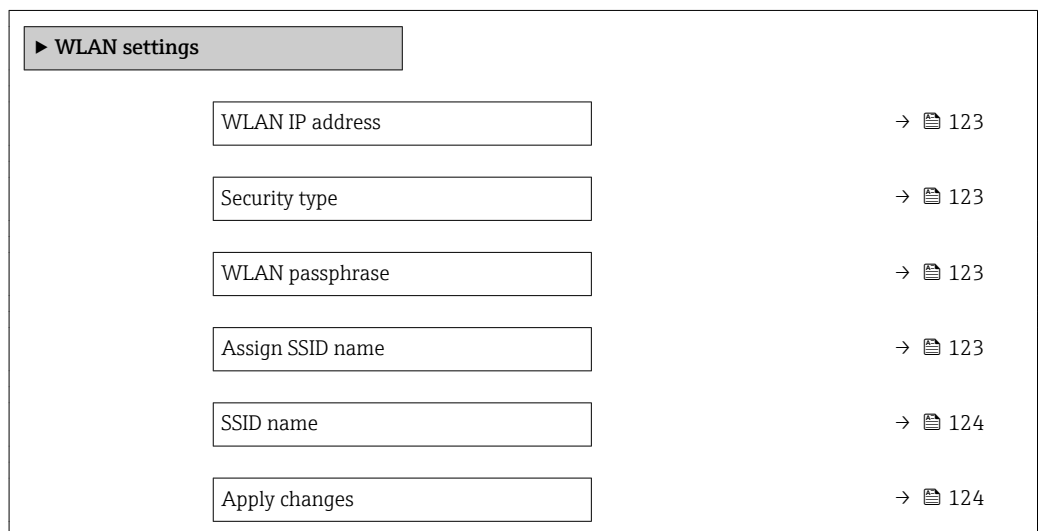
Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
ECC cleaning cycle	For the following order code: "Application package", option EC "ECC electrode cleaning"	Enter the pause duration between electrode cleaning cycles.	0.5 to 168 h	0.5 h
ECC Polarity	For the following order code: "Application package", option EC "ECC electrode cleaning"	Select the polarity of the electrode cleaning circuit.	<ul style="list-style-type: none"> ■ Positive ■ Negative 	Depends on the electrode material: <ul style="list-style-type: none"> ■ Platinum: Negative option ■ Tantalum, Alloy C22, stainless steel: Positive option

10.5.5 WLAN configuration

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


Navigation

"Setup" menu → Advanced setup → WLAN Settings



Parameter overview with brief description

Parameter	Prerequisite	Description	User entry / Selection	Factory setting
WLAN IP address	–	Enter IP address of the device WLAN interface.	4 octet: 0 to 255 (in the particular octet)	192.168.1.212
Security type	–	Select the security type of the WLAN interface.	<ul style="list-style-type: none"> ■ Unsecured ■ WPA2-PSK 	WPA2-PSK
WLAN passphrase	In the Security type parameter, the WPA2-PSK option is selected.	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	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.	<ul style="list-style-type: none"> ■ Device tag ■ User-defined 	User-defined

Parameter	Prerequisite	Description	User entry / Selection	Factory setting
SSID name	In the Assign SSID name parameter, the User-defined option is selected.	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)
Apply changes	–	Use changed WLAN settings.	<ul style="list-style-type: none"> ▪ Cancel ▪ Ok 	Cancel

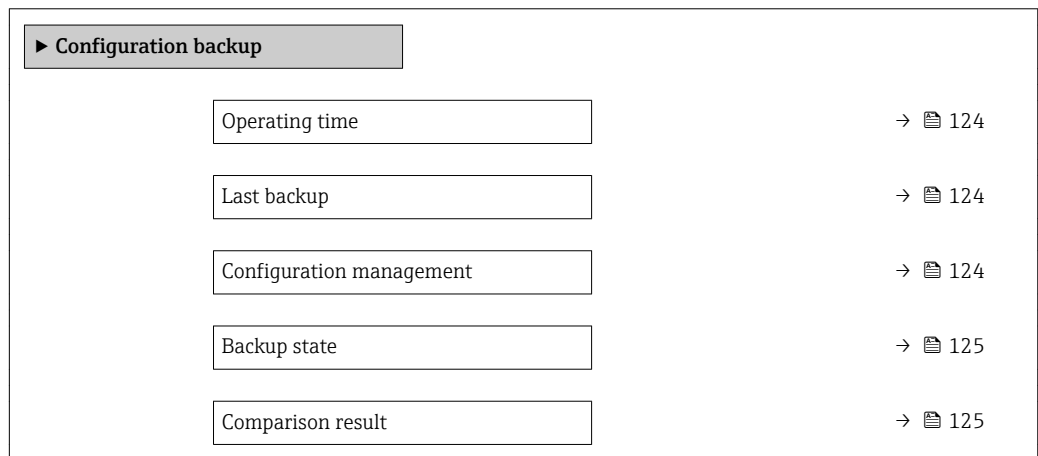
10.5.6 Configuration management

After commissioning, you can save the current device configuration or restore the previous device configuration.

You can do so using the **Configuration management** parameter and the related options found in the **Configuration backup** submenu.

Navigation

"Setup" menu → Advanced setup → Configuration backup



Parameter overview with brief description


Parameter	Description	User interface / Selection	Factory setting
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 embedded HistoROM.	Days (d), hours (h), minutes (m) and seconds (s)	–
Configuration management	Select action for managing the device data in the embedded HistoROM.	<ul style="list-style-type: none"> ▪ Cancel ▪ Execute backup ▪ Restore ▪ Compare ▪ Clear backup data 	Cancel

Parameter	Description	User interface / Selection	Factory setting
Backup state	Shows the current status of data saving or restoring.	<ul style="list-style-type: none"> ■ None ■ Backup in progress ■ Restoring in progress ■ Delete in progress ■ Compare in progress ■ Restoring failed ■ Backup failed 	None
Comparison result	Comparison of current device data with embedded HistoROM.	<ul style="list-style-type: none"> ■ Settings identical ■ Settings not identical ■ No backup available ■ Backup settings corrupt ■ Check not done ■ Dataset incompatible 	Check not done

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 integrated HistoROM 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 integrated HistoROM. 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 integrated HistoROM.
Clear backup data	The backup copy of the device configuration is deleted from the memory of the device.

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

 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.

10.5.7 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		→ ⓘ 126
▶ Reset access code		→ ⓘ 126
Device reset		→ ⓘ 127

Using the parameter to define the access code

Navigation

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

▶ Define access code

→ 126

→ 126

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

→ 126

→ 126

Parameter overview with brief description

Parameter	Description	User interface / User entry	Factory setting
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. For a reset code, contact your Endress+Hauser service organization. The reset code can only be entered via: <ul style="list-style-type: none"> ▪ Web browser ▪ DeviceCare, FieldCare (via service interface CDI-RJ45) ▪ Fieldbus 	Character string comprising numbers, letters and special characters	0x00

Using the parameter to reset the device

Navigation

"Setup" menu → Advanced setup → Administration

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Device reset	Reset the device configuration - either entirely or in part - to a defined state.	<ul style="list-style-type: none"> ■ Cancel ■ To delivery settings ■ Restart device ■ Restore S-DAT backup 	Cancel






10.6 Simulation

The **Simulation** submenu enables you to simulate, without a real flow situation, various process variables in the process and the device alarm mode and to verify downstream signal chains (switching valves or closed-control loops).



Navigation


"Diagnostics" menu → Simulation

► Simulation	
Assign simulation process variable	→ 128
Process variable value	→ 128
Status input simulation	→ 128
Input signal level	→ 128
Current input 1 to n simulation	→ 128
Value current input 1 to n	→ 128
Current output 1 to n simulation	→ 128
Value current output 1 to n	→ 128
Frequency output simulation 1 to n	→ 128
Frequency value 1 to n	→ 128
Pulse output simulation 1 to n	→ 128
Pulse value 1 to n	→ 129
Switch output simulation 1 to n	→ 129
Switch status 1 to n	→ 129
Relay output 1 to n simulation	→ 129
Switch status 1 to n	→ 129

Pulse output simulation	→  129
Pulse value	→  129
Device alarm simulation	→  129
Diagnostic event category	→  129
Diagnostic event simulation	→  129

Parameter overview with brief description




Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign simulation process variable	–	Select a process variable for the simulation process that is activated.	<ul style="list-style-type: none"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity* ▪ Conductivity* 	Off
Process variable value	–	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Status input simulation	–	Switch simulation of the status input on and off.	<ul style="list-style-type: none"> ▪ Off ▪ On 	Off
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.	<ul style="list-style-type: none"> ▪ High ▪ Low 	High
Current input 1 to n simulation	–	Switch simulation of the current input on and off.	<ul style="list-style-type: none"> ▪ Off ▪ On 	Off
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	0 mA
Current output 1 to n simulation	–	Switch the simulation of the current output on and off.	<ul style="list-style-type: none"> ▪ Off ▪ On 	Off
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	3.59 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.	<ul style="list-style-type: none"> ▪ Off ▪ On 	Off
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	0.0 Hz
Pulse output simulation 1 to n	In the Operating mode parameter, the Pulse option is selected.	Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter (→  102) defines the pulse width of the pulses output.	<ul style="list-style-type: none"> ▪ Off ▪ Fixed value ▪ Down-counting value 	Off

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
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 65535	0
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.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Switch status 1 to n	–	Select the status of the status output for the simulation.	<ul style="list-style-type: none"> ■ Open ■ Closed 	Open
Relay output 1 to n simulation	–	Switch simulation of the relay output on and off.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Switch status 1 to n	In the Switch output simulation 1 to n parameter, the On option is selected.	Select status of the relay output for the simulation.	<ul style="list-style-type: none"> ■ Open ■ Closed 	Open
Pulse output simulation	–	Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter defines the pulse width of the pulses output.	<ul style="list-style-type: none"> ■ Off ■ Fixed value ■ Down-counting value 	Off
Pulse value	In the Pulse output simulation parameter, the Down-counting value option is selected.	Set and switch off the pulse output simulation.	0 to 65535	0
Device alarm simulation	–	Switch the device alarm on and off.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Diagnostic event category	–	Select a diagnostic event category.	<ul style="list-style-type: none"> ■ Sensor ■ Electronics ■ Configuration ■ Process 	Process
Diagnostic event simulation	–	Select a diagnostic event to simulate this event.	<ul style="list-style-type: none"> ■ Off ■ Diagnostic event picklist (depends on the category selected) 	Off
Logging interval	–	Define the logging interval tlog for data logging. This value defines the time interval between the individual data points in the memory.	1.0 to 3600.0 s	–

* Visibility depends on order options or device settings

10.7 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 →  130
- Protect access to local operation via key locking →  74
- Protect access to measuring device via write protection switch →  131

10.7.1 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 local display

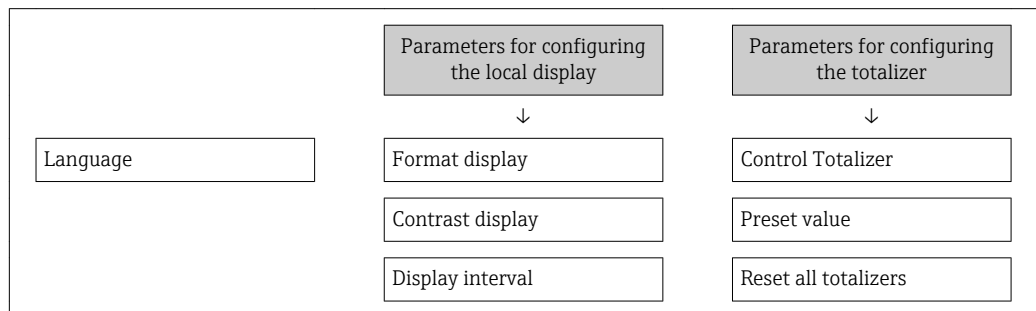
1. Navigate to the **Define access code** parameter (→  126).
2. Define a max. 16-digit character string comprising numbers, letters and special characters as the access code.
3. Enter the access code again in the **Confirm access code** parameter (→  126) to confirm the code.
 - ↳ The -symbol appears in front of all write-protected parameters.

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.


-  ■ If parameter write protection is activated via an access code, it can also only be deactivated via this access code →  74.
 - The user role with which the user is currently logged on via the local display is indicated by the →  74 **Access status** parameter. Navigation path: Operation → Access status





Parameters which can always be modified via the local display

Certain parameters that do not affect the measurement are exempted 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.



Defining the access code via the Web browser




1. Navigate to the **Define access code** parameter (→  126).
2. Max. Define a max. 4-digit numeric code as an access code.

3. Enter the access code again in the **Confirm access code** parameter (→  126) to confirm the code.
 - ↳ The Web browser switches to the login page.
-  If no action is performed for 10 minutes, the Web browser automatically returns to the login page.
- 
 - If parameter write protection is activated via an access code, it can also only be deactivated via this access code →  74.
 - The user role with which the user is currently logged on via Web browser is indicated by the **Access status** parameter. Navigation path: Operation → Access status

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

-  For a reset code, contact your Endress+Hauser service organization.
1. Navigate to the **Reset access code** parameter (→  126).
 2. Enter the reset code.
 - ↳ The access code has been reset to the factory setting **0000**. It can be redefined →  130.

10.7.2 Write protection via write protection switch

Unlike parameter write protection via a user-specific access code, this allows write access to the entire operating menu - except for the **"Contrast display" parameter** - to be locked.

The parameter values are now read only and cannot be edited any more (exception **"Contrast display" parameter**):

- Via local display
- Via HART protocol

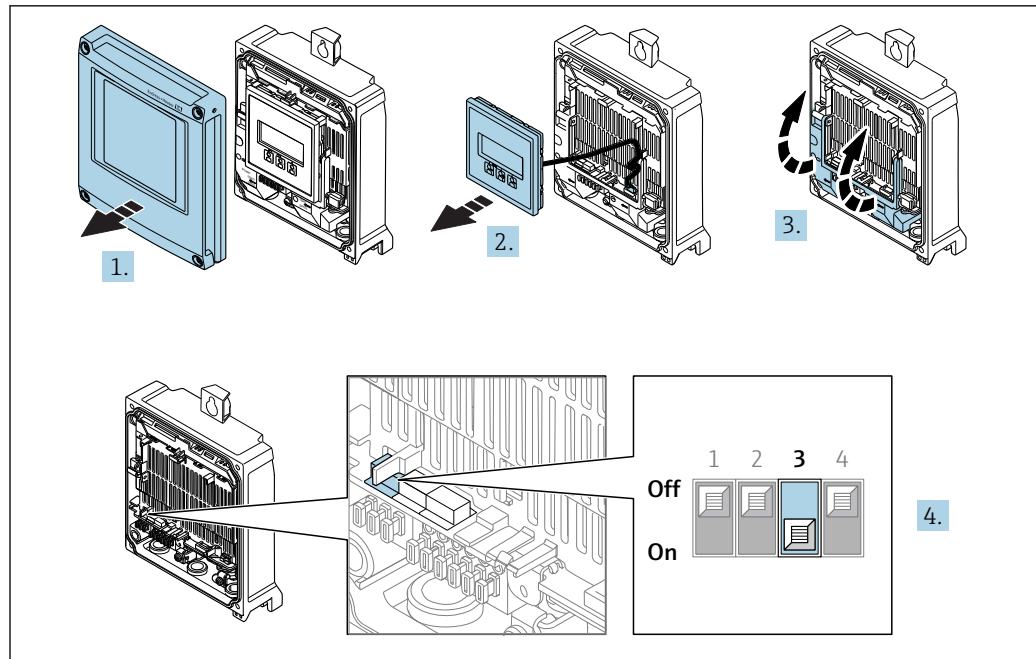
Proline 500 – digital

WARNING


Excessive tightening torque applied to the fixing screws!

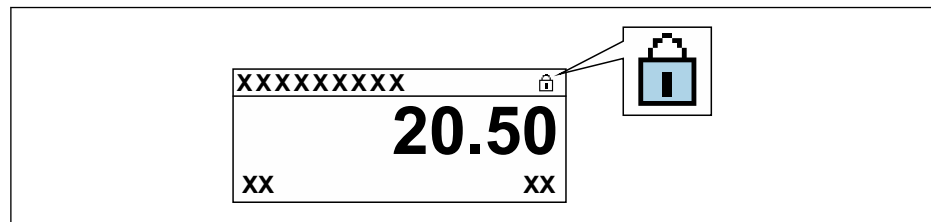
Risk of damaging the plastic transmitter.

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




A0029675

1. Open the housing cover.
2. Remove the display module.
3. Fold open the terminal cover.
4. 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 → 134. 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.

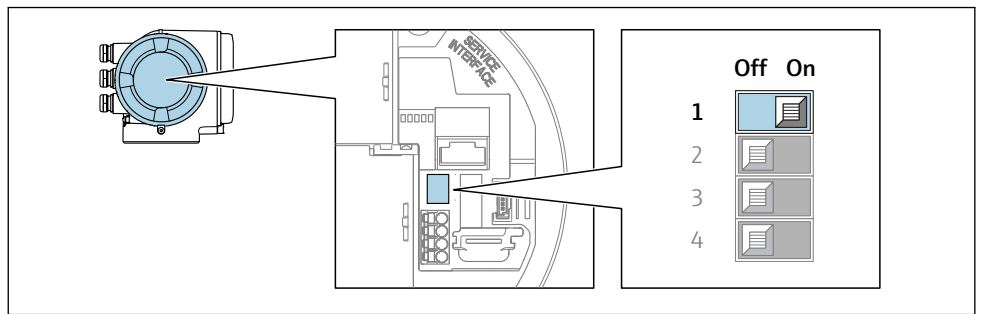


A0029425

5. 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 → 134. 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.

Proline 500

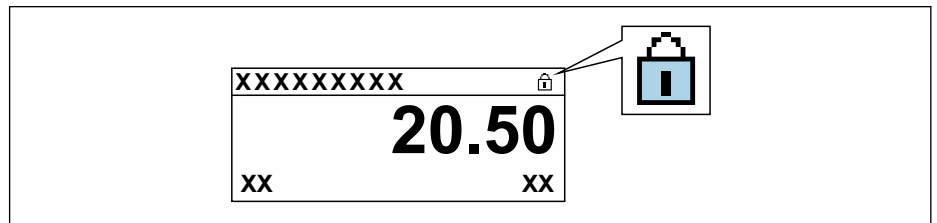
1.



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 → 134. 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 → 134. 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 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 status displayed in the Access status parameter applies → 74. 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).
SIL locked	The SIL mode is enabled. This locks write access to the parameters (e.g. via local display or operating tool).
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 → 92
- For information on the operating languages supported by the measuring device → 192

11.3 Configuring the display

Detailed information:

- On the basic settings for the local display → 107
- On the advanced settings for the local display → 119

11.4 Reading measured values

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

11.4.1 Process variables

The **Measured 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	→ 135
Mass flow	→ 135

Corrected volume flow	→ ⓘ 135
Flow velocity	
Conductivity	→ ⓘ 135
Corrected conductivity	→ ⓘ 135
Temperature	→ ⓘ 135
Density	

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Volume flow	–	Displays the volume flow currently measured. <i>Dependency</i> The unit is taken from the Volume flow unit parameter (→ ⓘ 95).	Signed floating-point number
Mass flow	–	Displays the mass flow currently calculated. <i>Dependency</i> The unit is taken from the Mass flow unit parameter (→ ⓘ 95).	Signed floating-point number
Conductivity	–	Displays the conductivity currently measured. <i>Dependency</i> The unit is taken from the Conductivity unit parameter (→ ⓘ 95).	Signed floating-point number
Corrected volume flow	–	Displays the corrected volume flow currently calculated. <i>Dependency</i> The unit is taken from the Corrected volume flow unit parameter (→ ⓘ 95).	Signed floating-point number
Temperature	One of the following conditions is met: <ul style="list-style-type: none"> ▪ 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 currently calculated. <i>Dependency</i> The unit is taken from the Temperature unit parameter (→ ⓘ 95).	Positive floating-point number
Corrected conductivity	One of the following conditions is met: <ul style="list-style-type: none"> ▪ 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. <i>Dependency</i> The unit is taken from the Conductivity unit parameter (→ ⓘ 95).	Positive 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

→ 136

Totalizer overflow 1 to n

→ 136

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 (→ 118) 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 (→ 118) 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.

Navigation

"Diagnostics" menu → Measured values → Input values

▶ Input values

▶ Current input 1 to n

→ 136

▶ Status input 1 to n

→ 137

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.

Navigation

"Diagnostics" menu → Measured values → Input values → Current input 1 to n

▶ Current input 1 to n

Measured values 1 to n

→ 137

Measured current 1 to n

→ 137

Parameter overview with brief description

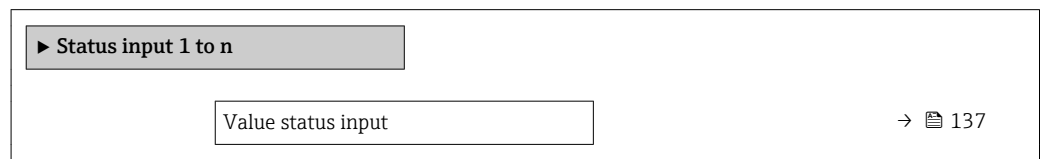
Parameter	Description	User interface
Measured values 1 to n	Displays the current input value.	Signed floating-point number
Measured current 1 to n	Displays the current value of the current input.	0 to 22.5 mA

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.

Navigation

"Diagnostics" menu → Measured values → Input values → Status input 1 to n



Parameter overview with brief description

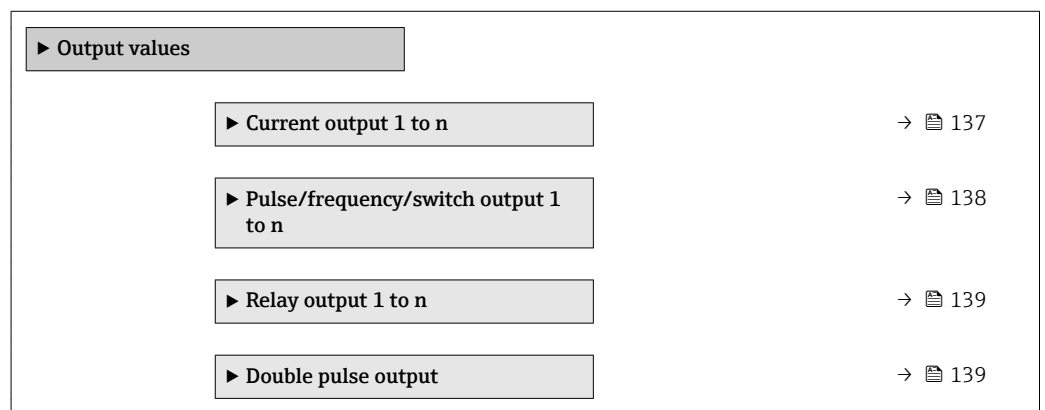
Parameter	Description	User interface
Value status input	Shows the current input signal level.	<ul style="list-style-type: none"> ■ High ■ Low

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 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

→ 138

Measured current 1 to n

→ 138

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.

Navigation

"Diagnostics" menu → Measured values → Output values → Pulse/frequency/switch output 1 to n

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

Output frequency 1 to n

→ 139

Pulse output 1 to n

→ 139

Switch status 1 to n

→ 139

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / User entry	Factory setting
Output frequency	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	–
Value per pulse	In the Operating mode parameter, the Pulse option is selected and one of the following options is selected in the Assign pulse output parameter (→ 102): <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow 	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Switch status	The Switch option is selected in the Operating mode parameter.	Displays the current switch output status.	<ul style="list-style-type: none"> ▪ 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.

Navigation

"Diagnostics" menu → Measured values → Output values → Relay output 1 to n

▶ Relay output 1 to n	
Switch status	→ 139
Switch cycles	→ 139
Max. switch cycles number	→ 139

Parameter overview with brief description

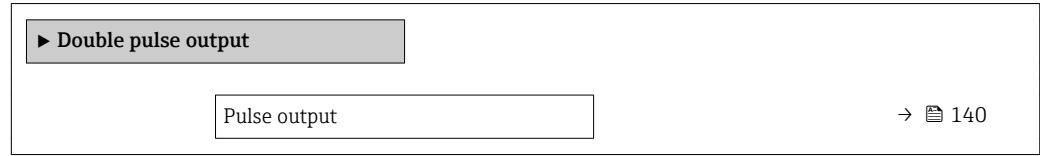
Parameter	Description	User interface
Switch status	Shows the current relay switch status.	<ul style="list-style-type: none"> ▪ Open ▪ Closed
Switch cycles	Shows number of all performed switch cycles.	Positive integer
Max. switch cycles number	Shows the maximal number of guaranteed switch cycles.	Positive integer

Output values for double pulse output

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

Navigation

"Diagnostics" menu → Measured values → Output values → Double pulse output



Parameter overview with brief description

Parameter	Description	User interface
Pulse output	Shows the currently output pulse frequency.	Positive floating-point number

11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu (→ 📄 92)
- Advanced settings using the **Advanced setup** submenu (→ 📄 116)

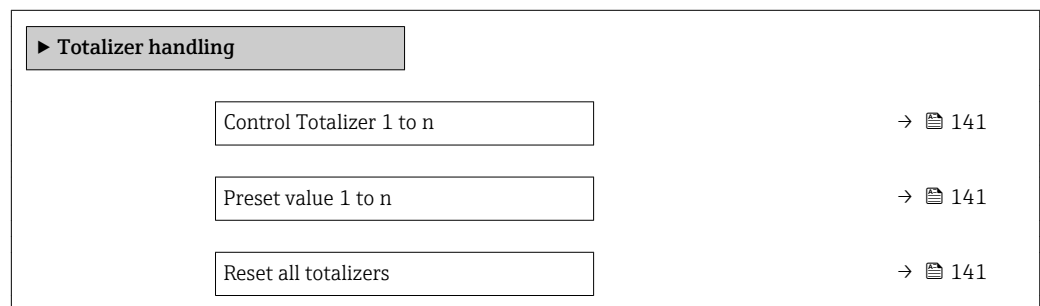
11.6 Performing a totalizer reset

The totalizers are reset in the **Operation** submenu:





- Control Totalizer
- Reset all totalizers

Navigation

"Operation" menu → Totalizer handling



Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Control Totalizer 1 to n	One of the following options is selected in the Assign process variable parameter (→  118) Totalizer 1 to n submenu: Volume flow	Control totalizer value.	<ul style="list-style-type: none"> ■ Totalize ■ Reset + hold ■ Preset + hold ■ Reset + totalize ■ Preset + totalize ■ Hold 	Totalize
Preset value 1 to n	One of the following options is selected in the Assign process variable parameter (→  118) Totalizer 1 to n submenu: Volume flow	Specify start value for totalizer. <i>Dependency</i>  The unit of the selected process variable is specified for the totalizer in the Unit totalizer parameter (→  118).	Signed floating-point number	0 l
Reset all totalizers	–	Reset all totalizers to 0 and start.	<ul style="list-style-type: none"> ■ Cancel ■ Reset + totalize 	Cancel

11.6.1 Function scope of the "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.
Preset + hold	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	The totalizer is set to the defined start value from the Preset value parameter and the totaling process is restarted.
Hold	Totalizing is stopped.

11.6.2 Function scope of the "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 flow values previously totalized.

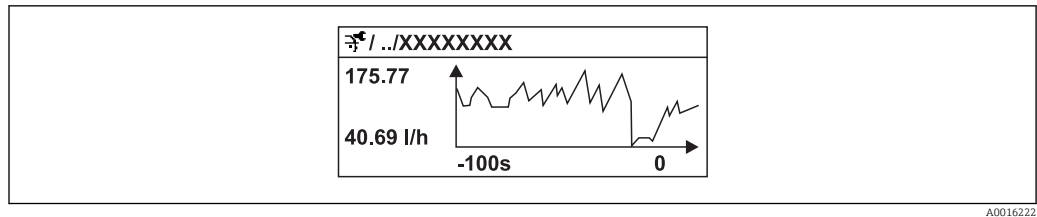
11.7 Showing data logging

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 →  84.
 - Web browser →  75

Function range

- A total of 1000 measured values can be stored
- 4 logging channels
- Adjustable logging interval for data logging
- Display of the measured value trend for each logging channel in the form of a chart



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41 Chart of a measured value trend

- 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.

i 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...4	→ 143
Logging interval	→ 143
Clear logging data	→ 143
Data logging	→ 143
Logging delay	→ 143
Data logging control	→ 143
Data logging status	→ 143
Entire logging duration	→ 143

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign channel 1 to n	The Extended HistoROM application package is available.	Assign process variable to logging channel.	<ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity * ■ Electronic temperature ■ Current output 1 ■ Current output 2 * ■ Current output 3 * ■ Current output 4 * 	Off
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 999.0 s	1.0 s
Clear logging data	The Extended HistoROM application package is available.	Clear the entire logging data.	<ul style="list-style-type: none"> ■ Cancel ■ Clear data 	Cancel
Data logging	–	Select the data logging method.	<ul style="list-style-type: none"> ■ Overwriting ■ Not overwriting 	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	0 h
Data logging control	In the Data logging parameter, the Not overwriting option is selected.	Start and stop measured value logging.	<ul style="list-style-type: none"> ■ None ■ Delete + start ■ Stop 	None
Data logging status	In the Data logging parameter, the Not overwriting option is selected.	Displays the measured value logging status.	<ul style="list-style-type: none"> ■ Done ■ Delay active ■ Active ■ Stopped 	Done
Entire logging duration	In the Data logging parameter, the Not overwriting option is selected.	Displays the total logging duration.	Positive floating-point number	0 s

* Visibility depends on order options or device settings

12 Diagnostics and troubleshooting

12.1 General troubleshooting


For local display

Error	Possible causes	Solution
Local display dark and no output signals	Supply voltage does not match the value indicated on the nameplate.	Apply the correct supply voltage .
Local display dark and no output signals	The polarity of the supply voltage is wrong.	Correct the polarity.
Local display dark and no output signals	No contact between connecting cables and terminals.	Check the connection of the cables and correct if necessary.
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 → 168.
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 is dark, but signal output is within the valid range	Display is set too bright or too dark.	<ul style="list-style-type: none"> ▪ 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	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 is dark, but signal output is within the valid range	Display module is defective.	Order spare part → 168.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures
Text on local display appears in a foreign language and cannot be understood.	Incorrect operating language is configured.	1. Press + for 2 s ("home position"). 2. Press .3. Set the desired language in the Display language parameter (→ 121).
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	<ul style="list-style-type: none"> ▪ Check the cable and the connector between the main electronics module and display module. ▪ Order spare part → 168.

For output signals

Error	Possible causes	Solution
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 168.
Signal output outside the valid current range (< 3.6 mA or > 22 mA)	Main electronics module is defective. I/O electronics module is defective.	Order spare part → 168.
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Configuration error	Check and correct the 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	Solution
No write access to parameters	Hardware write protection enabled	Set the write protection switch on main electronics module to the Off position → 131.
No write access to parameters	Current user role has limited access authorization	1. Check user role → 74. 2. Enter correct customer-specific access code → 74.
No connection via HART protocol	Communication resistor missing or incorrectly installed.	Install the communication resistor (250 Ω) correctly. Observe the maximum load → 176.
No connection via HART protocol	Commubox <ul style="list-style-type: none"> ▪ Connected incorrectly ▪ Configured incorrectly ▪ Drivers not installed correctly ▪ USB interface on computer configured incorrectly 	Observe the documentation for the Commubox.  FXA195 HART: Document "Technical Information" TI00404F
Not connecting to Web server	Web server disabled	Using the "FieldCare" or "DeviceCare" operating tool, check whether the web server of the measuring device is enabled, and enable it if necessary → 80.
	Incorrect setting for the Ethernet interface of the computer	1. Check the properties of the Internet protocol (TCP/IP) → 77. 2. Check the network settings with the IT manager.
Not connecting to Web server	Incorrect IP address	Check the IP address: 192.168.1.212 → 77
Not connecting to Web server	Incorrect WLAN access data	<ul style="list-style-type: none"> ▪ Check WLAN network status. ▪ Log on to the device again using WLAN access data. ▪ Verify that WLAN is enabled on the measuring device and operating device → 77.
	WLAN communication disabled	–
Not connecting to web server, FieldCare or DeviceCare	No WLAN network available	<ul style="list-style-type: none"> ▪ Check if WLAN reception is present: LED on display module is lit blue ▪ Check if WLAN connection is enabled: LED on display module flashes blue ▪ Switch on instrument function.

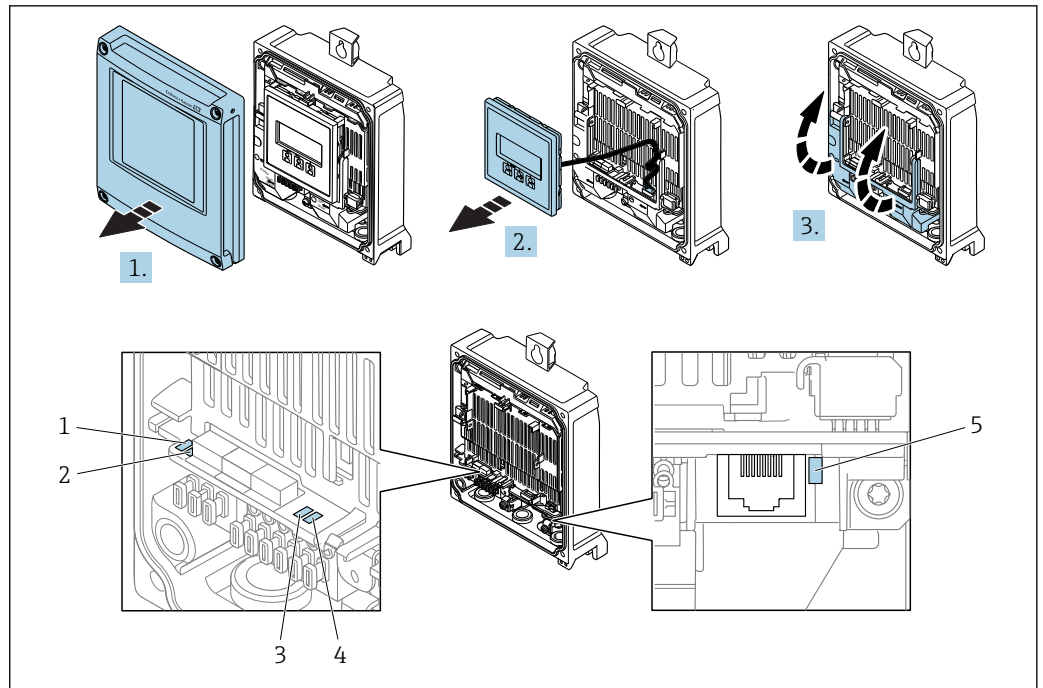
Error	Possible causes	Solution
Network connection not present or unstable	WLAN network is weak.	<ul style="list-style-type: none"> ▪ Operating device is outside of reception range: Check network status on operating device. ▪ To improve network performance, use an external WLAN antenna.
	Parallel WLAN and Ethernet communication	<ul style="list-style-type: none"> ▪ Check network settings. ▪ Temporarily enable only the WLAN as an interface.
Web browser frozen and operation no longer possible	Data transfer active	Wait until data transfer or current action is finished.
	Connection lost	<ol style="list-style-type: none"> 1. Check cable connection and power supply. 2. Refresh the Web browser and restart if necessary.
Content of Web browser incomplete or difficult to read	Not using optimum version of Web server.	<ol style="list-style-type: none"> 1. Use the correct Web browser version . 2. Clear the Web browser cache and restart the Web browser.
	Unsuitable view settings.	Change the font size/display ratio of the Web browser.
No or incomplete display of contents in the Web browser	<ul style="list-style-type: none"> ▪ JavaScript not enabled ▪ JavaScript cannot be enabled 	<ol style="list-style-type: none"> 1. Enable JavaScript. 2. Enter http://XXX.XXX.X.XXX/basic.html as the IP address.
Operation with FieldCare or DeviceCare via CDI-RJ45 service interface (port 8000)	Firewall of computer or network is preventing communication	Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access.
Flashing of firmware with FieldCare or DeviceCare via CDI-RJ45 service interface (via port 8000 or TFTP ports)	Firewall of computer or network is preventing communication	Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow 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

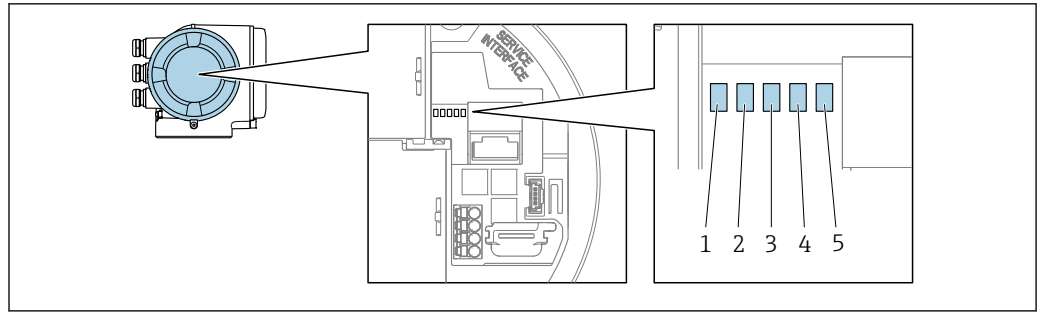
- 1 Supply voltage
- 2 Device status
- 3 Not used
- 4 Communication
- 5 Service interface (CDI) active

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

LED	Color	Meaning
1 Supply voltage	Green	Supply voltage is ok
	Off	Supply voltage is off or too low
2 Device status	Green	Device is OK
	Red	Error
	Flashing red	Warning
3 Not used	–	–
4 Communication	Flashing white	Communication active
5 Service interface (CDI)	Yellow	Connection established
	Flashing yellow	Communication active
	Off	No connection

Proline 500

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



A0029629

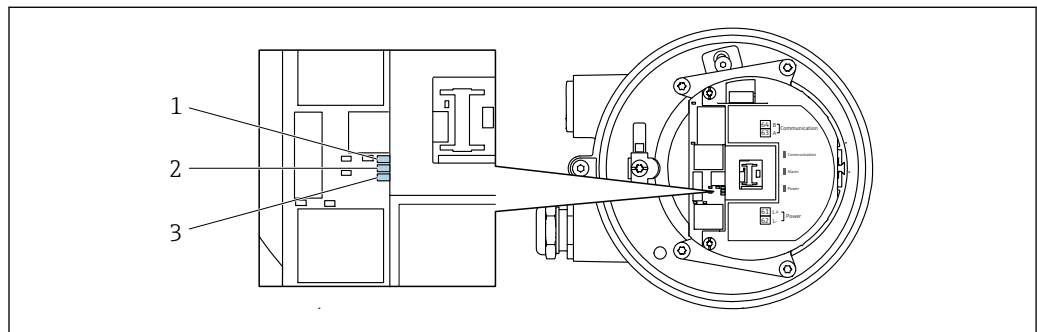
- 1 Supply voltage
- 2 Device status
- 3 Not used
- 4 Communication
- 5 Service interface (CDI) active

LED	Color	Meaning
1 Supply voltage	Green	Supply voltage is ok
	Off	Supply voltage is off or too low
2 Device status	Red	Error
	Flashing red	Warning
3 Not used	-	-
4 Communication	White	Communication active
5 Service interface (CDI)	Yellow	Connection established
	Flashing yellow	Communication active
	Off	No connection

12.2.2 Sensor connection housing

Proline 500 – digital

Various light emitting diodes (LED) on the ISEM electronics (Intelligent Sensor Electronic Module) in the sensor connection housing provide information on the device status.



A0029699

- 1 Communication
- 2 Device status
- 3 Supply voltage

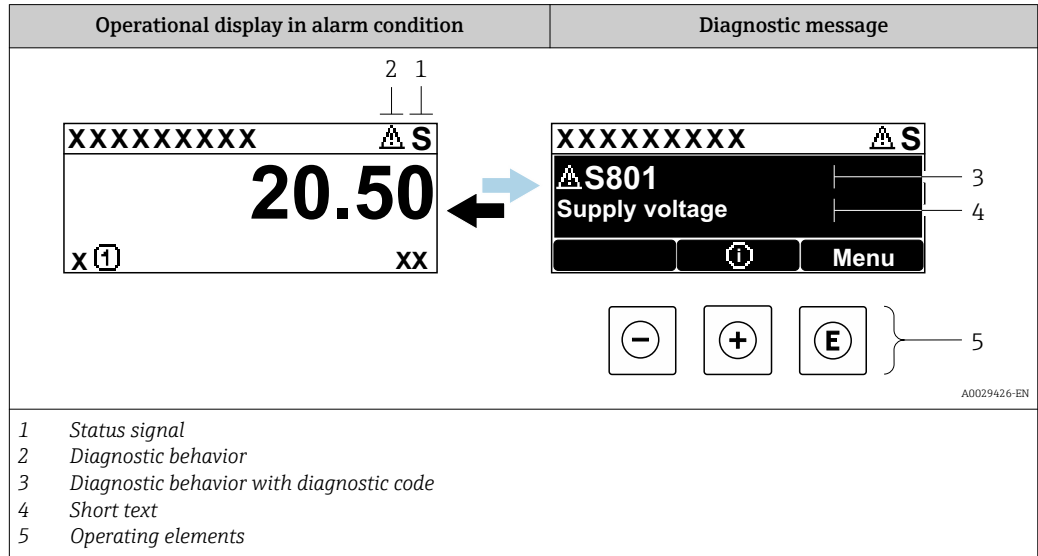
LED	Color	Meaning
1 Communication	White	Communication active
2 Device status	Red	Error
	Flashing red	Warning

LED	Color	Meaning
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.



If two or more diagnostic events are pending simultaneously, only the message of the diagnostic event with the highest priority is shown.

- i** Other diagnostic events that have occurred can be displayed in the **Diagnostics** menu:
 - Via parameter
 - Via submenus → 161



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).

- i** 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

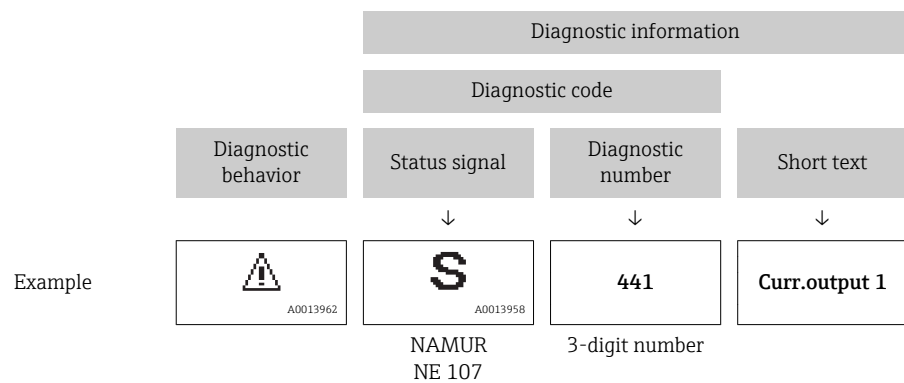
Symbol	Meaning
F	Failure A device error has occurred. The measured value is no longer valid.
C	Function check The device is in service mode (e.g. during a simulation).
S	Out of specification The device is operated: <ul style="list-style-type: none"> ▪ Outside its technical specification limits (e.g. outside the process temperature range) ▪ Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)
M	Maintenance required Maintenance is required. The measured value remains valid.

Diagnostic behavior



Symbol	Meaning
	Alarm <ul style="list-style-type: none"> 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

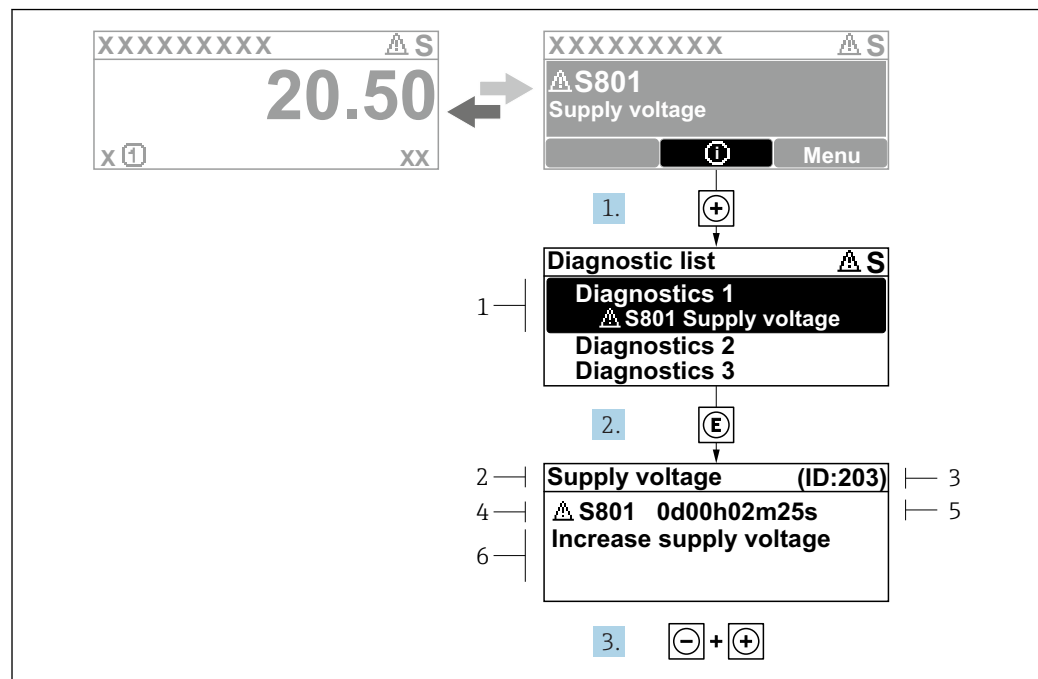
The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.



Operating elements

Key	Meaning
	Plus key <i>In a menu, submenu</i> Opens the message about remedy information.
	Enter key <i>In a menu, submenu</i> Opens the operating menu.

12.3.2 Calling up remedial measures



42 Message for remedial measures

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

The user is in the diagnostic message.

1. Press \oplus ($\text{\textcircled{1}}$ symbol).
 ↳ The **Diagnostic list** submenu opens.
2. Select the desired diagnostic event with \oplus or \ominus and press $\text{\textcircled{E}}$.
 ↳ The message for the remedial measures for the selected diagnostic event opens.
3. Press $\ominus + \oplus$ simultaneously.
 ↳ The message for the remedial measures closes.

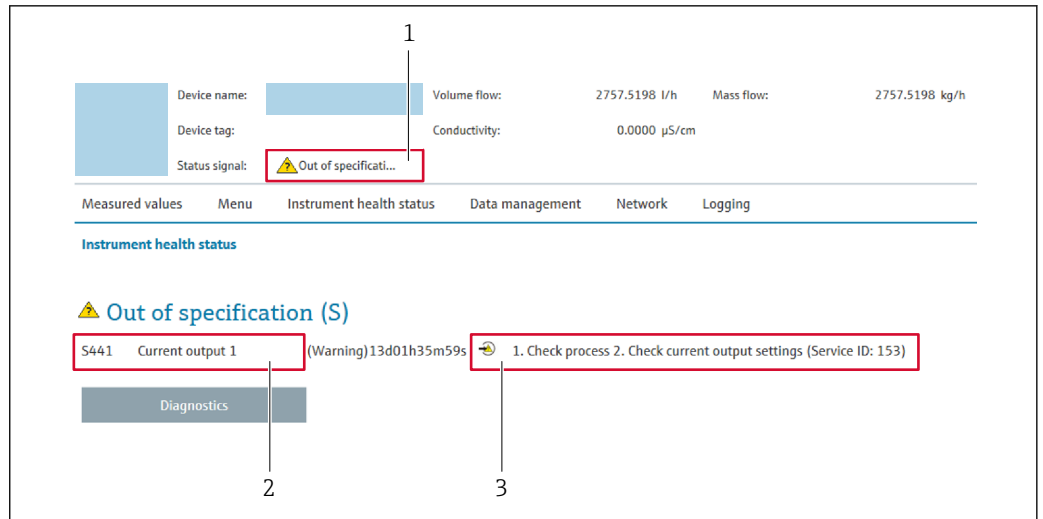
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or **Previous diagnostics** parameter.

1. Press $\text{\textcircled{E}}$.
 ↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press $\ominus + \oplus$ 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 → 151
- 3 Remedy information with Service ID

i In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:

- Via parameter
- Via submenu → 161

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 operated: <ul style="list-style-type: none"> ▪ Outside its technical specification limits (e.g. outside the process temperature range) ▪ Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)
	Maintenance required Maintenance is required. The measured value is still valid.

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

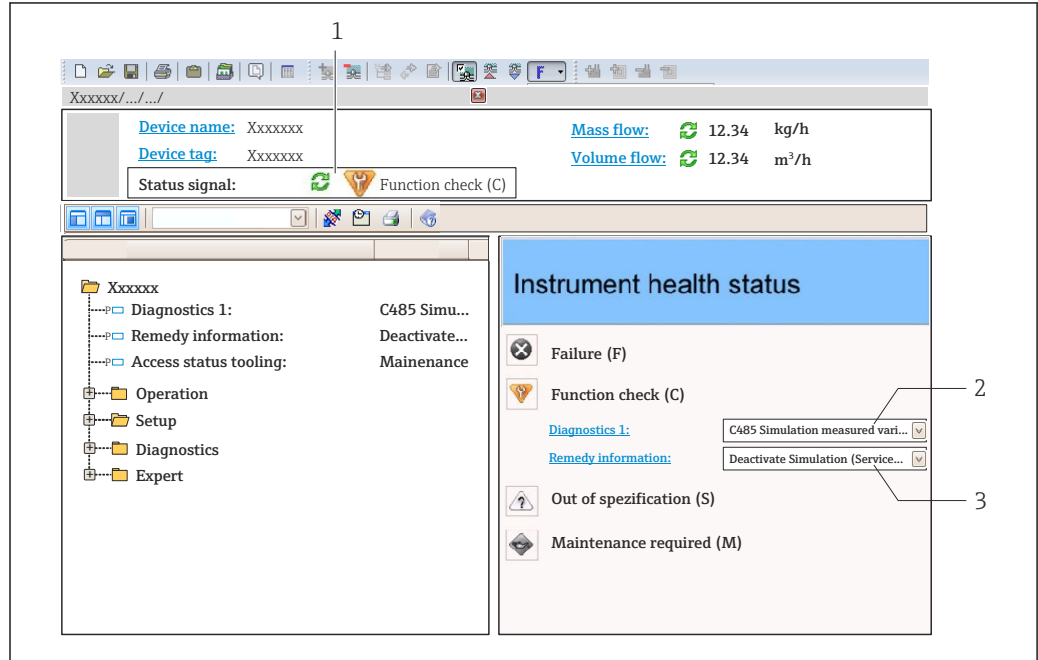
12.4.2 Calling up remedy information

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 DeviceCare or FieldCare

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.



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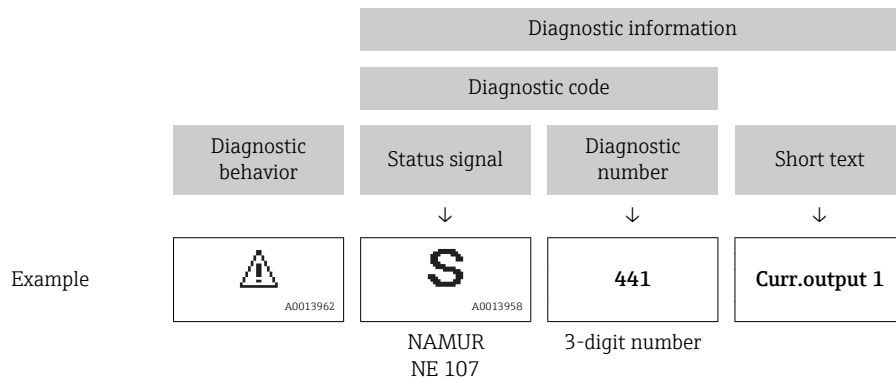
- 1 Status area with status signal → 150
- 2 Diagnostic information → 151
- 3 Remedy information with Service ID

i In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:

- Via parameter
- Via submenu → 161

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.

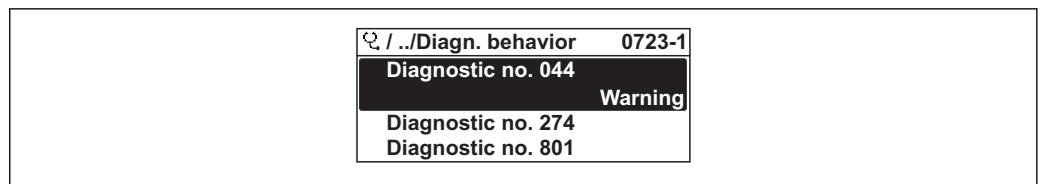
1. Call up the desired parameter.
2. On the right in the working area, mouse over the parameter.
 - ↳ A tool tip with remedy information for the diagnostic event appears.

12.6 Adapting the diagnostic information

12.6.1 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



A0014048-EN

43 Taking the example of the local display

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

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

12.6.2 Adapting the status signal

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


Expert → Communication → Diagnostic event category


Available status signals

Configuration as per HART 7 Specification (Condensed Status), in accordance with NAMUR NE107.

Symbol	Meaning
F <small>A0013956</small>	Failure A device error is present. The measured value is no longer valid.
C <small>A0013959</small>	Function check The device is in service mode (e.g. during a simulation).
S <small>A0013958</small>	Out of specification The device is being operated: <ul style="list-style-type: none"> ▪ Outside its technical specification limits (e.g. outside the process temperature range) ▪ Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)
M <small>A0013957</small>	Maintenance required Maintenance is required. The measured value is still valid.
N <small>A0023076</small>	Has no effect on the condensed status.

12.7 Overview of diagnostic information

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

 In the case of some items of diagnostic information, the status signal and the diagnostic behavior can be changed. Change the diagnostic information →  155

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
Diagnostic of sensor				
043	Sensor short circuit	1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor	S	Warning ¹⁾
082	Data storage	1. Check module connections 2. Contact service	F	Alarm
083	Memory content	1. Restart device 2. Restore HistoROM S-DAT backup ('Device reset' parameter) 3. Replace HistoROM S-DAT	F	Alarm
170	Coil resistance	Check ambient and process temperature	F	Alarm
180	Temperature sensor defective	1. Check sensor connections 2. Replace sensor cable or sensor 3. Turn off temperature measurement	F	Warning
181	Sensor connection	1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor	F	Alarm
Diagnostic of electronic				
201	Device failure	1. Restart device 2. Contact service	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
242	Software incompatible	1. Check software 2. Flash or change main electronics module	F	Alarm
252	Modules incompatible	1. Check electronic modules 2. Change electronic modules	F	Alarm
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	F	Alarm
270	Main electronic failure	Change main electronic module	F	Alarm
271	Main electronic failure	1. Restart device 2. Change main electronic module	F	Alarm
272	Main electronic failure	1. Restart device 2. Contact service	F	Alarm
273	Main electronic failure	Change electronic	F	Alarm
275	I/O module 1 to n defective	Change I/O module	F	Alarm
276	I/O module 1 to n faulty	1. Restart device 2. Change I/O module	F	Alarm
283	Memory content	1. Reset device 2. Contact service	F	Alarm
302	Device verification active	Device verification active, please wait.	C	Warning
311	Electronic failure	1. Do not reset device 2. Contact service	M	Warning
332	Writing in embedded HistoROM failed	Replace user interface board Ex d/XP: replace transmitter	F	Alarm
361	I/O module 1 to n faulty	1. Restart device 2. Check electronic modules 3. Change I/O Modul or main electronics	F	Alarm
372	Sensor electronic (ISEM) faulty	1. Restart device 2. Check if failure recurs 3. Replace sensor electronic module (ISEM)	F	Alarm
373	Sensor electronic (ISEM) faulty	1. Transfer data or reset device 2. Contact service	F	Alarm
375	I/O- 1 to n communication failed	1. Restart device 2. Check if failure recurs 3. Replace module rack inclusive electronic modules	F	Alarm
376	Sensor electronic (ISEM) faulty	1. Replace sensor electronic module (ISEM) 2. Turn off diagnostic message	F	Warning ¹⁾
377	Sensor electronic (ISEM) faulty	1. Check sensor cable and sensor 2. Perform Heartbeat Verification 3. Replace sensor cable or sensor	F	Warning ¹⁾
382	Data storage	1. Insert T-DAT 2. Replace T-DAT	F	Alarm
383	Memory content	1. Restart device 2. Delete T-DAT via 'Reset device' parameter 3. Replace T-DAT	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
387	Embedded HistoROM failed	Contact service organization	F	Alarm
512	Sensor electronic (ISEM) faulty	1. Check ECC recovery time 2. Turn off ECC	F	Alarm
Diagnostic of configuration				
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	M	Warning
330	Flash file invalid	1. Update firmware of device 2. Restart device	M	Warning
331	Firmware update failed	1. Update firmware of device 2. Restart device	F	Warning
410	Data transfer	1. Check connection 2. Retry data transfer	F	Alarm
412	Processing download	Download active, please wait	C	Warning
431	Trim 1 to n	Carry out trim	C	Warning
437	Configuration incompatible	1. Restart device 2. Contact service	F	Alarm
438	Dataset	1. Check data set file 2. Check device configuration 3. Up- and download new configuration	M	Warning
441	Current output 1 to n	1. Check process 2. Check current output settings	S	Warning ¹⁾
442	Frequency output 1 to n	1. Check process 2. Check frequency output settings	S	Warning ¹⁾
443	Pulse output 1 to n	1. Check process 2. Check pulse output settings	S	Warning ¹⁾
444	Current input 1 to n	1. Check process 2. Check current input settings	S	Warning ¹⁾
453	Flow override	Deactivate flow override	C	Warning
484	Failure mode simulation	Deactivate simulation	C	Alarm
485	Measured variable simulation	Deactivate simulation	C	Warning
486	Current input 1 to n simulation	Deactivate simulation	C	Warning
491	Current output 1 to n simulation	Deactivate simulation	C	Warning
492	Simulation frequency output 1 to n	Deactivate simulation frequency output	C	Warning
493	Simulation pulse output 1 to n	Deactivate simulation pulse output	C	Warning
494	Switch output simulation 1 to n	Deactivate simulation switch output	C	Warning
495	Diagnostic event simulation	Deactivate simulation	C	Warning
496	Status input simulation	Deactivate simulation status input	C	Warning


Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
502	CT activation/deactivation failed	Follow the sequence of the custody transfer activation/deactivation: First authorized user login, then set the DIP switch on the main electronic module	C	Warning
511	Sensor electronic (ISEM) faulty	1. Check measuring period and integration time 2. Check sensor properties	C	Alarm
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	F	Alarm
530	Electrode cleaning is running	Turn off ECC	C	Warning
531	Empty pipe detection	Execute EPD adjustment	S	Warning ¹⁾
537	Configuration	1. Check IP addresses in network 2. Change IP address	F	Warning
540	Custody transfer mode failed	1. Deactivate custody transfer mode 2. Reactivate custody transfer mode	F	Alarm
543	Double pulse output	1. Check process 2. Check pulse output settings	S	Warning ¹⁾
593	Double pulse output simulation	Deactivate simulation pulse output	C	Warning
594	Relay output simulation	Deactivate simulation switch output	C	Warning
599	Custody transfer logbook full	1. Deactivate custody transfer mode 2. Clear custody transfer logbook (all 30 entries) 3. Activate custody transfer mode	F	Warning
Diagnostic of process				
803	Current loop	1. Check wiring 2. Change I/O module	F	Alarm
832	Electronic temperature too high	Reduce ambient temperature	S	Warning ¹⁾
833	Electronic temperature too low	Increase ambient temperature	S	Warning ¹⁾
834	Process temperature too high	Reduce process temperature	S	Warning ¹⁾
835	Process temperature too low	Increase process temperature	S	Warning ¹⁾
842	Process limit	Low flow cut off active! 1. Check low flow cut off configuration	S	Warning
882	Input signal	1. Check input configuration 2. Check external device or process conditions	F	Alarm
937	EMC interference	1. Eliminate external magnetic field near sensor 2. Turn off diagnostic message	S	Warning ¹⁾





Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
938	EMC interference	1. Check ambient conditions regarding EMC influence 2. Turn off diagnostic message	F	Alarm ¹⁾
962	Empty pipe	1. Perform full pipe adjustment 2. Perform empty pipe adjustment 3. Turn off empty pipe detection	S	Warning ¹⁾



1) Diagnostic behavior can be changed.

12.8 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 →  152
- Via Web browser →  153
- Via "FieldCare" operating tool →  155
- Via "DeviceCare" operating tool →  155


 Other pending diagnostic events can be displayed in the **Diagnostic list** submenu →  161

Navigation

"Diagnostics" menu

Diagnostics	
Actual diagnostics	→  160
Previous diagnostics	→  160
Operating time from restart	→  161
Operating time	→  161

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Actual diagnostics	A diagnostic event has occurred.	Shows the current occurred 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.

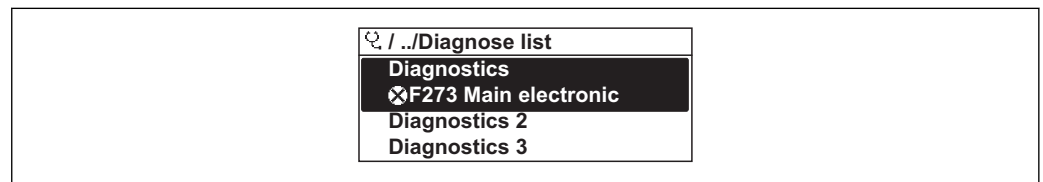
Parameter	Prerequisite	Description	User interface
Operating time from restart	–	Shows the time the device has been in operation since the last device restart.	Days (d), hours (h), minutes (m) and seconds (s)
Operating time	–	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)

12.9 Diagnostic 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



A0014006-EN

44 Taking the example of the local display

i To call up the measures to rectify a diagnostic event:

- Via local display → 152
- Via Web browser → 153
- Via "FieldCare" operating tool → 155
- Via "DeviceCare" operating tool → 155

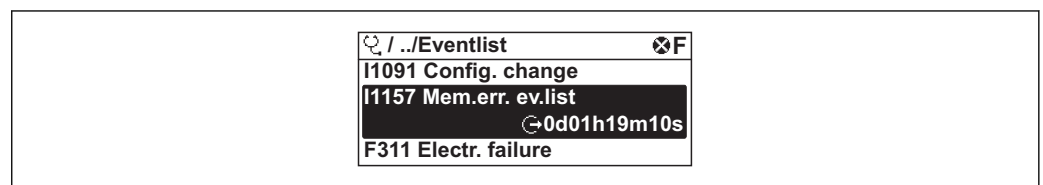
12.10 Event logbook

12.10.1 Event history

A chronological overview of the event messages that have occurred is provided in the **Events list** submenu.

Navigation path

Diagnostics menu → **Event logbook** submenu → Event list



A0014008-EN

45 Taking the example of the local display


- Max. 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 → 156
- Information events → 162

In addition to the operation time of its occurrence, each event is also assigned a symbol that indicates whether the event has occurred or is ended:

- Diagnostic 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 →  152
- Via Web browser →  153
- Via "FieldCare" operating tool →  155
- Via "DeviceCare" operating tool →  155

 For filtering the displayed event messages →  162

12.10.2 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)

12.10.3 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	Embedded HistoROM 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
I1264	Safety sequence aborted
I1278	I/O module reset detected
I1335	Firmware changed

Info number	Info name
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
I1450	Monitoring off
I1451	Monitoring on
I1457	Measured error verification failed
I1459	I/O module verification failed
I1461	Sensor verification failed
I1462	Sensor electronic module verific. failed
I1512	Download started
I1513	Download finished
I1514	Upload started
I1515	Upload finished
I1517	Custody transfer active
I1518	Custody transfer inactive
I1554	Safety sequence started
I1555	Safety sequence confirmed
I1556	Safety mode off
I1618	I/O module replaced
I1619	I/O module replaced
I1621	I/O module 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	Parameter factory reset
I1635	Parameter delivery reset
I1639	Max. switch cycles number reached
I1643	Custody transfer logbook cleared
I1649	Hardware write protection activated
I1650	Hardware write protection deactivated
I1651	Custody transfer parameter changed

Info number	Info name
I1712	New flash file received
I1725	Sensor electronic module (ISEM) changed
I1726	Configuration backup failed

12.11 Resetting the measuring device

Using the **Device reset** parameter (→  127) it is possible to reset the entire device configuration or some of the configuration to a defined state.

12.11.1 Function scope of the "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 this customer-specific value. All other parameters are reset to the factory setting.
Restart device	The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.
Restore S-DAT backup	Restore the data that are saved on the S-DAT. The data record is restored from the electronics memory to the S-DAT.

12.12 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	→  165
Serial number	→  165
Firmware version	→  165
Device name	→  165
Order code	→  165
Extended order code 1	→  165
Extended order code 2	→  165
Extended order code 3	→  165

ENP version	→ ⓘ 165
Device revision	→ ⓘ 165
Device ID	→ ⓘ 165
Device type	→ ⓘ 166
Manufacturer ID	→ ⓘ 166




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. @, %, /).	Promag300/500
Serial number	Shows the serial number of the measuring device.	A maximum of 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	Shows the name of the transmitter.  The name can be found on the nameplate of the transmitter.	Promag300/500	-
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	-
Extended order code 2	Shows the 2nd 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	-
Extended order code 3	Shows the 3rd 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	-
ENP version	Shows the version of the electronic nameplate (ENP).	Character string	2.02.00
Device revision	Shows the device revision with which the device is registered with the HART Communication Foundation.	2-digit hexadecimal number	1
Device ID	Shows the device ID for identifying the device in a HART network.	6-digit hexadecimal number	-

Parameter	Description	User interface	Factory setting
Device type	Shows the device type with which the measuring device is registered with the HART Communication Foundation.	2-digit hexadecimal number	0x3A (for Promag 500)
Manufacturer ID	Shows the manufacturer ID device is registered with the HART Communication Foundation.	2-digit hexadecimal number	0x11 (for Endress+Hauser)

12.13 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
08.2016	01.00.zz	Option 76	Original firmware	Operating Instructions	BA01399D/06/EN/01.16

-  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.
-  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
 - Text search: Manufacturer's information
 - Media type: Documentation – Technical Documentation

13 Maintenance

13.1 Maintenance tasks

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 seals.


13.1.2 Interior cleaning

No interior cleaning is planned for the device.

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) →  197

13.2 Measuring and test equipment

Endress+Hauser offers a wide variety of measuring and test equipment, such as W@M or device tests.

 Your Endress+Hauser Sales Center can provide detailed information on the services.

List of some of the measuring and testing equipment: →  170

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 Repairs

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 modification 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 every repair and each conversion and enter them into the *W@M* life cycle management database.

14.2 Spare parts


W@M 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.

-  Measuring device serial number:
 - Is located on the nameplate of the device.
 - Can be read out via the **Serial number** parameter (→  165) in the **Device information** submenu.

14.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

-  Your Endress+Hauser Sales Center can provide detailed information on the services.

14.4 Return

The measuring device must be returned if it is need of repair or a factory calibration, or if the wrong measuring device has been delivered or ordered. Legal specifications require Endress+Hauser, as an ISO-certified company, to follow certain procedures when handling products that are in contact with the medium.

To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at

<http://www.endress.com/support/return-material>

14.5 Disposal

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 fluids.

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 <ul style="list-style-type: none"> ▪ Proline 500 ▪ Proline 500 – digital 	Transmitter for replacement or storage. Use the order code to define the following specifications: <ul style="list-style-type: none"> ▪ Approvals ▪ Output ▪ Input ▪ Display / operation ▪ Housing ▪ Software <p> For details, see Installation Instructions EA01150</p> <p>For details</p> <ul style="list-style-type: none"> ▪ Proline 500 – digital transmitter: Installation Instructions EA01151 ▪ Proline 500 transmitter: Installation Instructions EA01152 <p> Proline 500 transmitter for replacement: the serial number of the current transmitter should always be quoted when ordering. On the basis of the serial number, the device-specific data of the replacement device can also be used for the new transmitter.</p>
WLAN antenna Wide range	External WLAN antenna for a range of up to 50 m (165 ft). <p> Further information on the WLAN interface →  82.</p>
Post mounting kit	Post mounting kit for transmitter. <p> The post mounting kit can only be ordered together with a transmitter.</p>
Protective cover Proline 500	Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight. <p> For details, see Installation Instructions EA01160</p>
Display guard Proline 500 – digital	Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight. <p> For details, see Installation Instructions EA01161</p>
Ground cable	Set, consisting of two ground cables for potential equalization.

Connecting cable Proline 500 – digital Sensor – Transmitter	The following cable lengths are available: order code for "Cable, sensor connection" <ul style="list-style-type: none"> ▪ Option B: 20 m (65 ft) ▪ Option E: User configurable up to max. 50 m ▪ Option F: User configurable up to max. 165 ft  Maximum possible cable length for a Proline 500 – digital connecting cable: 300 m (1000 ft)
Connecting cable Proline 500 Sensor – Transmitter	The following cable lengths are available: order code for "Cable, sensor connection" <ul style="list-style-type: none"> ▪ 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) Reinforced connecting cable with an additional, reinforcing metal braid: <ul style="list-style-type: none"> ▪ Option 6: User-configurable cable length (m) ▪ Option 7: User-configurable cable length (ft)  Possible cable length for a Proline 500 connecting cable: depends on the medium conductivity, max. 200 m (660 ft)



15.1.2 For the sensor

Accessories	Description
Ground disks	Are used to ground the fluid in lined measuring tubes to ensure proper measurement.  For details, see Installation Instructions EA00070D


15.2 Communication-specific accessories

Accessories	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface.  For details, see "Technical Information" TI00404F
HART Loop Converter HMX50	Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.  For details, see "Technical Information" TI00429F and Operating Instructions BA00371F
Fieldgate FXA320	Gateway for the remote monitoring of connected 4 to 20 mA measuring devices via a Web browser.  For details, see "Technical Information" TI00025S and Operating Instructions BA00053S
Fieldgate FXA520	Gateway for the remote diagnostics and remote configuration of connected HART measuring devices via a Web browser.  For details, see "Technical Information" TI00025S and Operating Instructions BA00051S
Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the non-Ex area .  For details, see Operating Instructions BA01202S
Field Xpert SFX370	Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the non-Ex area and the Ex area .  For details, see Operating Instructions BA01202S

15.3 Service-specific accessories

Accessories	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> 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. <p>Applicator is available:</p> <ul style="list-style-type: none"> Via the Internet: https://wapps.endress.com/applicator As a downloadable DVD for local PC installation.
W@M	<p>W@M Life Cycle Management</p> <p>Improved productivity with information at your fingertips. Data relevant to a plant and its components is generated from the first stages of planning and during the asset's complete life cycle.</p> <p>W@M Life Cycle Management is an open and flexible information platform with online and on-site tools. Instant access for your staff to current, in-depth data shortens your plant's engineering time, speeds up procurement processes and increases plant uptime.</p> <p>Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit www.endress.com/lifecyclemanagement</p>
FieldCare	<p>FDT-based plant asset management tool from Endress+Hauser.</p> <p>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.</p> <p> For details, see Operating Instructions BA00027S and BA00059S</p>
DeviceCare	<p>Tool for connecting and configuring Endress+Hauser field devices.</p> <p> For details, see Innovation brochure IN01047S</p>

15.4 System components

Accessories	Description
Memograph M graphic display recorder	<p>The Memograph M graphic display recorder provides information on all 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.</p> <p> For details, see "Technical Information" TI00133R and Operating Instructions BA00247R</p>

16 Technical data

16.1 Application

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 one or two connecting cable(s).

For information on the structure of the device →  14

16.3 Input

Measured variable **Direct measured variables**

- Volume flow (proportional to induced voltage)
- Electrical conductivity

Calculated measured variables

- Mass flow
- Corrected volume flow

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

Nominal diameter		Recommended flow min./max. full scale value ($v \sim 0.3/10$ m/s)	Factory settings		
[mm]	[in]		Full scale value current output ($v \sim 2.5$ m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off ($v \sim 0.04$ m/s)
		[dm ³ /min]	[dm ³ /min]	[dm ³]	[dm ³ /min]
15	½	4 to 100	25	0.2	0.5
25	1	9 to 300	75	0.5	1
32	–	15 to 500	125	1	2
40	1 ½	25 to 700	200	1.5	3
50	2	35 to 1100	300	2.5	5
65	–	60 to 2000	500	5	8
80	3	90 to 3000	750	5	12
100	4	145 to 4700	1200	10	20

Nominal diameter		Recommended flow min./max. full scale value (v ~ 0.3/10 m/s) [dm ³ /min]	Factory settings		
[mm]	[in]		Full scale value current output (v ~ 2.5 m/s) [dm ³ /min]	Pulse value (~ 2 pulse/s) [dm ³]	Low flow cut off (v ~ 0.04 m/s) [dm ³ /min]
125	–	220 to 7 500	1850	15	30
150	6	20 to 600 m ³ /h	150 m ³ /h	0.03 m ³	2.5 m ³ /h
200	8	35 to 1 100 m ³ /h	300 m ³ /h	0.05 m ³	5 m ³ /h
250	10	55 to 1 700 m ³ /h	500 m ³ /h	0.05 m ³	7.5 m ³ /h
300	12	80 to 2 400 m ³ /h	750 m ³ /h	0.1 m ³	10 m ³ /h
350	14	110 to 3 300 m ³ /h	1 000 m ³ /h	0.1 m ³	15 m ³ /h
400	16	140 to 4 200 m ³ /h	1 200 m ³ /h	0.15 m ³	20 m ³ /h
450	18	180 to 5 400 m ³ /h	1 500 m ³ /h	0.25 m ³	25 m ³ /h
500	20	220 to 6 600 m ³ /h	2 000 m ³ /h	0.25 m ³	30 m ³ /h
600	24	310 to 9 600 m ³ /h	2 500 m ³ /h	0.3 m ³	40 m ³ /h

Flow characteristic values in US units

Nominal diameter		Recommended flow min./max. full scale value (v ~ 0.3/10 m/s) [gal/min]	Factory settings		
[in]	[mm]		Full scale value current output (v ~ 2.5 m/s) [gal/min]	Pulse value (~ 2 pulse/s) [gal]	Low flow cut off (v ~ 0.04 m/s) [gal/min]
½	15	1.0 to 27	6	0.1	0.15
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
6	150	90 to 2 650	600	5	12
8	200	155 to 4 850	1 200	10	15
10	250	250 to 7 500	1 500	15	30
12	300	350 to 10 600	2 400	25	45
14	350	500 to 15 000	3 600	30	60
16	400	600 to 19 000	4 800	50	60
18	450	800 to 24 000	6 000	50	90
20	500	1 000 to 30 000	7 500	75	120
24	600	1 400 to 44 000	10 500	100	180

Recommended measuring range

"Flow limit" section → 187

Operable flow range


Over 1000 : 1

Input signal

External measured values

To increase the accuracy of certain measured variables or to calculate the corrected volume flow, the automation system can continuously write different measured values to the measuring device:

- Fluid temperature to increase the accuracy of the electrical conductivity (e.g. iTEMP)
- Reference density for calculating the corrected volume flow

 Various pressure transmitters and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section →  172

It is recommended to read in external measured values to calculate the following measured variables:

Corrected volume flow

HART protocol

The measured values are written from the automation system to the measuring device via the HART protocol. The pressure transmitter must support the following protocol-specific functions:

- HART protocol
- Burst mode

Current input

The measured values are written from the automation system to the measuring device via the current input →  175.

Current input 0/4 to 20 mA

Current input	0/4 to 20 mA (active/passive)
Current span	<ul style="list-style-type: none"> ■ 4 to 20 mA (active) ■ 0/4 to 20 mA (passive)
Resolution	1 μ A
Voltage drop	Typically: 0.6 to 2 V for 3.6 to 22 mA (passive)
Maximum input voltage	\leq 30 V (passive)
Open-circuit voltage	\leq 28.8 V (active)
Possible input variables	<ul style="list-style-type: none"> ■ Pressure ■ Temperature ■ Density

Status input

Maximum input values	<ul style="list-style-type: none"> ■ DC -3 to 30 V ■ If status input is active (ON): $R_i > 3 \text{ k}\Omega$
Response time	Adjustable: 5 to 200 ms
Input signal level	<ul style="list-style-type: none"> ■ Low signal: DC -3 to +5 V ■ High signal: DC 12 to 30 V
Assignable functions	<ul style="list-style-type: none"> ■ Off ■ Reset the individual totalizers separately ■ Reset all totalizers ■ Flow override

16.4 Output

Output signal

HART current output

Current output	4 to 20 mA HART
Current span	Can be set to: 4 to 20 mA (active/passive)
Open-circuit voltage	DC 28.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	250 to 700 Ω
Resolution	0.38 μA
Damping	Adjustable: 0.07 to 999 s
Assignable measured variables	<ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity ■ Corrected conductivity ■ Temperature ■ Electronic temperature

Current output 0/4 to 20 mA

Current output	0/4 to 20 mA
Maximum output values	22.5 mA
Current span	Can be set to: <ul style="list-style-type: none"> ■ 4 to 20 mA (active) ■ 0/4 to 20 mA (passive)
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	Adjustable: 0.07 to 999 s
Assignable measured variables	<ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity ■ Corrected conductivity ■ Temperature ■ Electronic temperature

Pulse/frequency/switch output

Function	Can be set to pulse, frequency or switch output
Version	Open collector Can be set to: <ul style="list-style-type: none"> ■ Active ■ 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	Adjustable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Adjustable
Assignable measured variables	<ul style="list-style-type: none"> ▪ 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	Adjustable: end value frequency 2 to 10 000 Hz ($f_{\max} = 12\,500$ Hz)
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Temperature ▪ Electronic 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	Adjustable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ Diagnostic behavior ▪ Limit value: <ul style="list-style-type: none"> - Off - Volume flow - Mass flow - Corrected volume flow - Flow velocity - Conductivity - Corrected conductivity - Totalizer 1-3 - Temperature - Electronic temperature ▪ Flow direction monitoring ▪ Status <ul style="list-style-type: none"> - Empty pipe detection - Low flow cut off

Double pulse output

Function	Double pulse
Version	Open collector Can be set to: <ul style="list-style-type: none"> ■ Active ■ 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
Output frequency	Adjustable: 0 to 1 000 Hz
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity ■ Corrected conductivity ■ Temperature ■ Electronic temperature

Relay output

Function	Switch output
Version	Relay output, galvanically isolated
Switching behavior	Can be set to: <ul style="list-style-type: none"> ■ NO (normally open), factory setting ■ NC (normally closed)
Maximum switching capacity (passive)	<ul style="list-style-type: none"> ■ DC 30 V, 0.1 A ■ AC 30 V, 0.5 A
Assignable functions	<ul style="list-style-type: none"> ■ Off ■ On ■ Diagnostic behavior ■ Limit value: <ul style="list-style-type: none"> - Off - Volume flow - Mass flow - Corrected volume flow - Flow velocity - Conductivity - Corrected conductivity - Totalizer 1-3 - Temperature - Electronic temperature ■ Flow direction monitoring ■ Status <ul style="list-style-type: none"> - Empty pipe detection - 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

The technical values correspond to those of the inputs and outputs described in this section.

Signal on alarm

Depending on the interface, failure information is displayed as follows:

Current output 0/4 to 20 mA

4 to 20 mA

Failure mode	Choose from: <ul style="list-style-type: none"> ■ 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 ■ Freely definable value between: 3.59 to 22.5 mA ■ Actual value ■ Last valid value
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0 to 20 mA

Failure mode	Choose from: <ul style="list-style-type: none"> ■ Maximum alarm: 22 mA ■ Freely definable value between: 0 to 20.5 mA
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Pulse/frequency/switch output

Pulse output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Actual value ■ No pulses
Frequency output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Actual value ■ 0 Hz ■ Defined value ($f_{max} \geq 2$ to 12 500 Hz)
Switch output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Current status ■ Open ■ Closed

Relay output

Failure mode	Choose from: <ul style="list-style-type: none"> ■ Current status ■ Open ■ Closed
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Local display

Plain text display	With information on cause and remedial measures
Backlight	Red backlighting indicates a device error.

 Status signal as per NAMUR recommendation NE 107

Interface/protocol


- Via digital communication:
HART protocol
- Via service interface

Plain text display	With information on cause and remedial measures
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Web server

Plain text display	With information on cause and remedial measures
---------------------------	---

Light emitting diodes (LED)

Status information	<p>Status indicated by various light emitting diodes</p> <p>The following information is displayed depending on the device version:</p> <ul style="list-style-type: none"> ■ Supply voltage active ■ Data transmission active ■ Device alarm/error has occurred <p> Diagnostic information via light emitting diodes</p>
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Low flow cut off The switch points for low flow cut off are user-selectable.

Galvanic isolation The outputs are galvanically isolated from one another and from earth (PE).

Protocol-specific data

Manufacturer ID	0x11
Device type ID	0x3C
HART protocol revision	7
Device description files (DTM, DD)	Information and files under: www.endress.com
HART load	Min. 250 Ω

<p>Dynamic variables</p>	<p>Read out the dynamic variables: HART command 3 The measured variables can be freely assigned to the dynamic variables.</p> <p>Measured variables for PV (primary dynamic variable)</p> <ul style="list-style-type: none"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Temperature ▪ Electronic temperature <p>Measured variables for SV, TV, QV (secondary, tertiary and quaternary dynamic variable)</p> <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Temperature ▪ Electronic temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3
<p>Device variables</p>	<p>Read out the device variables: HART command 9 The device variables are permanently assigned.</p> <p>A maximum of 8 device variables can be transmitted:</p> <ul style="list-style-type: none"> ▪ 0 = volume flow ▪ 1 = mass flow ▪ 2 = corrected volume flow ▪ 3 = flow velocity ▪ 4 = conductivity ▪ 5 = corrected conductivity ▪ 6 = temperature ▪ 7 = electronic temperature ▪ 8 = totalizer 1 ▪ 9 = totalizer 2 ▪ 10 = totalizer 3

16.5 Power supply

Terminal assignment →  40

Supply voltage

Order code for "Power supply"	terminal voltage		Frequency range
Option D	DC 24 V	±20%	-
Option E	AC100 to 240 V	-15...+10%	50/60 Hz, ±4 Hz
Option I	DC 24 V	±20%	-
	AC100 to 240 V	-15...+10%	50/60 Hz, ±4 Hz

Power consumption

Transmitter

Max. 10 W (active power)

Current consumption

Transmitter

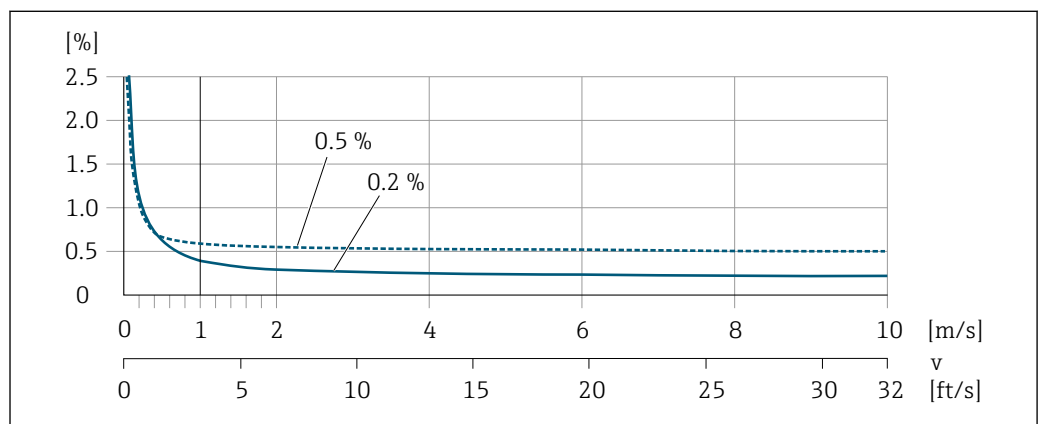
- Max. 400 mA (24 V)
- Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz)

Power supply failure	<ul style="list-style-type: none"> ■ Totalizers stop at the last value measured. ■ Configuration is retained in the plug-in memory (HistoROM DAT). ■ Error messages (incl. total operated hours) are stored.
Electrical connection	→ 43
Potential equalization	→ 53
Terminals	<p>Transmitter Spring terminals for conductor cross-section 0.2 to 2.5 mm² (24 to 12 AWG)</p>
Cable entries	<ul style="list-style-type: none"> ■ Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in) ■ Thread for cable entry: <ul style="list-style-type: none"> - NPT ½" - G ½" - M20
Cable specification	→ 37

16.6 Performance characteristics

Reference operating conditions	<ul style="list-style-type: none"> ■ Error limits following DIN EN 29104, in future ISO 20456 ■ Water, typically +15 to +45 °C (+59 to +113 °F); 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
--------------------------------	--

Maximum measured error	<p>Error limits under reference operating conditions o.r. = of reading</p> <p>Volume flow</p> <ul style="list-style-type: none"> ■ ±0.5 % o.r. ± 1 mm/s (0.04 in/s) ■ Optional: ±0.2 % o.r. ± 2 mm/s (0.08 in/s) <p> Fluctuations in the supply voltage do not have any effect within the specified range.</p>
------------------------	--



46 Maximum measured error in % o.r.

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Electrical conductivity

Max. measured error not specified.

Accuracy of outputs

The outputs have the following base accuracy specifications.

Current output

Accuracy	±5 µA
-----------------	-------

Pulse/frequency output

o.r. = of reading

Accuracy	Max. ±50 ppm o.r. (across the entire ambient temperature range)
-----------------	---

Repeatability

o.r. = of reading

Volume flow

Max. ±0.1 % o.r. ± 0.5 mm/s (0.02 in/s)

Electrical conductivity

Max. ±5 % o.r.

Influence of ambient temperature

Current output

o.r. = of reading

Temperature coefficient	Max. 1 µA/°C
--------------------------------	--------------

Pulse/frequency output


Temperature coefficient	No additional effect. Included in accuracy.
--------------------------------	---

16.7 Installation


"Mounting requirements" →  23


16.8 Environment

Ambient temperature range

→  25

Temperature tables

 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

-50 to +80 °C (-58 to +176 °F)

- 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.

Degree of protection

Transmitter

- As standard: IP66/67, type 4X enclosure
- When housing is open: IP20, type 1 enclosure
- Display module: IP20, type 1 enclosure

Sensor

As standard: IP66/67, type 4X enclosure

External WLAN antenna

IP67

Vibration resistance

- Vibration, sinusoidal according to IEC 60068-2-6
 - 2 to 8.4 Hz, 3.5 mm peak
 - 8.4 to 2 000 Hz, 1 g peak
- Vibration broad-band random, according to IEC 60068-2-64
 - 10 to 200 Hz, 0.003 g²/Hz
 - 200 to 2 000 Hz, 0.001 g²/Hz
 - Total: 1.54 g rms

Shock resistance

Shock, half-sine according to IEC 60068-2-27
6 ms 30 g

Impact resistance

Rough handling shocks according to IEC 60068-2-31

Mechanical load

- Protect the transmitter housing against mechanical effects, such as shock or impact.
- Never use the transmitter housing as a ladder or climbing aid.

Electromagnetic compatibility (EMC)

As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)

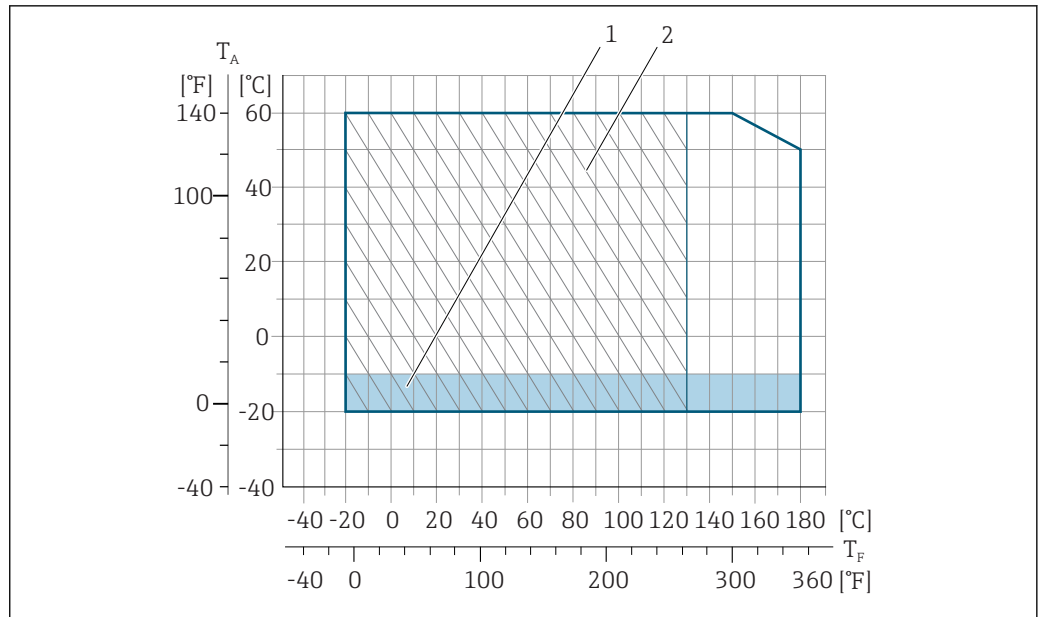


For details, refer to the Declaration of Conformity.

16.9 Process

Medium temperature range

- -20 to +150 °C (-4 to +302 °F) for PFA, DN 25 to 200 (1 to 8")
- -20 to +180 °C (-4 to +356 °F) for PFA high-temperature, DN 25 to 200 (1 to 8")
- -40 to +130 °C (-40 to +266 °F) for PTFE, DN 15 to 600 (½ to 24")



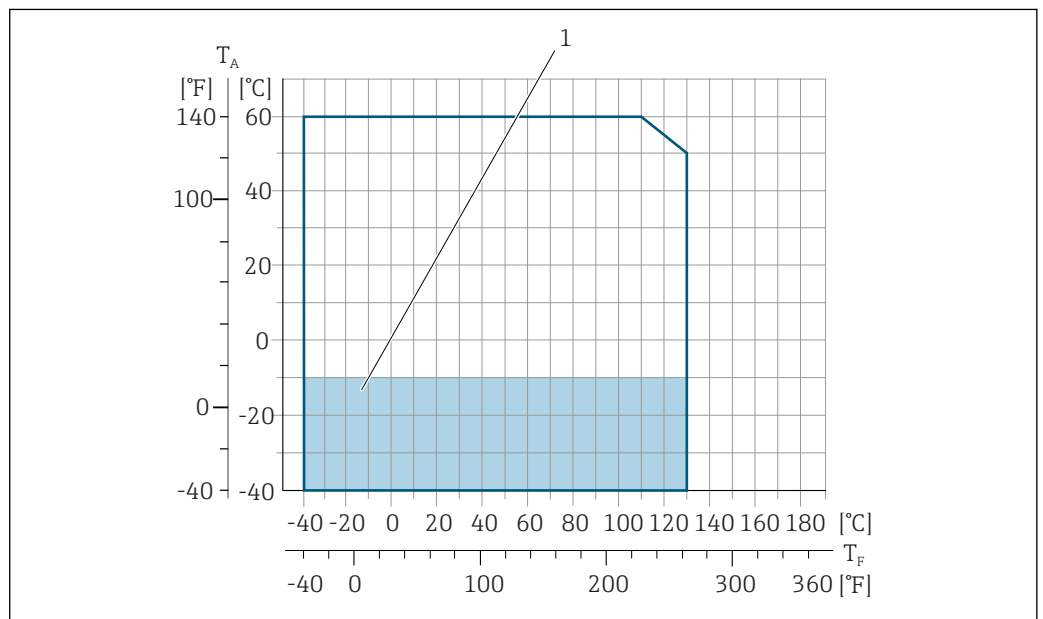
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47 PFA

T_A Ambient temperature range

T_F Fluid temperature

- 1 Colored area: the ambient temperature range -10 to -20 °C (+14 to -4 °F) applies to stainless flanges only
- 2 Hatched area: harsh environment IP69K only for fluid temperature range -20 to +130 °C (-4 to +266 °F)



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48 PTFE

T_A Ambient temperature range

T_F Fluid temperature

- 1 Colored area: the ambient temperature range of -10 to -40 °C (+14 to -40 °F) applies to stainless flanges only

Conductivity

≥ 5 μS/cm for liquids in general. Stronger filter damping is required for very low conductivity values.



Proline 500

The necessary minimum conductivity also depends on the cable length .

Pressure-temperature ratings



An overview of the pressure-temperature ratings for the process connections is provided in the "Technical Information" document

Pressure tightness







"-" = no specifications possible

Liner: PFA


Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures:		
[mm]	[in]	+25 °C (+77 °F)	+80 °C (+176 °F)	+100 to +180 °C (+212 to +356 °F)
25	1	0 (0)	0 (0)	0 (0)
32	-	0 (0)	0 (0)	0 (0)
40	1 ½	0 (0)	0 (0)	0 (0)
50	2	0 (0)	0 (0)	0 (0)
65	-	0 (0)	-	0 (0)
80	3	0 (0)	-	0 (0)
100	4	0 (0)	-	0 (0)
125	-	0 (0)	-	0 (0)
150	6	0 (0)	-	0 (0)
200	8	0 (0)	-	0 (0)

Liner: PTFE

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures:			
[mm]	[in]	+25 °C (+77 °F)	+80 °C (+176 °F)	+100 °C (+212 °F)	+130 °C (+266 °F)
15	½	0 (0)	0 (0)	0 (0)	100 (1.45)
25	1	0 (0)	0 (0)	0 (0)	100 (1.45)
32	-	0 (0)	0 (0)	0 (0)	100 (1.45)
40	1 ½	0 (0)	0 (0)	0 (0)	100 (1.45)
50	2	0 (0)	0 (0)	0 (0)	100 (1.45)
65	-	0 (0)	-	40 (0.58)	130 (1.89)
80	3	0 (0)	-	40 (0.58)	130 (1.89)
100	4	0 (0)	-	135 (1.96)	170 (2.47)
125	-	135 (1.96)	-	240 (3.48)	385 (5.58)
150	6	135 (1.96)	-	240 (3.48)	385 (5.58)
200	8	200 (2.90)	-	290 (4.21)	410 (5.95)
250	10	330 (4.79)	-	400 (5.80)	530 (7.69)
300	12	400 (5.80)	-	500 (7.25)	630 (9.14)
350	14	470 (6.82)	-	600 (8.70)	730 (10.6)
400	16	540 (7.83)	-	670 (9.72)	800 (11.6)
450	18	No negative pressure permitted!			
500	20				
600	24				

Flow limit	<p>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 fluid:</p> <ul style="list-style-type: none"> ■ v < 2 m/s (6.56 ft/s): for abrasive fluids (e.g. potter's clay, lime milk, ore slurry) ■ v > 2 m/s (6.56 ft/s): for fluids producing buildup (e.g. wastewater sludge) <p> A necessary increase in the flow velocity can be achieved by reducing the sensor nominal diameter.</p> <p> For an overview of the full scale values for the measuring range, see the "Measuring range" section →  173</p>
Pressure loss	<ul style="list-style-type: none"> ■ No pressure loss occurs 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	→  25
Vibrations	→  25

16.10 Mechanical construction

Design, dimensions	 For the dimensions and installation lengths of the device, see the "Technical Information" document, "Mechanical construction" section
Weight	<p>Excluding the transmitter</p> <ul style="list-style-type: none"> ■ Aluminum <ul style="list-style-type: none"> – 6.5 kg (14.3 lbs) – Digital: 2.4 kg (5.3 lbs) ■ Polycarbonate: 1.4 kg (3.1 lbs) ■ Cast, stainless: 15.6 kg (34.4 lbs) <p>Weight specifications apply to standard pressure ratings and without packaging material. Cast connection housing version, stainless: +3.7 kg (+8.2 lbs)</p>

Weight in SI units

Nominal diameter		EN (DIN), AS ¹⁾		ASME		JIS	
[mm]	[in]	Pressure rating	[kg]	Pressure rating	[kg]	Pressure rating	[kg]
15	½	PN 40	4.5	Class 150	4.5	10K	4.5
25	1	PN 40	5.3	Class 150	5.3	10K	5.3
32	–	PN 40	6	Class 150	–	10K	5.3
40	1 ½	PN 40	7.4	Class 150	7.4	10K	6.3
50	2	PN 40	8.6	Class 150	8.6	10K	7.3
65	–	PN 16	10	Class 150	–	10K	9.1
80	3	PN 16	12	Class 150	12	10K	10.5
100	4	PN 16	14	Class 150	14	10K	12.7
125	–	PN 16	19.5	Class 150	–	10K	19
150	6	PN 16	23.5	Class 150	23.5	10K	22.5

Nominal diameter		EN (DIN), AS ¹⁾		ASME		JIS	
[mm]	[in]	Pressure rating	[kg]	Pressure rating	[kg]	Pressure rating	[kg]
200	8	PN 10	43	Class 150	43	10K	39.9
250	10	PN 10	63	Class 150	73	10K	67.4
300	12	PN 10	68	Class 150	108	10K	70.3
350	14	PN 10	103	Class 150	173		
400	16	PN 10	118	Class 150	203		
450	18	PN 10	159	Class 150	253		
500	20	PN 10	154	Class 150	283		
600	24	PN 10	206	Class 150	403		

1) For flanges to AS, only DN 25 and 50 are available.

Weight in US units

Nominal diameter		ASME	
[mm]	[in]	Pressure rating	[lbs]
15	½	Class 150	9.92
25	1	Class 150	11.7
40	1 ½	Class 150	16.3
50	2	Class 150	19.0
80	3	Class 150	26.5
100	4	Class 150	30.9
150	6	Class 150	51.8
200	8	Class 150	94.8
250	10	Class 150	161.0
300	12	Class 150	238.1
350	14	Class 150	381.5
400	16	Class 150	447.6
450	18	Class 150	557.9
500	20	Class 150	624.0
600	24	Class 150	888.6

Measuring tube specification

Nominal diameter		Pressure rating					Process connection internal diameter			
		EN (DIN)	ASME	AS 2129	AS 4087	JIS	PFA		PTFE	
[mm]	[in]	[bar]	[psi]	[bar]	[bar]	[bar]	[mm]	[in]	[mm]	[in]
15	½	PN 40	Class 150	-	-	20K	-	-	15	0.59
25	1	PN 40	Class 150	Table E	-	20K	23	0.91	26	1.02
32	-	PN 40	-	-	-	20K	32	1.26	35	1.38
40	1 ½	PN 40	Class 150	-	-	20K	36	1.42	41	1.61
50	2	PN 40	Class 150	Table E	PN 16	10K	48	1.89	52	2.05
65	-	PN 16	-	-	-	10K	63	2.48	67	2.64
80	3	PN 16	Class 150	-	-	10K	75	2.95	80	3.15

Nominal diameter		Pressure rating					Process connection internal diameter			
		EN (DIN)	ASME	AS 2129	AS 4087	JIS	PFA		PTFE	
[mm]	[in]	[bar]	[psi]	[bar]	[bar]	[bar]	[mm]	[in]	[mm]	[in]
100	4	PN 16	Class 150	-	-	10K	101	3.98	104	4.09
125	-	PN 16	-	-	-	10K	126	4.96	129	5.08
150	6	PN 16	Class 150	-	-	10K	154	6.06	156	6.14
200	8	PN 10	Class 150	-	-	10K	201	7.91	202	7.95

Materials

Transmitter housing

Proline 500 – digital transmitter housing

Order code for "Transmitter housing":

- Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
- Option **D** "Polycarbonate": polycarbonate

Proline 500 transmitter housing

Order code for "Transmitter housing":

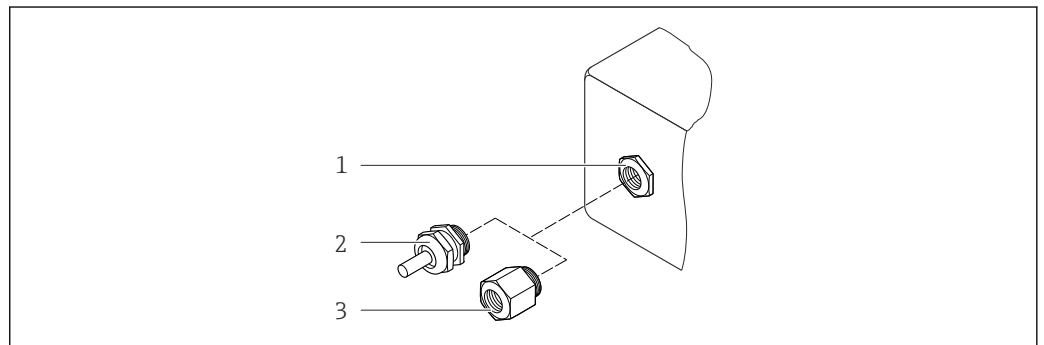
- Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
- Option **L** "Cast, stainless": cast, stainless steel, 1.4409 (CF3M) similar to 316L

Window material

Order code for "Transmitter housing":

- Option **A** "Aluminum, coated": glass
- Option **D** "Polycarbonate": plastic
- Option **L** "Cast, stainless": glass



Cable entries/cable glands



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49 Possible cable entries/cable glands

- 1 Cable entry with M20 × 1.5 internal thread
- 2 Cable gland M20 × 1.5
- 3 Adapter for cable entry with internal thread G ½" or NPT ½"

Cable entries and adapters	Material
Cable gland M20 × 1.5	Plastic
<ul style="list-style-type: none"> ■ Adapter for cable entry with internal thread G ½" ■ Adapter for cable entry with internal thread NPT ½" <p> Only available for certain device versions:</p> <ul style="list-style-type: none"> ■ Order code for "Transmitter housing": <ul style="list-style-type: none"> – Option A "Aluminum, coated" – Option D "Polycarbonate" ■ Order code for "Sensor connection housing": <ul style="list-style-type: none"> Option A "Aluminum coated" 	Nickel-plated brass
<ul style="list-style-type: none"> ■ Adapter for cable entry with internal thread G ½" ■ Adapter for cable entry with internal thread NPT ½" <p> Only available for certain device versions:</p> <ul style="list-style-type: none"> ■ Order code for "Transmitter housing": <ul style="list-style-type: none"> Option L "Cast, stainless" ■ Order code for "Sensor connection housing": <ul style="list-style-type: none"> Option L "Cast, stainless" 	Stainless steel, 1.4404 (316L)

Connecting cable

Connecting cable for sensor - Proline 500 – digital transmitter

PVC cable with copper shield

Connecting cable for sensor - Proline 500 transmitter

- Standard cable: PVC cable with copper shield
- Reinforced cable: PVC cable with copper shield and additional steel wire braided jacket

Sensor connection housing

Order code for "Sensor connection housing":

- Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
- Option **L** "Cast, stainless": 1.4409 (CF3M) similar to 316L

Sensor housing

- DN 15 to 300 (½ to 12"): coated aluminum AlSi10Mg
- DN 350 to 600 (14 to 24"): carbon steel with protective varnish

Measuring tubes

Stainless steel, 1.4301/304/1.4306/304L; for flanges made of carbon with Al/Zn protective coating (DN 15 to 300 (½ to 12")) or protective varnish (DN 350 to 600 (14 to 24"))

Liner

- PFA
- PTFE

Process connections

EN 1092-1 (DIN 2501)

Stainless steel, 1.4571 (F316L); carbon steel, FE410WB³⁾/S235JRG2; Alloy C22, 2.4602 (UNS N06022)

ASME B16.5

Stainless steel, F316L; carbon steel, A105³⁾

3) DN 15 to 300 (½ to 12") with Al/Zn protective coating; DN 350 to 600 (14 to 24") with protective varnish

JIS B2220
 Stainless steel, 1.0425 (F316L)³⁾; carbon steel, S235JRG2/HII
 AS 2129 Table E
 ■ DN 25 (1"): carbon steel, A105/S235JRG2
 ■ DN 40 (1 ½"): carbon steel, A105/S275JR
 AS 4087 PN 16
 Carbon steel, A105/S275JR

Electrodes

Stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); platinum; tantalum; titanium

Seals

In accordance with DIN EN 1514-1

Accessories

Protective cover



Stainless steel, 1.4404 (316L)

External WLAN antenna

- WLAN antenna:
ASA plastic (acrylic ester-styrene-acrylonitrile) and nickel-plated brass
- Adapter:
Stainless steel and copper

Ground disks

Stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum; titanium

Fitted electrodes	<p>Measuring electrodes, reference electrodes and electrodes for empty pipe detection:</p> <ul style="list-style-type: none"> ■ Standard: stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum, titanium ■ Optional: only platinum measuring electrodes
Process connections	<ul style="list-style-type: none"> ■ ASME B16.5 ■ JIS B2220 ■ AS 2129 Table E ■ AS 4087 PN 16 <p> For information on the different materials used in the process connections →  190</p>
Surface roughness	<p>Stainless steel electrodes, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); platinum; tantalum; titanium: ≤ 0.3 to $0.5 \mu\text{m}$ (11.8 to $19.7 \mu\text{in}$) (All data relate to parts in contact with fluid)</p> <p>Liner with PFA: $\leq 0.4 \mu\text{m}$ ($15.7 \mu\text{in}$) (All data relate to parts in contact with fluid)</p>

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, Arabic, Bahasa (Indonesian), Thai, Vietnamese, Czech, Swedish
- Via Web browser
English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Arabic, Bahasa (Indonesian), Thai, Vietnamese, Czech, Swedish
- Via "FieldCare", "DeviceCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese

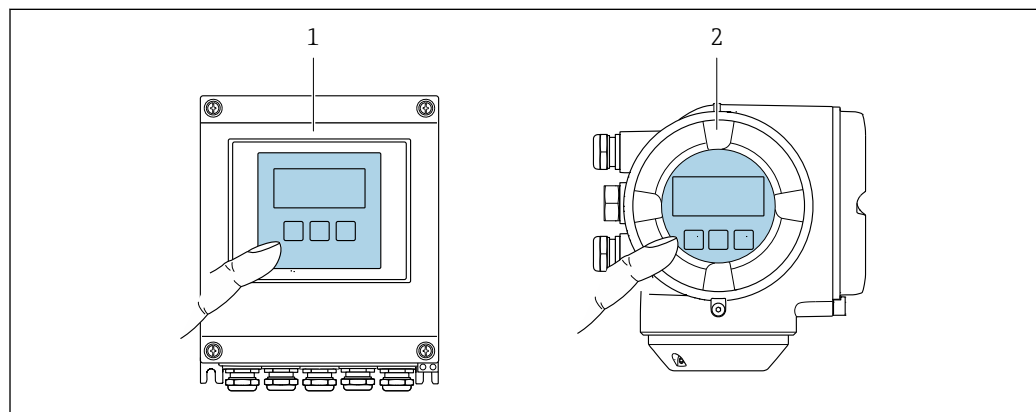
Local operation


Via display module

Two display modules are available:

- Order code for "Display; operation", option **F** "4-line, backlit, graphic display; touch control"
- Order code for "Display; operation", option **G** "4-line, backlit, graphic display; touch control + WLAN"

 Information about WLAN interface →  82






 50 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
- Permitted ambient temperature for the display: -20 to +60 °C (-4 to +140 °F)
The readability of the display may be impaired at temperatures outside the temperature range.




Operating elements

- External operation via touch control (3 optical keys) without opening the housing: , , 
- Operating elements also accessible in various hazardous areas

Remote operation →  81

Service interface →  82

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	<ul style="list-style-type: none"> ■ CDI-RJ45 service interface ■ WLAN interface 	Special Documentation for the device →  198
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	<ul style="list-style-type: none"> ■ CDI-RJ45 service interface ■ WLAN interface ■ Fieldbus protocol 	→  172
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	<ul style="list-style-type: none"> ■ CDI-RJ45 service interface ■ WLAN interface ■ Fieldbus protocol 	→  172
Device Xpert	Field Xpert SFX 100/350/370	HART and FOUNDATION Fieldbus fieldbus protocol	Operating Instructions BA01202S Device description files: Use update function of handheld terminal

 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:

- Process Device Manager (PDM) by Siemens → www.siemens.com
- Asset Management Solutions (AMS) by Emerson → www.emersonprocess.com
- FieldCommunicator 375/475 by Emerson → www.emersonprocess.com
- Field Device Manager (FDM) by Honeywell → www.honeywellprocess.com
- FieldMate by Yokogawa → www.yokogawa.com
- PACTWare → www.pactware.com

The associated device description files are available at: www.endress.com → Downloads

Web server

Thanks to the integrated Web server, the device can be operated and configured via a Web browser and via a service interface (CDI-RJ45) or a 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 also displayed and allows the user to monitor the status of the device. Furthermore the measuring device data can be managed and the network parameters can be configured. The WLAN connection requires a device that acts as an access point to enable communication via a computer or mobile handheld terminal.

Supported functions


Data exchange between the operating unit (such as a notebook for example) and the measuring device:

- Uploading 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, create documentation of the measuring point configuration)
- Export the Heartbeat verification log (PDF file, only available with the "Heartbeat Verification" application package)
- Flash firmware version for device firmware upgrade, for instance

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:

	Device memory	T-DAT	S-DAT
Available data	<ul style="list-style-type: none"> ▪ Event history, such as diagnostic events ▪ Parameter data record backup ▪ Device firmware package ▪ Driver for system integration e.g.: DD for HART 	<ul style="list-style-type: none"> ▪ Measured value memory ("Extended HistoROM" order option) ▪ Current parameter data record (used by firmware at run time) ▪ Maximum indicators (min/max values) ▪ Totalizer values 	<ul style="list-style-type: none"> ▪ Sensor data: diameter etc. ▪ Serial number ▪ User-specific access code (to use the "Maintenance" user role) ▪ Calibration data ▪ Device configuration (e.g. SW options, fixed I/O or multi I/O)
Storage location	Fixed on the user interface board in the connection compartment	Can be plugged into the user interface 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

Manual

Additional parameter data record (complete parameter settings) in the integrated device memory for:

- Data backup function
Backup and subsequent restoration of a device configuration in the device memory
- Data comparison function
Comparison of the current device configuration with the device configuration saved in the device memory

Data transfer

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)

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:

- Record up to 1 000 measured values via 1 to 4 channels
- User configurable recording interval
- Record up to 250 measured values via each of the 4 memory channels
- Export the measured value log via a variety of interfaces and operating tools e.g. FieldCare, DeviceCare or Web server
- Use the recorded measured value data in the integrated device simulation function in the **Diagnostics** submenu (→  160).

Service logbook**Manual**

- Create up to 20 user-specific events with a date and customized text in a separate logbook for documentation of the measuring point
- Use for calibration or service operations, for example, or for maintenance or revision work that has been performed

16.12 Certificates and approvals

CE mark	<p>The measuring system is in conformity with the statutory requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.</p> <p>Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.</p>
C-Tick symbol	<p>The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".</p>
Ex approval	<p>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.</p>
Functional safety	<p>The measuring device can be used for flow monitoring systems (min., max., range) up to SIL 2 (single-channel architecture; order code for "Additional approval", option LA) and SIL 3 (multichannel architecture with homogeneous redundancy) and is independently evaluated and certified by the TÜV in accordance with IEC 61508.</p> <p>The following types of monitoring in safety equipment are possible: Volume flow</p> <p> Functional Safety Manual with information on the SIL device →  198</p>

HART certification

HART interface

The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:

- Certified according to HART 7
- The device can also be operated with certified devices of other manufacturers (interoperability)

Radio approval

Europe:

RED 2014/53/EU

United States of America:

CFR Title 47, FCC Part 15.247

Canada:

RSS-247 Issue 1

Japan:

Article 2 clause 1 item 19



Additional country-specific approvals on request.

Other 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
- IEC/EN 61326
Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).
- 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

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.

Diagnostics functions

Package	Description
Extended HistoROM	<p>Comprises extended functions concerning the event log and the activation of the measured value memory.</p> <p>Event log: Memory volume is extended from 20 message entries (standard version) to up to 100 entries.</p> <p>Data logging (line recorder):</p> <ul style="list-style-type: none"> ▪ 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.



Heartbeat Technology

Package	Description
Heartbeat Verification +Monitoring	<p>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:</p> <ul style="list-style-type: none"> ▪ Draw conclusions - using these data and other information - about the impact process influences (such as corrosion, abrasion, buildup etc.) have on the measuring performance over time. ▪ Schedule servicing in time. ▪ Monitor the process or product quality, e.g. gas pockets. <p>Heartbeat Verification Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".</p> <ul style="list-style-type: none"> ▪ 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.


Cleaning

Package	Description
Electrode cleaning circuit (ECC)	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 highly conductive matter and thin layers (typical of magnetite).

16.14 Accessories

 Overview of accessories available for order →  170

16.15 Supplementary documentation

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

- The *W@M 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 2-D matrix code (QR code) on the nameplate.

Standard documentation

Brief Operating Instructions

Part 1 of 2: Sensor

Measuring device	Documentation code
Proline Promag	KA01216D

Part 2 of 2: Transmitter

Measuring device	Documentation code
Proline 500	KA01230D

Technical Information

Measuring device	Documentation code
Promag P 500	TI01226D

Description of device parameters

Measuring device	Documentation code
Promag 500	GP01054D

Supplementary device-dependent documentation



Safety Instructions

Contents	Documentation code
ATEX/IECEX Ex i	XA01522D
ATEX/IECEX Ex ec	XA01523D
cCSAus IS	XA01524D
cCSAus Ex e ia / Ex d ia	XA01525D
cCSAus Ex nA	XA01526D
INMETRO Ex i	XA01527D
INMETRO Ex ec	XA01528D
NEPSI Ex i	XA01529D
NEPSI Ex nA	XA01530D

Special documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Functional Safety Manual	SD01741D
Heartbeat Technology	SD01641D
Web server	SD01658D

Installation Instructions

Contents	Documentation code
Installation Instructions for spare part sets	 Overview of accessories available for order →  170

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