Operating Instructions
Proline Promag W 500

Electromagnetic flowmeter
PROFINET with Ethernet-APL

ethernet-apl ™
advanced physical layer

Endress+Hauser [EH]

People for Process Automation

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

Table of contents

1   About this document

1.1   Document function

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

1.2   Symbols

1.2.1   Safety symbols

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

1.2.2   Electrical symbols

Symbol	Meaning
⎓	Direct current
∼	Alternating current
⩯	Direct current and alternating current
⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⏛	**Potential equalization connection (PE: protective earth)** Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: • Interior ground terminal: potential equalization is connected to the supply network. • Exterior ground terminal: device is connected to the plant grounding system.

1.2.3   Communication-specific symbols

Symbol	Meaning
📶	**Wireless Local Area Network (WLAN)** Communication via a wireless, local network.
▣	**LED** Light emitting diode is off.

Symbol	Meaning
☀	**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
1. , 2. , 3. ...	Series of steps
↳	Result of a step
⁇	Help in the event of a problem
👁	Visual inspection

1.2.6   Symbols in graphics

Symbol	Meaning
1, 2, 3, ...	Item numbers
1. , 2. , 3. , ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
⚠EX	Hazardous area

Symbol	Meaning
⋈	Safe area (non-hazardous area)
≈→	Flow direction

1.3   Documentation

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

1.3.1   Document function

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

Document type	Purpose and content of the document
Technical Information (TI)	**Planning aid for your device** The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Brief Operating Instructions (KA)	**Guide that takes you quickly to the 1st measured value** The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.
Operating Instructions (BA)	**Your reference document** The Operating Instructions contain all the information that is required in the various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.
Description of Device Parameters (GP)	**Reference for your parameters** The document provides a detailed explanation of each individual parameter. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.
Safety Instructions (XA)	Depending on the approval, safety instructions for electrical equipment in hazardous areas are also supplied with the device. The Safety Instructions are an integral part of the Operating Instructions. Information on the Safety Instructions (XA) relevant to the device is provided on the nameplate.
Supplementary device-dependent documentation (SD/FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is an integral part of the device documentation.

1.4   Registered trademarks

Ethernet-APL™
Registered trademark of the PROFIBUS Nutzerorganisation e.V. (PROFIBUS User Organization), Karlsruhe, Germany

2 Safety instructions

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

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

The operating personnel must fulfill the following requirements:

▶ Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
▶ Follow the instructions in this manual.

2.2 Intended use

Application and media

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

Depending on the version ordered, the measuring 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:

▶ Keep within the specified pressure and temperature range.
▶ Only use the measuring device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
▶ Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area (e.g. explosion protection, pressure vessel safety).
▶ Use the measuring device only for media to which the process-wetted materials are sufficiently resistant.
▶ If the ambient temperature of the measuring device is outside the atmospheric temperature, it is absolutely essential to comply with the relevant basic conditions as specified in the device documentation → 🕮 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-intended use.

⚠ WARNING

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

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

Residual risks

> **⚠ CAUTION**
>
> **The electronics and the medium may cause the surfaces to heat up or freeze. Risk of burns or frostbite!**
> ▶ Mount suitable touch protection.

2.3   Workplace safety

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

2.4   Operational safety

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

Modifications to the device

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

Repair

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

2.5   Product safety

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

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

2.6   IT security

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

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

2.7   Device-specific IT security

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

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

2.7.1   Protecting access via hardware write protection

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

Hardware write protection is disabled when the device is delivered → 🖺 161.

2.7.2   Protecting access via a password

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

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

User-specific access code

Write access to the device parameters via the local display, web browser or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code (→ 🖺 160).

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

WLAN passphrase: Operation as WLAN access point

A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface (→ 🖱 102), which can be ordered as an optional extra, is protected by the network key. The WLAN authentication of the network key complies with the IEEE 802.11 standard.

When the device is delivered, the network key is pre-defined depending on the device. It can be changed via the **WLAN settings** submenu in the **WLAN passphrase** parameter (→ 🖱 152).

Infrastructure mode

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

General notes on the use of passwords

• The access code and network key supplied with the device should be changed during commissioning.
• 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.
• For information on configuring the access code or on what to do if you lose the password, for example, see the "Write protection via access code" section → 🖱 160

2.7.3   Access via Web server

The device can be operated and configured via a Web browser with the integrated Web server. The connection is via the service interface (CDI-RJ45), signal transmission connection for PROFINET with Ethernet-APL (IO1) 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.

📖 For detailed information on device parameters, see:
"Description of Device Parameters" document → 🖱 255.

2.7.4   Access via service interface (CDI-RJ45)

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

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

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

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

3 Product description

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

3.1 Product design

Two versions of the transmitter are available.

3.1.1 Proline 500 – digital
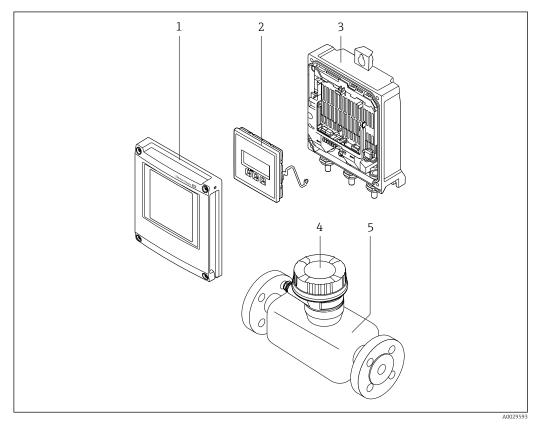
Signal transmission: digital
Order code for "Integrated ISEM electronics", option **A** "Sensor"

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

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

- A standard cable can be used as the connecting cable.
- Not sensitive to external EMC interference.

A0029593

 1   Important components of a measuring device

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

3.1.2 Proline 500
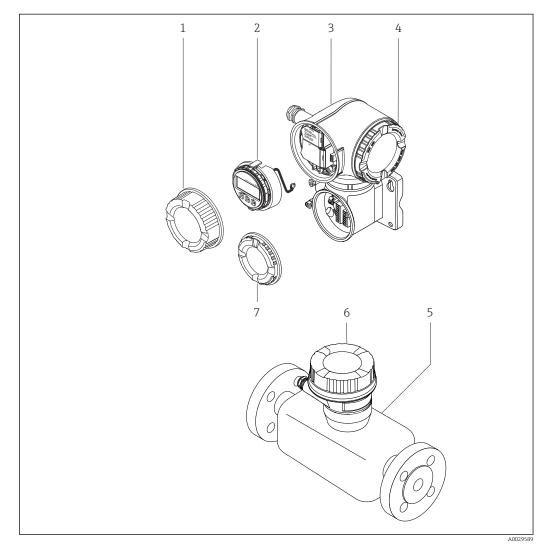
Signal transmission: analog
Order code for "Integrated ISEM electronics", option **B** "Transmitter"

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

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

A0029589
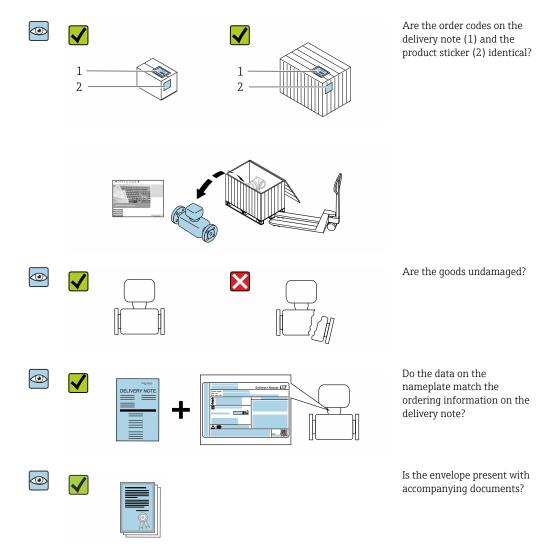
🖼 *2   Important components of a measuring device*

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

4 Incoming acceptance and product identification

4.1 Incoming acceptance

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

Are the goods undamaged?

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

Is the envelope present with accompanying documents?

- If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.
- The Technical Documentation is available via the Internet or via the *Endress+Hauser Operations App*, see the "Product identification" section → 🔖 16.

4.2 Product identification

The following options are available for identification of the device:
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter the serial numbers from the nameplates in the *Device Viewer* (www.endress.com/deviceviewer): all the information about the device is displayed.
- Enter the serial numbers from the nameplates into the *Endress+Hauser Operations App* or scan the DataMatrix code on the nameplate with the *Endress+Hauser Operations App*: all the information about the device is displayed.
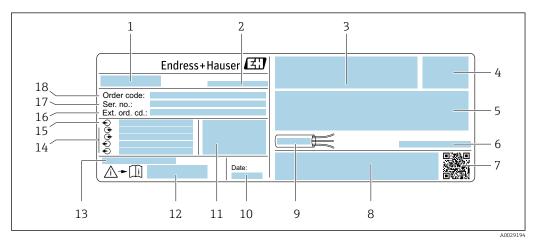
For an overview of the scope of the associated Technical Documentation, refer to the following:

- The chapters "Additional standard documentation on the device" and "Supplementary device-dependent documentation"
- The *Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the DataMatrix code on the nameplate.

4.2.1 Transmitter nameplate
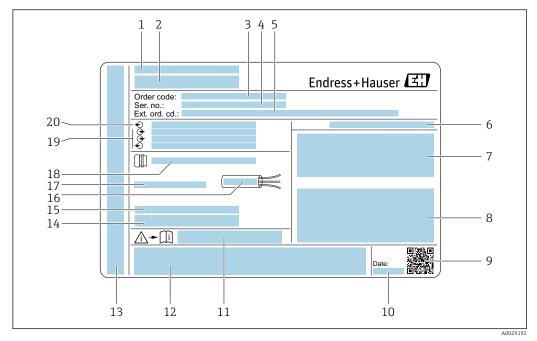
Proline 500 – digital

🖼 *3   Example of a transmitter nameplate*

1   Name of the transmitter
2   Place of manufacture
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, RCM tick
9   Permitted temperature range for cable
10   Date of manufacture: year-month
11   Firmware version (FW) and device revision (Dev.Rev.) from the factory
12   Document number of safety-related supplementary documentation
13   Space for additional information in the case of special products
14   Available inputs and outputs, supply voltage
15   Electrical connection data: supply voltage
16   Extended order code (Ext. ord. cd.)
17   Serial number (Ser. no.)
18   Order code

Proline 500

A0029192
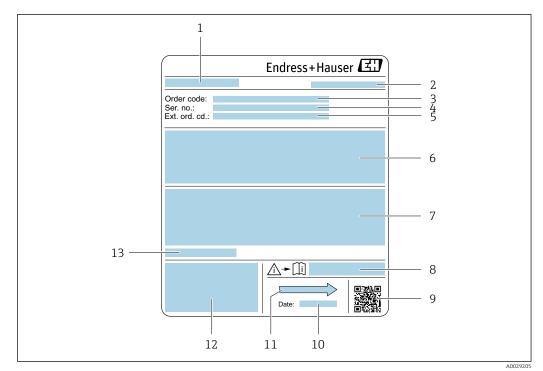
🖼 *4   Example of a transmitter nameplate*

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

⊞ 5   *Example of sensor nameplate*

1   Name of the sensor
2   Place of manufacture
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; medium 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
9   2-D matrix code
10   Date of manufacture: year-month
11   Flow direction
12   CE mark, RCM-Tick mark
13   Permitted ambient temperature (T_a)

Order code

The measuring device is reordered using the order code.

Extended order code

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

4.2.3   Symbols on 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. To determine the nature of the potential hazard and the measures required to avoid it, consult the documentation accompanying the measuring device.
📖	**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
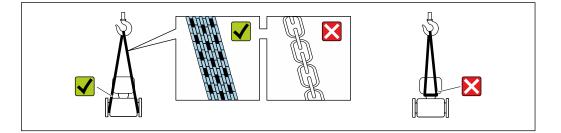
Observe the following notes for storage:

▶ 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 pipe.
▶ 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 liner.
▶ Store in a dry and dust-free place.
▶ Do not store outdoors.

Storage temperature → 🖹 234

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.
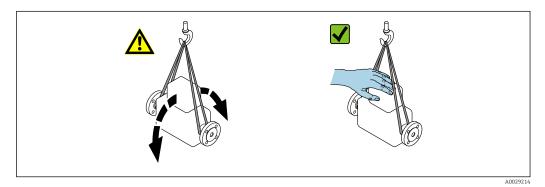
5.2.1   Measuring devices without lifting lugs

⚠ 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.
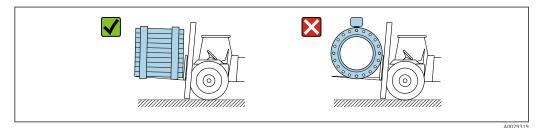
5.2.3 Transporting with a fork lift

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.

5.3 Packaging disposal

All packaging materials are environmentally friendly and 100 % recyclable:
• Outer packaging of device
  Polymer stretch wrap, complying with EU Directive 2002/95/EC (RoHS)
• Packaging
  • Wooden crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
  • Cardboard box in accordance with European packaging guideline 94/62EC, recyclability confirmed by Resy symbol
• Carrying and securing materials
  • Disposable plastic pallet
  • Plastic straps
  • Plastic adhesive strips
• Filler material
  Paper pads
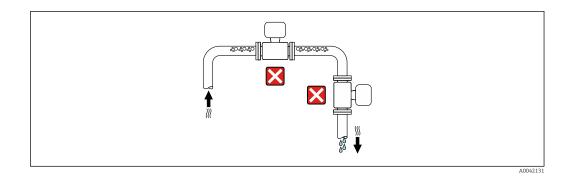
6 Mounting

6.1 Mounting requirements
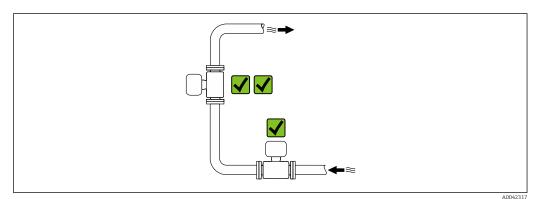
6.1.1 Mounting position

Mounting location

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

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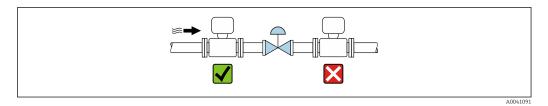
The device should ideally be installed in an ascending pipe.

A0042317

Installation near valves

Install the device in the direction of flow upstream from the valve.

A0041091
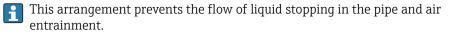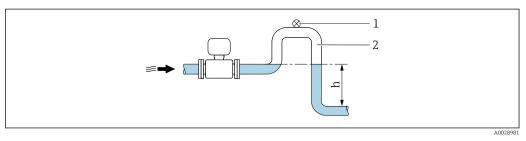
Installation upstream from a down pipe

NOTICE

Negative pressure in the measuring pipe can damage the liner!

▸ If installing upstream of down pipes whose length h ≥ 5 m (16.4 ft): install a siphon with a vent valve downstream of the device.

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

A0028981
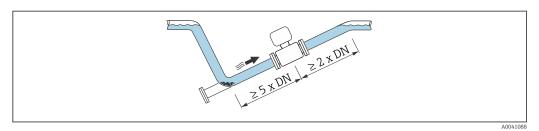
1   Vent valve
2   Pipe siphon
h   Length of down pipe

Installation with partially filled pipes

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

A0041088
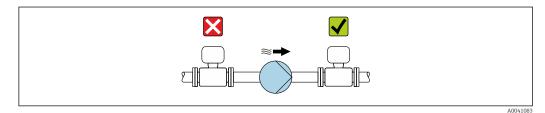
No inlet and outlet runs for devices with the order code for "Design": Option C, H or I.

Installation near pumps

NOTICE

Negative pressure in the measuring pipe can damage the liner!

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

A0041083

- Information on the liner's resistance to partial vacuum → 🖺 237
- Information on the measuring system's resistance to vibration and shock → 🖺 235

Installation of very heavy devices
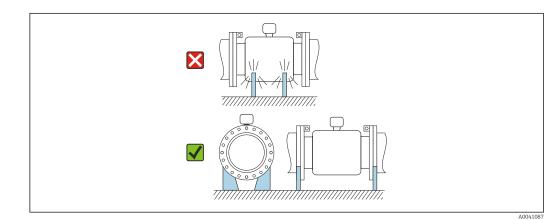
Support required for nominal diameters of DN ≥ 350 mm (14 in).

NOTICE

Damage to the device!

If incorrect support is provided, the sensor housing could buckle and the internal magnetic coils could be damaged.

▶ Only provide supports at the pipe flanges.

A0041087
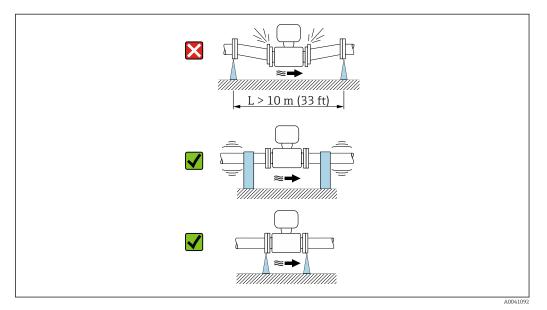
Installation in event of pipe vibrations

A remote version is recommended in the event of strong pipe vibrations.

> **NOTICE**
>
> **Pipe vibrations can damage the device!**
> ▶ Do not expose the device to strong vibrations.
> ▶ Support the pipe and fix it in place.
> ▶ Support the device and fix it in place.
> ▶ Mount the sensor and transmitter separately.

A0041092

ℹ️ Information on the measuring system's resistance to vibration and shock → 🖹 235

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).
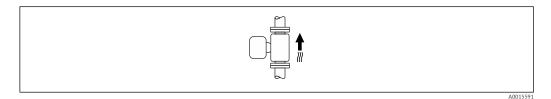
Orientation		Recommendation
Vertical orientation	 A0015591	✅✅
Horizontal orientation, transmitter at top	 A0015589	✅✅ [1]

Orientation		Recommendation
Horizontal orientation, transmitter at bottom	A0015590	✅✅ 2) 3) ❌ 4)
Horizontal orientation, transmitter at side	A0015592	❌

1) Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
3) To prevent the electronics from overheating in the event of strong heat formation (e.g. CIP or SIP cleaning process), install the device with the transmitter part pointing downwards.
4) When the empty pipe detection function is switched on, empty pipe detection only works if the transmitter housing is pointing upwards.
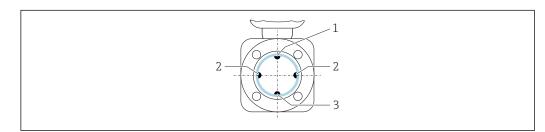
Vertical

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

Horizontal

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

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

Inlet and outlet runs
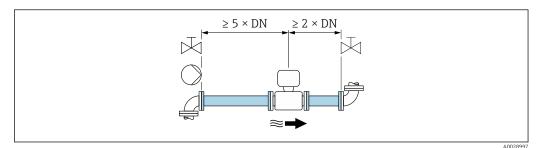
Installation with inlet and outlet runs
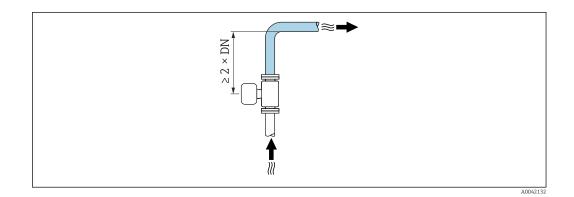
Installation requires inlet and outlet runs: devices with the order code for "Design", option D, E, F and G.

Installation with elbows, pumps or valves

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

Maintain straight, unimpeded inlet and outlet runs.

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Installation without inlet and outlet runs

Depending on the device design and installation location, the inlet and outlet runs can be reduced or omitted entirely.

Maximum measured error
When the device is installed with the inlet and outlet runs described, a maximum measured error of ±0.5 % of the reading ±1 mm/s (0.04 in/s) can be guaranteed.

Devices and possible order options
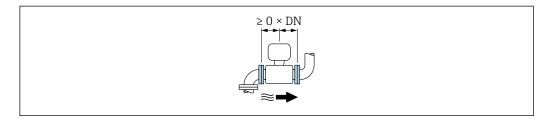
Order code for "Design"			
Option	Description		Design
C	Fixed flange, constricted measuring tube, 0 x DN inlet/outlet runs		Constricted measuring tube [1]
H	Lap joint flange, 0 x DN inlet/outlet runs		Full Bore [2]
I	Fixed flange, 0 x DN inlet/outlet runs		
J	Fixed flange, short installed length, 0 x DN inlet/outlet runs		
K	Fixed flange, long installed length, 0 x DN inlet/outlet runs		

1)   "Constricted measuring tube" stands for a reduction of the internal diameter of the measuring tube. The reduced internal diameter causes a higher flow velocity inside the measuring tube.
2)   "Full Bore" stands for the full diameter of the measuring tube. There is no pressure loss with a full diameter.

Installation before or after bends

Installation without inlet and outlet runs is possible: devices with the order code for "Design", option C, H, I, J and K.
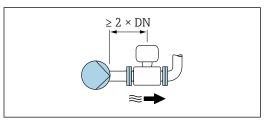
Installation downstream of pumps

Installation without inlet and outlet runs is possible: devices with the order code for "Design", option C, H and I.
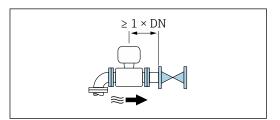
ℹ️ In the case of devices with the order code for "Design", option J and K, an inlet run of only ≥ 2 x DN must be taken into consideration.

Installation upstream of valves

Installation without inlet and outlet runs is possible: devices with the order code for "Design", option C, H and I.
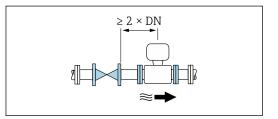
ℹ️ In the case of devices with the order code for "Design", option J and K, an outlet run of only ≥ 1 x DN must be taken into consideration.

Installation downstream of valves

Installation without inlet and outlet runs is possible if the valve is 100% open during operation: devices with the order code for "Design", option C, H and I.

ℹ️ In the case of devices with the order code for "Design", option J and K, an inlet run of only ≥ 2 x DN must be taken into consideration if the valve is 100% open during operation.

Dimensions

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

6.1.2   Environment and process requirements

Ambient temperature range

Transmitter	• Standard: –40 to +60 ℃ (–40 to +140 ℉) • Optional: –50 to +60 ℃ (–58 to +140 ℉) (Order code for "Test, certificate", option **JN** "Ambient temperature of transmitter –50 ℃ (–58 ℉)")
Local display	–20 to +60 ℃ (–4 to +140 ℉), the readability of the display may be impaired at temperatures outside the temperature range.

Sensor	• Process connection material, carbon steel:
	  –10 to +60 ℃ (+14 to +140 ℉)
	• Process connection material, stainless steel:
	  –40 to +60 ℃ (–40 to +140 ℉)

Liner	Do not exceed or fall below the permitted temperature range of the liner .

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

System pressure

Installation near pumps → 🕮 23

Vibrations

Installation in event of pipe vibrations → 🕮 24
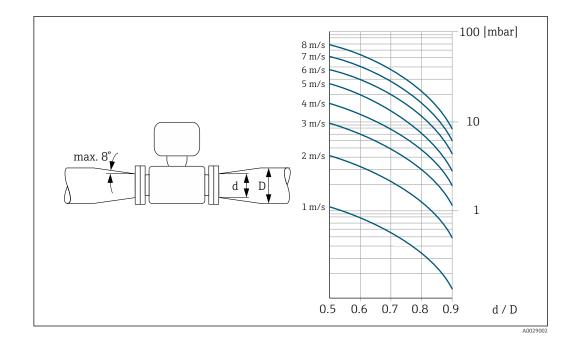
Adapters

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.

ℹ️ 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.

Length of connecting cable
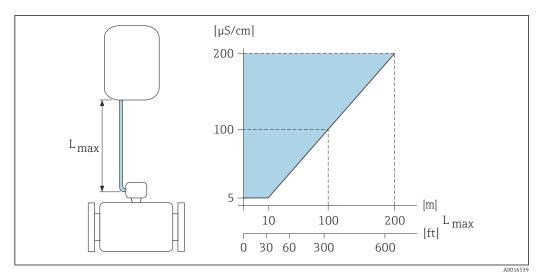
Proline 500 – digital transmitter
Lengths of connecting cable → 🖺 46

Proline 500 transmitter
Max. 200 m (650 ft)

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

🖻 6   *Permitted length of connecting cable*

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

6.1.3 Special mounting instructions

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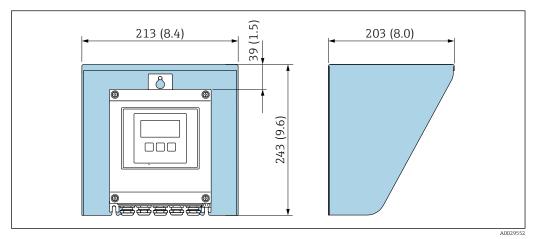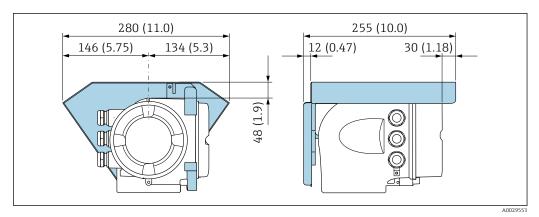
⊞ 7   Weather protection cover for Proline 500 – digital; engineering unit mm (in)

⊞ 8   Weather protection cover for Proline 500; engineering unit mm (in)

Immersion in water

- Only the remote version of the device with IP68 protection, Type 6P is suitable for underwater use: order code for "Sensor option", options CB, CC, CD, CE and CQ.
- Pay attention to regional installation instructions.

NOTICE

If the maximum water depth and operating duration is exceeded, this can damage the device!

▸ Observe the maximum water depth and operating duration.

Order code for "Sensor option", options CB, CC
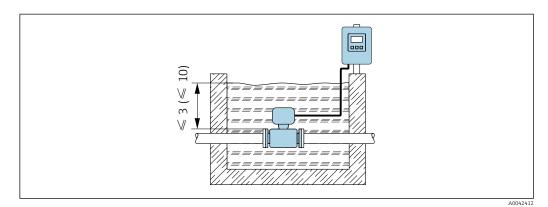
- For the operation of the device under water
- Operating duration at a maximum depth of:
  - 3 m (10 ft): permanent use
  - 10 m (30 ft): maximum 48 hours

Order code for "Sensor option", option CQ "Temporarily water-proof"

- For the temporary operation of the device under non-corrosive water
- Operating duration at a maximum depth of:
  3 m (10 ft): maximum 168 hours

Order code for "Sensor option", options CD, CE

- For the operation of the device under water and in saline water
- Operating duration at a maximum depth of:
  - 3 m (10 ft): permanent use
  - 10 m (30 ft): maximum 48 hours

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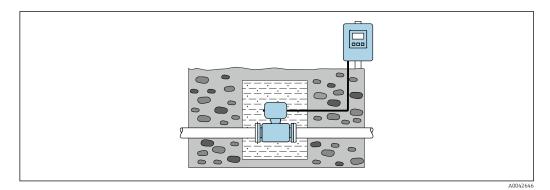
Use in buried applications

- Only the remote version of the device with IP68 protection is suitable for use in buried applications: order code for "Sensor option", options CD and CE.
- Pay attention to regional installation instructions.

Order code for "Sensor option", options CD, CE

For the use of the device in buried applications.

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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 Ø 6.0 mm

For sensor

For flanges and other process connections: use a suitable mounting tool

6.2.2   Preparing the measuring device
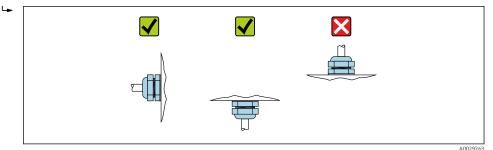
1. Remove all remaining transport packaging.

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

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

6.2.3   Mounting the sensor

⚠ **WARNING**

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

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

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

3. If using ground disks, comply with the Installation Instructions provided.

4. Observe the necessary screw tightening torques → 🖺 33.

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

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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. Make sure that the seals do not protrude into the piping cross-section.

2. For DIN flanges: only use seals according to DIN EN 1514-1.

3. For a "hard rubber" liner: additional seals are **always** required.

4. For a "polyurethane" liner: additional seals are generally **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 surface or damage the seal.
- For hard rubber liners, seals made of rubber or rubber-like materials are recommended.

ℹ️ Nominal screw tightening torques → 🗎 38

NOTICE

Insufficient sealing!
Operational reliability of the measuring device could be compromised. Overtightening the screws can deform or damage the liner in the area of the sealing surface.
▶ The values for the screw tightening torques depend on variables such as the seal, screws, lubricants, tightening methods etc. These variables are outside the control of the manufacturer. The values indicated are therefore guideline values only.

Maximum screw tightening torques

Maximum screw tightening torques for EN 1092-1 (DIN 2501)

Nominal diameter		Pressure rating	Screws	Flange thickness	Max. screw tightening torque [Nm]		
[mm]	[in]	[bar]	[mm]	[mm]	HG	PUR	PTFE
25	1	PN 40	4 × M12	18	–	15	26
32	–	PN 40	4 × M16	18	–	24	41
40	1 ½	PN 40	4 × M16	18	–	31	52
50	2	PN 40	4 × M16	20	48	40	65
65 [1]	–	PN 16	8 × M16	18	32	27	44
65	–	PN 40	8 × M16	22	32	27	44
80	3	PN 16	8 × M16	20	40	34	53
		PN 40	8 × M16	24	40	34	53
100	4	PN 16	8 × M16	20	43	36	57
		PN 40	8 × M20	24	59	50	79
125	–	PN 16	8 × M16	22	56	48	75
		PN 40	8 × M24	26	83	71	112
150	6	PN 16	8 × M20	22	74	63	99
		PN 40	8 × M24	28	104	88	137
200	8	PN 10	8 × M20	24	106	91	141
		PN 16	12 × M20	24	70	61	94
		PN 25	12 × M24	30	104	92	139
250	10	PN 10	12 × M20	26	82	71	110
		PN 16	12 × M24	26	98	85	132
		PN 25	12 × M27	32	150	134	201
300	12	PN 10	12 × M20	26	94	81	126
		PN 16	12 × M24	28	134	118	179
		PN 25	16 × M27	34	153	138	204
350	14	PN 6	12 × M20	22	111	120	–

Nominal diameter		Pressure rating	Screws	Flange thickness	Max. screw tightening torque [Nm]		
[mm]	[in]	[bar]	[mm]	[mm]	HG	PUR	PTFE
		PN 10	16 × M20	26	112	118	–
		PN 16	16 × M24	30	152	165	–
		PN 25	16 × M30	38	227	252	–
400	16	PN 6	16 × M20	22	90	98	–
		PN 10	16 × M24	26	151	167	–
		PN 16	16 × M27	32	193	215	–
		PN 25	16 × M33	40	289	326	–
450	18	PN 6	16 × M20	22	112	126	–
		PN 10	20 × M24	28	153	133	–
		PN 16	20 × M27	40	198	196	–
		PN 25	20 × M33	46	256	253	–
500	20	PN 6	20 × M20	24	119	123	–
		PN 10	20 × M24	28	155	171	–
		PN 16	20 × M30	34	275	300	–
		PN 25	20 × M33	48	317	360	–
600	24	PN 6	20 × M24	30	139	147	–
		PN 10	20 × M27	28	206	219	–
600	24	PN 16	20 × M33	36	415	443	–
600	24	PN 25	20 × M36	58	431	516	–
700	28	PN 6	24 × M24	24	148	139	–
		PN 10	24 × M27	30	246	246	–
		PN 16	24 × M33	36	278	318	–
		PN 25	24 × M39	46	449	507	–
800	32	PN 6	24 × M27	24	206	182	–
		PN 10	24 × M30	32	331	316	–
		PN 16	24 × M36	38	369	385	–
		PN 25	24 × M45	50	664	721	–
900	36	PN 6	24 × M27	26	230	637	–
		PN 10	28 × M30	34	316	307	–
		PN 16	28 × M36	40	353	398	–
		PN 25	28 × M45	54	690	716	–
1000	40	PN 6	28 × M27	26	218	208	–
		PN 10	28 × M33	34	402	405	–
		PN 16	28 × M39	42	502	518	–
		PN 25	28 × M52	58	970	971	–
1200	48	PN 6	32 × M30	28	319	299	–
		PN 10	32 × M36	38	564	568	–
		PN 16	32 × M45	48	701	753	–
1400	–	PN 6	36 × M33	32	430	–	–
		PN 10	36 × M39	42	654	–	–
		PN 16	36 × M45	52	729	–	–

Nominal diameter		Pressure rating	Screws	Flange thickness	Max. screw tightening torque [Nm]		
[mm]	[in]	[bar]	[mm]	[mm]	HG	PUR	PTFE
1600	–	PN 6	40 × M33	34	440	–	–
		PN 10	40 × M45	46	946	–	–
		PN 16	40 × M52	58	1007	–	–
1800	72	PN 6	44 × M36	36	547	–	–
		PN 10	44 × M45	50	961	–	–
		PN 16	44 × M52	62	1108	–	–
2000	–	PN 6	48 × M39	38	629	–	–
		PN 10	48 × M45	54	1047	–	–
		PN 16	48 × M56	66	1324	–	–
2200	–	PN 6	52 × M39	42	698	–	–
		PN 10	52 × M52	58	1217	–	–
2400	–	PN 6	56 × M39	44	768	–	–
		PN 10	56 × M52	62	1229	–	–

1)   Sizing as per EN 1092-1 (not DIN 2501)

Maximum screw tightening torques for ASME B16.5

Nominal diameter		Pressure rating	Screws	Max. screw tightening torque			
				HG		PUR	
[mm]	[in]	[psi]	[in]	[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
25	1	Class 150	4 × ½	–	–	7	5
25	1	Class 300	4 × 5/8	–	–	8	6
40	1 ½	Class 150	4 × ½	–	–	10	7
40	1 ½	Class 300	4 × ¾	–	–	15	11
50	2	Class 150	4 × 5/8	35	26	22	16
50	2	Class 300	8 × 5/8	18	13	11	8
80	3	Class 150	4 × 5/8	60	44	43	32
80	3	Class 300	8 × ¾	38	28	26	19
100	4	Class 150	8 × 5/8	42	31	31	23
100	4	Class 300	8 × ¾	58	43	40	30
150	6	Class 150	8 × ¾	79	58	59	44
150	6	Class 300	12 × ¾	70	52	51	38
200	8	Class 150	8 × ¾	107	79	80	59
250	10	Class 150	12 × 7/8	101	74	75	55
300	12	Class 150	12 × 7/8	133	98	103	76
350	14	Class 150	12 × 1	135	100	158	117
400	16	Class 150	16 × 1	128	94	150	111
450	18	Class 150	16 × 1 1/8	204	150	234	173
500	20	Class 150	20 × 1 1/8	183	135	217	160
600	24	Class 150	20 × 1 ¼	268	198	307	226

Maximum screw tightening torques for JIS B2220

Nominal diameter	Pressure rating	Screws	Max. screw tightening torque [Nm]	
[mm]	[bar]	[mm]	HG	PUR
25	10K	4 × M16	–	19
25	20K	4 × M16	–	19
32	10K	4 × M16	–	22
32	20K	4 × M16	–	22
40	10K	4 × M16	–	24
40	20K	4 × M16	–	24
50	10K	4 × M16	40	33
50	20K	8 × M16	20	17
65	10K	4 × M16	55	45
65	20K	8 × M16	28	23
80	10K	8 × M16	29	23
80	20K	8 × M20	42	35
100	10K	8 × M16	35	29
100	20K	8 × M20	56	48
125	10K	8 × M20	60	51
125	20K	8 × M22	91	79
150	10K	8 × M20	75	63
150	20K	12 × M22	81	72
200	10K	12 × M20	61	52
200	20K	12 × M22	91	80
250	10K	12 × M22	100	87
250	20K	12 × M24	159	144
300	10K	16 × M22	74	63
300	20K	16 × M24	138	124

Maximum screw tightening torques for AWWA C207, Class D

Nominal diameter		Screws	Max. screw tightening torque			
[mm]	[in]	[in]	HG		PUR	
			[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
700	28	28 × 1 ¼	247	182	292	215
750	30	28 × 1 ¼	287	212	302	223
800	32	28 × 1 ½	394	291	422	311
900	36	32 × 1 ½	419	309	430	317
1000	40	36 × 1 ½	420	310	477	352
–	42	36 × 1 ½	528	389	518	382
–	48	44 × 1 ½	552	407	531	392
–	54	44 × 1 ¾	730	538	–	–
–	60	52 × 1 ¾	758	559	–	–
–	66	52 × 1 ¾	946	698	–	–
–	72	60 × 1 ¾	975	719	–	–

Nominal diameter		Screws	Max. screw tightening torque			
			HG		PUR	
[mm]	[in]	[in]	[Nm]	[lbf · ft]	[Nm]	[lbf · ft]
–	78	64 × 2	853	629	–	–
–	84	64 x 2	931	687	–	–
–	90	64 x 2 ¼	1048	773	–	–

Maximum screw tightening torques for AS 2129, Table E

Nominal diameter	Screws	Max. screw tightening torque [Nm]	
[mm]	[mm]	HG	PUR
50	4 × M16	32	–
80	4 × M16	49	–
100	8 × M16	38	–
150	8 × M20	64	–
200	8 × M20	96	–
250	12 × M20	98	–
300	12 × M24	123	–
350	12 × M24	203	–
400	12 × M24	226	–
450	16 × M24	226	–
500	16 × M24	271	–
600	16 × M30	439	–
700	20 × M30	355	–
750	20 × M30	559	–
800	20 × M30	631	–
900	24 × M30	627	–
1000	24 × M30	634	–
1200	32 × M30	727	–

Maximum screw tightening torques for AS 4087, PN 16

Nominal diameter	Screws	Max. screw tightening torque [Nm]	
[mm]	[mm]	HG	PUR
50	4 × M16	32	–
80	4 × M16	49	–
100	4 × M16	76	–
150	8 × M20	52	–
200	8 × M20	77	–
250	8 × M20	147	–
300	12 × M24	103	–
350	12 × M24	203	–
375	12 × M24	137	–
400	12 × M24	226	–

Nominal diameter	Screws	Max. screw tightening torque [Nm]	
[mm]	[mm]	HG	PUR
450	12 × M24	301	–
500	16 × M24	271	–
600	16 × M27	393	–
700	20 × M27	330	–
750	20 × M30	529	–
800	20 × M33	631	–
900	24 × M33	627	–
1000	24 × M33	595	–
1200	32 × M33	703	–

Nominal screw tightening torques

Nominal screw tightening torques for EN 1092-1 (DIN 2501); calculated according to EN 1591-1:2014 for flanges according to EN 1092-1:2013

Nominal diameter		Pressure rating	Screws	Flange thickness	Nom. screw tightening torque [Nm]		
[mm]	[in]	[bar]	[mm]	[mm]	HG	PUR	PTFE
1000	40	PN 6	28 × M27	38	175	185	–
		PN 10	28 × M33	44	350	360	–
		PN 16	28 × M39	59	630	620	–
		PN 25	28 × M52	63	1300	1290	–
1200	48	PN 6	32 × M30	42	235	250	–
		PN 10	32 × M36	55	470	480	–
		PN 16	32 × M45	78	890	900	–
1400	–	PN 6	36 × M33	56	300	–	–
		PN 10	36 × M39	65	600	–	–
		PN 16	36 × M45	84	1050	–	–
1600	–	PN 6	40 × M33	63	340	–	–
		PN 10	40 × M45	75	810	–	–
		PN 16	40 × M52	102	1420	–	–
1800	72	PN 6	44 × M36	69	430	–	–
		PN 10	44 × M45	85	920	–	–
		PN 16	44 × M52	110	1600	–	–
2000	–	PN 6	48 × M39	74	530	–	–
		PN 10	48 × M45	90	1040	–	–
		PN 16	48 × M56	124	1900	–	–
2200	–	PN 6	52 × M39	81	580	–	–
		PN 10	52 × M52	100	1290	–	–
2400	–	PN 6	56 × M39	87	650	–	–
		PN 10	56 × M52	110	1410	–	–

Nominal screw tightening torques for JIS B2220

Nominal diameter	Pressure rating	Screws	Nom. screw tightening torque [Nm]	
[mm]	[bar]	[mm]	HG	PUR
350	10K	16 × M22	109	109
	20K	16 × M30×3	217	217
400	10K	16 × M24	163	163
	20K	16 × M30×3	258	258
450	10K	16 × M24	155	155
	20K	16 × M30×3	272	272
500	10K	16 × M24	183	183
	20K	16 × M30×3	315	315
600	10K	16 × M30	235	235
	20K	16 × M36×3	381	381
700	10K	16 × M30	300	300
750	10K	16 × M30	339	339

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 → 🖹 28.
▶ If operating outdoors: Avoid direct sunlight and exposure to weathering, particularly in warm climatic regions.

⚠ CAUTION

Excessive force can damage the housing!
▶ Avoid excessive mechanical stress.

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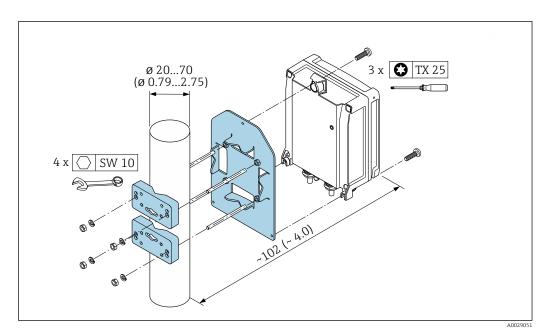
Pipe mounting

⚠ 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)
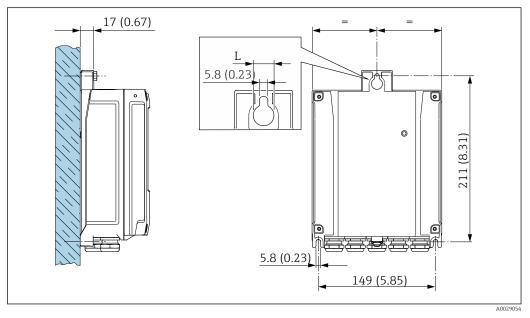
⊞ 9   Engineering unit mm (in)

Wall mounting

⊞ 10   Engineering unit mm (in)

L   Depends on order code for "Transmitter housing"

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

1. Drill the holes.

2. Insert wall plugs into the drilled holes.

3. Screw in the securing screws slightly.

4. Fit the transmitter housing over the securing screws and hook into 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 → 🔖 28.
▶ If operating outdoors: Avoid direct sunlight and exposure to weathering, particularly in warm climatic regions.

⚠ **CAUTION**

Excessive force can damage the housing!

▶ Avoid excessive mechanical stress.
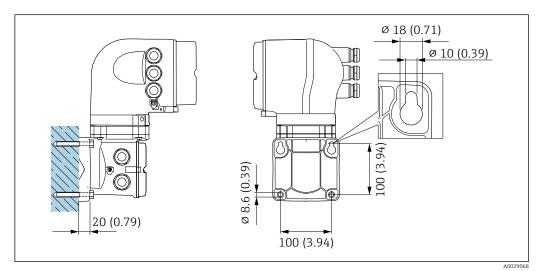
The transmitter can be mounted in the following ways:
• Post mounting
• Wall mounting

Wall mounting

🖼 *11   Engineering unit mm (in)*

1. Drill the holes.

2. Insert wall plugs into the drilled holes.

3. Screw in the securing screws slightly.

4. Fit the transmitter housing over the securing screws and hook into place.
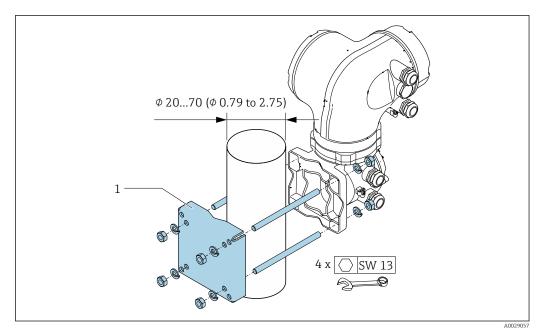
5. Tighten the securing screws.

Post mounting

⚠ **WARNING**

Order code for "Transmitter housing", option L "Cast, stainless": cast transmitters are very heavy.
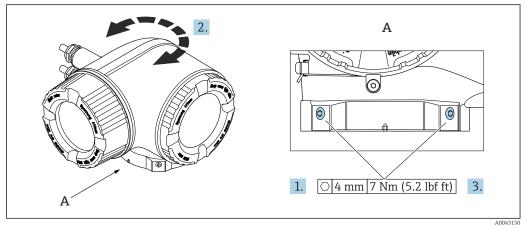
They are unstable if they are not mounted on a secure, fixed post.

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

A0029057

🖾 *12   Engineering unit mm (in)*

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.

A0043150
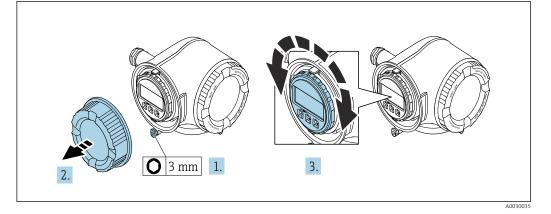
🖾 *13   Ex housing*

1. Loosen the fixing screws.

2. Turn the housing to the desired position.

3. Tighten the securing screws.

6.2.7   Turning the display module: Proline 500

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

A0030035

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

2. Unscrew the connection compartment cover.

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

4. Screw on the connection compartment cover.

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

6.3   Post-installation check

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

7 Electrical connection

⚠ WARNING

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

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

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

7.1 Electrical safety

In accordance with applicable national regulations.

7.2 Connecting requirements

7.2.1 Required tools

- For cable entries: Use 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)

7.2.2 Requirements for connecting cable

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

Protective grounding cable for the outer ground terminal

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

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

The grounding impedance must be less than 2 Ω.

Permitted temperature range

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

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

Standard installation cable is sufficient.

Signal cable

PROFINET with Ethernet-APL

The reference cable type for APL segments is fieldbus cable type A, MAU type 1 and 3 (specified in IEC 61158-2). This cable meets the requirements for intrinsically safe applications according to IEC TS 60079-47 and can also be used in non-intrinsically safe applications.

Cable type	A
Cable capacitance	45 to 200 nF/km

Loop resistance	15 to 150 Ω/km
Cable inductance	0.4 to 1 mH/km

Further details are provided in the Ethernet-APL Engineering Guideline (https://www.ethernet-apl.org).

Current output 0/4 to 20 mA

Standard installation cable is sufficient

Pulse /frequency /switch output

Standard installation cable is sufficient

Relay output

Standard installation cable is sufficient.

Current input 0/4 to 20 mA

Standard installation cable is sufficient

Status input
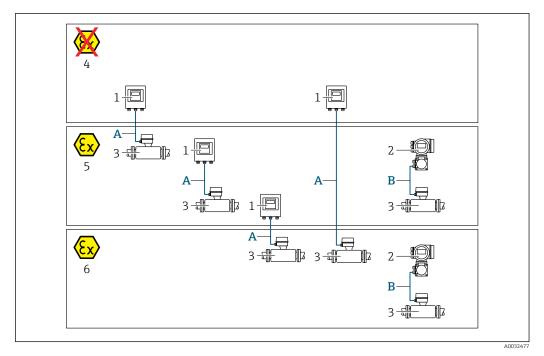
Standard installation cable is sufficient

Cable diameter

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

Choice of connecting cable between the transmitter and sensor

Depends on the type of transmitter and the installation zones

A0032477

1   Proline 500 digital transmitter
2   Proline 500 transmitter
3   Promag sensor
4   Non-hazardous area
5   Hazardous area: Zone 2; Class I, Division 2
6   Hazardous area: Zone 1; Class I, Division 1
A   Standard cable to 500 digital transmitter → 🖺 46
      Transmitter installed in the non-hazardous area or hazardous area: Zone 2; Class I, Division 2 / sensor
      installed in the hazardous area: Zone 2; Class I, Division 2 or Zone 1; Class I, Division 1
B   Signal cable to 500 transmitter → 🖺 47
      Transmitter and sensor installed in the hazardous area: Zone 2; Class I, Division 2 or Zone 1;
      Class I, Division 1

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

Standard cable

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

Design	4 cores (2 pairs); uninsulated stranded CU wires; pair-stranded with common shield
Shielding	Tin-plated copper braid, optical cover ≥ 85 %
Cable length	Maximum 300 m (900 ft), see the following table.

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

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

Optionally available connecting cable

Design	2 × 2 × 0.34 mm² (AWG 22) PVC cable [1] with common shield (2 pairs, uninsulated stranded CU wires; pair-stranded)
Flame resistance	According to DIN EN 60332-1-2
Oil-resistance	According to DIN EN 60811-2-1
Shielding	Tin-plated copper braid, optical cover ≥ 85 %
Operating temperature	When mounted in a fixed position: −50 to +105 ℃ (−58 to +221 ℉); when cable can move freely: −25 to +105 ℃ (−13 to +221 ℉)
Available cable length	Fixed: 20 m (60 ft); variable: up to maximum 50 m (150 ft)

1)   UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where possible.
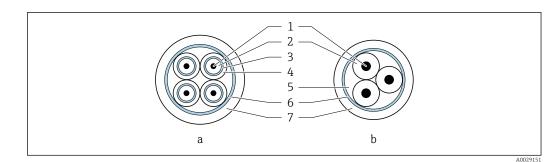
B: Connecting cable between sensor and transmitter: Proline 500

Signal cable

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

Coil current cable

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

🖻 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*

Operation in zones of severe electrical interference

The measuring system meets the general safety requirements → 🖹 253 and EMC specifications → 🖹 236.

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

7.2.3   Terminal assignment

Transmitter: supply voltage, input/outputs

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

Supply voltage		Input/output 1		Input/output 2		Input/output 3		Input/output 4	
1 (+)	2 (−)	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→ 🖹 53
- Proline 500 → 🖹 60

7.2.4   Available device plugs

ℹ️ Device plugs may not be used in hazardous areas!

Order code for "Input; output 1", option RB "PROFINET with Ethernet-APL"

Order code	Cable entry/connection	
"Electrical connection"	2	3
L, N, P, U	M12 plug × 1	–

7.2.5 device plug pin assignment

Pin	Assignment	Coding	Plug/socket
1	APL signal -	A	Socket
2	APL signal +		
3	Cable shield[1]		
4	Not assigned		
Metal plug housing	Cable shield		
[1]If a cable shield is used			

7.2.6 Shielding and grounding

Optimal electromagnetic compatibility (EMC) of the fieldbus system can be guaranteed only if the system components and, in particular, the lines are shielded and the shield forms as complete a cover as possible.

1. To ensure optimal EMC protection, connect the shield to the reference ground as often as possible.

2. For reasons concerning explosion protection, it is recommended that grounding be dispensed with.

To comply with both requirements, there are basically three different types of shielding in the fieldbus system:
- Shielding at both ends
- Shielding at one end on the feed side with capacitance termination at the field device
- Shielding at one end on the feed side

Experience shows that the best results with regard to EMC are achieved in most cases in installations with one-sided shielding on the feed side (without capacitance termination at the field device). Appropriate measures with regard to input wiring must be taken to allow unrestricted operation when EMC interference is present. These measures have been taken into account for this device. Operation in the event of disturbance variables as per NAMUR NE21 is thus guaranteed.

1. Observe national installation requirements and guidelines during installation.

2. Where there are large differences in potential between the individual grounding points,
   connect only one point of the shielding directly to the reference ground.
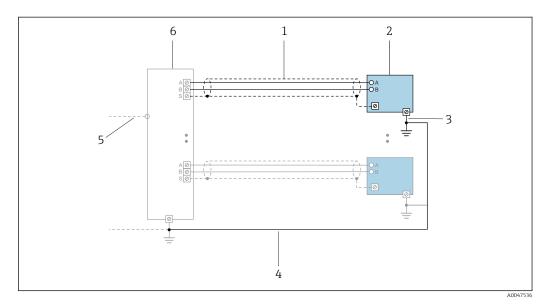
3. In systems without potential equalization,
   the cable shielding of fieldbus systems should be grounded on one side only, for example at the fieldbus supply unit or at safety barriers.

NOTICE

In systems without potential matching, the multiple grounding of the cable shield causes mains frequency equalizing currents!
Damage to the bus cable shield.
▸ Only ground the bus cable shield to either the local ground or the protective ground at one end.
▸ Insulate the shield that is not connected.

🖾 15   Connection example for PROFINET with Ethernet-APL

1   Cable shield
2   Measuring device
3   Local grounding
4   Potential equalization
5   Trunk or TCP
6   Field switch

7.2.7   Preparing the measuring device

Carry out the steps in the following order:

1. Mount the sensor and transmitter.

2. Sensor connection housing: Connect connecting cable.

3. Transmitter: Connect connecting cable.

4. Transmitter: Connect signal cable and cable for supply voltage.

NOTICE

Insufficient sealing of the housing!
Operational reliability of the measuring device could be compromised.
▸ Use suitable cable glands corresponding to the degree of protection.
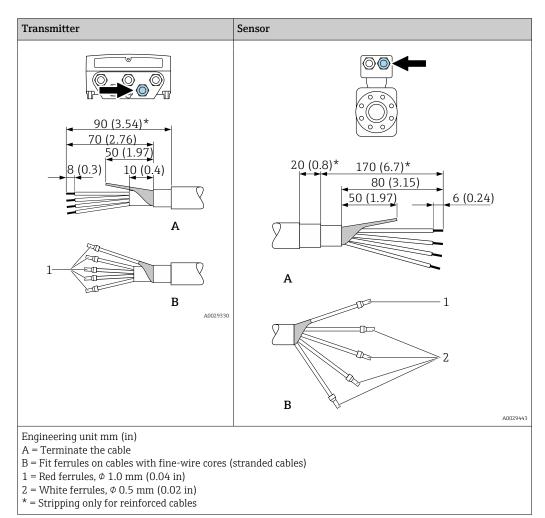
1. Remove dummy plug if present.

2. If the measuring device is supplied without cable glands:
   Provide suitable cable gland for corresponding connecting cable.

3. If the measuring device is supplied with cable glands:
   Observe requirements for connecting cables → 🖺 44.

7.2.8   Preparing the connecting cable: Proline 500 – digital

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

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

Transmitter	Sensor
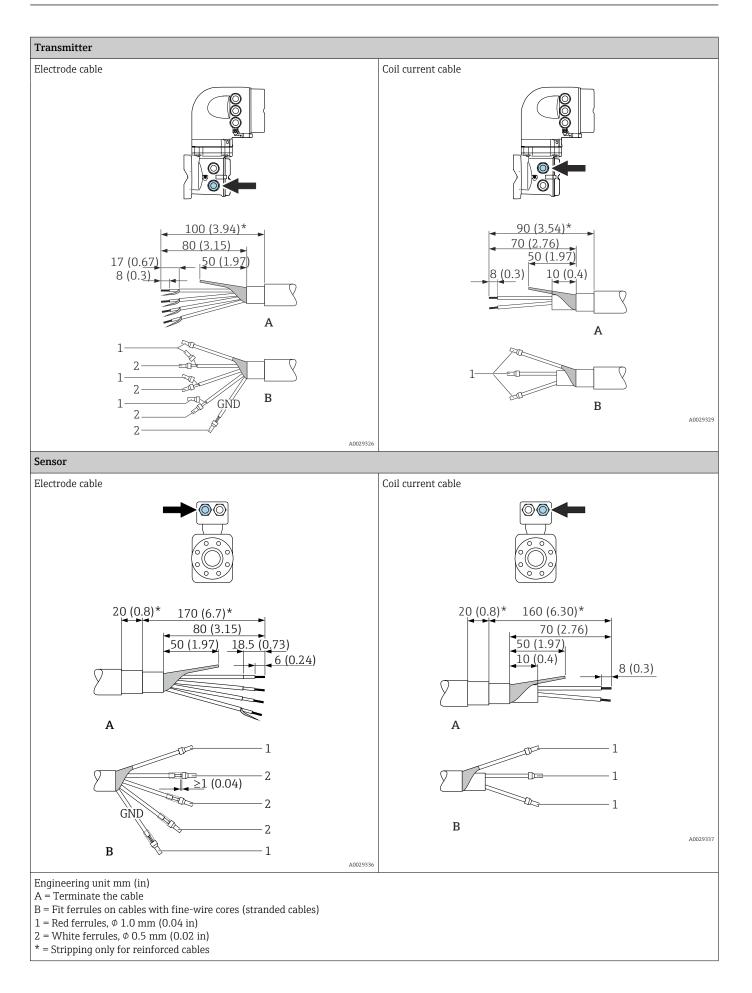
Engineering unit mm (in)
A = Terminate the cable
B = Fit ferrules on cables with fine-wire cores (stranded cables)
1 = Red ferrules, ⌀ 1.0 mm (0.04 in)
2 = White ferrules, ⌀ 0.5 mm (0.02 in)
* = Stripping only for reinforced cables

7.2.9   Preparing the connecting cable: Proline 500

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

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

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

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

Transmitter	
Electrode cable	Coil current cable
100 (3.94)* 80 (3.15) 50 (1.97) 17 (0.67) 8 (0.3) A 1 2 1 2 1 2 2 GND B A0029326	90 (3.54)* 70 (2.76) 50 (1.97) 8 (0.3) 10 (0.4) A 1 B A0029329
Sensor	
Electrode cable	Coil current cable
20 (0.8)* 170 (6.7)* 80 (3.15) 50 (1.97) 18.5 (0.73) 6 (0.24) A 1 2 ≥1 (0.04) 2 GND 2 B 1 A0029336	20 (0.8)* 160 (6.30)* 70 (2.76) 50 (1.97) 10 (0.4) 8 (0.3) A 1 1 1 B 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

7.3 Connecting the measuring device: Proline 500 – digital

NOTICE

An incorrect connection compromises electrical safety!

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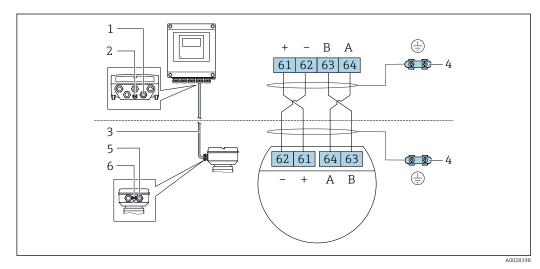
7.3.1 Connecting the connecting cable

⚠ WARNING

Risk of damaging electronic components!

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

Connecting cable terminal assignment

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

Connecting the connecting cable to the sensor connection housing
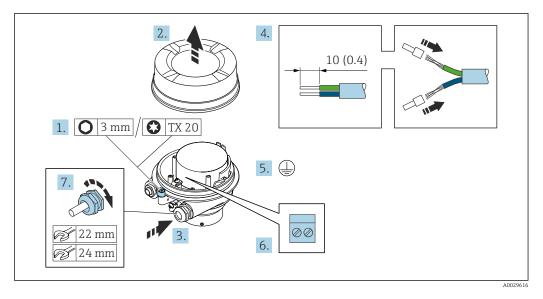
Connection via terminals with order code for "Sensor connection housing":
Option **A** "Aluminum, coated" → 🖱 54

Connecting the connecting cable to the transmitter

The cable is connected to the transmitter via terminals → 🖱 55.

Connecting the sensor connection housing via terminals

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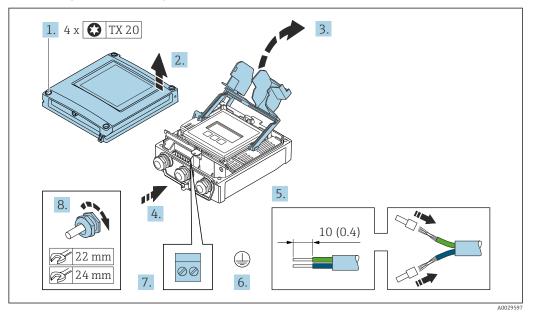
A0029616

1. Loosen the securing clamp of the housing cover.

2. Unscrew the housing cover.

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

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

5. Connect the protective ground.

6. Connect the cable in accordance with the connecting cable terminal assignment.

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

⚠ WARNING

Housing degree of protection voided due to insufficient sealing of the housing.
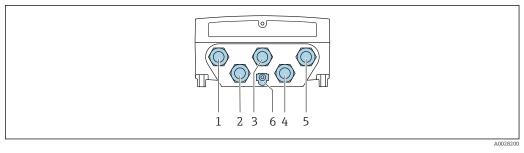
▶ Screw in the thread on the cover without using any lubricant. The thread on the cover is coated with a dry lubricant.

8. Screw on the housing cover.

9. Tighten the securing clamp of the housing cover.

Connecting the connecting cable to the transmitter

A0029597

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

2. Open the housing cover.

3. Fold open the terminal cover.

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

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

6. Connect the protective ground.

7. Connect the cable according to the terminal assignment for the connecting cable → 🕮 53.

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 .
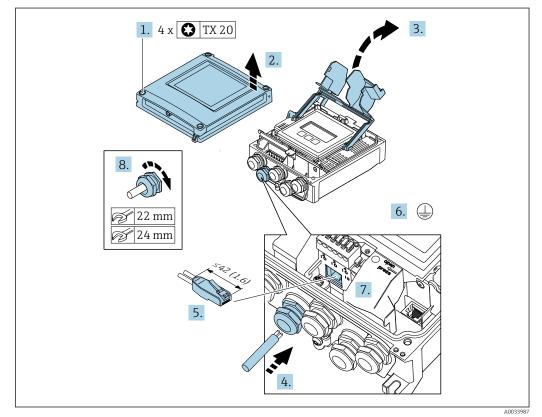
7.3.2 Connecting the transmitter

A0028200

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

In addition to connecting the device via and the available input/outputs, additional connection options are also available:
Integrate into a network via the service interface (CDI-RJ45) → 🖺 59.

Connecting the plug
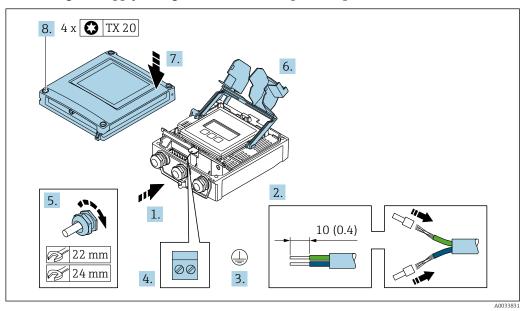
A0033987

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

2. Open the housing cover.

3. Fold open the terminal cover.

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

5. Strip the cable and cable ends and connect to the RJ45 connector.

6. Connect the protective ground.

7. Plug in the RJ45 connector.

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

Connecting the supply voltage and additional inputs/outputs

A0033831

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

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

3. Connect the protective ground.

4. Connect the cable according to the terminal assignment.
   ↳ **Signal cable terminal assignment:** The device-specific terminal assignment is documented on an adhesive label in the terminal cover.
   Supply voltage terminal assignment: Adhesive label in the terminal cover or → 🖺 48.

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

6. Close the terminal cover.

7. Close the housing cover.

⚠ **WARNING**

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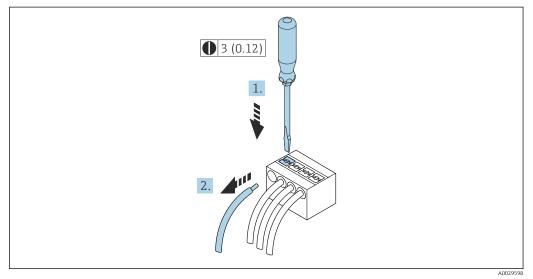
⚠ **WARNING**

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)

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

Removing a cable

🖻 *16   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.

7.3.3 Integrating the transmitter into a network

This section only presents the basic options for integrating the device into a network.
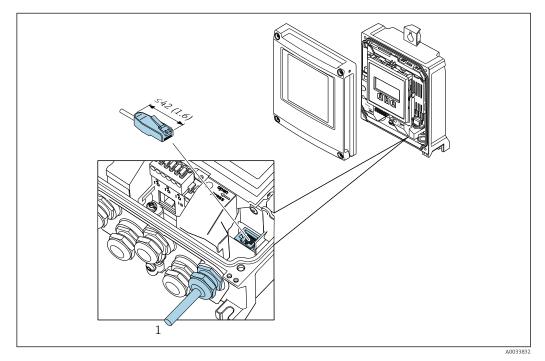
For information on the procedure to follow to connect the transmitter correctly → 🖺 53.

Integrating via the service interface

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

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

1   Service interface (CDI-RJ45)

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

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

7.4 Connecting the measuring device: Proline 500

NOTICE

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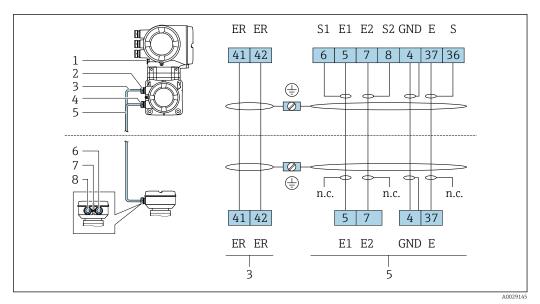
7.4.1 Connecting the connecting cable

⚠ WARNING

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

Connecting cable terminal assignment

A0029145

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

Connecting the connecting cable to the sensor connection housing
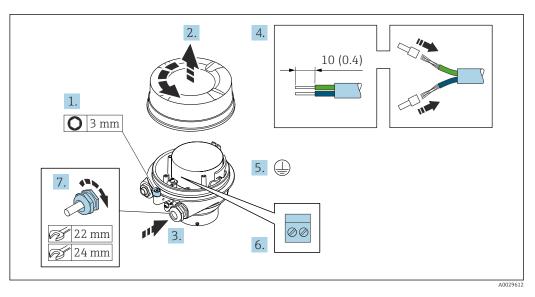
Connection via terminals with order code for "Housing":
- Option **A** "Aluminum coated" → 🖱 61
- Option **D** "Polycarbonate" → 🖱 61

Connecting the sensor connection housing via terminals

For the device version with the order code for "Housing":
- Option **A** "Aluminum coated"
- Option **D** "Polycarbonate"
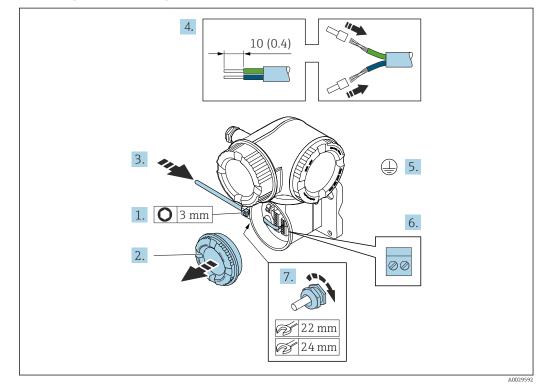
1. Loosen the securing clamp of the housing cover.

2. Unscrew the housing cover.

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

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

5. Connect the protective ground.

6. Connect the cable in accordance with the connecting cable terminal assignment.

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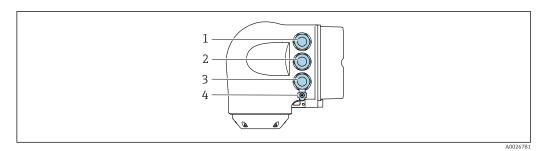
Attaching the connecting cable to the transmitter

A0029592

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

2. Unscrew the connection compartment cover.

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

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

5. Connect the protective ground.

6. Connect the cable in accordance with the connecting cable terminal assignment → 🔲 60.

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

8. Screw on the connection compartment cover.

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

10. After connecting the connecting cables:
    Connect the signal cable and the supply voltage cable .
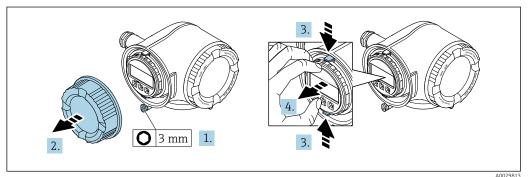
7.4.2   Connecting the transmitter
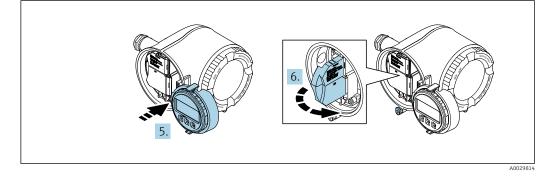
A0026781

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

In addition to connecting the device via PROFINET with Ethernet-APL and the available inputs/outputs, an additional connection option is also available: Integrate into a network via the service interface (CDI-RJ45) → 🖺 66.

Connecting the plug
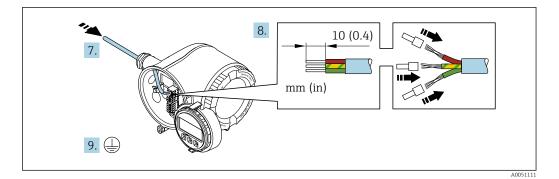
A0029813

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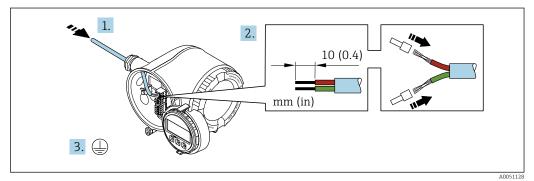
5. Attach the holder to the edge of the electronics compartment.

6. Open the terminal cover.

A0051111
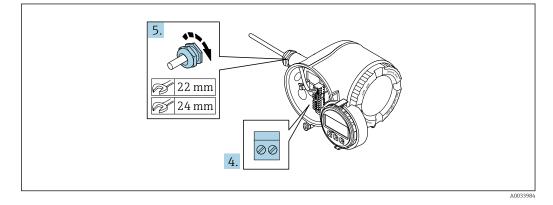
7. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.

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

9. Connect protective earth (PE).

10. Firmly tighten the cable glands.

   ↳ This concludes the connection via the APL port.

Connecting the supply voltage and additional inputs/outputs

A0051128

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

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

3. Connect the protective ground.
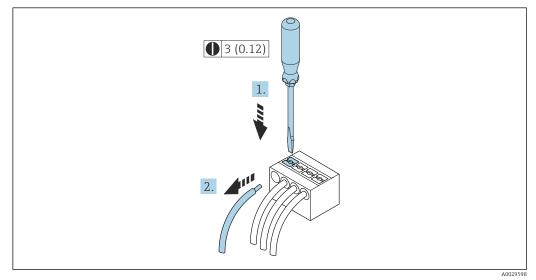
A0033984

4. Connect the cable according to the terminal assignment.

   ↳ **Signal cable terminal assignment:** The device-specific terminal assignment is documented on an adhesive label in the terminal cover.
   Supply voltage terminal assignment: Adhesive label in the terminal cover or → 🖹 48.

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

6. Close the terminal cover.

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

8. Screw on the connection compartment cover.

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

Removing a cable

🖼 *17   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.

7.4.3 Integrating the transmitter into a network

This section only presents the basic options for integrating the device into a network.
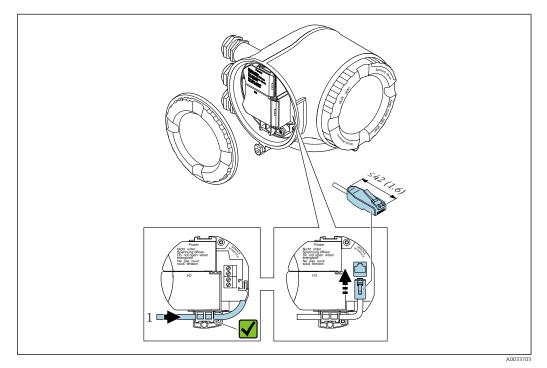
For information on the procedure to follow to connect the transmitter correctly → 🗎 60.

Integrating via the service interface

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

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

A0033703

1   Service interface (CDI-RJ45)

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

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

7.5   Ensuring potential equalization

7.5.1   Introduction

Correct potential equalization (equipotential bonding) is a prerequisite for stable and reliable flow measurement. Inadequate or incorrect potential equalization can result in device failure and present a safety hazard.

The following requirements must be observed to ensure correct, trouble-free measurement:
- The principle that the medium, the sensor and the transmitter must be at the same electrical potential applies.
- Take in-company grounding guidelines, materials and the grounding conditions and potential conditions of the pipe into consideration.
- The necessary potential equalization connections must be established using a ground cable with a minimum cross-section of 6 mm² (0.0093 in²) and a cable lug.
- In the case of remote device versions, the ground terminal in the example always refers to the sensor and not to the transmitter.

ℹ️ You can order accessories such as ground cables and ground disks directly from Endress+Hauser → 🕮 215

📖 For devices intended for use in hazardous areas, observe the instructions in the Ex documentation (XA).

Abbreviations used
- PE (Protective Earth): potential at the protective earth terminals of the device
- P_P (Potential Pipe): potential of the pipe, measured at the flanges
- P_M (Potential Medium): potential of the medium
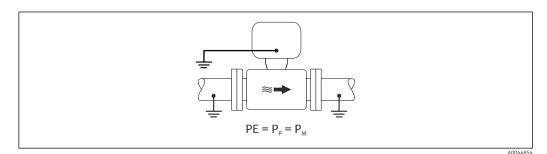
7.5.2   Connection examples for standard situations

Unlined and grounded metal pipe
- Potential equalization is via the measuring pipe.
- The medium is set to ground potential.

Starting conditions:
- Pipes are correctly grounded on both sides.
- Pipes are conductive and at the same electrical potential as the medium
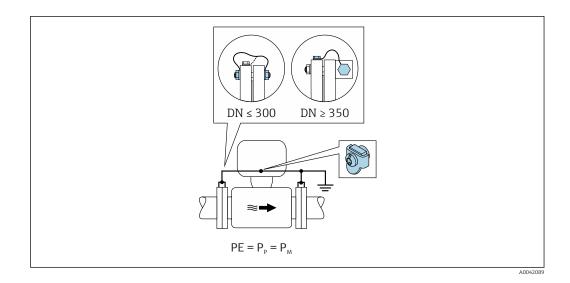
$$PE = P_P = P_M$$

A0044854

▸ Connect the connection housing of the transmitter or sensor to ground potential by means of the ground terminal provided for this purpose.

Metal pipe without liner
- Potential equalization is via the ground terminal and pipe flanges.
- The medium is set to ground potential.

Starting conditions:
- Pipes are not sufficiently grounded.
- Pipes are conductive and at the same electrical potential as the medium
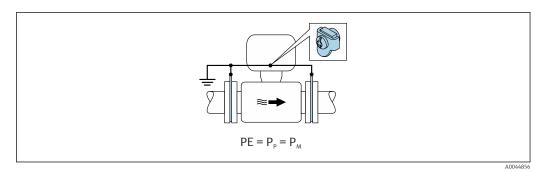
1. Connect both sensor flanges to the pipe flange via a ground cable and ground them.

2. Connect the connection housing of the transmitter or sensor to ground potential by means of the ground terminal provided for this purpose.

3. For DN ≤ 300 (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.

4. For DN ≥ 350 (14"): Mount the ground cable directly on the metal transport bracket. Observe the screw tightening torques: see the Brief Operating Instructions for the sensor.

Plastic pipe or pipe with insulating liner

• Potential equalization is via the ground terminal and ground disks.
• The medium is set to ground potential.

Starting conditions:
• The pipe has an insulating effect.
• Low-impedance medium grounding close to the sensor is not guaranteed.
• Equalizing currents through the medium cannot be ruled out.

1. Connect the ground disks to the ground terminal of the transmitter or sensor connection housing via the ground cable.

2. Connect the connection to ground potential.

7.5.3 Connection example with the potential of medium not equal to protective ground without the "Floating measurement" option
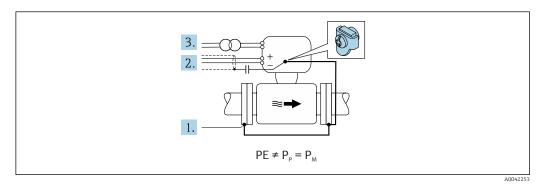
In these cases, the medium potential can differ from the potential of the device.

Metal, ungrounded pipe

The sensor and transmitter are installed in a way that provides electrical insulation from PE, e.g. applications for electrolytic processes or systems with cathodic protection.

Starting conditions:
• Unlined metal pipe
• Pipes with an electrically conductive liner

$$PE \neq P_P = P_M$$

A0042253

1. Connect the pipe flanges and transmitter via the ground cable.

2. Route the shielding of the signal lines via a capacitor (recommended value 1.5μF/50V).

3. Device connected to power supply such that it is floating in relation to the protective earth (isolation transformer). This measure is not required in the case of 24V DC supply voltage without PE (= SELV power unit).

7.5.4 Connection examples with the potential of medium not equal to protective ground with the "Floating measurement" option

In these cases, the medium potential can differ from the potential of the device.

Introduction

The "Floating measurement" option enables the galvanic isolation of the measuring system from the device potential. This minimizes harmful equalizing currents caused by differences in potential between the medium and the device. The "Floating measurement" option is optionally available: order code for "Sensor option", option CV

Operating conditions for the use of the "Floating measurement" option

Device version	Compact version and remote version (length of connecting cable ≤ 10 m)
Differences in voltage between medium potential and device potential	As small as possible, usually in the mV range
Alternating voltage frequencies in the medium or at ground potential (PE)	Below typical power line frequency in the country

To achieve the specified conductivity measuring accuracy, a conductivity calibration is recommended when the device is installed.
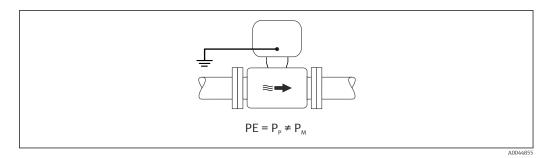
A full pipe adjustment is recommended when the device is installed.

Plastic pipe

Sensor and transmitter are correctly grounded. A difference in potential can occur between the medium and protective earth. Potential equalization between P_M and PE via the reference electrode is minimized with the "Floating measurement" option.

Starting conditions:
• The pipe has an insulating effect.
• Equalizing currents through the medium cannot be ruled out.

$$PE = P_P \neq P_M$$

A0044855
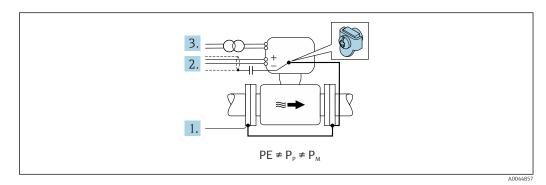
1. Use the "Floating measurement" option, while also observing the operating conditions for floating measurement.

2. Connect the connection housing of the transmitter or sensor to ground potential by means of the ground terminal provided for this purpose.

Metal, ungrounded pipe with insulating liner

The sensor and transmitter are installed in a way that provides electrical insulation from PE. The medium and pipe have different potentials. The "Floating measurement" option minimizes harmful equalizing currents between P_M and P_P via the reference electrode.

Starting conditions:
• Metal pipe with insulating liner
• Equalizing currents through the medium cannot be ruled out.
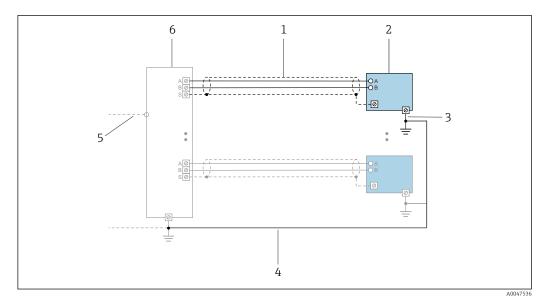
$$PE \neq P_P \neq P_M$$

A0044857

1. Connect the pipe flanges and transmitter via the ground cable.

2. Route the shielding of the signal cables via a capacitor (recommended value 1.5µF/ 50V).

3. Device connected to power supply such that it is floating in relation to the protective earth (isolation transformer). This measure is not required in the case of 24V DC supply voltage without PE (= SELV power unit).

4. Use the "Floating measurement" option, while also observing the operating conditions for floating measurement.

7.6   Special connection instructions

7.6.1   Connection examples
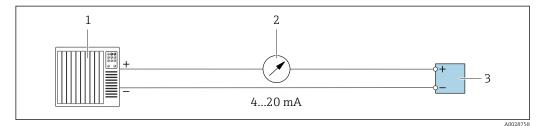
PROFINET with Ethernet-APL
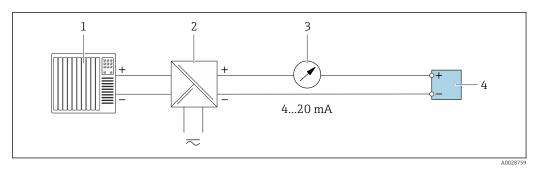
🖼 *18   Connection example for PROFINET with Ethernet-APL*

1   Cable shield
2   Measuring device
3   Local grounding
4   Potential equalization
5   Trunk or TCP
6   Field switch

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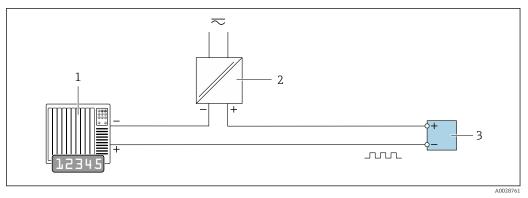
🖼 *19   Connection example for 4-20 mA current output (active)*

1   Automation system with current input (e.g. PLC)
2   Analog display unit: observe maximum load
3   Transmitter

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

1   Automation system with current input (e.g. PLC)
2   Active barrier for power supply (e.g. RN221N)
3   Analog display unit: observe maximum load
4   Transmitter

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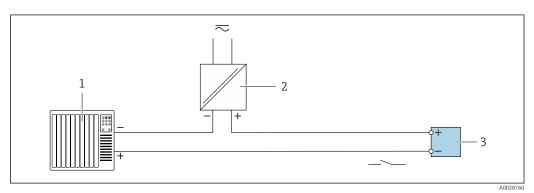
21   Connection example for pulse/frequency output (passive)

1   Automation system with pulse/frequency input (e.g. PLC with 10 kΩ pull-up or pull-down resistor)
2   Power supply
3   Transmitter: observe input values → 🖹 226
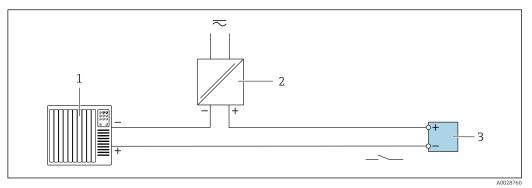
Switch output

22   Connection example for switch output (passive)

1   Automation system with switch input (e.g. PLC with a 10 kΩ pull-up or pull-down resistor)
2   Power supply
3   Transmitter: observe input values → 🖹 226

Relay output

A0028760
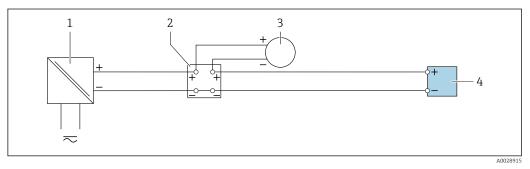
⊠ *23   Connection example for relay output (passive)*
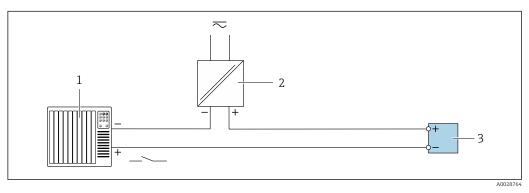
1   Automation system with relay input (e.g. PLC)
2   Power supply
3   Transmitter: observe input values → ⓐ 227

Current input

A0028915

⊠ *24   Connection example for 4 to 20 mA current input*

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

Status input

A0028764

⊠ *25   Connection example for status input*

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

7.7 Hardware settings

7.7.1 Setting the device name

A measuring point can be quickly identified within a plant on the basis of the tag name. The factory-assigned device name can be changed using the DIP switches or the automation system.

Example: EH-Promag500-XXXX

EH	Endress+Hauser
Promag	Instrument family
500	Transmitter
XXXX	Serial number of the device

The device name currently used is displayed in Setup → Name of station.

Setting the device name using the DIP switches

The last part of the device name can be set using DIP switches 1-8. The address range is between 1 and 254 (factory setting: serial number of the device)

Overview of the DIP switches

DIP switch	Bit	Description
1	128	
2	64	
3	32	
4	16	Configurable part of the device name
5	8	
6	4	
7	2	
8	1	

Example: setting the device name EH-PROMAG500-065
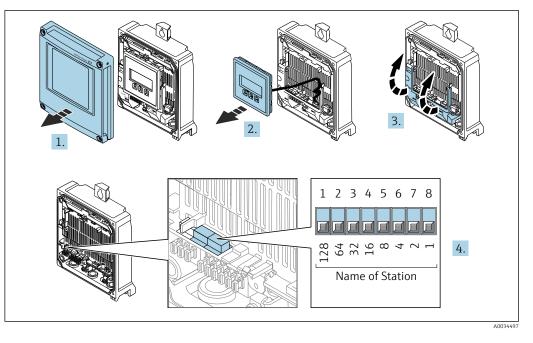
DIP switch	ON/OFF	Bit	Device name
1	OFF	–	
2	ON	64	
3...7	OFF	–	
8	ON	1	
Serial number of the device:		065	EH-PROMAG500-065

Setting the device name: Proline 500 - digital

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

The default IP address may **not** be activated → 🔖 76.
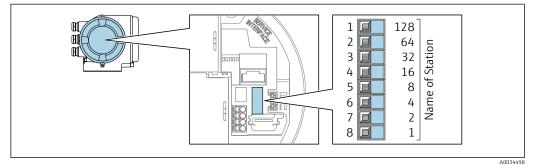
1. Loosen the 4 securing screws on the housing cover.

2. Open the housing cover.

3. Fold open the terminal cover.

4. Set the desired device name using the corresponding DIP switches on the I/O electronics module.

5. Reassemble the transmitter in the reverse order.

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

Setting the device name: Proline 500

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

The default IP address may **not** be activated → 🖺 76.

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

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

3. Set the desired device name using the corresponding DIP switches on the I/O electronics module.

4. Reassemble the transmitter in the reverse order.

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

Setting the device name via the automation system

DIP switches 1-8 must all be set to **OFF** (factory setting) or all be set to **ON** to be able to set the device name via the automation system.

The complete device name (name of station) can be changed individually via the automation system.
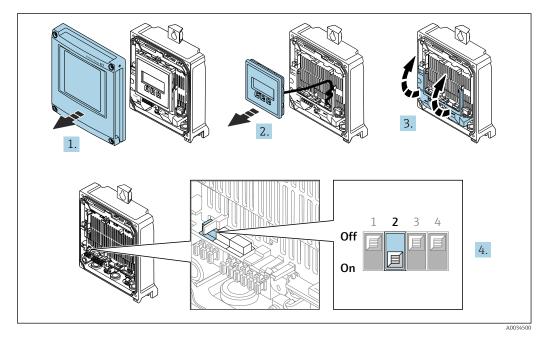
🛈 • The serial number used as part of the device name in the factory setting is not saved. It is not possible to reset the device name to the factory setting with the serial number. The device name is empty following the reset.
   • When assigning the device name via the automation system: assign the device name in lower case letters.

7.7.2 Activating the default IP address

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

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

A0034500

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

2. Open the housing cover.
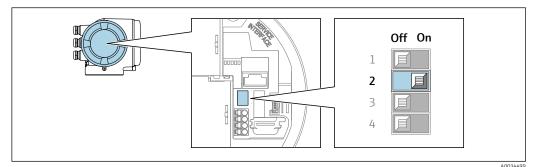
3. Fold open the terminal cover.

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

5. Reassemble the transmitter in the reverse order.

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

Activating the default IP address by DIP switch: Proline 500

Risk of electric shock when opening the transmitter housing.
▸ Before opening the transmitter housing:

▶ Disconnect the device from the power supply.

A0034499

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

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

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

4. Reassemble the transmitter in the reverse order.

5. Reconnect the device to the power supply.
    ↳ The default IP address is used once the device is restarted.
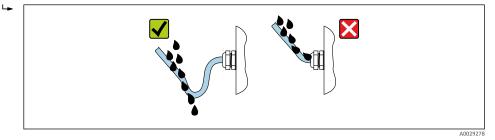
7.8   Ensuring the degree of protection

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

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

1. Check that the housing seals are clean and fitted correctly.

2. Dry, clean or replace the seals if necessary.

3. Tighten all housing screws and screw covers.

4. Firmly tighten the cable glands.

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

A0029278

6. The cable glands supplied do not provide any housing protection if they are not used. Therefore, they must be replaced by dummy plugs that match the housing protection.
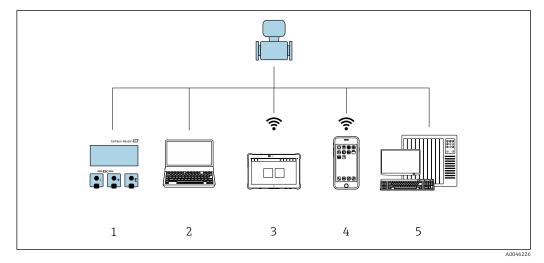
7.9   Post-connection check

Are cables or the device undamaged (visual inspection)?	☐
Is the protective earthing established correctly?	
Do the cables used comply with the requirements ?	☐

Do the mounted cables have adequate strain relief?	❑
Are all cable glands installed, securely tightened and leak-tight? Cable run with "water trap" → 🕮 77?	❑
Is the terminal assignment correct ?	❑
Is the potential equalization established correctly ?	❑
Are dummy plugs inserted in unused cable entries and have transportation plugs been replaced with dummy plugs?	

8   Operation options

8.1   Overview of operation options

A0046226
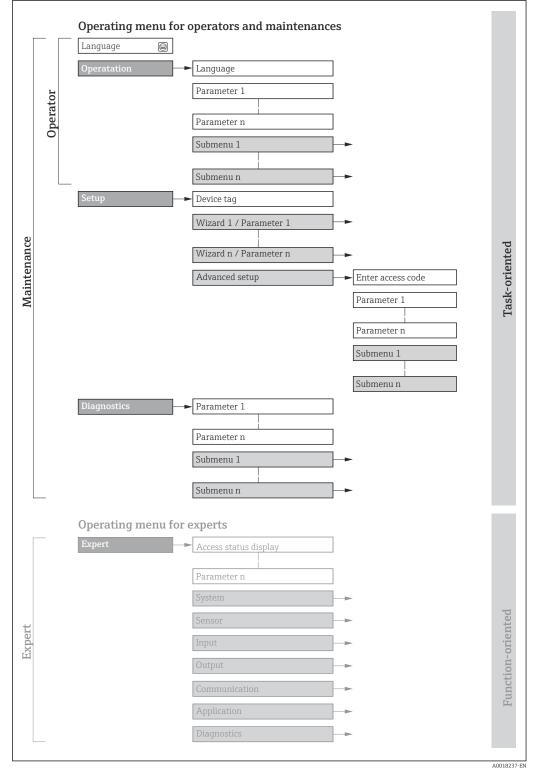
1   Local operation via display module
2   Computer with web browser (e.g. Internet Explorer) or with operating tool (e.g. FieldCare, SIMATIC PDM)
3   Field Xpert SMT70
4   Mobile handheld terminal
5   Control system (e.g. PLC)

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: see the "Description of Device
Parameters" document supplied with the device → 🖹 255

■ 26   Schematic structure of the operating menu
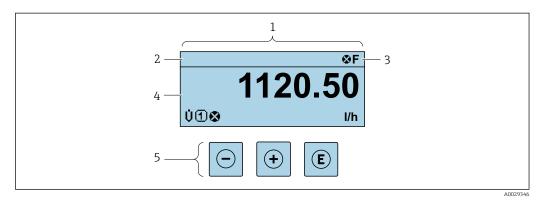
8.2.2 Operating philosophy

The individual parts of the operating menu are assigned to certain user roles (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: • Configuration of the operational display • Reading measured values	• Defining the operating language • Defining the Web server operating language • Resetting and controlling totalizers
Operation			• Configuring the operational display (e.g. display format, display contrast) • Resetting and controlling totalizers
Setup		**"Maintenance" role** Commissioning: • Configuration of the measurement • Configuration of the inputs and outputs • Configuration of the communication interface	Wizards for quick commissioning: • Configuration of the system units • Display the I/O configuration • Configuration of the inputs • Configuration of the outputs • Configuration of the operational display • Configuration of the low flow cut off • Configuration of empty pipe detection Advanced setup • For more customized configuration of the measurement (adaptation to special measuring conditions) • Configuration of totalizers • Configuration of electrode cleaning (optional) • Configuration of WLAN settings • Administration (define access code, reset measuring device)
Diagnostics		**"Maintenance" role** Troubleshooting: • Diagnostics and elimination of process and device errors • Measured value simulation	Contains all parameters for error detection and analyzing process and device errors: • Diagnostic list Contains up to 5 currently pending diagnostic messages. • Event logbook Contains event messages that have occurred. • Device information Contains information for identifying the device. • Measured values Contains all current measured values. • **Data logging** submenu with the "Extended HistoROM" order option Storage and visualization of measured values • Heartbeat 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: • 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: • System Contains all higher-level device parameters that do not pertain either to the measurement or to measured value communication. • Sensor Configuration of the measurement. • Input Configuration of the status input. • Output Configuration of the analog current outputs as well as the pulse/frequency and switch output. • Communication Configuration of the digital communication interface and the Web server. • Application Configuration of the functions that go beyond the actual measurement (e.g. totalizer). • Diagnostics Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology.

8.3 Access to the operating menu via the local display

8.3.1 Operational display

1 Operational display
2 Tag name
3 Status area
4 Display area for measured values (4-line)
5 Operating elements → 🖻 88

Status area

The following symbols appear in the status area of the operational display at the top right:
- Status signals→ 🖻 180
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
  - **M**: Maintenance required
- Diagnostic behavior→ 🖻 181
  - ☒: Alarm
  - ⚠: Warning
- 🔒: Locking (the device is locked via the hardware)
- ↔: Communication (communication via remote operation is active)

Display area

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

Measured variables

Symbol	Meaning
G	Conductivity
ṁ	Mass flow
Σ	Totalizer ℹ The measurement channel number indicates which of the three totalizers is displayed.
⟶)	Status input

Measurement channel numbers

Symbol	Meaning
[1] ... [4]	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).	
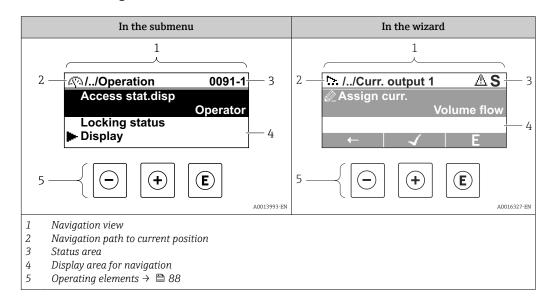
Diagnostic behavior

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable. For information on the symbols → 🖺 181
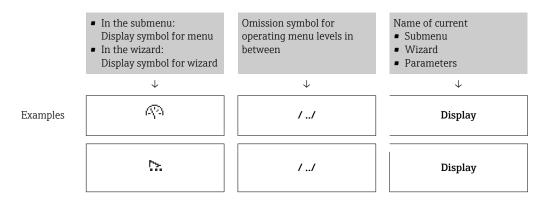
The number and display format of the measured values can be configured via the **Format display** parameter (→ 🖺 149).

8.3.2   Navigation view

In the submenu	In the wizard

1 Navigation view
2 Navigation path to current position
3 Status area
4 Display area for navigation
5 Operating elements → 🖺 88

Navigation path

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

• 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 • Submenu • Wizard • Parameters
↓	↓	↓
Examples	/ ../	Display
	/ ../	Display

For more information about the icons in the menu, refer to the "Display area" section → 🖺 85

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 → 🖺 180
• For information on the function and entry of the direct access code → 🖺 90

Display area

Menus

Symbol	Meaning
	Operation Appears: • In the menu next to the "Operation" selection • At the left in the navigation path in the **Operation** menu
	Setup Appears: • In the menu next to the "Setup" selection • At the left in the navigation path in the **Setup** menu
	Diagnostics Appears: • In the menu next to the "Diagnostics" selection • At the left in the navigation path in the **Diagnostics** menu
	Expert Appears: • 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
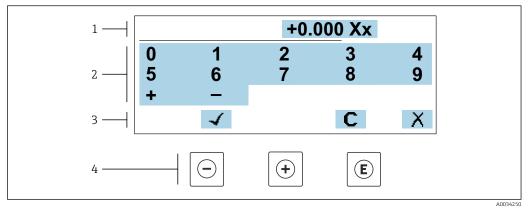
Symbol	Meaning
	Parameter locked When displayed in front of a parameter name, indicates that the parameter is locked. • By a user-specific access code • By the hardware write protection switch

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
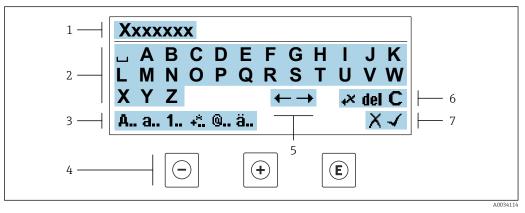
Numeric editor

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

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

Text editor

⊠ 28   For entering text in parameters (e.g. tag name)

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

Using the operating elements in the editing view

Key	Meaning
⊟	**Minus key** Move the entry position to the left.
⊕	**Plus key** Move the entry position to the right.

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

Input screens

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

Controlling data entries

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

8.3.4 Operating elements

Key	Meaning
$\ominus$	**Minus key** *In menu, submenu* Moves the selection bar upwards in a picklist. *With a wizard* Confirms the parameter value and goes to the previous parameter. *For text and numeric editor* Move the entry position to the left.
$\oplus$	**Plus key** *In menu, submenu* Moves the selection bar downwards in a picklist. *With a wizard* Confirms the parameter value and goes to the next parameter. *For text and numeric editor* Move the entry position to the right.

$\mathbb{E}$	**Enter key**
	
	 For operational display
	 Pressing the key briefly opens the operating menu.
	
	 In menu, submenu
	 • Pressing the key briefly:
	   • Opens the selected menu, submenu or parameter.
	   • Starts the wizard.
	   • If help text is open, closes the help text of the parameter.
	 • Pressing the key for 2 s in a parameter:
	   If present, opens the help text for the function of the parameter.
	
	 With a wizard
	 Opens the editing view of the parameter.
	
	 For text and numeric editor
	 • Pressing the key briefly confirms the selection.
	 • Pressing the key for 2 s confirms your entry.

$\ominus$ + $\oplus$	**Escape key combination (press keys simultaneously)**
	
	 In menu, submenu
	 • Pressing the key briefly:
	   • Exits the current menu level and takes you to the next level up.
	   • 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").
	
	 With a wizard
	 Exits the wizard and takes you to the next level up.
	
	 For text and numeric editor
	 Closes the editing view without applying changes.

$\ominus$ + $\mathbb{E}$	**Minus/Enter key combination (press and hold down the keys simultaneously)**
	
	 • If the keypad lock is enabled:
	   Pressing the key for 3 s disables the keypad lock.
	 • If the keypad lock is not enabled:
	   Pressing the key for 3 s opens the context menu including the selection for activating the keypad lock.

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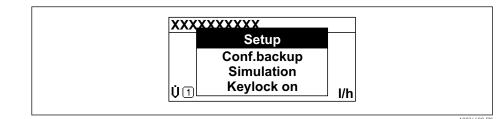
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Data backup
- Simulation

Calling up and closing the context menu

The user is in the operational display.

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

```
┌─────────────────────────────────────────────────┐
│        ┌──────────────────────────┐              │
│        │ XXXXXXXXX                 │              │
│        │ ▐ Setup          ▌        │              │
│        │   Conf.backup            │              │
│        │   Simulation             │              │
│        │   Keylock on   ┌─────┐   │              │
│        │  Ů①            │ l/h │   │              │
│        └────────────────┴─────┘              │
└─────────────────────────────────────────────────┘
```
                                                              A0034608-EN

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

Calling up the menu via the context menu

1. Open the context menu.

2. Press ⊞ to navigate to the desired menu.

3. Press 𝔼 to confirm the selection.
   ↳ The selected menu opens.
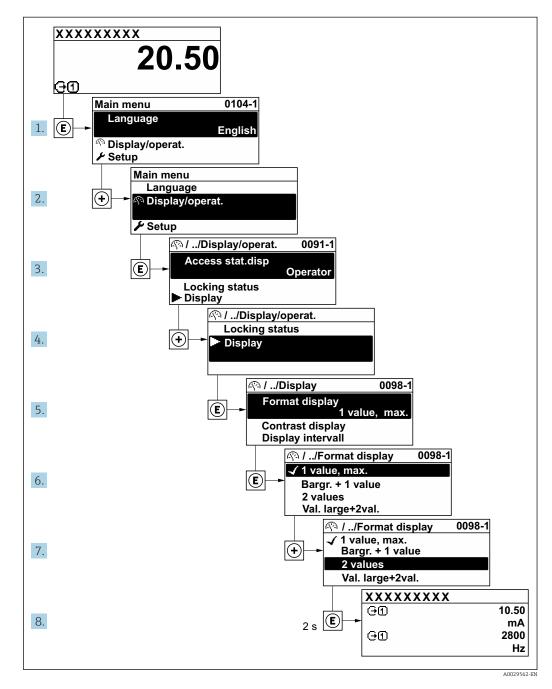
8.3.6 Navigating and selecting from list

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

For an explanation of the navigation view with symbols and operating elements → 🖹 84

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

A0029562-EN
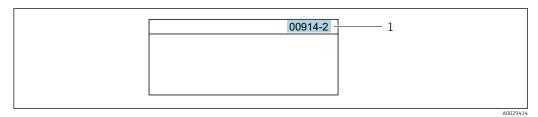
8.3.7 Calling the parameter directly

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

Navigation path
Expert → Direct access

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

1   Direct access code

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

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

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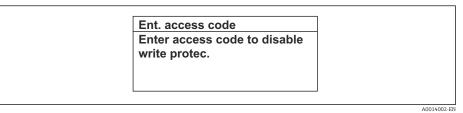
Help text is available for some parameters and can be called up from the navigation view. The help text provides a brief explanation of the parameter function and thereby supports swift and safe commissioning.

Calling up and closing the help text

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

1. Press 🗉 for 2 s.
   ↳ The help text for the selected parameter opens.

29   *Example: Help text for parameter "Enter access code"*

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

8.3.9   Changing the parameters

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

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

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

A0014049-EN

ℹ️ For a description of the editing view - consisting of the text editor and numeric editor - with symbols → 🖹 86, for a description of the operating elements → 🖹 88

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 → 🖹 160.

Defining access authorization for user roles

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

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

Access authorization to parameters: "Maintenance" user role

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

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

Access authorization to parameters: "Operator" user role

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

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

ℹ️ 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 → 🖹 160.

Parameter write protection via local operation can be disabled by entering the user-specific access code in the **Enter access code** parameter (→ 🖹 146) via the respective access option.

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

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

8.3.12 Enabling and disabling the keypad lock

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

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

Switching on the keypad lock

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

To activate the keylock manually:

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

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

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

Switching off the keypad lock

▶ The keypad lock is switched on.
    Press the □ and Ⓔ keys for 3 seconds.
    ↳ The keypad lock is switched off.

8.4   Access to operating menu via Web browser

8.4.1   PROFINET with Ethernet-APL

Device use	**Device connection to an APL field switch** The device may only be operated according to the following APL port classifications: • If used in hazardous areas: SLAA or SLAC [1] • If used in non-hazardous areas: SLAX • Connection values of APL field switch (for example corresponds to APL port classification SPCC or SPAA): • Maximum input voltage: 15 V_{DC} • Minimum output values: 0.54 W **Device connection to an SPE switch** If used in non-hazardous areas: suitable SPE switch SPE switch prerequisite: • Support of 10BASE-T1L standard • Support of PoDL power class 10, 11 or 12 • Detection of SPE field devices without integrated PoDL module Connection values of SPE switch: • Maximum input voltage: 30 V_{DC} • Minimum output values: 1.85 W
PROFINET	According to IEC 61158 and IEC 61784
Ethernet-APL	According to IEEE 802.3cg, APL port profile specification v1.0, galvanically isolated
Data transfer	10 Mbit/s
Current consumption	**Transmitter** Max. 55.56 mA
Permitted supply voltage	• Ex: 9 to 15 V • Non-Ex: 9 to 32 V
Network connection	With integrated reverse polarity protection

1)   For more information on using the device in the hazardous area, see the Ex-specific Safety Instructions

8.4.2   Prerequisites

Computer hardware

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

1)   Recommended cable: CAT5e, CAT6 or CAT7, with shielded connector (e.g. brand YAMAICHI ; Part No Y-ConProfixPlug63 / Prod. ID: 82-006660)

Computer software

Software	Interface	
	CDI-RJ45	**WLAN**

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

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

Computer settings

Settings	Interface	
	CDI-RJ45	**WLAN**
User rights	Appropriate user rights (e.g. administrator rights) for TCP/IP and proxy server settings are necessary (for adjusting the IP address, subnet mask etc.).	
Proxy server settings of the web browser	The web browser setting *Use proxy server for LAN* must be **disabled** .	
JavaScript	JavaScript must be enabled. ⓘ If JavaScript cannot be enabled: Enter http://192.168.1.212/servlet/basic.html in the address bar of the web browser. A fully functional but simplified version of the operating menu structure starts in the web browser. ⓘ When installing a new firmware version: To enable correct data display, clear the temporary memory (cache) under **Internet options** in the web browser.	
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: → 🗎 175

Measuring device: Via CDI-RJ45 service interface

Device	CDI-RJ45 service interface
Measuring device	The measuring device has an RJ45 interface.
Web server	Web server must be enabled; factory setting: ON ⓘ For information on enabling the Web server → 🗎 100

Measuring device: via WLAN interface

Device	WLAN interface
Measuring device	The measuring device has a WLAN antenna: • Transmitter with integrated WLAN antenna • Transmitter with external WLAN antenna
Web server	Web server and WLAN must be enabled; factory setting: ON ⓘ For information on enabling the Web server → 🗎 100

8.4.3 Establishing a connection

Via service interface (CDI-RJ45)

Preparing the measuring device

Proline 500 – digital

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

2. Open the housing cover.

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

Proline 500

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

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

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

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)

The IP address can be assigned to the measuring device in a variety of ways:
- Software addressing:
  The IP address is entered via the **IP address** parameter (→ 🖺 122) .
- DIP switch for "Default IP address":
  To establish the network connection via the service interface (CDI-RJ45): the fixed IP address 192.168.1.212 is used .

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

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

2. Switch on the measuring device.

3. Connect the computer to the RJ45 plug via the standard Ethernet cable → 🖺 102.

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

5. Close any open Internet browsers.

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

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

Via WLAN interface

Configuring the Internet protocol of the mobile terminal

> **NOTICE**

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

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

> **NOTICE**

Note the following to avoid a network conflict:

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

Preparing the mobile terminal

▶ Enable WLAN on the mobile terminal.

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

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

2. If necessary, select the WPA2 encryption method.

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

🔢 The serial number can be found on the nameplate.

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

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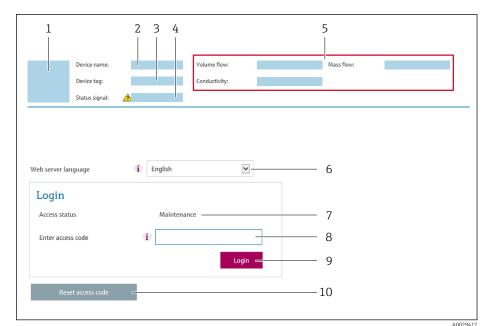
▶ After configuring the device:
   Terminate the WLAN connection between the mobile terminal and measuring device.

Starting the Web browser

1. Start the Web browser on the computer.

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

   ↳ The login page appears.

A0029417

1   Picture of device
2   Device name
3   Device tag
4   Status signal
5   Current measured values
6   Operating language
7   User role
8   Access code
9   Login
10   Reset access code (→ 🖹 157)

If a login page does not appear, or if the page is incomplete → 🖹 175

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

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

8.4.5 User interface

1 Function row
2 Local display language
3 Navigation area

Header

The following information appears in the header:
- Device name
- Device tag
- Device status with status signal → ☐ 183
- Current measured values

Function row

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

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

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

Navigation area

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

Working area

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

8.4.6 Disabling the Web server

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

Navigation
"Expert" menu → Communication → Web server

Parameter overview with brief description

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

Function scope of the "Web server functionality" parameter

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

Enabling the Web server

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

8.4.7 Logging out

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

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

2. Close the Web browser.

3. If no longer needed:
   Reset the modified properties of the Internet protocol (TCP/IP) → 🖹 96.
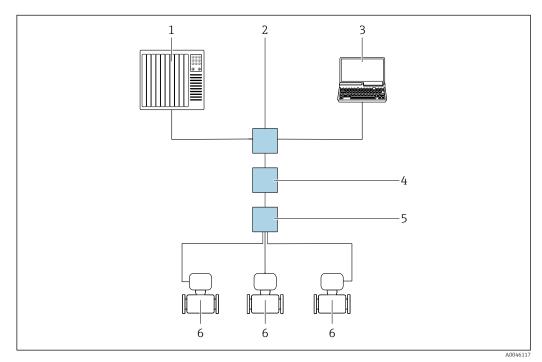
If communication with the web server was established via the default IP address 192.168.1.212, DIP switch no. 10 must be reset (from **ON** → **OFF**). Afterwards, the IP address of the device is active again for network communication.

8.5 Access to the operating menu via the operating tool

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

8.5.1 Connecting the operating tool

Via APL network

🖾 *30   Options for remote operation via APL network*

1   Automation system, e.g. Simatic S7 (Siemens)
2   Ethernet switch, e.g. Scalance X204 (Siemens)
3   Computer with Web browser (e.g. Internet Explorer) for access to integrated Web server or computer with
*   operating tool (e.g. FieldCare, DeviceCare with PROFINET COM DTM or SIMATIC PDM with FDI-Package)*
4   APL power switch (optional)
5   APL field switch
6   Measuring device

Service interface

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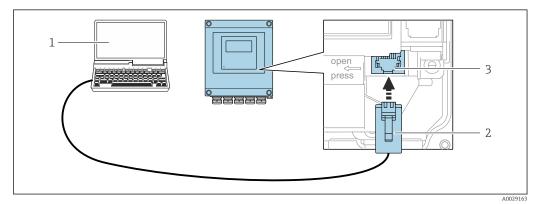
A point-to-point connection can be established via onsite device configuration. With the housing open, the connection is established directly via the service interface (CDI-RJ45) of the device.

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

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

Proline 500 – digital transmitter
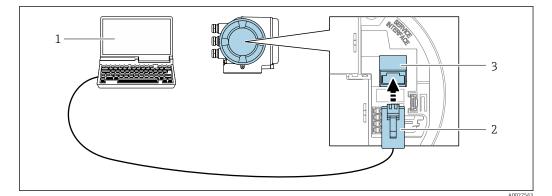
🖾 *31   Connection via service interface (CDI-RJ45)*

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

Proline 500 transmitter
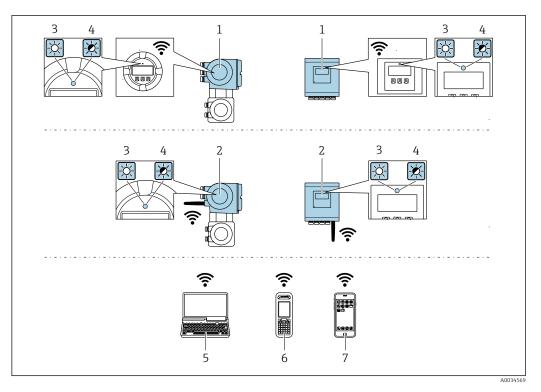
🖾 *32   Connection via service interface (CDI-RJ45)*

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

Via WLAN interface

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

A0034569

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

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

Configuring the Internet protocol of the mobile terminal

NOTICE

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

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

NOTICE

Note the following to avoid a network conflict:

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

Preparing the mobile terminal

▶ Enable WLAN on the mobile terminal.

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

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

2. If necessary, select the WPA2 encryption method.

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

ℹ The serial number can be found on the nameplate.

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

Terminating the WLAN connection

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

8.5.2   FieldCare

Function scope

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

Access is via:
- CDI-RJ45 service interface → 🖩 102
- WLAN interface → 🖩 102

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 → 🖩 107

Establishing a connection

1. Start FieldCare and launch the project.

2. In the network: Add a device.
   ↳ The **Add device** window opens.
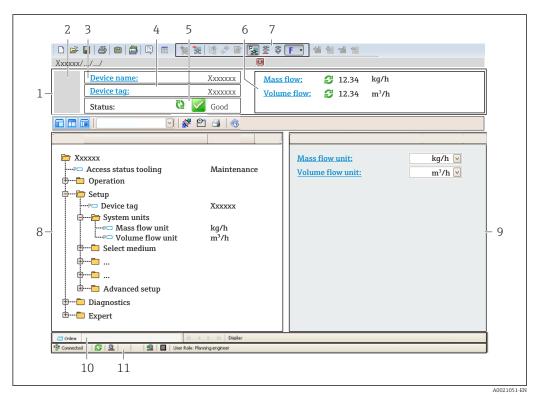
3. Select the **CDI Communication TCP/IP** option from the list and press **OK** to confirm.

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

A0021051-EN

1 Header
2 Picture of device
3 Device name
4 Tag name
5 Status area with status signal → 🖺 183
6 Display area for current measured values
7 Edit toolbar with additional functions such as save/load, event list and create documentation
8 Navigation area with operating menu structure
9 Working area
10 Range of action
11 Status area

8.5.3   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 → 🔖 107

8.5.4   SIMATIC PDM

Function scope

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

Source for device description files

See information → 🔖 107

9 System integration

9.1 Overview of device description files

9.1.1 Current version data for the device

Firmware version	01.00.zz	• On the title page of the Operating Instructions • On the transmitter nameplate • Firmware version Diagnostics → Device information → Firmware version
Manufacturer	17	Manufacturer Expert → Communication → Physical block → Manufacturer
Device ID	0xA43C	–
Device type ID	Promag 500	Device type Expert → Communication → Physical block → Device type
Device revision	1	–
PROFINET with Ethernet-APL version	2.43	Version of the PROFINET specification

For an overview of the various firmware versions for the device → 🖹 211

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.

FieldCare	• www.endress.com → Download Area • USB stick (contact Endress+Hauser) • DVD (contact Endress+Hauser)
DeviceCare	• www.endress.com → Download Area • CD–ROM (contact Endress+Hauser) • DVD (contact Endress+Hauser)
SIMATIC PDM (Siemens)	www.endress.com → Download Area

9.2 Device master file (GSD)

In order to integrate field devices into a bus system, PROFINET needs a description of the device parameters, such as output data, input data, data format and data volume.

These data are available in the device master file (GSD) which is provided to the automation system when the communication system is commissioned. In addition device bit maps, which appear as icons in the network structure, can also be integrated.

The device master file (GSD) is in XML format, and the file is created in the GSDML description markup language.

With the PA Profile 4.02 device master file (GSD) it is possible to exchange field devices made by different manufacturers without having to reconfigure.

The use of two different device master files (GSDs) is possible: the manufacturer-specific GSD and the PA-Profile GSD.

9.2.1 File name of the manufacturer-specific device master file (GSD)

Example of the name of a device master file:

GSDML-V2.43-EH-PROMAG_300_500_APL_yyyymmdd.xml

GSDML	Description language
V2.43	Version of the PROFINET specification
EH	Endress+Hauser
PROMAG	Instrument family
300_500_APL	Transmitter
yyyymmdd	Date of issue (yyyy: year, mm: month, dd: day)
.xml	File name extension (XML file)

9.2.2 File name of the PA Profile device master file (GSD)

Example of the name of a PA Profile device master file:

GSDML-V2.43-PA_Profile_V4.02-B332-FLOW_EL_MAGNETIC-yyyymmdd.xml

GSDML	Description language
V2.43	Version of the PROFINET specification
PA_Profile_V4.02	Version of the PA Profile specification
B332	PA Profile device identification
FLOW	Product family
EL_MAGNETIC	Flow measuring principle
yyyymmdd	Date of issue (yyyy: year, mm: month, dd: day)
.xml	File name extension (XML file)

API	Supported modules	Slot	Input and output variables
0x9700	Analog input	1	Volume flow
	Totalizer	2	Totalizer value: volume/volume Totalizer control

Source for device master files (GSD):

Manufacturer-specific GSD:	www.endress.com → Download Area
PA Profile GSD:	https://www.profibus.com/products/gsd-files/gsd-library-profile-for-process-control-devices-version-40 → Download Area

9.3   Cyclic data transmission

9.3.1   Overview of the modules

The following graphic shows which modules are available to the device for cyclic data transfer. Cyclic data transfer is performed with an automation system.

	Measuring device			Direction	Control
API	Modules	Slot	Sub-slot	Data flow	system
0x9700	Analog Input 1 (Volume flow)	1	1	→	PROFINET
	Analog Input 2	20	1	→	
	Analog Input 3	21	1	→	
	Analog Input 4	22	1	→	
	Analog Input 5	23	1	→	
	Analog Input 6	24	1	→	
	Analog Input 7	25	1	→	
	Analog Input 8	26	1	→	
	Totalizer 1 (Volume)	2	1	→ ←	
	Totalizer 2	70	1	→ ←	
	Totalizer 3	71	1	→ ←	
	Binary Input 1 (Heartbeat)	80	1	→	
	Binary Input 2	81	1	→	
	Analog Output 1 (Temperature)	160	1	←	
	Analog Output 2 (Density)	161	1	←	
	Binary Input 1 (Heartbeat)	210	1	←	
	Binary Output 2	211	1	←	

9.3.2   Description of the modules

The data structure is described from the perspective of the automation system:
- Input data: Are sent from the measuring device to the automation system.
- Output data: Are sent from the automation system to the measuring device.

Analog Input module

Transmit input variables from the measuring device to the automation system.

Analog Input modules cyclically transmit the selected input variables, including the status, from the measuring device to the automation system. The input variable is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

Selection: input variable

Slot	Sub-slot	Input variables
1	1	Volume flow
20 to 26	1	• Volume flow • Mass flow • Corrected volume flow • Flow velocity • Temperature • Electronics temperature • Buildup index • Current input 1 • Current input 2 • Current input 3 **Additional input variables with the Heartbeat Verification application package** • Noise • Coil current rise time • Reference electrode potential against PE • HBSI **Additional input variables with the Conductivity application package** • Conductivity • Corrected conductivity

Data structure

Output data of Analog Output

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measured value: floating point number (IEEE 754)				Status [1]

1) Status coding → 🖫 115

Binary Input module

Transmit binary input variables from the measuring device to the automation system.

Binary input variables are used by the measuring device to transmit the state of device functions to the automation system.

Binary Input modules cyclically transmit discrete input variables, including the status, from the measuring device to the automation system. The discrete input variable is depicted in the first byte. The second byte contains standardized status information pertaining to the input variable.

Selection: Device function Binary Input Slot 80

Slot	Sub-slot	Bit	Device function	Status (meaning)
80	1	0	Verification has not been performed.	• 0 (device function not active) • 1 (device function active)
		1	Verification has failed.	
		2	Currently performing verification.	
		3	Verification completed.	
		4	Verification has failed.	
		5	Verification performed successfully.	
		6	Verification has not been performed.	
		7	Reserved	

Selection: Device function Binary Input Slot 81

Slot	Sub-slot	Bit	Device function	Status (meaning)
81	1	0	Partially empty pipe detection	• 0 (device function not active) • 1 (device function active)
		1	Low flow cut off	
		2	Reserved	
		3	Reserved	
		4	Reserved	
		5	Reserved	
		6	Reserved	
		7	Reserved	

Data structure

Input data of Binary Input

Byte 1	Byte 2
Binary Input	Status [1]

1)   Status coding → 🗐 115

Volume module

Transmit the volume counter value from the measuring device to the automation system.

The Volume module cyclically transmits the volume, including the status, from the measuring device to the automation system. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

Selection: input variable

Slot	Sub-slot	Input variables
2	1	Volume

Data structure

Volume input data

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measured value: floating point number (IEEE 754)				Status [1]

1)   Status coding → 🗐 115

Volume Totalizer Control module

Transmit the volume counter value from the measuring device to the automation system.

The Volume Totalizer Control module cyclically transmits the volume, including the status, from the measuring device to the automation system. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

Selection: input variable

Slot	Sub-slot	Input variables
2	1	Volume

Data structure

Volume Totalizer Control input data

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measured value: floating point number (IEEE 754)				Status [1]

1)   Status coding → 🖺 115

Selection: output variable

Transmit the control value from the automation system to the measuring device.

Slot	Sub-slot	Value	Input variable
2	1	1	Reset to "0"
		2	Preset value
		3	Stop
		4	Totalize

Data structure

Volume Totalizer Control output data

Byte 1
Control variable

Totalizer module

Transmit totalizer value from the measuring device to the automation system.

The Totalizer module cyclically transmits a selected totalizer value, including the status, from the measuring device to the automation system. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

Selection: input variable

Slot	Sub-slot	Input variable
70 to 71	1	• Mass flow • Volume flow • Corrected volume flow

Data structure

Totalizer input data

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measured value: floating point number (IEEE 754)				Status [1]

1)   Status coding → 🖺 115

Totalizer Control module

Transmit totalizer value from the measuring device to the automation system.

The Totalizer Control module cyclically transmits a selected totalizer value, including the status, from the measuring device to the automation system. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

Selection: input variable

Slot	Sub-slot	Input variable
70 to 71	1	• Mass flow • Volume flow • Corrected volume flow

Data structure

Totalizer Control input data

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measured value: floating point number (IEEE 754)				Status [1]

1) Status coding → 🖻 115

Selection: output variable

Transmit the control value from the automation system to the measuring device.

Slot	Sub-slot	Value	Input variable
70 to 71	1	1	Reset to "0"
		2	Preset value
		3	Stop
		4	Totalize

Data structure

Totalizer Control output data

Byte 1
Control variable

Analog Output module

Transmit a compensation value from the automation system to the measuring device.

Analog Output modules cyclically transmit compensation values, including the status and associated unit, from the automation system to the measuring device. The compensation value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the compensation value.

Assigned compensation values

The selection is made via: Expert → Sensor → External compensation

Slot	Sub-slot	Compensation value
160	1	Temperature
161		Density

Data structure

Output data of Analog Output

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measured value: floating point number (IEEE 754)				Status [1]

1)   Status coding → 🕮 115

Failsafe mode

A failsafe mode can be defined for using the compensation values.

If the status is GOOD or UNCERTAIN, the compensation values transmitted by the automation system are used. If the status is BAD, the failsafe mode is activated for the use of the compensation values.

Parameters are available per compensation value to define the failsafe mode: Expert → Sensor → External compensation

Fail safe type parameter

- Fail safe value option: The value defined in the Fail safe value parameter is used.
- Fallback value option: The last valid value is used.
- Off option: The failsafe mode is disabled.

Fail safe value parameter

Use this parameter to enter the compensation value which is used if the Fail safe value option is selected in the Fail safe type parameter.

Binary Output module

Transmit binary output values from the automation system to the measuring device.

Binary output values are used by the automation system to enable and disable device functions.

Binary output values cyclically transmit discrete output values, including the status, from the automation system to the measuring device. The discrete output values are transmitted in the first byte. The second byte contains standardised status information pertaining to the output value.

Selection: Device function Binary Output Slot 210

Slot	Sub-slot	Bit	Device function	Status (meaning)
210	1	0	Start verification.	A change of status from 0 to 1 starts Heartbeat Verification [1]
		1	Reserved	
		2	Reserved	
		3	Reserved	
		4	Reserved	
		5	Reserved	

Slot	Sub-slot	Bit	Device function	Status (meaning)
		6	Reserved	
		7	Reserved	

1) Only available with the Heartbeat application package

Selection: Device function Binary Output Slot 211

Slot	Sub-slot	Bit	Device function	Status (meaning)
211	1	0	Flow override	• 0 (disable device function) • 1 (enable device function)
		1	Zero adjust	
		2	Relay output	Relay output value: • 0 • 1
		3	Relay output	
		4	Relay output	
		5	Reserved	
		6	Reserved	
		7	Reserved	

Data structure

Binary Output input data

Byte 1	Byte 2
Binary Output	Status [1] [2]

1) Status coding → 🖺 115
2) If the status is BAD, the control variable is not adopted.

9.3.3 Status coding

Status	Coding (hex)	Meaning
BAD - Maintenance alarm	0x24 to 0x27	A measured value is not available because a device error has occurred.
BAD - Process related	0x28 to 0x2B	A measured value is not available because the process conditions are not within the device's technical specification limits.
BAD - Function check	0x3C to 0x03F	A function check is active (e.g. cleaning or calibration)
UNCERTAIN - Initial value	0x4F to 0x4F	A predefined value is output until a correct measured value is available again or corrective measures have been performed that change this status.
UNCERTAIN - Maintenance demanded	0x68 to 0x6B	Signs of wear and tear have been detected on the measuring device. Short-term maintenance is needed to ensure that the measuring device remains operational. The measured value might be invalid. The use of the measured value depends on the application.
UNCERTAIN - Process related	0x78 to 0x7B	The process conditions are not within the device's technical specification limits. This could have a negative impact on the quality and accuracy of the measured value. The use of the measured value depends on the application.
GOOD - OK	0x80 to 0x83	No error has been diagnosed.

Status	Coding (hex)	Meaning
GOOD - Maintenance required	0xA4 to 0xA7	The measured value is valid. The device will require servicing in the near future.
GOOD - Maintenance demanded	0xA8 to 0xAB	The measured value is valid. It is highly advisable to service the device in the near future.
GOOD - Function check	0xBC to 0XBF	The measured value is valid. The measuring device is performing an internal function check. The function check does not have any noticeable effect on the process.

9.3.4   Factory setting
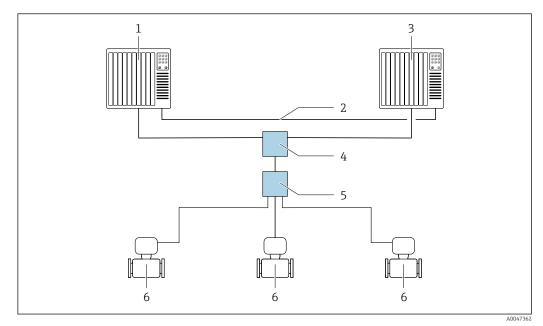
The slots are already assigned in the automation system for initial commissioning.

Assigned slots

Slot	Factory setting
1	Volume flow
2	Volume
20 to 26	–
70 to 71	–
80 to 81	–
160 to 161	–
210 to 211	–

9.4   System redundancy S2

A redundant layout with two automation systems is necessary for processes that are in continuous operation. If one system fails the second system guarantees continued, uninterrupted operation. The measuring device supports S2 system redundancy and can communicate with both automation systems simultaneously.

☒ 33   Example of the layout of a redundant system (S2): star topology

1   Automation system 1
2   Synchronization of automation systems
3   Automation system 2
4   Industrial Ethernet Managed Switch
5   APL field switch
6   Measuring device

All the devices in the network must support S2 system redundancy.

10   Commissioning

10.1   Post-installation and post-connection check

Before commissioning the device:

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

- "Post-installation check" checklist → 🖺 43
- "Post-connection check" checklist → 🖺 77

10.2   Switching on the measuring device

▶ After a successful post-installation and post-connection check, switch on the device.
   ↳ After a successful startup, the local display switches automatically from the startup display to the operational display.
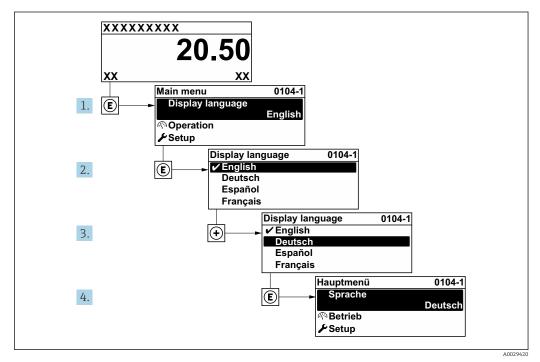
🛈 If the local display is blank or if a diagnostic message is displayed, refer to the section on "Diagnostics and troubleshooting" → 🖺 174.

10.3   Connecting via FieldCare

- For FieldCare → 🖺 102 connection
- For connecting via FieldCare → 🖺 105
- For the FieldCare → 🖺 105 user interface

10.4   Setting the operating language
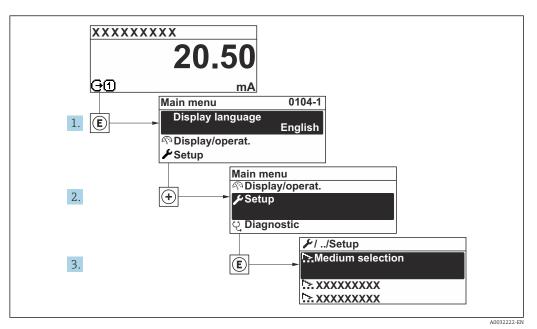
Factory setting: English or ordered local language

🖻 34   Taking the example of the local display

10.5   Configuring the measuring device

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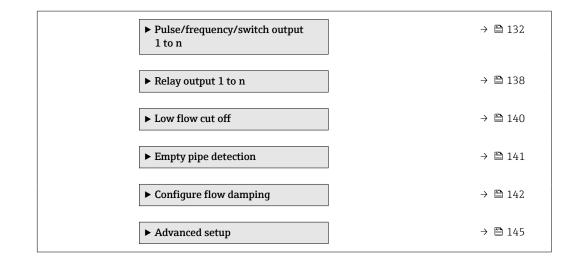
35   Taking the example of the local display

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

Navigation
"Setup" menu → PROFINET device name

🔧 **Setup**		
PROFINET device name	→	🖹 120
► Communication	→	🖹 120
► System units	→	🖹 122
► Analog inputs	→	🖹 125
► I/O configuration	→	🖹 126
► Current input 1 to n	→	🖹 126
► Status input 1 to n	→	🖹 128
► Current output 1 to n	→	🖹 128

▶ Pulse/frequency/switch output 1 to n	→ 🕮 132
▶ Relay output 1 to n	→ 🕮 138
▶ Low flow cut off	→ 🕮 140
▶ Empty pipe detection	→ 🕮 141
▶ Configure flow damping	→ 🕮 142
▶ Advanced setup	→ 🕮 145

10.5.1 Defining the tag name

A measuring point can be quickly identified within a plant on the basis of the tag name. The tag name is equivalent to the device name (name of station) of the PROFINET specification (data length: 255 bytes)

The device name can be changed via DIP switches or the automation system .

The device name currently used is displayed in the **Name of station** parameter.

Navigation
"Setup" menu → PROFINET device name

Parameter overview with brief description

Parameter	Description	User interface	Factory setting
PROFINET device name	Name of the measuring point.	Max. 32 characters such as letters and numbers.	EH-PROMAG500 serial number of the device

10.5.2 Displaying the communication interface

The **Communication** submenu shows all the current parameter settings for selecting and configuring the communication interface.

Navigation
"Setup" menu → Communication

▶ Communication	
▶ APL port	→ 🕮 121
▶ Service interface	→ 🕮 121
▶ Network diagnostics	→ 🕮 122

"APL port" submenu

Navigation
"Setup" menu → Communication → APL port

▶ APL port	
IP address (7263)	→ 🖺 121
Subnet mask (7265)	→ 🖺 121
Default gateway (7264)	→ 🖺 121
MAC address (7262)	→ 🖺 121

Parameter overview with brief description

Parameter	Description	User entry / User interface	Factory setting
IP address	Enter the IP address of the measuring device.	Character string comprising numbers, letters and special characters (15)	0.0.0.0
Default gateway	Enter IP address for the default gateway of the measuring device.	Character string comprising numbers, letters and special characters (15)	0.0.0.0
Subnet mask	Enter subnet mask of the measuring device.	Character string comprising numbers, letters and special characters (15)	255.255.255.0
MAC address	Shows the MAC address of the measuring device.	Character string comprising numbers, letters and special characters	

"Service interface" submenu

Navigation
"Setup" menu → Communication → Service interface

▶ Service interface	
IP address (7209)	→ 🖺 122
Subnet mask (7211)	→ 🖺 122
Default gateway (7210)	→ 🖺 122
MAC address (7214)	→ 🖺 122
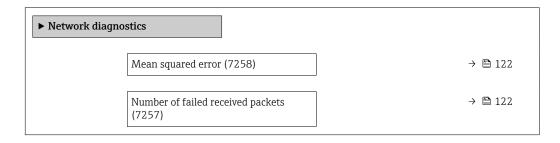
Parameter overview with brief description

Parameter	Description	User entry / User interface	Factory setting
IP address	Enter the IP address of the measuring device.	4 octet: 0 to 255 (in the particular octet)	192.168.1.212
Subnet mask	Displays the subnet mask.	4 octet: 0 to 255 (in the particular octet)	255.255.255.0
Default gateway	Displays the default gateway.	4 octet: 0 to 255 (in the particular octet)	0.0.0.0
MAC address	Displays the MAC address of the measuring device. ℹ️ MAC = Media Access Control	Unique 12-digit character string comprising letters and numbers, e.g.: 00:07:05:10:01:5F	Each measuring device is given an individual address.

"Network diagnostics" submenu

Navigation

"Setup" menu → Communication → Network diagnostics

▶ Network diagnostics		
	Mean squared error (7258)	→ 🖹 122
	Number of failed received packets (7257)	→ 🖹 122

Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Mean squared error	Provides an indication of the link signal quality.	Signed floating-point number	0 dB
Number of failed received packets	Shows the number of failed received packets.	0 to 65 535	0

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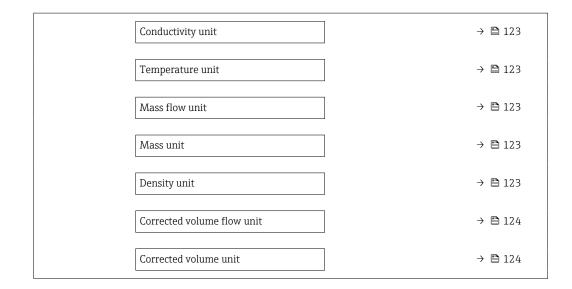
In the **System units** submenu the units of all the measured values can be set.

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

Navigation

"Setup" menu → System units

▶ System units		
	Volume flow unit	→ 🖹 123
	Volume unit	→ 🖹 123

Conductivity unit	→ 🖹 123
Temperature unit	→ 🖹 123
Mass flow unit	→ 🖹 123
Mass unit	→ 🖹 123
Density unit	→ 🖹 123
Corrected volume flow unit	→ 🖹 124
Corrected volume unit	→ 🖹 124

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Volume flow unit	–	Select volume flow unit. *Effect* The selected unit applies for: • Output • Low flow cut off • Simulation process variable	Unit choose list	Depends on country: • l/h • gal/min (us)
Volume unit	–	Select volume unit.	Unit choose list	Country-specific: • m³ • gal (us)
Conductivity unit	The **On** option is selected in the **Conductivity measurement** parameter parameter.	Select conductivity unit. *Effect* The selected unit applies for: Simulation process variable	Unit choose list	µS/cm
Temperature unit	–	Select temperature unit. *Effect* The selected unit applies for: • **Temperature** parameter • **Maximum value** parameter • **Minimum value** parameter • **External temperature** parameter • **Maximum value** parameter • **Minimum value** parameter	Unit choose list	Country-specific: • ℃ • ℉
Mass flow unit	–	Select mass flow unit. *Effect* The selected unit applies for: • Output • Low flow cut off • Simulation process variable	Unit choose list	Country-specific: • kg/h • lb/min
Mass unit	–	Select mass unit.	Unit choose list	Country-specific: • kg • lb
Density unit	–	Select density unit. *Effect* The selected unit applies for: • Output • Simulation process variable	Unit choose list	Country-specific: • kg/l • lb/ft³

Parameter	Prerequisite	Description	Selection	Factory setting
Corrected volume flow unit	–	Select corrected volume flow unit. *Result* The selected unit applies for: **Corrected volume flow** parameter (→ 🖺 165)	Unit choose list	Country-specific: • Nl/h • Sft³/h
Corrected volume unit	–	Select corrected volume unit.	Unit choose list	Country-specific: • Nm³ • Sft³

10.5.4 Configuration of the Analog Inputs

The **Analog inputs** submenu guides the user systematically to the individual **Analog input 1 to n** submenu. From here you get to the parameters of the individual analog input.

Navigation
"Setup" menu → Analog inputs

▸ Analog inputs	
▸ Volume flow	→ 🖺 125

"Analog inputs" submenu

Navigation
"Setup" menu → Analog inputs → Volume flow

▸ Volume flow	
Assign process variable (11074)	→ 🖺 125
Damping (11073)	→ 🖺 125

Parameter overview with brief description

Parameter	Description	User interface / User entry	Factory setting
Parent class		0 to 255	60
Assign process variable	Select a process variable.	• Mass flow • Volume flow • Temperature • Electronics temperature • Noise * • Coil current shot time * • Reference electrode potential against PE * • HBSI * • Build-up index ** • Current input 1 • Current input 2 • Current input 3 • Flow velocity • Conductivity * • Corrected conductivity * • Corrected volume flow	Volume flow
Damping	Enter time constant for input damping (PT1 element). Damping reduces the effect of fluctuations in the measured value on the output signal.	Positive floating-point number	1.0 s

*   Visibility depends on order options or device settings
**   The build-up index is only available in conjunction with Heartbeat Technology. If Heartbeat Technology was ordered together with the measuring device, the option will already be enabled, and no further action is required. If Heartbeat Technology was ordered at a later date, you must first activate the option under 'Activate SW option' by entering the activation key you received. To purchase Heartbeat Technology, contact your local sales and service center. In addition to Heartbeat Technology, conductivity measurement must be enabled on the device. To do this, go to the 'Conductivity measurement' parameter on the 'Process parameters' menu and select the 'On' option.
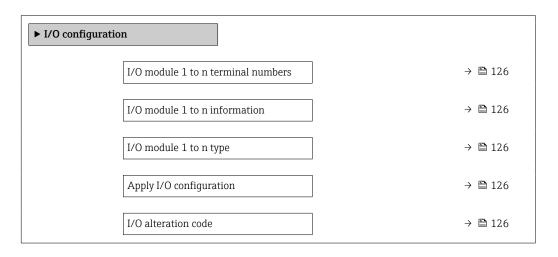
10.5.5 Displaying the I/O configuration

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

Navigation

"Setup" menu → I/O configuration

▶ I/O configuration		
I/O module 1 to n terminal numbers	→ 🖹	126
I/O module 1 to n information	→ 🖹	126
I/O module 1 to n type	→ 🖹	126
Apply I/O configuration	→ 🖹	126
I/O alteration code	→ 🖹	126

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.	• Not used • 26-27 (I/O 1) • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4)	–
I/O module 1 to n information	Shows information of the plugged I/O module.	• Not plugged • Invalid • Not configurable • Configurable • PROFINET	–
I/O module 1 to n type	Shows the I/O module type.	• Off • Current output * • Current input * • Status input * • Pulse/frequency/switch output * • Double pulse output * • Relay output *	Off
Apply I/O configuration	Apply parameterization of the freely configurable I/O module.	• No • Yes	No
I/O alteration code	Enter the code in order to change the I/O configuration.	Positive integer	0

*   Visibility depends on order options or device settings

10.5.6 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	→ 🖺 127
Signal mode	→ 🖺 127
0/4 mA value	→ 🖺 127
20 mA value	→ 🖺 127
Current span	→ 🖺 127
Failure mode	→ 🖺 127
Failure value	→ 🖺 127

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	–	Shows the terminal numbers used by the current input module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *	–
Signal mode	The measuring device is **not** approved for use in the hazardous area with type of protection Ex-i.	Select the signal mode for the current input.	• Passive • Active *	Active
0/4 mA value	–	Enter 4 mA value.	Signed floating-point number	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.	• 4...20 mA (4...20.5 mA) • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA) • 0...20 mA (0...20.5 mA)	Country-specific: • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA)
Failure mode	–	Define input behavior in alarm condition.	• 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

10.5.7 Configuring the status input

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

Navigation
"Setup" menu → Status input 1 to n

▶ Status input 1 to n	
Assign status input	→ 🖺 128
Terminal number	→ 🖺 128
Active level	→ 🖺 128
Terminal number	→ 🖺 128
Response time status input	→ 🖺 128
Terminal number	→ 🖺 128

Parameter overview with brief description

Parameter	Description	Selection / User interface / User entry	Factory setting
Assign status input	Select function for the status input.	• Off • Reset totalizer 1 • Reset totalizer 2 • Reset totalizer 3 • Reset all totalizers • Flow override • Zero adjustment	Off
Terminal number	Shows the terminal numbers used by the status input module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *	–
Active level	Define input signal level at which the assigned function is triggered.	• High • Low	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

10.5.8 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**	

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	–	Shows the terminal numbers used by the current output module.	• Not used • 26-27 (I/O 1) • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *	–
Signal mode	–	Select the signal mode for the current output.	• Active * • Passive *	Active

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Process variable current output	–	Select the process variable for the current output.	• Off • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity • Electronics temperature • Noise * • Coil current shot time * • Reference electrode potential against PE * • HBSI * • Build-up index * • Test point 1 • Test point 2 • Test point 3	Volume flow
Current range output	–	Select current range for process value output and upper/lower level for alarm signal.	• 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA) • 4...20 mA (4... 20.5 mA) • 0...20 mA (0... 20.5 mA) • Fixed value	Depends on country: • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA)
Lower range value output	One of the following options is selected in the **Current span** parameter (→ 🖺 130): • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA) • 4...20 mA (4... 20.5 mA) • 0...20 mA (0... 20.5 mA)	Enter lower range value for the measured value range.	Signed floating-point number	Depends on country: • 0 l/h • 0 gal/min (us)
Upper range value output	One of the following options is selected in the **Current span** parameter (→ 🖺 130): • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA) • 4...20 mA (4... 20.5 mA) • 0...20 mA (0... 20.5 mA)	Enter upper range value for the measured value range.	Signed floating-point number	Depends on country and nominal diameter
Fixed current	The **Fixed current** option is selected in the **Current span** parameter (→ 🖺 130).	Defines the fixed output current.	0 to 22.5 mA	22.5 mA
Damping current output	A process variable is selected in the **Assign current output** parameter (→ 🖺 130) and one of the following options is selected in the **Current span** parameter (→ 🖺 130): • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA) • 4...20 mA (4... 20.5 mA) • 0...20 mA (0... 20.5 mA)	Set reaction time for output signal to fluctuations in the measured value.	0.0 to 999.9 s	1.0 s

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Failure behavior current output	A process variable is selected in the **Assign current output** parameter (→ 🖹 130) and one of the following options is selected in the **Current span** parameter (→ 🖹 130): • 4…20 mA NE (3.8…20.5 mA) • 4…20 mA US (3.9…20.8 mA) • 4…20 mA (4… 20.5 mA) • 0…20 mA (0… 20.5 mA)	Define output behavior in alarm condition.	• Min. • Max. • Last valid value • Actual value • Fixed value	Max.
Failure current	The **Defined value** option is selected in the **Failure mode** parameter.	Enter current output value in alarm condition.	0 to 22.5 mA	22.5 mA

*   Visibility depends on order options or device settings

10.5.9 Configuring the pulse/frequency/switch output

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

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

▶ Pulse/frequency/switch output
1 to n

| Operating mode | → 🖺 132 |

Parameter overview with brief description

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

Configuring the pulse output

Navigation
"Setup" menu → Pulse/frequency/switch output

▶ Pulse/frequency/switch output
1 to n

Operating mode	→ 🖺 133
Terminal number	→ 🖺 133
Signal mode	→ 🖺 133
Assign pulse output	→ 🖺 133
Pulse scaling	→ 🖺 133
Pulse width	→ 🖺 133
Failure mode	→ 🖺 133
Invert output signal	→ 🖺 133

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	• Pulse • Frequency • Switch	Pulse
Terminal number	–	Shows the terminal numbers used by the PFS output module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *	–
Signal mode	–	Select the signal mode for the PFS output.	• Passive • Active * • Passive NE	Passive
Assign pulse output	The **Pulse** option is selected in the **Operating mode** parameter.	Select process variable for pulse output.	• Off • Volume flow • Mass flow • Corrected volume flow	Off
Pulse scaling	The **Pulse** option is selected in the **Operating mode** parameter (→ 🖺 132) and a process variable is selected in the **Assign pulse output** parameter (→ 🖺 133).	Enter quantity for measured value at which a pulse is output.	Positive floating point number	Depends on country and nominal diameter
Pulse width	The **Pulse** option is selected in the **Operating mode** parameter (→ 🖺 132) and a process variable is selected in the **Assign pulse output** parameter (→ 🖺 133).	Define time width of the output pulse.	0.05 to 2 000 ms	100 ms
Failure mode	The **Pulse** option is selected in the **Operating mode** parameter (→ 🖺 132) and a process variable is selected in the **Assign pulse output** parameter (→ 🖺 133).	Define output behavior in alarm condition.	• Actual value • No pulses	No pulses
Invert output signal	–	Invert the output signal.	• 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	→ 🖺 134
Terminal number	→ 🖺 134
Signal mode	→ 🖺 134

Assign frequency output		→ 🕮 134
Minimum frequency value		→ 🕮 135
Maximum frequency value		→ 🕮 135
Measuring value at minimum frequency		→ 🕮 135
Measuring value at maximum frequency		→ 🕮 135
Failure mode		→ 🕮 135
Failure frequency		→ 🕮 135
Invert output signal		→ 🕮 135

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	• Pulse • Frequency • Switch	Pulse
Terminal number	–	Shows the terminal numbers used by the PFS output module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3) • 20-21 (I/O 4) *	–
Signal mode	–	Select the signal mode for the PFS output.	• Passive • Active * • Passive NE	Passive
Assign frequency output	In the **Operating mode** parameter (→ 🕮 132), the **Frequency** option is selected.	Select process variable for frequency output.	• Off • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity * • Electronics temperature • Noise * • Coil current shot time * • Reference electrode potential against PE * • HBSI * • Build-up index * • Test point 1 • Test point 2 • Test point 3	Off

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Minimum frequency value	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖺 132) and a process variable is selected in the **Assign frequency output** parameter (→ 🖺 134).	Enter minimum frequency.	0.0 to 10 000.0 Hz	0.0 Hz
Maximum frequency value	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖺 132) and a process variable is selected in the **Assign frequency output** parameter (→ 🖺 134).	Enter maximum frequency.	0.0 to 10 000.0 Hz	10 000.0 Hz
Measuring value at minimum frequency	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖺 132) and a process variable is selected in the **Assign frequency output** parameter (→ 🖺 134).	Enter measured value for minimum frequency.	Signed floating-point number	Depends on country and nominal diameter
Measuring value at maximum frequency	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖺 132) and a process variable is selected in the **Assign frequency output** parameter (→ 🖺 134).	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖺 132) and a process variable is selected in the **Assign frequency output** parameter (→ 🖺 134).	Define output behavior in alarm condition.	• Actual value • Defined value • 0 Hz	0 Hz
Failure frequency	In the **Operating mode** parameter (→ 🖺 132), the **Frequency** option is selected, in the **Assign frequency output** parameter (→ 🖺 134) a process variable is selected, and in the **Failure mode** parameter, the **Defined value** option is selected.	Enter frequency output value in alarm condition.	0.0 to 12 500.0 Hz	0.0 Hz
Invert output signal	–	Invert the output signal.	• 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	→	🖹 136
Terminal number	→	🖹 136
Signal mode	→	🖹 136
Switch output function	→	🖹 137
Assign diagnostic behavior	→	🖹 137
Assign limit	→	🖹 137
Assign flow direction check	→	🖹 137
Assign status	→	🖹 137
Switch-on value	→	🖹 137
Switch-off value	→	🖹 137
Switch-on delay	→	🖹 137
Switch-off delay	→	🖹 138
Failure mode	→	🖹 138
Invert output signal	→	🖹 138

Parameter overview with brief description

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

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

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

*   Visibility depends on order options or device settings

10.5.10 Configuring the relay output

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

Navigation
"Setup" menu → Relay output 1 to n

▶ Relay output 1 to n	
Terminal number	→ 🖹 139
Relay output function	→ 🖹 139
Assign flow direction check	→ 🖹 139
Assign limit	→ 🖹 139
Assign diagnostic behavior	→ 🖹 139
Assign status	→ 🖹 139
Switch-off value	→ 🖹 139
Switch-off delay	→ 🖹 139
Switch-on value	→ 🖹 139
Switch-on delay	→ 🖹 139
Failure mode	→ 🖹 139

Parameter overview with brief description

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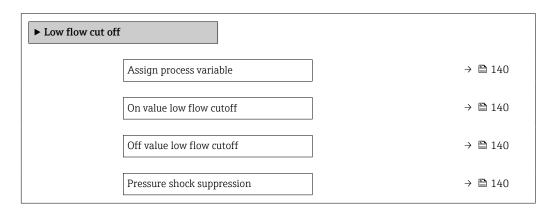
* Visibility depends on order options or device settings

10.5.11 Configuring the low flow cut off

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

Navigation

"Setup" menu → Low flow cut off

▶ Low flow cut off	
Assign process variable	→ 🕮 140
On value low flow cutoff	→ 🕮 140
Off value low flow cutoff	→ 🕮 140
Pressure shock suppression	→ 🕮 140

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for low flow cut off.	• Off • Volume flow • Mass flow • Corrected volume flow	Volume flow
On value low flow cutoff	A process variable is selected in the **Assign process variable** parameter (→ 🕮 140).	Enter on value for low flow cut off.	Positive floating-point number	Depends on country and nominal diameter
Off value low flow cutoff	A process variable is selected in the **Assign process variable** parameter (→ 🕮 140).	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	A process variable is selected in the **Assign process variable** parameter (→ 🕮 140).	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

10.5.12 Configuring empty pipe detection

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

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

Navigation

"Setup" menu → Empty pipe detection

▶ Empty pipe detection	
Empty pipe detection	→ 🗎 141
New adjustment	→ 🗎 141
Progress	→ 🗎 141
Switch point empty pipe detection	→ 🗎 141
Response time empty pipe detection	→ 🗎 141

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Empty pipe detection	–	Switch empty pipe detection on and off.	• Off • On	Off
New adjustment	The **On** option is selected in the **Empty pipe detection** parameter.	Select type of adjustment.	• Cancel • Empty pipe adjust • Full pipe adjust	Cancel
Progress	The **On** option is selected in the **Empty pipe detection** parameter.	Shows the progress.	• Ok • Busy • Not ok	–
Switch point empty pipe detection	The **On** option is selected in the **Empty pipe detection** parameter.	Enter the switch point in % of the difference between the two adjustment values. The lower the percentage, the earlier the pipe is detected as empty.	0 to 100 %	50 %
Response time empty pipe detection	A process variable is selected in the **Assign process variable** parameter (→ 🗎 141).	Use this function to enter the minimum time (hold time) the signal must be present before diagnostic message S962 "Empty pipe" is triggered in the event of a partially filled or empty measuring pipe.	0 to 100 s	1 s

10.5.13 Configuring flow damping

The **Configure flow damping** wizard guides the user systematically through the parameters, depending on the selected scenario:
- Configuration of damping for the application
  To configure flow damping for the specific requirements of the process application.
- Replace old device
  To adopt the flow damping for the new device in the event of a device replacement.
- Restoring factory settings
  To restore the factory settings of all the parameters that are relevant for flow damping.

Navigation
"Setup" menu → Configure flow damping

‣ Configure flow damping	
Scenario	→ 🖺 143
Old device	→ 🖺 143
CIP filter on	→ 🖺 143
Damping level	→ 🖺 143
Flow change rate	→ 🖺 143
Application	→ 🖺 143
Pulsating flow	→ 🖺 143
Flow peaks	→ 🖺 143
Damping level	→ 🖺 143
Filter options	→ 🖺 143
Median filter depth	→ 🖺 143
Flow damping	→ 🖺 143
Support ID	→ 🖺 143
Save settings	→ 🖺 143

Parameter overview with brief description

| Parameter	Description	Selection / User interface	Factory setting
Scenario	Select the applicable scenario.	• Replace old device • Configure damping for application • Restore factory settings	Configure damping for application
Old device	Select the measuring device to replace.	• Promag 10 (pre-2021) • Promag 50/53 • Promag 55 H	Promag 50/53
CIP filter on	Indicate whether the CIP filter was applied for the device to be replaced.	• No • Yes	No
Damping level	Select the degree of damping to apply.	• Default • Weak • Strong	Default
Flow change rate	Select the rate at which the flow changes.	• Once a day or less • Once an hour or less • Once a minute or less • Once a second or more	Once a minute or less
Application	Select the type of application that applies.	• Display flow • Control loop • Totalizing • Batching	Display flow
Pulsating flow	Indicate whether the process is characterized by pulsating flow (e.g. due to a displacement pump).	• No • Yes	No
Flow peaks	Select the frequency at which flow interference peaks occur.	• Never • Sporadically • Regularly • Continuously	Never
Response Time		• Fast • Slow • Normal	Normal
Filter options	Shows the type of flow filter recommended for damping.	• Adaptive • Adaptive CIP on • Dynamic • Dynamic CIP on • Binomial • Binomial CIP on	Binomial
Median filter depth	Shows median filter depth recommended for damping.	0 to 255	6
Flow damping	Shows the flow filter depth recommended for damping.	0 to 15	7
Support ID	If the recommended settings are not satisfactory: please contact your Endress+Hauser service organization with the support ID displayed.	0 to 65535	0
Save settings	Indicate whether to save the recommended settings.	• Cancel • Save *	Cancel
Filter Wizard result:		• Completed • Aborted	Aborted
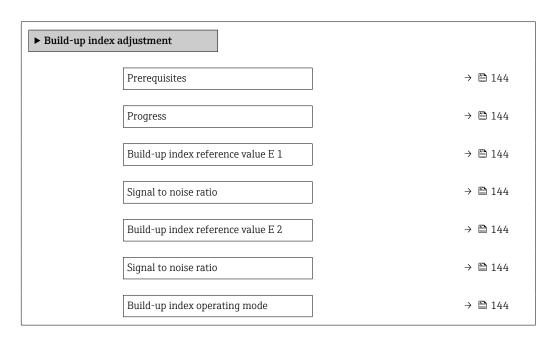
*   Visibility depends on order options or device settings

10.5.14 "Build-up index adjustment" wizard

The **Build-up index adjustment** wizard guides the user systematically through all the parameters that have to be set for the configuration of build-up detection.

Navigation

"Expert" menu → Sensor → Build-up index adjustment

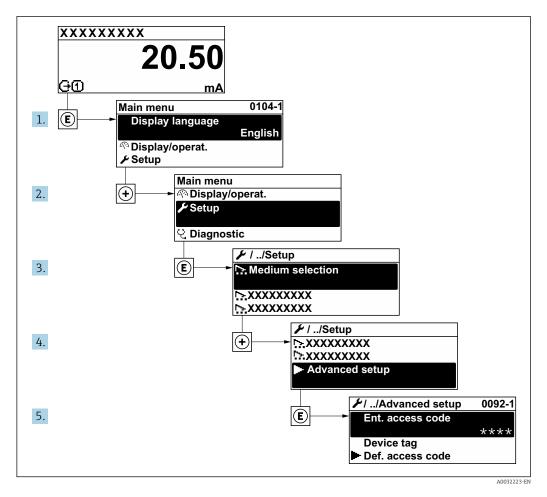| ▶ Build-up index adjustment	
Prerequisites	→ 🖹 144
Progress	→ 🖹 144
Build-up index reference value E 1	→ 🖹 144
Signal to noise ratio	→ 🖹 144
Build-up index reference value E 2	→ 🖹 144
Signal to noise ratio	→ 🖹 144
Build-up index operating mode	→ 🖹 144

Parameter overview with brief description

Parameter	Description	User interface / Selection	Factory setting
Prerequisites	The following conditions must be met before performing a build-up index adjustment.	▪ The sensor is free of build-up ▪ The measuring tube is completely filled	–
Progress	Shows the progress of the process.	0 to 100 %	–
Build-up index reference value E 1	Shows the reference value 'Build-up free sensor' measured for electrode E1.	0 to 1	0.0
Signal to noise ratio	Shows the signal to noise ratio during the measurement. A value between 1.0 - 2.0 is sufficient to excellent.	Signed floating-point number	0
Build-up index reference value E 2	Shows the reference value 'Build-up free sensor' measured for electrode E2.	0 to 1	0.0
Build-up index operating mode	Select mode of operation for build-up index.	▪ Off ▪ Slow ▪ Standard ▪ Fast	Off

10.6 Advanced settings

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

Navigation to the "Advanced setup" submenu
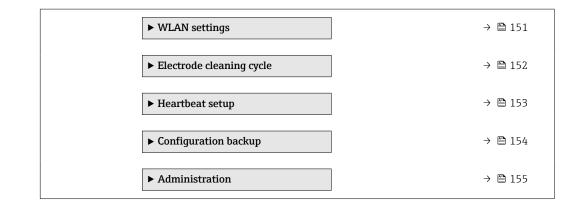

A0032223-EN

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

Navigation
"Setup" menu → Advanced setup

▶ **Advanced setup**	
Enter access code	→ 🖹 146
▶ **Sensor adjustment**	→ 🖹 146
▶ **Totalizer 1 to n**	→ 🖹 146
▶ **Display**	→ 🖹 148

▶ WLAN settings	→ 🖹 151
▶ Electrode cleaning cycle	→ 🖹 152
▶ Heartbeat setup	→ 🖹 153
▶ Configuration backup	→ 🖹 154
▶ Administration	→ 🖹 155

10.6.1 Using the parameter to enter the access code

Navigation
"Setup" menu → Advanced setup

Parameter overview with brief description

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

10.6.2 Carrying out a sensor adjustment

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

Navigation
"Setup" menu → Advanced setup → Sensor adjustment

▶ Sensor adjustment	
Installation direction	→ 🖹 146

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Installation direction	Select sign of flow direction.	• Forward flow • Reverse flow	Forward flow

10.6.3 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                    → 🖹 147

                    Unit totalizer                             → 🖹 147

                    Totalizer operation mode                   → 🖹 147

                    Failure mode                               → 🖹 147
```

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Assign process variable	Select process variable for totalizer.	• Volume flow • Mass flow • Corrected volume flow	Volume flow
Unit totalizer	Select the unit for the process variable of the totalizer.	Unit choose list	Country-specific: • m^3 • ft^3
Totalizer operation mode	Select totalizer calculation mode.	• Net flow total • Forward flow total • Reverse flow total • Last valid value	Net flow total
Failure mode	Define the totalizer behavior in the event of a device alarm.	• Stop • Actual value • Last valid value	Actual value

10.6.4   Carrying out additional display configurations

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

Navigation
"Setup" menu → Advanced setup → Display

▸ **Display**		
	Format display	→ 🗎 149
	Value 1 display	→ 🗎 149
	0% bargraph value 1	→ 🗎 149
	100% bargraph value 1	→ 🗎 149
	Decimal places 1	→ 🗎 149
	Value 2 display	→ 🗎 149
	Decimal places 2	→ 🗎 149
	Value 3 display	→ 🗎 149
	0% bargraph value 3	→ 🗎 149
	100% bargraph value 3	→ 🗎 150
	Decimal places 3	→ 🗎 150
	Value 4 display	→ 🗎 150
	Decimal places 4	→ 🗎 150
	Display language	→ 🗎 150
	Display interval	→ 🗎 150
	Display damping	→ 🗎 150
	Header	→ 🗎 150
	Header text	→ 🗎 150
	Separator	→ 🗎 150
	Backlight	→ 🗎 150

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	• 1 value, max. size • 1 bargraph + 1 value • 2 values • 1 value large + 2 values • 4 values	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	• Volume flow • Mass flow • Corrected volume flow • Flow velocity • Totalizer 1 • Totalizer 2 • Totalizer 3 • Current output 1 * • Current output 2 * • Current output 3 * • Current output 4 * • Electronics temperature • HBSI * • Noise * • Coil current shot time * • Reference electrode potential against PE * • Build-up index * • Test point 1 • Test point 2 • Test point 3	Volume flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: • 0 l/h • 0 gal/min (us)
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Decimal places 1	A measured value is specified in the **Value 1 display** parameter.	Select the number of decimal places for the display value.	• x • x.x • x.xx • x.xxx • x.xxxx	x.xx
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖺 149)	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.	• 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 1 display** parameter (→ 🖺 149)	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: • 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.	• 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 1 display** parameter (→ 🖹 149)	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.	• x • x.x • x.xx • x.xxx • x.xxxx	x.xx
Display language	A local display is provided.	Set display language.	• English • Deutsch • Français • Español • Italiano • Nederlands • Portuguesa • Polski • русский язык (Russian) • Svenska • Türkçe • 中文 (Chinese) • 日本語 (Japanese) • 한국어 (Korean) • tiếng Việt (Vietnamese) • čeština (Czech)	English (alternatively, the ordered language is preset in the device)
Display interval	A local display is provided.	Set time measured values are shown on display if display alternates between values.	1 to 10 s	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.	• Device tag • Free text	Device tag
Header text	The **Free text** option is selected in the **Header** parameter.	Enter display header text.	Max. 12 characters, such as letters, numbers or special characters (e.g. @, %, /)	------------
Separator	A local display is provided.	Select decimal separator for displaying numerical values.	• . (point) • , (comma)	. (point)
Backlight	One of the following conditions is met: • Order code for "Display; operation", option **F** "4-line, illum.; touch control" • Order code for "Display; operation", option **G** "4-line, illum.; touch control +WLAN"	Switch the local display backlight on and off.	• Disable • Enable	Enable

*   Visibility depends on order options or device settings

10.6.5 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	Selection / User entry / User interface	Factory setting
WLAN	–	Switch WLAN on and off.	• Disable • Enable	Enable
WLAN mode	–	Select WLAN mode.	• WLAN access point • WLAN Client	WLAN access point
SSID name	The client is activated.	Enter the user-defined SSID name (max. 32 characters).	–	–

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Network security	–	Select the security type of the WLAN network.	• Unsecured • WPA2-PSK • EAP-PEAP with MSCHAPv2 * • EAP-PEAP MSCHAPv2 no server authentic. * • EAP-TLS *	WPA2-PSK
Security identification	–	Select security settings and download these settings via menu Data management > Security > WLAN.	• Trusted issuer certificate • Device certificate • Device private key	–
User name	–	Enter user name.	–	–
WLAN password	–	Enter WLAN password.	–	–
WLAN IP address	–	Enter IP address of the WLAN interface of the device.	4 octet: 0 to 255 (in the particular octet)	192.168.1.212
WLAN passphrase	The **WPA2-PSK** option is selected in the **Security type** parameter.	Enter the network key (8 to 32 characters). ℹ The network key supplied with the device should be changed during commissioning for security reasons.	8 to 32-digit character string comprising numbers, letters and special characters (without spaces)	Serial number of the measuring device (e.g. L100A802000)
Assign SSID name	–	Select which name will be used for SSID: device tag or user-defined name.	• Device tag • User-defined	User-defined
SSID name	• The **User-defined** option is selected in the **Assign SSID name** parameter. • The **WLAN access point** option is selected in the **WLAN mode** parameter.	Enter the user-defined SSID name (max. 32 characters). ℹ The user-defined SSID name may only be assigned once. If the SSID name is assigned more than once, the devices can interfere with one another.	Max. 32-digit character string comprising numbers, letters and special characters	EH_device designation_last 7 digits of the serial number (e.g. EH_Promag_500_A 802000)
Connection state	–	Displays the connection status.	• Connected • Not connected	Not connected
Received signal strength	–	Shows the received signal strength.	• Low • Medium • High	High

*   Visibility depends on order options or device settings

10.6.6   Performing electrode cleaning

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

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

Navigation
"Setup" menu → Advanced setup → Electrode cleaning cycle

▶ Electrode cleaning cycle

	Electrode cleaning cycle	→ 🖺 153
	ECC duration	→ 🖺 153
	ECC recovery time	→ 🖺 153
	ECC interval	→ 🖺 153
	ECC polarity	→ 🖺 153

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Electrode cleaning cycle	For the following order code: "Application package", option **EC** "ECC electrode cleaning"	Switch electrode cleaning on or off.	• Off • On	On
ECC duration	For the following order code: "Application package", option **EC** "ECC electrode cleaning"	Specify the duration of the cleaning phase of the cycle. Diag. msg. no. 530 is displayed until the cleaning phase and recovery phase are complete.	0.01 to 30 s	2 s
ECC recovery time	For the following order code: "Application package", option **EC** "ECC electrode cleaning"	Specify the maximum timespan after the cleaning phase for recovery before measurement resumes during which the output signal values are frozen.	1 to 600 s	60 s
ECC interval	For the following order code: "Application package", option **EC** "ECC electrode cleaning"	Specify the interval between one cleaning cycle and the next.	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.	• Positive • Negative	Depends on the electrode material: • Tantalum: **Negative** option • Platinum, Alloy C22, stainless steel: **Positive** option

10.6.7 Performing Heartbeat basic setup

Heartbeat setup submenu guides the user systematically through all the parameters that can be used for the Heartbeat basic setup.

ℹ️ The wizard only appears if the device has the Heartbeat Verification +Monitoring application package.

Navigation
"Setup" menu → Advanced setup → Heartbeat setup

► Heartbeat setup	
► Heartbeat base settings	→ 🖺 154

"Heartbeat base settings" submenu

Navigation

"Setup" menu → Advanced setup → Heartbeat setup → Heartbeat base settings

▶ Heartbeat base settings	
Plant operator (2754)	→ 🕮 154
Location (2755)	→ 🕮 154
Partially filled pipe (6465)	→ 🕮 154

Parameter overview with brief description

Parameter	Description	User entry / Selection	Factory setting
Plant operator	Enter the plant operator.	Max. 32 characters such as letters, numbers or special characters (e.g. @, %, /)	–
Location	Enter the location.	Max. 32 characters such as letters, numbers or special characters (e.g. @, %, /)	–
Partially filled pipe	Indicate, if the measuring tube is partially filled during the verification process in order to avoid evaluating the EPD electrode cable.	• No • Yes	No

10.6.8 Configuration management

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

Navigation

"Setup" menu → Advanced setup → Configuration backup

▶ Configuration backup	
Operating time	→ 🕮 155
Last backup	→ 🕮 155
Configuration management	→ 🕮 155
Backup state	→ 🕮 155
Comparison result	→ 🕮 155

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 HistoROM backup.	Days (d), hours (h), minutes (m) and seconds (s)	–
Configuration management	Select action for managing the device data in the HistoROM backup.	• Cancel • Execute backup • Restore * • Compare * • Clear backup data	Cancel
Backup state	Shows the current status of data saving or restoring.	• None • Backup in progress • Restoring in progress • Delete in progress • Compare in progress • Restoring failed • Backup failed	None
Comparison result	Comparison of current device data with HistoROM backup.	• Settings identical • Settings not identical • No backup available • Backup settings corrupt • Check not done • Dataset incompatible	Check not done

*   Visibility depends on order options or device settings

Function scope of the "Configuration management" parameter

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

HistoROM backup
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.

10.6.9   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	→ 🖹 156
▶ Reset access code	→ 🖹 156
Device reset	→ 🖹 157

Using the parameter to define the access code

Complete this wizard to specify an access code for the Maintenance role.

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

▶ Define access code	
Define access code	→ 🖹 156
Confirm access code	→ 🖹 156

Parameter overview with brief description

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

Using the parameter to reset the access code

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

▶ Reset access code	
Operating time	→ 🖹 157
Reset access code	→ 🖹 157

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. ℹ️ For a reset code, contact your Endress+Hauser service organization. The reset code can only be entered via: • Web browser • DeviceCare, FieldCare (via CDI-RJ45 service interface) • Fieldbus	Character string comprising numbers, letters and special characters	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.	• Cancel • To delivery settings • Restart device • Restore S-DAT backup [*]	Cancel

*   Visibility depends on order options or device settings

10.7   Simulation

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

Navigation
"Diagnostics" menu → Simulation

‣ Simulation		
	Assign simulation process variable	→ 🖺 158
	Process variable value	→ 🖺 158
	Current input 1 to n simulation	→ 🖺 159
	Value current input 1 to n	→ 🖺 159
	Status input 1 to n simulation	→ 🖺 159
	Input signal level 1 to n	→ 🖺 159

Current output 1 to n simulation	→ 🖹 158	
Current output value	→ 🖹 158	
Frequency output 1 to n simulation	→ 🖹 158	
Frequency output 1 to n value	→ 🖹 158	
Pulse output simulation 1 to n	→ 🖹 159	
Pulse value 1 to n	→ 🖹 159	
Switch output simulation 1 to n	→ 🖹 159	
Switch state 1 to n	→ 🖹 159	
Relay output 1 to n simulation	→ 🖹 159	
Switch state 1 to n	→ 🖹 159	
Device alarm simulation	→ 🖹 159	
Diagnostic event category	→ 🖹 159	
Diagnostic event simulation	→ 🖹 159	

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign simulation process variable	–	Select a process variable for the simulation process that is activated.	• Off • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity *	Off
Process variable value	A process variable is selected in the **Assign simulation process variable** parameter (→ 🖹 158).	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Current output 1 to n simulation	–	Switch the simulation of the current output on and off.	• Off • On	Off
Current output value	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 1 to n simulation	In the **Operating mode** parameter, the **Frequency** option is selected.	Switch the simulation of the frequency output on and off.	• Off • On	Off
Frequency output 1 to n value	In the **Frequency 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

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
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 (→ 🖻 133) defines the pulse width of the pulses output.	• Off • Fixed value • Down-counting value	Off
Pulse value 1 to n	In the **Pulse output simulation 1 to n** parameter, the **Down-counting value** option is selected.	Enter the number of pulses for simulation.	0 to 65 535	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.	• Off • On	Off
Switch state 1 to n	–	Select the status of the status output for the simulation.	• Open • Closed	Open
Relay output 1 to n simulation	–	Switch simulation of the relay output on and off.	• Off • On	Off
Switch state 1 to n	The **On** option is selected in the **Switch output simulation 1 to n** parameter parameter.	Select status of the relay output for the simulation.	• Open • Closed	Open
Device alarm simulation	–	Switch the device alarm on and off.	• Off • On	Off
Diagnostic event category	–	Select a diagnostic event category.	• Sensor • Electronics • Configuration • Process	Process
Diagnostic event simulation	–	Select a diagnostic event to simulate this event.	• Off • Diagnostic event picklist (depends on the category selected)	Off
Current input 1 to n simulation	–	Switch simulation of the current input on and off.	• 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
Status input 1 to n simulation	–	Switch simulation of the status input on and off.	• Off • On	Off
Input signal level 1 to n	In the **Status input simulation** parameter, the **On** option is selected.	Select the signal level for the simulation of the status input.	• High • Low	High

*   Visibility depends on order options or device settings

10.8 Protecting settings from unauthorized access

The following write protection options exist in order to protect the configuration of the measuring device from unintentional modification:
- Protect access to parameters via access code → 🖻 160
- Protect access to local operation via key locking → 🖻 93
- Protect access to measuring device via write protection switch → 🖻 161

10.8.1   Write protection via access code

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

Defining the access code via local display

1. Navigate to the **Define access code** parameter (→ 🖺 156).
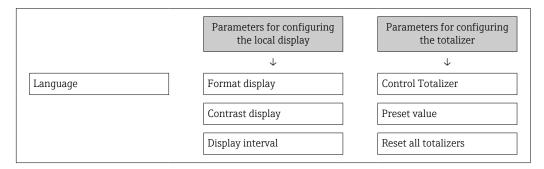
2. Define a max. 16-digit character string comprising numbers, letters and special characters as the access code.

3. Enter the access code again in the **Confirm access code** parameter (→ 🖺 156) 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 → 🖺 92.
- The user role with which the user is currently logged on via the local display → 🖺 92 is indicated by the **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 excepted from parameter write protection via the local display. Despite the user-specific access code, they can always be modified, even if the other parameters are locked.

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

Defining the access code via the Web browser

1. Navigate to the **Define access code** parameter (→ 🖺 156).

2. Define a max. 16-digit numeric code as an access code.

3. Enter the access code again in the **Confirm access code** parameter (→ 🗎 156) 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 → 🗎 92.
  • 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

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

1. Note down the serial number of the device.

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

3. Contact the local Endress+Hauser service organization and tell them the serial number and the operating time.

   ↳ Get the calculated reset code.

4. Enter the reset code in the **Reset access code** parameter (→ 🗎 157).

   ↳ The access code has been reset to the factory setting **0000**. It can be redefined → 🗎 160.

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

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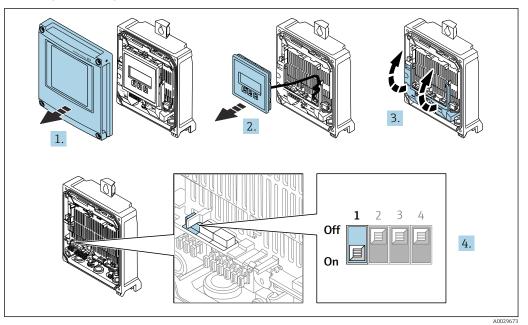
Unlike parameter write protection via a user-specific access code, this allows the user to lock write access to the entire operating menu - apart from the **"Contrast display" parameter**.

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

Proline 500 – digital
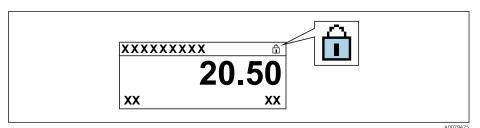
Enabling/disabling write protection

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1. Open the housing cover.

2. Remove the display module.

3. Fold open the terminal cover.

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

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

   ↳ In the **Locking status** parameter, the **Hardware locked** option is displayed → 🖹 164. When hardware write protection is active, the 🔒 symbol appears in the header of the measured value display and in the navigation view in front of the parameters.

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5. Insert the display module.

6. Close the housing cover.
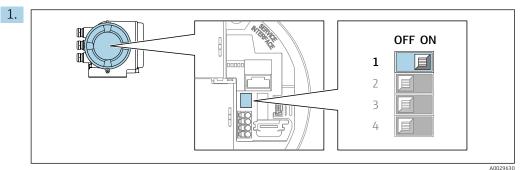
7. **⚠ WARNING**

   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)
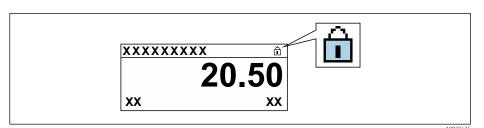
   Tighten the securing screws.

Proline 500

1.

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 → 🔲 164. 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.

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 → 🔲 164. On the local display, the 🔒 symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

11 Operation

11.1 Reading off the device locking status

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

Operation → Locking status

Function scope of the "Locking status" parameter

Options	Description
None	The access authorization displayed in the **Access status** parameter applies → 🖺 92. 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) → 🖺 161.
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

ℹ️ Detailed information:
  • To configure the operating language → 🖺 118
  • For information on the operating languages supported by the measuring device → 🖺 249

11.3 Configuring the display

Detailed information:
• On the basic settings for the local display
• On the advanced settings for the local display → 🖺 148

11.4 Reading measured values

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

Navigation
"Diagnostics" menu → Measured values

▸ Measured values	
▸ Process variables	→ 🖺 165
▸ Totalizer	→ 🖺 166
▸ Input values	→ 🖺 167
▸ Output values	→ 🖺 168

11.4.1 "Process variables" submenu

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

Navigation

"Diagnostics" menu → Measured values → Process variables

▸ Process variables		
	Volume flow	→ 🖹 165
	Mass flow	→ 🖹 165
	Corrected volume flow	→ 🖹 165
	Flow velocity	→ 🖹 165
	Conductivity	→ 🖹 165
	Corrected conductivity	→ 🖹 166
	Temperature	→ 🖹 166
	Density	→ 🖹 166

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Volume flow	–	Displays the volume flow that is currently measured. *Dependency* The unit is taken from: **Volume flow unit** parameter (→ 🖹 123)	Signed floating-point number
Mass flow	–	Displays the mass flow that is currently calculated. *Dependency* The unit is taken from the **Mass flow unit** parameter (→ 🖹 123).	Signed floating-point number
Corrected volume flow	–	Displays the corrected volume flow that is currently calculated. *Dependency* The unit is taken from: **Corrected volume flow unit** parameter (→ 🖹 124)	Signed floating-point number
Flow velocity	–	Displays the flow velocity that is currently calculated.	Signed floating-point number
Conductivity	–	Displays the conductivity that is currently measured. *Dependency* The unit is taken from the **Conductivity unit** parameter (→ 🖹 123).	Signed floating-point number
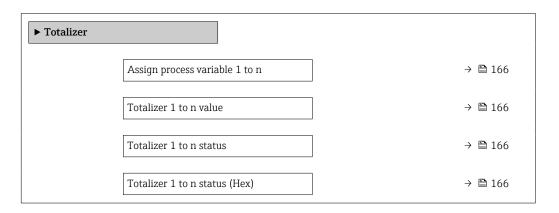
Parameter	Prerequisite	Description	User interface
Corrected conductivity	One of the following conditions is met: • Order code for "Sensor option", option **CI** "Medium temperature measurement" or • The temperature is read into the flowmeter from an external device.	Displays the conductivity that is currently corrected. *Dependency* The unit is taken from: **Conductivity unit** parameter (→ 🖺 123)	Positive floating-point number
Temperature	One of the following conditions is met: • Order code for "Sensor option", option **CI** "Medium temperature measurement" or • The temperature is read into the flowmeter from an external device.	Displays the temperature that is currently calculated. *Dependency* The unit is taken from: **Temperature unit** parameter (→ 🖺 123)	Positive floating-point number
Density	–	Displays the current fixed density or density read in from an external device. *Dependency* The unit is taken from the **Density unit** parameter.	Signed floating-point number

11.4.2   Totalizer

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

Navigation
"Diagnostics" menu → Measured values → Totalizer

▶ Totalizer	
Assign process variable 1 to n	→ 🖺 166
Totalizer 1 to n value	→ 🖺 166
Totalizer 1 to n status	→ 🖺 166
Totalizer 1 to n status (Hex)	→ 🖺 166

Parameter overview with brief description

Parameter	Description	Selection / User interface	Factory setting
Assign process variable 1 to n	Select process variable for totalizer.	• Volume flow • Mass flow • Corrected volume flow	Volume flow
Totalizer 1 to n value	Shows the totalizer value reported to the controller for further processing.	Signed floating-point number	0 l
Totalizer 1 to n status	Shows the status of the totalizer value reported to the controller for further processing ('Good', 'Uncertain', 'Bad').	• Good • Uncertain • Bad	Good
Totalizer 1 to n status (Hex)	Shows the status of the totalizer value reported to the controller for further processing (Hex).	0 to 255	128

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	→ 🖺 167
	► Status input 1 to n	→ 🖺 167

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	→ 🖺 167
	Measured current 1 to n	→ 🖺 167

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

► Status input 1 to n		
	Value status input	→ 🖺 168

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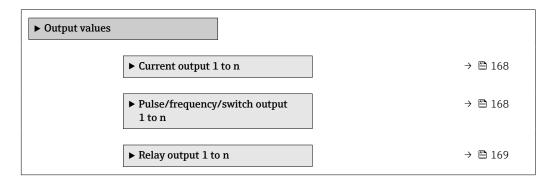
Parameter	Description	User interface
Value status input	Shows the current input signal level.	• High • Low

11.4.4 Output values

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

Navigation

"Diagnostics" menu → Measured values → Output values

► Output values	
► Current output 1 to n	→ 🖹 168
► Pulse/frequency/switch output 1 to n	→ 🖹 168
► Relay output 1 to n	→ 🖹 169

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	→ 🖹 168
Measured current	→ 🖹 168

Parameter overview with brief description

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

Output values for pulse/frequency/switch output

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

▶ Pulse/frequency/switch output 1 to n	
Output frequency	→ 🖹 169
Pulse output 1 to n	→ 🖹 169
Switch state	→ 🖹 169

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
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
Pulse output 1 to n	The **Pulse** option is selected in the **Operating mode** parameter parameter.	Displays the pulse frequency currently output.	Positive floating-point number
Switch state	The **Switch** option is selected in the **Operating mode** parameter.	Displays the current switch output status.	• Open • Closed

Output values for relay output

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

▶ Relay output 1 to n	
Switch state	→ 🖹 169
Switch cycles	→ 🖹 169
Max. switch cycles number	→ 🖹 169

Parameter overview with brief description

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

11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:
• Basic settings using the **Setup** menu (→ 🖹 119)
• Advanced settings using the **Advanced setup** submenu (→ 🖹 145)
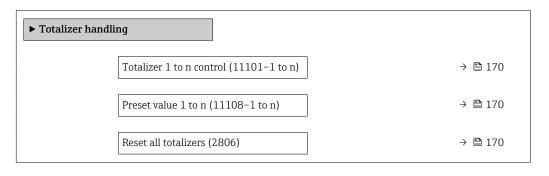
11.6 Performing a totalizer reset

The totalizers are reset in the **Operation** submenu:
• Control Totalizer
• Reset all totalizers

Navigation
"Operation" menu → Totalizer handling

▶ Totalizer handling		
Totalizer 1 to n control (11101–1 to n)	→ 🖹	170
Preset value 1 to n (11108–1 to n)	→ 🖹	170
Reset all totalizers (2806)	→ 🖹	170

Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Totalizer 1 to n control	Operate the totalizer.	• Reset + hold • Preset + hold • Hold • Totalize	Totalize
Preset value 1 to n	Specify start value for totalizer.	Signed floating-point number	0 l
Reset all totalizers	Reset all totalizers to 0 and start.	• Cancel • Reset + totalize	Cancel

11.6.1 Function scope of "Control Totalizer" parameter

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

1) Visible depending on the order options or device settings

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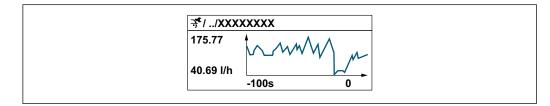
The **Extended HistoROM** application package must be enabled in the device (order option) for the **Data logging** submenu to appear. This contains all the parameters for the measured value history.

Data logging is also available via:
- Plant Asset Management Tool FieldCare → 🖺 104.
- Web browser

Function scope

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

- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

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

Navigation
"Diagnostics" menu → Data logging

► Data logging		
Assign channel 1	→ 🖺	172
Assign channel 2	→ 🖺	172
Assign channel 3	→ 🖺	172
Assign channel 4	→ 🖺	173
Logging interval	→ 🖺	173
Clear logging data	→ 🖺	173

Data logging	→ 🗏 173
Logging delay	→ 🗏 173
Data logging control	→ 🗏 173
Data logging status	→ 🗏 173
Entire logging duration	→ 🗏 173

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign channel 1	The **Extended HistoROM** application package is available.	Assign process variable to logging channel.	• Off • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity [*] • Electronics temperature • Current output 1 [*] • Current output 2 [*] • Current output 3 [*] • Current output 4 [*] • Noise [*] • Coil current shot time [*] • Reference electrode potential against PE [*] • HBSI [*] • Build-up index [*] • Test point 1 • Test point 2 • Test point 3	Off
Assign channel 2	The **Extended HistoROM** application package is available. ℹ️ The software options currently enabled are displayed in the **Software option overview** parameter.	Assign a process variable to logging channel.	For the picklist, see the **Assign channel 1** parameter (→ 🗏 172)	Off
Assign channel 3	The **Extended HistoROM** application package is available. ℹ️ The software options currently enabled are displayed in the **Software option overview** parameter.	Assign a process variable to logging channel.	For the picklist, see the **Assign channel 1** parameter (→ 🗏 172)	Off

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign channel 4	The **Extended HistoROM** application package is available. ⓘ The software options currently enabled are displayed in the **Software option overview** parameter.	Assign a process variable to logging channel.	For the picklist, see the **Assign channel 1** parameter (→ 🗎 172)	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 3 600.0 s	1.0 s
Clear logging data	The **Extended HistoROM** application package is available.	Clear the entire logging data.	• Cancel • Clear data	Cancel
Data logging	–	Select the type of data logging.	• 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.	• 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.	• 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	Remedy
Local display dark and no output signals	Supply voltage does not match that specified 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 → 🖹 213.
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.	• 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 → 🖹 213.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures → 🖹 186
Text on local display appears in a foreign language and cannot be understood.	Incorrect operating language is configured.	1. Press 2 s ⊟ + ⊞ ("home position"). 2. Press Ⓔ. 3. Set the desired language in the **Display language** parameter (→ 🖹 150).
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	• Check the cable and the connector between the main electronics module and display module. • Order spare part → 🖹 213.

For output signals

Error	Possible causes	Remedial action
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 🖹 213.
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Parametrization errors	Check parameterization and correct it.
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

Problem	Possible causes	Remedy
No write access to parameters.	Hardware write protection is enabled.	Set the write protection switch on the main electronics module to the **OFF** position → 🖹 161.
No write access to parameters.	Current user role has limited access authorization.	1. Check user role → 🖹 92. 2. Enter correct customer-specific access code → 🖹 92.
No connection to web server.	Web server is disabled.	Using the "FieldCare" or "DeviceCare" operating tool, check whether the Web server of the measuring device is enabled, and enable it if necessary → 🖹 100.
	Incorrect settings for the Ethernet interface of the computer.	1. Check the properties of the Internet protocol (TCP/IP) → 🖹 96→ 🖹 96. 2. Check the network settings with the IT manager.
No connection to web server.	Incorrect WLAN access data.	• Check WLAN network status. • Log on to the device again using WLAN access data. • Check that WLAN is enabled on the measuring device and operating device → 🖹 96.
	WLAN communication is disabled.	–
Not connecting to web server, FieldCare or DeviceCare.	No WLAN network available.	• 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.
Network connection not present or unstable.	WLAN network is weak.	• 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.	• Check network settings. • Temporarily enable only the WLAN as an interface.
Web browser is frozen and operation no longer possible.	Data transfer is active.	Wait until data transfer or current action is finished.
	Connection lost	1. Check cable connection and power supply. 2. Refresh the Web browser and restart if necessary.
Content of web browser is incomplete or difficult to read.	Not using optimum version of Web server.	1. Use the correct Web browser version → 🖹 94. 2. Clear the Web browser cache and restart the Web browser.

Problem	Possible causes	Remedy
	Unsuitable view settings.	Change the font size/display ratio of the Web browser.
No or incomplete display of contents in the web browser.	• JavaScript is not enabled • JavaScript cannot be enabled	1. Enable JavaScript. 2. Enter http://XXX.XXX.X.X.XX/servlet/ basic.html as the IP address.
Operation with FieldCare or DeviceCare is not possible 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) is not possible.	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.

For system integration
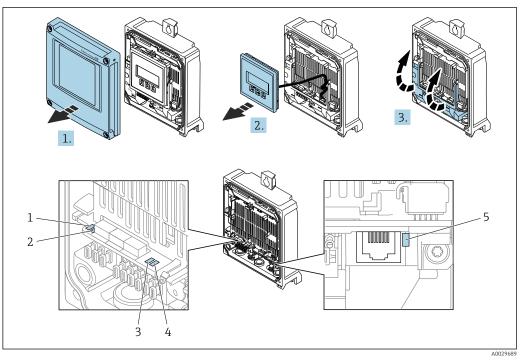
Error	Possible causes	Remedy
The PROFINET device name is not displayed correctly and contains coding.	A device name containing one or more underscores has been specified via the automation system.	Specify a correct device name (without underscores) via the automation system.

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.

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1   Supply voltage
2   Device status
3   Flashing/network status
4   Port 1 active: PROFINET with Ethernet-APL
5   Port 2 active: service interface (CDI)

1. Open the housing cover.

2. Remove the display module.
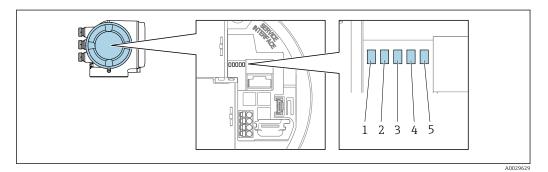
3. Fold open the terminal cover.

LED		Color	Meaning
1	Supply voltage	Off	Supply voltage is off or too low.
		Green	Supply voltage is ok.
2	Device status/module status (normal operation)	Off	Firmware error
		Green	Device status is ok.
		Flashing green	Device is not configured.
		Flashing red	A diagnostic event with "Warning" diagnostic behavior has occurred.
		Red	A diagnostic event with "Alarm" diagnostic behavior has occurred.
		Flashing red/green	The device restarts/self-test.
3	Flashing/network status	Green	Cyclic data exchange is active.
		Flashing green	Following request from automation system: Flash frequency: 1 Hz (flash functionality: 500 ms on, 500 ms off)
			Cyclic data exchange is not active, no IP address is available: Flash frequency: 4 Hz
		Red	IP address is available but there is no connection to the automation system
		Flashing red	Cyclic data exchange was active but the connection was disconnected: Flash frequency: 3 Hz

LED		Color	Meaning
4	Port 1 active: PROFINET with Ethernet-APL	Off	Not connected or no connection established.
		Green	Connection available, no active communication
		Flashing green	Connection with active communication
5	Port 2 active: Service interface (CDI)	Off	Not connected or no connection established.
		Amber	Connection available but no activity.
		Flashing amber	Activity present.

Proline 500

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

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1   Supply voltage
2   Device status
3   Flashing/network status
4   Port 1 active: PROFINET with Ethernet-APL
5   Port 2 active: service interface (CDI)

LED		Color	Meaning
1	Supply voltage	Off	Supply voltage is off or too low.
		Green	Supply voltage is ok.
2	Device status/module status (normal operation)	Off	Firmware error
		Green	Device status is ok.
		Flashing green	Device is not configured.
		Flashing red	A diagnostic event with "Warning" diagnostic behavior has occurred.
		Red	A diagnostic event with "Alarm" diagnostic behavior has occurred.
		Flashing red/green	The device restarts/self-test.
3	Flashing/network status	Green	Cyclic data exchange is active.
		Flashing green	Following request from automation system: Flash frequency: 1 Hz (flash functionality: 500 ms on, 500 ms off) If no "Name of Station" is defined: • Flash frequency: 4 Hz • Display: no "Name of Station" available.
		Red	IP address is available but there is no connection to the automation system
		Flashing red	Cyclic data exchange was active but the connection was disconnected: Flash frequency: 3 Hz

LED		Color	Meaning
4	Port 1 active: PROFINET with Ethernet-APL	Off	Not connected or no connection established.
		White	Connection available, no active communication
		Flashing white	Connection with active communication
5	Port 2 active: Service interface (CDI-RJ45)	Off	Not connected or no connection established.
		Amber	Connection available but no activity.
		Flashing amber	Activity present.

12.2.2 Sensor connection housing

Proline 500 – digital

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

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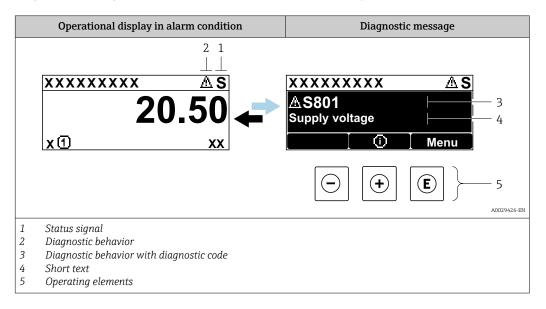
LED		Color	Meaning
1	Communication	White	Communication active.
2	Device status (normal operation)	Red	Error
		Flashing red	Warning
2	Device status (during start-up)	Flashes red slowly	If > 30 seconds: problem with the boot loader.
		Flashes red quickly	If > 30 seconds: compatibility problem when reading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

12.3 Diagnostic information on local display

12.3.1 Diagnostic message

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

Operational display in alarm condition	Diagnostic message

1 Status signal
2 Diagnostic behavior
3 Diagnostic behavior with diagnostic code
4 Short text
5 Operating elements

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

Other diagnostic events that have occurred can be displayed in the **Diagnostics** menu:
- Via parameter → 🖺 205
- Via submenus → 🖺 206
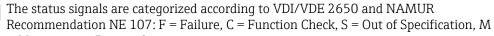
Status signals

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

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

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

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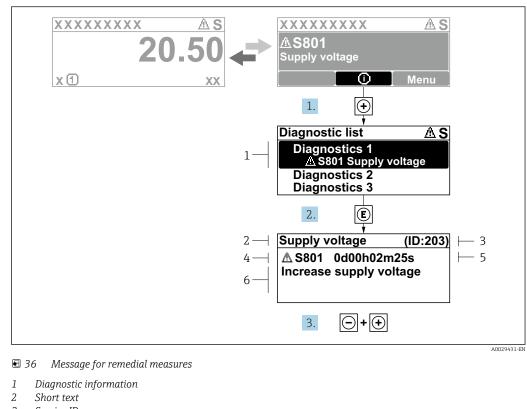
Symbol	Meaning
⊗	**Alarm** • Measurement is interrupted. • Signal outputs and totalizers assume the defined alarm condition. • A diagnostic message is generated.
⚠	**Warning** Measurement is resumed. The signal outputs and totalizers are not affected. A diagnostic message is generated.

Diagnostic information

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

Operating elements

Key	Meaning
⊕	**Plus key** *In a menu, submenu* Opens the message about remedy information.
Ⓔ	**Enter key** *In a menu, submenu* Opens the operating menu.

12.3.2 Calling up remedial measures

A0029431-EN

▣ 36 Message for remedial measures

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

1. The user is in the diagnostic message.
   Press ⊞ (ⓘ symbol).
   ↳ The **Diagnostic list** submenu opens.

2. Select the desired diagnostic event with ⊞ or ⊟ and press ⓔ .
   ↳ The message about the remedial measures opens.

3. Press ⊟ + ⊞ simultaneously.
   ↳ The message about the remedial measures closes.
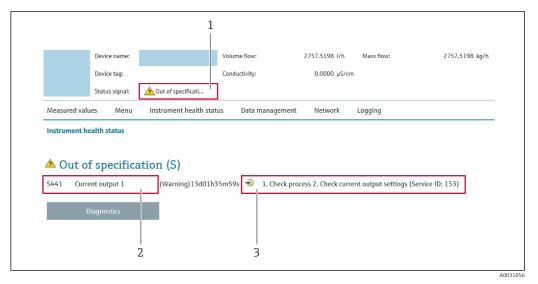
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the
Diagnostic list submenu or **Previous diagnostics** parameter.

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

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

12.4 Diagnostic information in the Web browser

12.4.1 Diagnostic options

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

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

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
- Via parameter → 🗎 205
- Via submenu → 🗎 206

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 the service mode (during a simulation, for example).
⚠?	**Out of specification** The device is being operated: Outside its technical specification limits (e.g. outside the process temperature range)
◇	**Maintenance required** Maintenance is required. The measured value is still valid.

The status signals are categorized in accordance with VDI/VDE 2650 and NAMUR Recommendation NE 107.
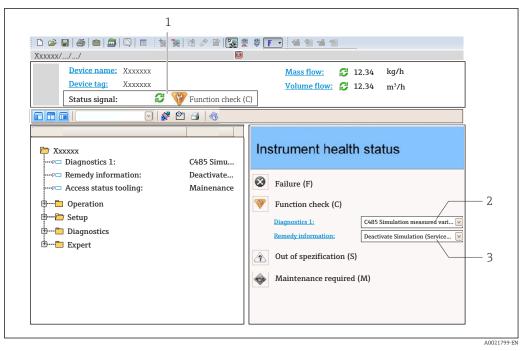
12.4.2   Calling up remedy information

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

12.5   Diagnostic information in FieldCare or DeviceCare

12.5.1   Diagnostic options

Any faults detected by the measuring device are displayed on the home page of the operating tool once the connection has been established.

1 Status area with status signal → 🖺 180
2 Diagnostics information → 🖺 181
3 Remedial measures with service ID

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
- Via parameter → 🖺 205
- Via submenu → 🖺 206

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
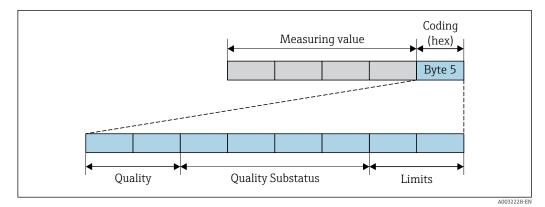
Available diagnostic behaviors

The following diagnostic behaviors can be assigned:

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

Displaying the measured value status

If modules with input data (e.g. Analog Input module, Discrete Input module, Totalizer module, Heartbeat module) are configured for cyclic data transmission, the measured value status is coded as per PROFINET PA Profile 4 Specification and transmitted along with the measured value to the PROFINET Controller via the status byte. The status byte is split into three segments: Quality, Quality Substatus and Limits.

🖾 37   Structure of the status byte

The content of the status byte depends on the configured failure mode in the individual function block. Depending on which failure mode has been configured, status information in accordance with PROFINET PA Profile Specification 4 is transmitted to the the PROFINET with Ethernet-APL controller via the status byte status information. The two bits for the limits always have the value 0.

Supported status information

Status	Coding (hex)
BAD - Maintenance alarm	0x24 to 0x27
BAD - Process related	0x28 to 0x2B
BAD - Function check	0x3C to 0x3F
UNCERTAIN - Initial value	0x4C to 0x4F
UNCERTAIN - Maintenance demanded	0x68 to 0x6B
UNCERTAIN - Process related	0x78 to 0x7B
GOOD - OK	0x80 to 0x83
GOOD - Maintenance required	0xA4 to 0xA7
GOOD - Maintenance demanded	0xA8 to 0xAB
GOOD - Function check	0xBC to 0xBF

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 diagnostic behavior can be changed. Adapting the diagnostic information → 🖹 185

12.7.1 Diagnostic of sensor

No.	Diagnostic information / Short text		Remedy instructions	Influenced measured variables
043	Sensor 1 short circuit detected		1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status [from the factory] [1]			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

No.	Diagnostic information / Short text		Remedy instructions	Influenced measured variables
082	Data storage inconsistent		Check module connections	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
083	Memory content inconsistent	1. Restart device 2. Restore S-DAT data 3. Replace S-DAT	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
143	HBSI limit exceeded	1. Check if external magnetic interference is present 2. Check flow value 3. Replace sensor	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status [from the factory] [1]		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	M	
	Diagnostic behavior	Warning	

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
168	Build-up limit exceeded	Clean measuring tube	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	M	
	Diagnostic behavior	Warning	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
169	Conductivity measurement failed	1. Check grounding conditions 2. Deactivate conductivity measurement	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	M	
	Diagnostic behavior	Warning	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
170	Coil resistance faulty	Check ambient and process temperature	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
180	Temperature sensor defective	1. Check sensor connections 2. Replace sensor cable or sensor 3. Turn off temperature measurement	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Warning	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
181	Sensor connection faulty	1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

12.7.2 Diagnostic of electronic

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
201	Electronics faulty	1. Restart device 2. Replace electronics	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
242	Firmware incompatible	1. Check firmware version 2. Flash or replace electronic module	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
252	Module incompatible	1. Check electronic modules 2. Check if correct modules are available (e.g. NEx, Ex) 3. Replace electronic modules	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
262	Module connection interrupted	1. Check or replace connection cable between sensor electronic module (ISEM) and main electronics 2. Check or replace ISEM or main electronics	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
270	Main electronics defective	1. Restart device 2. Replace main electronic module	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
271	Main electronics faulty	1. Restart device 2. Replace main electronic module	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
272	Main electronics faulty	Restart device	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
273	Main electronics defective	1. Pay attention to display emergency operation 2. Replace main electronics	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
275	I/O module defective	Change I/O module	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
276	I/O module faulty	1. Restart device 2. Change I/O module	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow option** • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
283	Memory content inconsistent	Restart device	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow option** • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
302	Device verification active	Device verification active, please wait.	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow option** • Temperature • Volume flow
	Measured variable status [from the factory] [1]		
	Quality	Good	
	Quality substatus	Function check	
	Coding (hex)	0xBC to 0xBF	
	Status signal	C	
	Diagnostic behavior	Warning	

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
303	I/O 1 to n configuration changed	1. Apply I/O module configuration (parameter 'Apply I/O configuration') 2. Afterwards reload device description and check wiring	–
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	M	
	Diagnostic behavior	Warning	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
311	Sensor electronics (ISEM) faulty	Maintenance required! Do not reset device	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	M		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
330	Flash file invalid	1. Update firmware of device 2. Restart device	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	M		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
331	Firmware update failed	1. Update firmware of device 2. Restart device	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
332	Writing in HistoROM backup failed	1. Replace user interface board 2. Ex d/XP: replace transmitter	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
361	I/O module 1 to n faulty	1. Restart device 2. Check electronic modules 3. Change I/O module or main electronics	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
372	Sensor electronics (ISEM) faulty	1. Restart device 2. Check if failure recurs 3. Replace sensor electronic module (ISEM)	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
373	Sensor electronics (ISEM) faulty	Transfer data or reset device	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
375	I/O- 1 to n communication failed	1. Restart device 2. Check if failure recurs 3. Replace module rack inclusive electronic modules	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
376	Sensor electronics (ISEM) faulty	1. Replace sensor electronic module (ISEM) 2. Turn off diagnostic message	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status [from the factory] [1]		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

1)   Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
377	Electrode signal faulty	1. Activate empty pipe detection 2. Check partial filled pipe and installation direction 3. Check sensor cabling 4. Deactivate diagnostics 377	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status [from the factory] [1]		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

1)   Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
378	Supply voltage ISEM faulty	1. If available: Check connection cable between sensor and transmitter 2. Replace main electronic module 3. Replace sensor electronic module (ISEM)	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
382	Data storage	1. Insert T-DAT 2. Replace T-DAT	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	**Short text**		
383	Memory content	Reset device	• Conductivity
	Measured variable status		• Corrected conductivity
			• Measured values
	Quality	Good	• Density
	Quality substatus	Ok	• Electronics temperature
	Coding (hex)	0x80 to 0x83	• Flow velocity
	Status signal	F	• Mass flow
	Diagnostic behavior	Alarm	• **Corrected volume flow** option
			• Temperature
			• Volume flow

Diagnostic information		Remedy instructions	Influenced measured variables
No.	**Short text**		
387	HistoROM data faulty	Contact service organization	• Conductivity
	Measured variable status		• Corrected conductivity
			• Measured values
	Quality	Good	• Density
	Quality substatus	Ok	• Electronics temperature
	Coding (hex)	0x80 to 0x83	• Flow velocity
	Status signal	F	• Mass flow
	Diagnostic behavior	Alarm	• **Corrected volume flow** option
			• Temperature
			• Volume flow

12.7.3 Diagnostic of configuration

Diagnostic information		Remedy instructions	Influenced measured variables
No.	**Short text**		
410	Data transfer failed	1. Retry data transfer	• Conductivity
	Measured variable status	2. Check connection	• Corrected conductivity
			• Measured values
	Quality	Good	• Density
	Quality substatus	Ok	• Electronics temperature
	Coding (hex)	0x80 to 0x83	• Flow velocity
	Status signal	F	• Mass flow
	Diagnostic behavior	Alarm	• **Corrected volume flow** option
			• Temperature
			• Volume flow

Diagnostic information		Remedy instructions	Influenced measured variables
No.	**Short text**		
412	Processing download	Download active, please wait	• Conductivity
	Measured variable status		• Corrected conductivity
			• Measured values
	Quality	Good	• Density
	Quality substatus	Ok	• Electronics temperature
	Coding (hex)	0x80 to 0x83	• Flow velocity
	Status signal	C	• Mass flow
	Diagnostic behavior	Warning	• **Corrected volume flow** option
			• Temperature
			• Volume flow

	Diagnostic information		Remedy instructions	Influenced measured variables
No.		Short text		
431	Trim 1 to n required		Carry out trim	–
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	C		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured variables
No.		Short text		
437	Configuration incompatible		1. Update firmware 2. Execute factory reset	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measured variables
No.		Short text		
438	Dataset different		1. Check dataset file 2. Check device parameterization 3. Download new device parameterization	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	M		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured variables
No.		Short text		
441	Current output 1 to n saturated		1. Check current output settings 2. Check process	–
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
442	Frequency output 1 saturated		1. Check frequency output settings 2. Check process	–
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
443	Pulse output 1 saturated		1. Check pulse output settings 2. Check process	–
	Measured variable status [from the factory] [1]			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

1)   Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
444	Current input 1 to n saturated		1. Check current input settings 2. Check connected device 3. Check process	Measured values
	Measured variable status [from the factory] [1]			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

1)   Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
453	Flow override active		Deactivate flow override	• Conductivity • Corrected conductivity • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	C		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
484	Failure mode simulation active	Deactivate simulation	• Conductivity • Corrected conductivity • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	C	
	Diagnostic behavior	Alarm	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
485	Process variable simulation active	Deactivate simulation	• Conductivity • Corrected conductivity • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	C	
	Diagnostic behavior	Warning	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
486	Current input 1 to n simulation active	Deactivate simulation	Measured values
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	C	
	Diagnostic behavior	Warning	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
491	Current output 1 to n simulation active	Deactivate simulation	–
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	C	
	Diagnostic behavior	Warning	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
492	Frequency output 1 to n simulation active	Deactivate simulation frequency output	–
	Measured variable status		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	C		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
493	Pulse output simulation active	Deactivate simulation pulse output	–
	Measured variable status		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	C		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
494	Switch output 1 to n simulation active	Deactivate simulation switch output	–
	Measured variable status		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	C		
	Diagnostic behavior	Warning		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
495	Diagnostic event simulation active	Deactivate simulation	–
	Measured variable status		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	C		
	Diagnostic behavior	Warning		

No.	Diagnostic information / Short text		Remedy instructions	Influenced measured variables
496	Status input 1 to n simulation active		Deactivate simulation status input	–
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	C		
	Diagnostic behavior	Warning		

No.	Diagnostic information / Short text		Remedy instructions	Influenced measured variables
511	Sensor setting error		1. Check measuring period and integration time 2. Check sensor properties	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	C		
	Diagnostic behavior	Alarm		

No.	Diagnostic information / Short text		Remedy instructions	Influenced measured variables
512	ECC recovery time exceeded		1. Check ECC recovery time 2. Turn off ECC	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Alarm		

No.	Diagnostic information / Short text		Remedy instructions	Influenced measured variables
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	–
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
530	Electrode cleaning active	Switch off electrode cleaning	• Conductivity
	Measured variable status		• Corrected conductivity
	Quality	Good	• Measured values
	Quality substatus	Ok	• Density
	Coding (hex)	0x80 to 0x83	• Electronics temperature
	Status signal	C	• Flow velocity
			• Mass flow
	Diagnostic behavior	Warning	• **Corrected volume flow** option
			• Temperature
			• Volume flow

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
531	Empty pipe adjustment faulty	Execute EPD adjustment	• Conductivity
	Measured variable status [from the factory] [1]		• Corrected conductivity
	Quality	Good	• Measured values
	Quality substatus	Ok	• Density
	Coding (hex)	0x80 to 0x83	• Electronics temperature
	Status signal	S	• Flow velocity
			• Mass flow
	Diagnostic behavior	Warning	• **Corrected volume flow** option
			• Temperature
			• Volume flow

[1]   Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
537	Configuration	1. Check IP addresses in network	–
	Measured variable status	2. Change IP address	
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Warning	

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
594	Relay output 1 to n simulation active	Deactivate simulation switch output	–
	Measured variable status		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	C	
	Diagnostic behavior	Warning	

12.7.4 Diagnostic of process

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
803	Loop current 1 faulty	1. Check wiring 2. Change I/O module	–
	Measured variable status		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Alarm		

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
832	Electronics temperature too high	Reduce ambient temperature	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status [from the factory] [1]		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
833	Electronics temperature too low	Increase ambient temperature	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status [from the factory] [1]		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
834	Process temperature too high	Reduce process temperature	• Conductivity
	Measured variable status [from the factory] [1]		• Corrected conductivity
			• Density
	Quality	Good		• Electronics temperature
	Quality substatus	Ok		• Flow velocity
	Coding (hex)	0x80 to 0x83		• Mass flow
	Status signal	S		• **Corrected volume flow** option
	Diagnostic behavior	Warning		• Temperature
				• Volume flow

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
835	Process temperature too low	Increase process temperature	• Conductivity
	Measured variable status [from the factory] [1]		• Corrected conductivity
			• Density
	Quality	Good		• Electronics temperature
	Quality substatus	Ok		• Flow velocity
	Coding (hex)	0x80 to 0x83		• Mass flow
	Status signal	S		• **Corrected volume flow** option
	Diagnostic behavior	Warning		• Temperature
				• Volume flow

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
842	Process value below limit	1. Decrease process value	• Conductivity
	Measured variable status [from the factory] [1]	2. Check application	• Corrected conductivity
		3. Check sensor	• Density
	Quality	Good		• Electronics temperature
	Quality substatus	Ok		• Flow velocity
	Coding (hex)	0x80 to 0x83		• Mass flow
	Status signal	S		• **Corrected volume flow** option
	Diagnostic behavior	Warning		• Temperature
				• Volume flow

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
882	Input signal faulty	1. Check input signal parameterization	• Conductivity
	Measured variable status	2. Check external device	• Corrected conductivity
		3. Check process conditions	• Measured values
	Quality	Bad		• Density
	Quality substatus	Maintenance alarm		• Electronics temperature
	Coding (hex)	0x24 to 0x27		• Flow velocity
	Status signal	F		• Mass flow
	Diagnostic behavior	Alarm		• **Corrected volume flow** option
				• Temperature
				• Volume flow

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
937	Sensor symmetry	1. Eliminate external magnetic field near sensor 2. Turn off diagnostic message	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status [from the factory] [1]		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	S	
	Diagnostic behavior	Warning	

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
938	Coil current not stable	1. Check if external magnetic interference is present 2. Perform Heartbeat Verification 3. Check flow value	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status [from the factory] [1]		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	F	
	Diagnostic behavior	Alarm	

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
961	Electrode potential out of specification	1. Check process conditions 2. Check ambient conditions	• Mass flow • Status • Volume flow
	Measured variable status [from the factory] [1]		
	Quality	Good	
	Quality substatus	Ok	
	Coding (hex)	0x80 to 0x83	
	Status signal	S	
	Diagnostic behavior	Warning	

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
962	Pipe empty	1. Perform full pipe adjustment 2. Perform empty pipe adjustment 3. Turn off empty pipe detection	• Conductivity • Corrected conductivity • Measured values • Density • Electronics temperature • Flow velocity • Mass flow • **Corrected volume flow** option • Temperature • Volume flow
	Measured variable status [from the factory] [1]		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

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 → 🗎 182
- Via web browser → 🗎 183
- Via "FieldCare" operating tool → 🗎 184
- Via "DeviceCare" operating tool → 🗎 184

Other pending diagnostic events can be displayed in the **Diagnostic list** submenu → 🗎 206

Navigation
"Diagnostics" menu

⟳ **Diagnostics**	
Actual diagnostics	→ 🗎 206
Previous diagnostics	→ 🗎 206
Operating time from restart	→ 🗎 206
Operating time	→ 🗎 206

Parameter overview with brief description
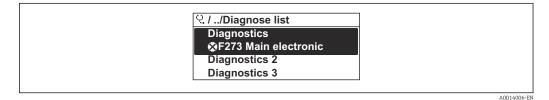
Parameter	Prerequisite	Description	User interface
Actual diagnostics	A diagnostic event has occurred.	Shows the current occured diagnostic event along with its diagnostic information. ℹ️ If two or more messages occur simultaneously, the message with the highest priority is shown on the display.	Symbol for diagnostic behavior, diagnostic code and short message.
Previous diagnostics	Two diagnostic events have already occurred.	Shows the diagnostic event that occurred prior to the current diagnostic event along with its diagnostic information.	Symbol for diagnostic behavior, diagnostic code and short message.
Operating time from restart	–	Shows the time the device has been in operation since the last device restart.	Days (d), hours (h), minutes (m) and seconds (s)
Operating time	–	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)

12.9   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_

🖼 *38   Taking the example of the local display*

ℹ️ To call up the measures to rectify a diagnostic event:
- Via local display → 📖 182
- Via web browser → 📖 183
- Via "FieldCare" operating tool → 📖 184
- Via "DeviceCare" operating tool → 📖 184

12.10   Event logbook

12.10.1 Reading out the event logbook

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

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

A0014008-EN

🖾 39   Taking the example of the local display

- A maximum of 20 event messages can be displayed in chronological order.
- If the **Extended HistoROM** application package (order option) is enabled in the device, the event list can contain up to 100 entries .

The event history includes entries for:
- Diagnostic events → 🖾 186
- Information events → 🖾 207

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 → 🖾 182
- Via web browser → 🖾 183
- Via "FieldCare" operating tool → 🖾 184
- Via "DeviceCare" operating tool → 🖾 184

For filtering the displayed event messages → 🖾 207

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

Info number	Info name
I1092	HistoROM backup deleted
I1137	Electronics changed
I1151	History reset
I1155	Reset electronics temperature
I1156	Memory error trend
I1157	Memory error event list
I1256	Display: access status changed
I1278	I/O module restarted
I1335	Firmware changed
I1351	Empty pipe detection adjustment failure
I1353	Empty pipe detection adjustment ok
I1361	Web server: login failed
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1443	Build-up thickness not determined
I1444	Device verification passed
I1445	Device verification failed
I1457	Measurement 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
I1618	I/O module 2 replaced
I1619	I/O module 3 replaced
I1621	I/O module 4 replaced
I1622	Calibration changed
I1624	All totalizers reset
I1625	Write protection activated
I1626	Write protection deactivated
I1627	Web server: login successful
I1628	Display: login successful
I1629	CDI: login successful
I1631	Web server access changed
I1632	Display: login failed
I1633	CDI: login failed
I1634	Reset to factory settings
I1635	Reset to delivery settings
I1639	Max. switch cycles number reached
I1649	Hardware write protection activated
I1650	Hardware write protection deactivated

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

The entire device configuration or some of the configuration can be reset to a defined state with the **Device reset** parameter (→ 🖺 157).

12.11.1 Function scope of "Device reset" parameter

Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to the customer-specific value. All other parameters are reset to the factory setting.
Restart device	The restart resets every parameter with data stored in volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

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                          → 🖺 210

        Serial number                       → 🖺 210

        Firmware version                    → 🖺 210

        Device name                         → 🖺 210

        Manufacturer                        → 🖺 210

        Order code                          → 🖺 210

        Extended order code 1               → 🖺 210

        Extended order code 2               → 🖺 210

        Extended order code 3               → 🖺 210

        ENP version                         → 🖺 210
```

Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Device tag	Shows name of measuring point.	Character string comprising numbers, letters and special characters	Promag
Serial number	Shows the serial number of the measuring device.	Max. 11-digit character string comprising letters and numbers.	–
Firmware version	Shows the device firmware version installed.	Character string in the format xx.yy.zz	–
Device name	Shows the name of the transmitter. 🛈 The name can be found on the nameplate of the transmitter.	Promag 300/500	–
Device name		Character string comprising numbers, letters and special characters	Prowirl
Manufacturer	Displays the manufacturer.	Character string comprising numbers, letters and special characters	Endress+Hauser
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

12.13   Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
2023	01.00.zz	Option **61**	Original firmware	Operating Instructions	BA02101D/06/EN/01.21

It is possible to flash the firmware to the current version using the service interface.

For the compatibility of the firmware version with 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. 5W5B
    The product root is the first part of the order code: see the nameplate on the device.
  - Text search: Manufacturer's information
  - Media type: Documentation – Technical Documentation

13   Maintenance

13.1   Maintenance 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.

⚠ WARNING

Cleaning agents can damage the plastic transmitter housing!
▸ Do not use high-pressure steam.
▸ Only use the permitted cleaning agents specified.

Permitted cleaning agents for the plastic transmitter housing
• Commercially available household cleaners
• Methyl alcohol or isopropyl alcohol
• Mild soap solutions

13.1.2   Interior cleaning

No interior cleaning is planned for the device.

13.2   Measuring and test equipment

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

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

List of some of the measuring and testing equipment: → 🖺 215→ 🖺 217

13.3   Endress+Hauser services

Endress+Hauser offers a wide variety of services for maintenance such as recalibration, maintenance service or device tests.

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

14   Repair

14.1   General information

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 and Netilion Analytics.

14.2   Spare parts

Device Viewer (www.endress.com/deviceviewer):
All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.

Measuring device serial number:
- Is located on the nameplate of the device.
- Can be read out via the **Serial number** parameter (→ 🕮 210) 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 requirements for safe device return can vary depending on the device type and national legislation.

1. Refer to the web page for information:
   http://www.endress.com/support/return-material
   ↳ Select the region.

2. Return the device if repairs or a factory calibration are required, or if the wrong device was ordered or delivered.

14.5   Disposal

If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

14.5.1   Removing the measuring device

1. Switch off the device.

⚠ WARNING

Danger to persons from process conditions!
▶ Beware of hazardous process conditions such as pressure in the measuring device, high temperatures or aggressive media.

2. Carry out the mounting and connection steps from the "Mounting the measuring device" and "Connecting the measuring device" sections in reverse order. Observe the safety instructions.

14.5.2   Disposing of the measuring device

⚠ WARNING

Danger to personnel and environment from fluids that are hazardous to health.
▶ Ensure that the measuring device and all cavities are free of fluid residues that are hazardous to health or the environment, e.g. substances that have permeated into crevices or diffused through plastic.

Observe the following notes during disposal:
▶ Observe valid federal/national regulations.
▶ Ensure proper separation and reuse of the device components.

15 Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

15.1 Device-specific accessories

15.1.1 For the transmitter

Accessories	Description

Transmitter
• Proline 500 – digital
• Proline 500
	Transmitter for replacement or storage. Use the order code to define the following specifications:
	• Approvals
	• Output
	• Input
	• Display/operation
	• Housing
	• Software
	
	• Proline 500 – digital transmitter:
	  Order number: 5X5BXX-*********A
	• Proline 500 transmitter:
	  Order number: 5X5BXX-*********B
	
	Proline 500 transmitter for replacement:
	It is essential to specify the serial number of the current transmitter when ordering. On the basis of the serial number, the device-specific data (e.g. calibration factors) of the replaced device can be used for the new transmitter.
	
	• Proline 500 – digital transmitter: Installation Instructions EA01151D
	• Proline 500 transmitter: Installation Instructions EA01152D

External WLAN antenna	External WLAN antenna with 1.5 m (59.1 in) connecting cable and two angle brackets. Order code for "Accessory enclosed", option P8 "Wireless antenna wide area". • The external WLAN antenna is not suitable for use in hygienic applications. • Additional information regarding the WLAN interface → 🖹 102. Order number: 71351317 Installation Instructions EA01238D
Pipe mounting set	Pipe mounting set for transmitter. Proline 500 – digital transmitter Order number: 71346427 Installation Instructions EA01195D Proline 500 transmitter Order number: 71346428

Weather protection cover
 	
Transmitter
• Proline 500 – digital
• Proline 500
	Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight.
	
	• Proline 500 – digital transmitter
	  Order number: 71343504
	• Proline 500 transmitter
	  Order number: 71343505
	
	Installation Instructions EA01191D

Display guard Proline 500 – digital	Is used to protect the display against impact or scoring, for example from sand in desert areas.
	ℹ️ Order number: 71228792
	📖 Installation Instructions EA01093D
Ground cable	Set, consisting of two ground cables for potential equalization.
Connecting cable Proline 500 – digital Sensor – Transmitter	The connecting cable can be ordered directly with the measuring device (order code for "Cable, sensor connection) or as an accessory (order number DK5012).
	The following cable lengths are available: order code for "Cable, sensor connection" • Option B: 20 m (65 ft) • Option E: User-configurable up to max. 50 m • Option F: User-configurable up to max. 165 ft
	ℹ️ Maximum possible cable length for a Proline 500 – digital connecting cable: 300 m (1000 ft)
Connecting cable Proline 500 Sensor – Transmitter	The connecting cable can be ordered directly with the measuring device (order code for "Cable, sensor connection") or as an accessory (order number DK5012).
	The following cable lengths are available: order code for "Cable, sensor connection" • Option 1: 5 m (16 ft) • Option 2: 10 m (32 ft) • Option 3: 20 m (65 ft) • Option 4: User-configurable cable length (m) • Option 5: User-configurable cable length (ft)
	ℹ️ Possible cable length for a Proline 500 connecting cable: depending on the medium conductivity, max. 200 m (660 ft)

15.1.2 For the sensor

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

15.2 Communication-specific accessories

Accessories	Description
Fieldgate FXA42	Is used to transmit the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices
	📖 • Technical Information TI01297S • Operating Instructions BA01778S • Product page: www.endress.com/fxa42
Field Xpert SMT50	The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.
	📖 • Technical Information TI01342S • Operating Instructions BA01709S • Product page: www.endress.com/smt50

Field Xpert SMT70	The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.
	• Technical Information TI01342S • Operating Instructions BA01709S • Product page: www.endress.com/smt70
Field Xpert SMT77	The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.
	• Technical Information TI01418S • Operating Instructions BA01923S • Product page: www.endress.com/smt77

15.3 Service-specific accessories

Accessory	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: • Choice of measuring devices with industrial requirements • Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy. • Graphic illustration of the calculation results • Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: • Via the Internet: https://portal.endress.com/webapp/applicator • As a downloadable DVD for local PC installation.
W@M	W@M Life Cycle Management 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. 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. Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, see: www.endress.com/lifecyclemanagement
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. Operating Instructions BA00027S and BA00059S
DeviceCare	Tool for connecting and configuring Endress+Hauser field devices. Innovation brochure IN01047S

15.4   System components

Accessories	Description

Memograph M graphic data manager	The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.
	
	    • Technical Information TI00133R
	    • Operating Instructions BA00247R

iTEMP	The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature. "Fields of Activity" document FA00006T

16 Technical data

16.1 Application

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

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

To ensure that the device remains in proper operating condition for its service life, use the measuring device only for media against which the process-wetted materials are sufficiently resistant.

16.2 Function and system design

Measuring principle	Electromagnetic flow measurement on the basis of *Faraday's law of magnetic induction*.
Measuring system	The measuring system consists of a transmitter and a sensor. The transmitter and sensor are mounted in physically separate locations. They are interconnected by connecting cables. Information on the structure of the device → 🖹 13

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 Electrical conductivity: ≥ 5 µS/cm for liquids in general

Flow characteristic values in SI units: DN 25 to 125 mm (1 to 4 in)

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3...10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 Pulse/s at v ~ 2.5 m/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[dm³/min]	[dm³/min]	[dm³]	[dm³/min]
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 1 100	300	2.5	5
65	–	60 to 2 000	500	5	8

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3…10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 Pulse/s at v ~ 2.5 m/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[dm³/min]	[dm³/min]	[dm³]	[dm³/min]
80	3	90 to 3 000	750	5	12
100	4	145 to 4 700	1 200	10	20
125	–	220 to 7 500	1 850	15	30

Flow characteristic values in SI units: DN 150 to 3 000 mm (6 to 120 in)

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3…10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 Pulse/s at v ~ 2.5 m/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[m³/h]	[m³/h]	[m³]	[m³/h]
150	6	20 to 600	150	0.025	2.5
200	8	35 to 1 100	300	0.05	5
250	10	55 to 1 700	500	0.05	7.5
300	12	80 to 2 400	750	0.1	10
350	14	110 to 3 300	1 000	0.1	15
375	15	140 to 4 200	1 200	0.15	20
400	16	140 to 4 200	1 200	0.15	20
450	18	180 to 5 400	1 500	0.25	25
500	20	220 to 6 600	2 000	0.25	30
600	24	310 to 9 600	2 500	0.3	40
700	28	420 to 13 500	3 500	0.5	50
750	30	480 to 15 000	4 000	0.5	60
800	32	550 to 18 000	4 500	0.75	75
900	36	690 to 22 500	6 000	0.75	100
1000	40	850 to 28 000	7 000	1	125
–	42	950 to 30 000	8 000	1	125
1200	48	1 250 to 40 000	10 000	1.5	150
–	54	1 550 to 50 000	13 000	1.5	200
1400	–	1 700 to 55 000	14 000	2	225
–	60	1 950 to 60 000	16 000	2	250
1600	–	2 200 to 70 000	18 000	2.5	300
–	66	2 500 to 80 000	20 500	2.5	325
1800	72	2 800 to 90 000	23 000	3	350
–	78	3 300 to 100 000	28 500	3.5	450
2000	–	3 400 to 110 000	28 500	3.5	450
–	84	3 700 to 125 000	31 000	4.5	500
2200	–	4 100 to 136 000	34 000	4.5	540
–	90	4 300 to 143 000	36 000	5	570

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3...10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 Pulse/s at v ~ 2.5 m/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[m³/h]	[m³/h]	[m³]	[m³/h]
2400	–	4 800 to 162 000	40 000	5.5	650
–	96	5 000 to 168 000	42 000	6	675
–	102	5 700 to 190 000	47 500	7	750
2600	–	5 700 to 191 000	48 000	7	775
–	108	6 500 to 210 000	55 000	7	850
2800	–	6 700 to 222 000	55 500	8	875
–	114	7 100 to 237 000	59 500	8	950
3000	–	7 600 to 254 000	63 500	9	1 025
–	120	7 900 to 263 000	65 500	9	1 050

Flow characteristic values in SI units: DN 50 to 200 mm (2 to 8 in) for order code for "Design", option C "Fixed flange, constricted measuring tube, 0 x DN inlet/outlet runs"

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.12...5 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 4 Pulse/s at v ~ 2.5 m/s)	Low flow cut off (v ~ 0.01 m/s)
[mm]	[in]	[dm³/min]	[dm³/min]	[dm³]	[dm³/min]
50	2	15 to 600	300	1.25	1.25
65	–	25 to 1 000	500	2	2
80	3	35 to 1 500	750	3	3.25
100	4	60 to 2 400	1 200	5	4.75
125	–	90 to 3 700	1 850	8	7.5
150	6	145 to 5 400	2 500	10	11
200	8	220 to 9 400	5 000	20	19

Flow characteristic values in SI units: DN 250 to 300 mm (10 to 12 in) for order code for "Design", option C "Fixed flange, constricted measuring tube, 0 x DN inlet/outlet runs"

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.12...5 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 4 Pulse/s at v ~ 2.5 m/s)	Low flow cut off (v ~ 0.01 m/s)
[mm]	[in]	[m³/h]	[m³/h]	[m³]	[m³/h]
250	10	20 to 850	500	0.03	1.75
300	12	35 to 1 300	750	0.05	2.75

Flow characteristic values in US units: DN 1 to 48 in (25 to 1200 mm)

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3…10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 Pulse/s at v ~ 2.5 m/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/min]
1	25	2.5 to 80	18	0.2	0.25
–	32	4 to 130	30	0.2	0.5
1 ½	40	7 to 185	50	0.5	0.75
2	50	10 to 300	75	0.5	1.25
–	65	16 to 500	130	1	2
3	80	24 to 800	200	2	2.5
4	100	40 to 1 250	300	2	4
–	125	60 to 1 950	450	5	7
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
15	375	600 to 19 000	4 800	50	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
28	700	1 900 to 60 000	13 500	125	210
30	750	2 150 to 67 000	16 500	150	270
32	800	2 450 to 80 000	19 500	200	300
36	900	3 100 to 100 000	24 000	225	360
40	1000	3 800 to 125 000	30 000	250	480
42	–	4 200 to 135 000	33 000	250	600
48	1200	5 500 to 175 000	42 000	400	600

Flow characteristic values in US units: DN 54 to 120 in (1400 to 3000 mm)
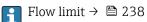
Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3…10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 Pulse/s at v ~ 2.5 m/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[Mgal/d]	[Mgal/d]	[Mgal]	[Mgal/d]
54	–	9 to 300	75	0.0005	1.3
–	1400	10 to 340	85	0.0005	1.3
60	–	12 to 380	95	0.0005	1.3
–	1600	13 to 450	110	0.0008	1.7
66	–	14 to 500	120	0.0008	2.2
72	1800	16 to 570	140	0.0008	2.6

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.3…10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 Pulse/s at v ~ 2.5 m/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[Mgal/d]	[Mgal/d]	[Mgal]	[Mgal/d]
78	–	18 to 650	175	0.0010	3.0
–	2000	20 to 700	175	0.0010	2.9
84	–	24 to 800	190	0.0011	3.2
–	2200	26 to 870	210	0.0012	3.4
90	–	27 to 910	220	0.0013	3.6
–	2400	31 to 1030	245	0.0014	4.0
96	–	32 to 1066	265	0.0015	4.0
102	–	34 to 1203	300	0.0017	5.0
–	2600	34 to 1212	305	0.0018	5.0
108	–	35 to 1300	340	0.0020	5.0
–	2800	42 to 1405	350	0.0020	6.0
114	–	45 to 1503	375	0.0022	6.0
–	3000	48 to 1613	405	0.0023	6.0
120	–	50 to 1665	415	0.0024	7.0

Flow characteristic values in US units: DN 2 to 12 in (50 to 300 mm) for order code for "Design", option C "Fixed flange, constricted measuring tube, 0 x DN inlet/outlet runs"

Nominal diameter		Recommended flow	Factory settings		
		min./max. full scale value (v ~ 0.12…5 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 4 Pulse/s at v ~ 2.5 m/s)	Low flow cut off (v ~ 0.01 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/min]
2	50	4 to 160	75	0.3	0.35
–	65	7 to 260	130	0.5	0.6
3	80	10 to 400	200	0.8	0.8
4	100	16 to 650	300	1.2	1.25
–	125	24 to 1000	450	1.8	2
6	150	40 to 1400	600	2.5	3
8	200	60 to 2500	1200	5	5
10	250	90 to 3700	1500	6	8
12	300	155 to 5700	2400	9	12

Recommended measuring range

Flow limit → 🔲 238

Operable flow range   Over 1000 : 1

Input signal	**External measured values**

To increase the accuracy of certain measured variables or to calculate the mass flow, the automation system can continuously write different measured values to the measuring device:
- Medium temperature enables temperature-compensated conductivity measurement (e.g. iTEMP)
- Reference density for calculating the mass flow

ℹ️ Various pressure and temperature measuring devices can be ordered from Endress +Hauser: see "Accessories" section → 🕮 218

It is recommended to read in external measured values to calculate the corrected volume flow.

Current input

The measured values are written from the automation system to the measuring device via the current input → 🕮 224.

Digital communication

The measured values are written by the automation system via PROFINET with Ethernet-APL.

Current input 0/4 to 20 mA

Current input	0/4 to 20 mA (active/passive)
Current span	• 4 to 20 mA (active) • 0/4 to 20 mA (passive)
Resolution	1 µA
Voltage drop	Typically: 0.6 to 2 V for 3.6 to 22 mA (passive)
Maximum input voltage	≤ 30 V (passive)
Open-circuit voltage	≤ 28.8 V (active)
Possible input variables	• Temperature • Density

Status input

Maximum input values	• DC −3 to 30 V • If status input is active (ON): R_i >3 kΩ
Response time	Configurable: 5 to 200 ms
Input signal level	• Low signal: DC −3 to +5 V • High signal: DC 12 to 30 V
Assignable functions	• Off • Reset the individual totalizers separately • Reset all totalizers • Flow override

16.4 Output

Output signal

PROFINET with Ethernet-APL

Device use	Device connection to an APL field switch
	The device may only be operated according to the following APL port classifications:
	• If used in hazardous areas: SLAA or SLAC [1]
	• If used in non-hazardous areas: SLAX
	Connection values of APL field switch (for example corresponds to APL port classification SPCC or SPAA, for instance):
	• Maximum input voltage: 15 V_{DC}
	• Minimum output values: 0.54 W
	Device connection to an SPE switch
	• In non-hazardous areas, the device can be used with a suitable SPE switch: The device can be connected to an SPE switch with a maximum voltage of 30 V_{DC} and a minimum output power of 1.85 W.
	• The SPE switch must support the 10BASE-T1L standard and the PoDL power classes 10, 11 or 12 and have a function to disable power class recognition.
PROFINET	According to IEC 61158 and IEC 61784
Ethernet-APL	According to IEEE 802.3cg, APL port profile specification v1.0, galvanically isolated
Data transfer	10 Mbit/s
Current consumption	**Transmitter**
	• Max. 400 mA(24 V)
	• Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz)
Permitted supply voltage	9 to 30 V
Network connection	With integrated reverse polarity protection

1)   For more information on using the device in the hazardous area, see the Ex-specific Safety Instructions

Current output 4 to 20 mA

Signal mode	Can be set to:
	• Active
	• Passive
Current span	Can be set to:
	• 4 to 20 mA NAMUR
	• 4 to 20 mA US
	• 4 to 20 mA
	• 0 to 20 mA (only if the signal mode is active)
	• Fixed current
Maximum output values	22.5 mA
Open-circuit voltage	DC 28.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	0 to 700 Ω
Resolution	0.38 µA
Damping	Configurable: 0 to 999.9 s
Assignable measured variables	• Volume flow
	• Mass flow
	• Corrected volume flow
	• Flow velocity
	• Conductivity
	• Electronics temperature

Pulse/frequency/switch output

Function	Can be configured as pulse, frequency or switch output
Version	Open collector Can be set to: • Active • Passive • Passive NAMUR ⓘ Ex-i, passive
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Voltage drop	For 22.5 mA: ≤ DC 2 V
Pulse output	
Maximum input values	DC 30 V, 250 mA (passive)
Maximum output current	22.5 mA (active)
Open-circuit voltage	DC 28.8 V (active)
Pulse width	Configurable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Configurable
Assignable measured variables	• Volume flow • Mass flow • Corrected volume flow
Frequency output	
Maximum input values	DC 30 V, 250 mA (passive)
Maximum output current	22.5 mA (active)
Open-circuit voltage	DC 28.8 V (active)
Output frequency	Configurable: end value frequency 2 to 10 000 Hz(f_{max} = 12 500 Hz)
Damping	Configurable: 0 to 999.9 s
Pulse/pause ratio	1:1
Assignable measured variables	• Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity • Electronics temperature
Switch output	
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Switching behavior	Binary, conductive or non-conductive
Switching delay	Configurable: 0 to 100 s

Number of switching cycles	Unlimited

Assignable functions	• Off
	• On
	• Diagnostic behavior
	• Limit value:
	  • Off
	  • Volume flow
	  • Mass flow
	  • Corrected volume flow
	  • Flow velocity
	  • Conductivity
	  • Totalizer 1-3
	  • Electronics temperature
	• Flow direction monitoring
	• Status
	  • Empty pipe detection
	  • Buildup index
	  • HBSI limit value exceeded
	  • Low flow cut off

Relay output

Function	Switch output
Version	Relay output, galvanically isolated
Switching behavior	Can be set to: • NO (normally open), factory setting • NC (normally closed)
Maximum switching capacity (passive)	• DC 30 V, 0.1 A • AC 30 V, 0.5 A

Assignable functions	• Off
	• On
	• Diagnostic behavior
	• Limit value:
	  • Off
	  • Volume flow
	  • Mass flow
	  • Corrected volume flow
	  • Flow velocity
	  • Conductivity
	  • Totalizer 1-3
	  • Electronics temperature
	• Flow direction monitoring
	• Status
	  • Empty pipe detection
	  • Buildup index
	  • HBSI limit value exceeded
	  • Low flow cut off

User-configurable input/output

One specific input or output is assigned to a user-configurable input/output (configurable I/O) during device commissioning.

The following inputs and outputs are available for assignment:
• Choice of current output: 4 to 20 mA (active), 0/4 to 20 mA (passive)
• Pulse/frequency/switch output
• Choice of current input: 4 to 20 mA (active), 0/4 to 20 mA (passive)
• Status input

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

PROFINET with Ethernet-APL

Device diagnostics	Diagnostics according to PROFINET PA Profile 4

Current output 0/4 to 20 mA

4 to 20 mA

Failure mode	Choose from: • 4 to 20 mA in accordance with NAMUR recommendation NE 43 • 4 to 20 mA in accordance with US • Min. value: 3.59 mA • Max. value: 22.5 mA • Definable value between: 3.59 to 22.5 mA • Actual value • Last valid value

0 to 20 mA

Failure mode	Choose from: • Maximum alarm: 22 mA • Definable value between: 0 to 20.5 mA

Pulse/frequency/switch output

Pulse output	
Failure mode	Choose from: • Actual value • No pulses
Frequency output	
Failure mode	Choose from: • Actual value • 0 Hz • Definable value between: 2 to 12 500 Hz
Switch output	
Failure mode	Choose from: • Current status • Open • Closed

Relay output

Failure mode	Choose from: • Current status • Open • Closed

Local display

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

Status signal as per NAMUR recommendation NE 107

Interface/protocol

- Via digital communication:
  PROFINET with Ethernet-APL
- Via service interface
  - CDI-RJ45 service interface
  - WLAN interface

Plain text display	With information on cause and remedial measures

Web browser

Plain text display	With information on cause and remedial measures

Light emitting diodes (LED)

Status information	Status indicated by various light emitting diodes
	The following information is displayed depending on the device version: • Supply voltage active • Data transmission active • Device alarm/error has occurred • PROFINET network available • PROFINET connection established • PROFINET blinking feature ⓘ Diagnostic information via light emitting diodes → 🖱 176

Low flow cut off | The switch points for low flow cut off are user-selectable.

Galvanic isolation | The outputs are galvanically isolated:
- from the power supply
- from one another
- from the potential equalization (PE) terminal

protocol-specific data

Protocol	Application layer protocol for decentral device periphery and distributed automation, Version 2.43
Communication type	Ethernet Advanced Physical Layer 10BASE-T1L
Conformance Class	Conformance Class B (PA)
Netload Class	PROFINET Netload Robustness Class 2 10 Mbit/s
Baud rates	10 Mbit/s Full-duplex
Cycle times	64 ms
Polarity	Automatic correction of crossed "APL signal +" and "APL signal -" signal lines
Media Redundancy Protocol (MRP)	Not possible (point-to-point connection to APL field switch)
System redundancy support	System redundancy S2 (2 AR with 1 NAP)
Device profile	PROFINET PA profile 4 (Application interface identifier API: 0x9700)
Manufacturer ID	17
Device type ID	0xA43C
Device description files (GSD, DTM, FDI)	Information and files at: • www.endress.com → Download Area • www.profibus.com

Supported connections	• 2x AR (IO Controller AR) • 2x AR (IO Supervisor Device AR connection allowed)
Configuration options for measuring device	• DIP switches on the electronics module, for device name assignment (last part) • Asset management software (FieldCare, DeviceCare, Field Xpert) • Integrated Web server via Web browser and IP address • Device master file (GSD), can be read out via the integrated Web server of the measuring device. • Onsite operation
Configuration of the device name	• DIP switches on the electronics module, for device name assignment (last part) • DCP protocol • Asset management software (FieldCare, DeviceCare, Field Xpert) • Integrated Web server

Supported functions	• Identification & Maintenance, simple device identifier via:
	  • Control system
	  • Nameplate
	• Measured value status
	  The process variables are communicated with a measured value status
	• Blinking feature via the local display for simple device identification and assignment
	• Device operation via asset management software (e.g. FieldCare, DeviceCare, SIMATIC PDM with FDI package)

System integration	Information regarding system integration . • Cyclic data transmission • Overview and description of the modules • Status coding • Factory setting

16.5 Power supply

Terminal assignment	→ 🖺 48

Available device plugs	→ 🖺 49

Pin assignment, device plug	→ 🖺 49

Supply voltage

Order code for "Power supply"	Terminal voltage		Frequency range
Option **D**	DC 24 V	±20%	–
Option **E**	AC 100 to 240 V	−15 to +10%	50/60 Hz, ±4 Hz
Option **I**	DC 24 V	±20%	–
	AC 100 to 240 V	−15 to +10%	50/60 Hz, ±4 Hz

Power consumption

Transmitter

Max. 10 W (active power)

switch-on current	Max. 36 A (<5 ms) as per NAMUR Recommendation NE 21

Current consumption	**Transmitter**
	• Max. 400 mA (24 V) • Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz)

Power supply failure	• Totalizers stop at the last value measured. • Depending on the device version, the configuration is retained in the device memory or in the plug-in memory (HistoROM DAT). • Error messages (incl. total operated hours) are stored.

Overcurrent protection element	The device must be operated with a dedicated circuit breaker, as it does not have an ON/OFF switch of its own. • The circuit breaker must be easy to reach and labeled accordingly. • Permitted nominal current of the circuit breaker: 2 A up to maximum 10 A.

Electrical connection	• → 🗎 53 • → 🗎 60

Potential equalization	→ 🗎 66

Terminals	Spring-loaded terminals: Suitable for strands and strands with ferrules. Conductor cross-section 0.2 to 2.5 mm² (24 to 12 AWG).

Cable entries	• Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
	• Thread for cable entry:
	  • NPT ½"
	  • G ½"
	  • M20

Cable specification	→ 🗎 44

Overvoltage protection		
	Mains voltage fluctuations	→ 🗎 230
	Overvoltage category	Overvoltage category II
	Short-term, temporary overvoltage	Up to 1200 V between cable and ground, for max. 5 s
	Long-term, temporary overvoltage	Up to 500 V between cable and ground

16.6   Performance characteristics
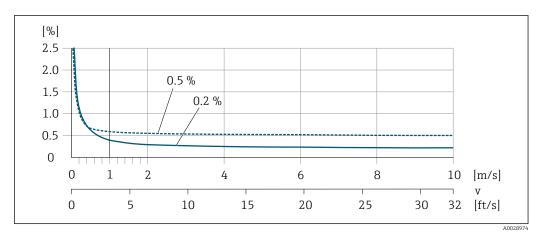
Reference operating conditions	• Error limits following DIN EN 29104, in future ISO 20456 • Water, typically: +15 to +45 ℃ (+59 to +113 ℉); 0.5 to 7 bar (73 to 101 psi) • Data as indicated in the calibration protocol • Accuracy based on accredited calibration rigs according to ISO 17025

Maximum measured error	o.r. = of reading

Error limits under reference operating conditions

Volume flow
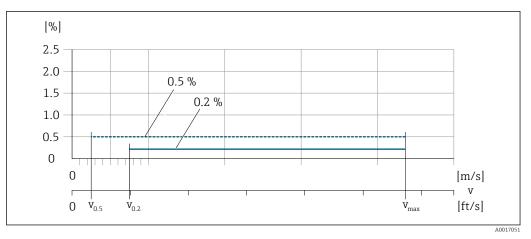
- ±0.5 % o.r. ± 1 mm/s (0.04 in/s)
- Optional: ±0.2 % o.r. ± 2 mm/s (0.08 in/s)

Fluctuations in the supply voltage do not have any effect within the specified range.

🖂 *40   Maximum measured error in % o.r.*

Flat Spec

In the case of Flat Spec, the measured error is constant in the range from $v_{0.5}$ ($v_{0.2}$) to v_{max}.

🖂 *41   Flat Spec in % o.r.*

Flat Spec flow values 0.5 %

Nominal diameter		$v_{0.5}$		v_{max}	
[mm]	[in]	[m/s]	[ft/s]	[m/s]	[ft/s]
25 to 600	1 to 24	0.5	1.64	10	32
50 to 300 [1]	2 to 12	0.25	0.82	5	16

1)   Order code for "Design", option C

Flat Spec flow values 0.2 %

Nominal diameter		$v_{0.2}$		v_{max}	
[mm]	[in]	[m/s]	[ft/s]	[m/s]	[ft/s]
25 to 600	1 to 24	1.5	4.92	10	32
50 to 300 [1]	2 to 12	0.6	1.97	4	13

1)   Order code for "Design", option C
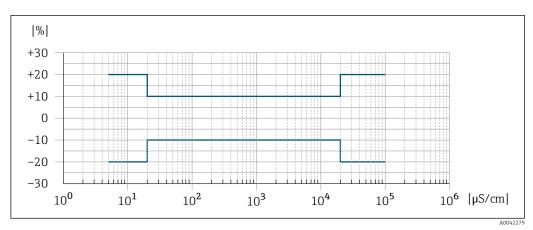
Electrical conductivity

The values apply for:
- Proline 500 – digital device version
- Devices installed in a metal pipe or in a non-metal pipe with ground disks
- Devices whose potential equalization was performed according to the instructions in the associated Operating Instructions
- Measurements at a reference temperature of 25 ℃ (77 ℉). At different temperatures, attention must be paid to the temperature coefficient of the medium (typically 2.1 %/K)

Conductivity [µS/cm]	Measured error [%] of reading
5 to 20	± 20%
> 20 to 50	± 10%
> 50 to 10 000	- Standard: ± 10% - Optional [1]: ± 5%
> 10 000 to 20 000	± 10%
> 20 000 to 100 000	± 20%

1)   Order code for "Calibrated conductivity measurement", option CW

⊠ 42   Measured error (standard)

43   Measured error (optional: order code for "Calibrated conductivity measurement", option CW)

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**

Temperature coefficient	Max. 1 µA/°C

Pulse/frequency output

Temperature coefficient	No additional effect. Included in accuracy.

16.7   Mounting

Mounting requirements	→ 🔲 21

16.8   Environment

Ambient temperature range	→ 🔲 28

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	The storage temperature corresponds to the operating temperature range of the transmitter and the sensor → 🔲 28.

- 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.

Relative humidity	The device is suitable for use in outdoor and indoor areas with a relative humidity of 4 to 95%.
Operating height	According to EN 61010-1 • ≤ 2 000 m (6 562 ft) • > 2 000 m (6 562 ft) with additional overvoltage protection (e.g. Endress+Hauser HAW Series)

Degree of protection

Transmitter

- IP66/67, Type 4X enclosure, suitable for pollution degree 4
- When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2
- Display module: IP20, Type 1 enclosure, suitable for pollution degree 2

Sensor

- IP66/67, Type 4X enclosure, suitable for pollution degree 4
- When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2

Optional

Order code for "Sensor option", option CB, CC
- IP68, type 6P enclosure
- Fully welded, with protective coating as per EN ISO 12944 C5-M/Im1 and EN 60529
- For the operation of the device under water
- Operating duration at a maximum depth of:
  - 3 m (10 ft): permanent use
  - 10 m (30 ft): maximum 48 hours

Order code for "Sensor option", option CQ
- IP68, type 6P, temporarily waterproof
- Sensor with aluminum half-shell housing
- For the temporary operation of the device under non-corrosive water
- Operating duration at a maximum depth of:
  3 m (10 ft): maximum 168 hours

Order code for "Sensor option", option CD, CE
- IP68, type 6P enclosure
- Fully welded, with protective coating as per EN ISO 12944 Im2/Im3 and EN 60529
- For the operation of the device in buried applications
- For the operation of the device under water and in saline water
- Operating duration at a maximum depth of:
  - 3 m (10 ft): permanent use
  - 10 m (30 ft): maximum 48 hours

External WLAN antenna

IP67

Vibration- and shock-resistance

Sinusoidal vibration according to IEC 60068-2-6

Order code for "Sensor connection housing", option L "Cast alloy, stainless" and order code for "Sensor option", option CG "Extended neck for insulation"
• 2 to 8.4 Hz, 3.5 mm peak
• 8.4 to 2 000 Hz, 1 g peak

Order code for "Sensor connection housing", option A "Aluminum, coated" and option D "Polycarbonate, sensor, fully welded"
• 2 to 8.4 Hz, 7.5 mm peak
• 8.4 to 2 000 Hz, 2 g peak

Vibration broad-band random, according to IEC 60068-2-64

Order code for "Sensor connection housing", option L "Cast alloy, stainless" and order code for "Sensor option", option CG "Extended neck for insulation"
• 10 to 200 Hz, 0.003 g^2/Hz
• 200 to 2 000 Hz, 0.001 g^2/Hz
• Total: 1.54 g rms

Order code for "Sensor connection housing", option A "Aluminum, coated" and option D "Polycarbonate, sensor, fully welded"
• 10 to 200 Hz, 0.01 g^2/Hz
• 200 to 2 000 Hz, 0.003 g^2/Hz
• Total: 2.70 g rms
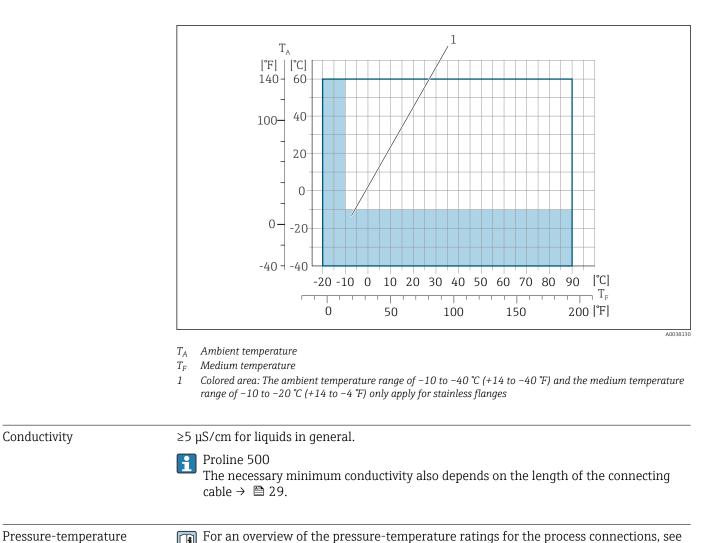
Shock half-sine, according to IEC 60068-2-27

• Order code for "Sensor connection housing", option L "Cast alloy, stainless" and order code for "Sensor option", option CG "Extended neck for insulation"
6 ms 30 g
• Order code for "Sensor connection housing", option A "Aluminum, coated" and option D "Polycarbonate, sensor, fully welded"
6 ms 50 g

Rough handling shocks according to IEC 60068-2-31

Mechanical load	Transmitter housing and sensor connection housing: • Protect against mechanical effects, such as shock or impact • Do not use as a ladder or climbing aid
Electromagnetic compatibility (EMC)	Details are provided in the Declaration of Conformity. This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.

16.9   Process

Medium temperature range	• 0 to +80 °C (+32 to +176 °F) for hard rubber, DN 50 to 3000 (2 to 120") • −20 to +50 °C (−4 to +122 °F) for polyurethane, DN 25 to 1200 (1 to 48") • −20 to +90 °C (−4 to +194 °F) for PTFE, DN 25 to 300 (1 to 12")

T$_A$ *Ambient temperature*
T$_F$ *Medium temperature*
1   *Colored area: The ambient temperature range of −10 to −40 ℃ (+14 to −40 ℉) and the medium temperature range of −10 to −20 ℃ (+14 to −4 ℉) only apply for stainless flanges*

Conductivity	≥5 µS/cm for liquids in general.

Proline 500
The necessary minimum conductivity also depends on the length of the connecting cable → 🖩 29.

Pressure-temperature ratings	For an overview of the pressure-temperature ratings for the process connections, see the Technical Information

Pressure tightness

Liner: hard rubber

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:		
[mm]	[in]	+25 ℃ (+77 ℉)	+50 ℃ (+122 ℉)	+80 ℃ (+176 ℉)
50 … 3000	2 … 120	0 (0)	0 (0)	0 (0)

Liner: polyurethane
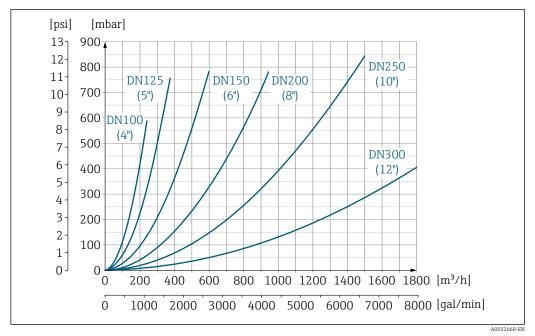
Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:	
[mm]	[in]	+25 ℃ (+77 ℉)	+50 ℃ (+122 ℉)
25 … 1200	1 … 48	0 (0)	0 (0)

Liner: PTFE

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:	
[mm]	[in]	+25 ℃ (+77 ℉)	+90 ℃ (+194 ℉)
25	1	0 (0)	0 (0)
40	2	0 (0)	0 (0)
50	2	0 (0)	0 (0)

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:	
[mm]	[in]	+25 °C (+77 °F)	+90 °C (+194 °F)
65	2 ½	0 (0)	40 (0.58)
80	3	0 (0)	40 (0.58)
100	4	0 (0)	135 (2.0)
125	5	135 (2.0)	240 (3.5)
150	6	135 (2.0)	240 (3.5)
200	8	200 (2.9)	290 (4.2)
250	10	330 (4.8)	400 (5.8)
300	12	400 (5.8)	500 (7.3)

Flow limit

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 to 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the medium:
- v < 2 m/s (6.56 ft/s): for abrasive media (e.g. potter's clay, lime milk, ore slurry)
- v > 2 m/s (6.56 ft/s): for media producing buildup (e.g. wastewater sludge)

A necessary increase in the flow velocity can be achieved by reducing the sensor nominal diameter.

For an overview of the full scale values for the measuring range, see the "Measuring range" section

Pressure loss

- 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 → 🖺 28

🖼 44   *Pressure loss DN 50 to 80 (2 to 3") for order code for "Design", option C "Fixed flange, constricted measuring tube", 0 x DN inlet/outlet runs"*

45   Pressure loss DN 100 to 300 (4 to 12") for order code for "Design", option C "Fixed flange, constricted measuring tube", 0 x DN inlet/outlet runs"

System pressure	→ 🖹 28

Vibrations	→ 🖹 28

16.10   Mechanical construction

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

Weight

All values (weight exclusive of packaging material) refer to devices with flanges of the standard pressure rating.
The weight may be lower than indicated depending on the pressure rating and design.

Transmitter

- Proline 500 – digital polycarbonate: 1.4 kg (3.1 lbs)
- Proline 500 – digital aluminum: 2.4 kg (5.3 lbs)
- Proline 500 aluminum: 6.5 kg (14.3 lbs)
- Proline 500 cast, stainless: 15.6 kg (34.4 lbs)

Sensor

- Sensor with cast connection housing version, stainless: +3.7 kg (+8.2 lbs)
- Sensor with aluminum connection housing version:

Weight in SI units

Order code for "Design", option C, D, E, H, I : DN 25 to 400 mm (1 to 16 in)			
Nominal diameter		Reference values EN (DIN), AS, JIS	
[mm]	[in]	Pressure rating	[kg]
25	1	PN 40	10
32	–	PN 40	11
40	1 ½	PN 40	12
50	2	PN 40	13
65	–	PN 16	13
80	3	PN 16	15
100	4	PN 16	18
125	–	PN 16	25
150	6	PN 16	31
200	8	PN 10	52
250	10	PN 10	81
300	12	PN 10	95
350	14	PN 6	106
375	15	PN 6	121
400	16	PN 6	121

Order code for "Design", option F, J: DN 450 to 2 000 mm (18 to 78 in)			
Nominal diameter		Reference values	
		EN (DIN) (PN16)	AS (PN 16)
[mm]	[in]	[kg]	[kg]
450	18	142	138
500	20	182	186
600	24	227	266
700	28	291	369
–	30	–	447
800	32	353	524
900	36	444	704
1000	40	566	785

Order code for "Design", option F, J: DN 450 to 2 000 mm (18 to 78 in)			
		Reference values	
Nominal diameter		EN (DIN) (PN16)	AS (PN 16)
[mm]	[in]	[kg]	[kg]
–	42	–	–
1200	48	843	1229
–	54	–	–
1400	–	1204	–
–	60	–	–
1600	–	1845	–
–	66	–	–
1800	72	2357	–
–	78	2929	–
2000	–	2929	–

Order code for "Design", option F, J: DN 2 200 to 3 000 mm (84 to 120 in)		
		Reference values
Nominal diameter		EN (DIN) (PN6)
[mm]	[in]	[kg]
–	84	–
2200	–	3422
–	90	–
2400	–	4094
–	96	–
–	102	–
2600	–	6433
–	108	–
2800	–	7195
–	114	–
3000	–	8567
–	120	–

Order code for "Design", option G, K: DN 450 to 2 000 mm (18 to 78 in)		
		Reference values
Nominal diameter		EN (DIN) (PN 6)
[mm]	[in]	[kg]
450	18	161
500	20	156
600	24	208
700	28	304
–	30	–
800	32	357
900	36	485

Order code for "Design", option G, K: DN 450 to 2 000 mm (18 to 78 in)		
Nominal diameter		Reference values
		EN (DIN) (PN 6)
[mm]	[in]	[kg]
1000	40	589
–	42	–
1200	48	850
–	54	850
1400	–	1300
–	60	–
1600	–	1845
–	66	–
1800	72	2357
–	78	2929
2000	–	2929

Weight in US units

Order code for "Design", option C, D, E, H, I: DN 1 to 16 in (25 to 400 mm)		
Nominal diameter		Reference values
		ASME (Class 150)
[mm]	[in]	[lb]
25	1	11
32	–	–
40	1 ½	15
50	2	20
65	–	–
80	3	31
100	4	42
125	–	–
150	6	73
200	8	115
250	10	198
300	12	284
350	14	379
375	15	–
400	16	448

Order code for "Design", option F, J: DN 18 to 120 in (450 to 3 000 mm)		
Nominal diameter		Reference values
		ASME (Class 150), AWWA (Class D)
[mm]	[in]	[lb]
450	18	421
500	20	503
600	24	666

Order code for "Design", option F, J: DN 18 to 120 in (450 to 3 000 mm)		
Nominal diameter		Reference values ASME (Class 150), AWWA (Class D)
[mm]	[in]	[lb]
700	28	587
–	30	701
800	32	845
900	36	1036
1000	40	1294
–	42	1477
1200	48	1987
–	54	2807
1400	–	–
–	60	3515
1600	–	–
–	66	4699
1800	72	5662
–	78	6864
2000	–	6864
–	84	8280
2200	–	–
–	90	10577
2400	–	–
–	96	15575
–	102	18024
2600	–	–
–	108	20783
2800	–	–
–	114	24060
3000	–	–
–	120	27724

Order code for "Design", option G, K: DN 18 to 78 in (450 to 2 000 mm)		
Nominal diameter		Reference values ASME (Class 150), AWWA (Class D)
[mm]	[in]	[lb]
450	18	562
500	20	628
600	24	893
700	28	882
–	30	1014
800	32	1213
900	36	1764
1000	40	1984

Order code for "Design", option G, K: DN 18 to 78 in (450 to 2000 mm)		
Nominal diameter		Reference values ASME (Class 150), AWWA (Class D)
[mm]	[in]	[lb]
–	42	2426
1200	48	3087
–	54	4851
1400	–	–
–	60	5954
1600	–	–
–	66	8158
1800	72	9040
–	78	10143
2000	–	–

Measuring tube specification

ℹ The values are reference values and can vary depending on the pressure rating, design and order option.

Nominal diameter		Pressure rating				Measuring tube internal diameter					
		EN (DIN)	ASME AWWA	AS 2129 AS 4087	JIS	Hard rubber		Polyurethane		PTFE	
[mm]	[in]					[mm]	[in]	[mm]	[in]	[mm]	[in]
25	1	PN 40	Class 150	–	20K	–	–	24	0.93	25	1.00
32	–	PN 40	–	–	20K	–	–	32	1.28	34	1.34
40	1 ½	PN 40	Class 150	–	20K	–	–	38	1.51	40	1.57
50	2	PN 40	Class 150	Table E, PN 16	10K	50	1.98	50	1.98	52	2.04
50 [1]	2	PN 40	Class 150	Table E, PN 16	10K	32	1.26	–	–	–	–
65	–	PN 16	–	–	10K	66	2.60	66	2.60	68	2.67
65 [1]	–	PN 16	–	–	10K	38	1.50	–	–	–	–
80	3	PN 16	Class 150	Table E, PN 16	10K	79	3.11	79	3.11	80	3.15
80 [1]	3	PN 16	Class 150	Table E, PN 16	10K	50	1.97	–	–	–	–
100	4	PN 16	Class 150	Table E, PN 16	10K	101	3.99	104	4.11	104	4.09
100 [1]	4	PN 16	Class 150	Table E, PN 16	10K	66	2.60	–	–	–	–
125	–	PN 16	–	–	10K	127	4.99	130	5.11	129	5.08
125 [1]	–	PN 16	–	–	10K	79	3.11	–	–	–	–
150	6	PN 16	Class 150	Table E, PN 16	10K	155	6.11	158	6.23	156	6.15
150 [1]	6	PN 16	Class 150	Table E, PN 16	10K	102	4.02	–	–	–	–
200	8	PN 10	Class 150	Table E, PN 16	10K	204	8.02	207	8.14	202	7.96
200 [1]	8	PN 16	Class 150	Table E, PN 16	10K	127	5.00	–	–	–	–
250	10	PN 10	Class 150	Table E, PN 16	10K	258	10.14	261	10.26	256	10.09
250 [1]	10	PN 16	Class 150	Table E, PN 16	10K	156	6.14	–	–	–	–
300	12	PN 10	Class 150	Table E, PN 16	10K	309	12.15	312	12.26	306	12.03
300 [1]	12	PN 16	Class 150	Table E, PN 16	10K	204	8.03	–	–	–	–
350	14	PN 10	Class 150	Table E, PN 16	10K	337	13.3	340	13.4	–	–

Nominal diameter		Pressure rating				Measuring tube internal diameter					
		EN (DIN)	ASME AWWA	AS 2129 AS 4087	JIS	Hard rubber		Polyurethane		PTFE	
[mm]	[in]					[mm]	[in]	[mm]	[in]	[mm]	[in]
375	15	–	–	PN 16	10K	389	15.3	392	15.4	–	–
400	16	PN 10	Class 150	Table E, PN 16	10K	387	15.2	390	15.4	–	–
450	18	PN 10	Class 150	–	10K	436	17.2	439	17.3	–	–
500	20	PN 10	Class 150	Table E, PN 16	10K	487	19.2	490	19.3	–	–
600	24	PN 10	Class 150	Table E, PN 16	10K	585	23.0	588	23.1	–	–
700	28	PN 10	Class D	Table E, PN 16	10K	694	27.3	697	27.4	–	–
750	30	–	Class D	Table E, PN 16	10K	743	29.3	746	29.4	–	–
800	32	PN 10	Class D	Table E, PN 16	–	794	31.3	797	31.4	–	–
900	36	PN 10	Class D	Table E, PN 16	–	895	35.2	898	35.4	–	–
1000	40	PN 6	Class D	Table E, PN 16	–	991	39.0	994	39.1	–	–
–	42	–	Class D	–	–	1043	41.1	1043	41.1	–	–
1200	48	PN 6	Class D	Table E, PN 16	–	1191	46.9	1197	47.1	–	–
–	54	–	Class D	–	–	1339	52.7	–	–	–	–
1400	–	PN 6	–	–	–	1402	55.2	–	–	–	–
–	60	–	Class D	–	–	1492	58.7	–	–	–	–
1600	–	PN 6	–	–	–	1600	63.0	–	–	–	–
–	66	–	Class D	–	–	1638	64.5	–	–	–	–
1800	72	PN 6	–	–	–	1786	70.3	–	–	–	–
–	78	–	Class D	–	–	1989	78.3	–	–	–	–
2000	–	PN 6	–	–	–	1989	78.3	–	–	–	–
–	84	–	Class D	–	–	2099	84.0	–	–	–	–
2200	–	PN 6	–	–	–	2194	87.8	–	–	–	–
–	90	–	Class D	–	–	2246	89.8	–	–	–	–
2400	–	PN 6	–	–	–	2391	94.1	–	–	–	–
–	96	–	Class D	–	–	2382	93.8	–	–	–	–
–	102	–	Class D	–	–	2533	99.7	–	–	–	–
2600	–	PN 6	–	–	–	2580	101.6	–	–	–	–
–	108	–	Class D	–	–	2683	105.6	–	–	–	–
2800	–	PN 6	–	–	–	2780	109.5	–	–	–	–
–	114	–	Class D	–	–	2832	111.5	–	–	–	–
3000	–	PN 6	–	–	–	2976	117.2	–	–	–	–
–	120	–	Class D	–	–	2980	117.3	–	–	–	–

1)   Order code for "Design", option C

Materials	**Transmitter housing**

Housing of Proline 500 – digital transmitter

Order code for "Transmitter housing":
- Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
- Option **D** "Polycarbonate": polycarbonate

Housing of Proline 500 transmitter

Order code for "Transmitter housing":
- Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
- 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

Fastening components for mounting on a post

- Screws, threaded bolts, washers, nuts: stainless A2 (chrome-nickel steel)
- Metal plates: stainless steel, 1.4301 (304)

Sensor connection housing

Order code for "Sensor connection housing":
- Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
- Option **D** "Polycarbonate": polycarbonate
- Option **L** "Cast, stainless": 1.4409 (CF3M) similar to 316L

Cable entries/cable glands

Cable entries and adapters	Material
Cable gland M20 × 1.5	Plastic

• Adapter for cable entry with female thread G ½"
• Adapter for cable entry with female thread NPT ½"
 	
ⓘ Only available for certain device versions:
  • Order code for "Transmitter housing":
    • Option A "Aluminum, coated"
    • Option D "Polycarbonate"
  • Order code for "Sensor connection housing":
    • Proline 500 – digital:
      Option A "Aluminum coated"
      Option L "Cast, stainless"
    • Proline 500:
      Option A "Aluminum coated"
      Option D "Polycarbonate"
      Option L "Cast, stainless"
	Nickel-plated brass

• Adapter for cable entry with female thread G ½"
• Adapter for cable entry with female thread NPT ½"
 	
ⓘ Only available for certain device versions:
  • Order code for "Transmitter housing":
    Option L "Cast, stainless"
  • Order code for "Sensor connection housing":
    Option L "Cast, stainless"
	Stainless steel, 1.4404 (316L)

Connecting cable

ⓘ UV rays can impair the cable outer sheath. Protect the cable from exposure to sun as much as possible.

Connecting cable for sensor - Proline 500 – digital transmitter

PVC cable with copper shield

Connecting cable for sensor - Proline 500 transmitter

PVC cable with copper shield

Sensor housing

- DN 25 to 300 (1 to 12")
  - Aluminum half-shell housing, aluminum, AlSi10Mg, coated
  - Fully welded carbon steel housing with protective varnish
- DN 350 to 3000 (14 to 120")
  Fully welded carbon steel housing with protective varnish

Measuring tubes

- DN 25 to 600 (1 to 24")
  Stainless steel: 1.4301, 1.4306, 304, 304L
- DN 700 to 3000 (28 to 120")
  Stainless steel: 1.4301, 304

Liner

- DN 25 to 300 (1 to 12"): PTFE
- DN 25 to 1200 (1 to 48"): polyurethane
- DN 50 to 3000 (2 to 120"): hard rubber

Electrodes

- Stainless steel, 1.4435 (316L)
- Alloy C22, 2.4602 (UNS N06022)
- Tantalum

Process connections

For flanges made of carbon steel:
- DN ≤ 300 (12"): with Al/Zn protective coating or protective varnish
- DN ≥ 350 (14"): protective varnish

All carbon steel lap joint flanges are supplied with a hot-dip galvanized finish.

EN 1092-1 (DIN 2501)

Fixed flange
- Carbon steel:
  - DN ≤ 300: S235JRG2, S235JR+N, P245GH, A105, E250C
  - DN 350 to 3000: P245GH, S235JRG2, A105, E250C
- Stainless steel:
  - DN ≤ 300: 1.4404, 1.4571, F316L
  - DN 350 to 600: 1.4571, F316L, 1.4404
  - DN 700 to 1000: 1.4404, F316L

Lap joint flange
- Carbon steel DN ≤ 300: S235JRG2, A105, E250C
- Stainless steel DN ≤ 300: 1.4306,1.4404, 1.4571, F316L

Lap joint flange, stamped plate
- Carbon steel DN ≤ 300: S235JRG2 similar to S235JR+AR or 1.0038
- Stainless steel DN ≤ 300: 1.4301 similar to 304

ASME B16.5

Fixed flange, lap joint flange
- Carbon steel: A105
- Stainless steel: F316L

JIS B2220

- Carbon steel: A105, A350 LF2
- Stainless steel: F316L

AWWA C207

Carbon steel: A105, P265GH, A181 Class 70, E250C, S275JR

AS 2129

Carbon steel: A105, E250C, P235GH, P265GH, S235JRG2

AS 4087

Carbon steel: A105, P265GH, S275JR

Seals

As per DIN EN 1514-1, form IBC

Accessories

Protective cover

Stainless steel, 1.4404 (316L)

External WLAN antenna

- Antenna: ASA plastic (acrylonitrile styrene acrylate) and nickel-plated brass
- Adapter: Stainless steel and nickel-plated brass
- Cable: Polyethylene
- Plug: Nickel-plated brass
- Angle bracket: Stainless steel

Ground disks

- Stainless steel, 1.4435 (316L)
- Alloy C22, 2.4602 (UNS N06022)
- Tantalum

Fitted electrodes	Measurement, reference and empty pipe detection electrodes available as standard with: - 1.4435 (316L) - Alloy C22, 2.4602 (UNS N06022) - Tantalum
Process connections	- EN 1092-1 (DIN 2501) - ASME B16.5 - JIS B2220 - AS 2129 Table E - AS 4087 PN 16 - AWWA C207 Class D For information on the different materials used in the process connections → 247
Surface roughness	Electrodes with 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022); tantalum: < 0.5 μm (19.7 μin) (All data refer to parts in contact with the medium)

16.11 Operability

Languages	Can be operated in the following languages: • Via local operation English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Vietnamese, Czech, Swedish • Via Web browser English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Vietnamese, Czech, Swedish • Via "FieldCare", "DeviceCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese

Local operation	**Via display module**

Equipment:
• Order code for "Display; operation", option F "4-line, illuminated, graphic display; touch control"
• Order code for "Display; operation", option G "4-line, illuminated, graphic display; touch control + WLAN"

ℹ️ Information about WLAN interface → 🖹 102

🖼 46   *Operation with touch control*

1   Proline 500 – digital
2   Proline 500

Display elements

• 4-line, illuminated, graphic display
• White background lighting; switches to red in event of device errors
• Format for displaying measured variables and status variables can be individually configured

Operating elements

• External operation via touch control (3 optical keys) without opening the housing: ⊞, ⊟, 🄴
• Operating elements also accessible in the various zones of the hazardous area

Remote operation	→ 🖹 101

Service interface	→ 🖹 102

Supported operating tools	Different operating tools can be used for local or remote access to the measuring device. Depending on the operating tool used, access is possible with different operating units and via a variety of interfaces.

Supported operating tools	Operating unit	Interface	Additional information
Web browser	Notebook, PC or tablet with Web browser	• CDI-RJ45 service interface • WLAN interface	Special Documentation for the device
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	• CDI-RJ45 service interface • WLAN interface • Fieldbus protocol	→ 🖺 217
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	• CDI-RJ45 service interface • WLAN interface • Fieldbus protocol	→ 🖺 217
Field Xpert	SMT70/77/50	• All fieldbus protocols • WLAN interface • Bluetooth • CDI-RJ45 service interface	Operating Instructions BA01202S Device description files: Use update function of handheld terminal
SmartBlue app	Smart phone or tablet with iOs or Android	WLAN	→ 🖺 217

Other operating tools based on FDT technology with a device driver such as DTM/iDTM or DD/EDD can be used for device operation. These operating tools are available from the individual manufacturers. Integration into the following operating tools, among others, is supported:

- Field Device Manager (FDM) from Honeywell → www.process.honeywell.com
- FieldMate from Yokogawa → www.yokogawa.com
- PACTWare → www.pactware.com

The related device description files are available: www.endress.com → Download Area

Web server

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

Access to the network is required for the Ethernet-APL connection.

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

Supported functions
Data exchange between the operating unit (such as a notebook for example) and the measuring device:
- Upload the configuration from the measuring device (XML format, configuration backup)
- Save the configuration to the measuring device (XML format, restore configuration)
- Export event list (.csv file)
- Export parameter settings (.csv file or PDF file, document the measuring point configuration)

- Export the Heartbeat verification log (PDF file, only available with the "Heartbeat Verification" application package)
- Flash firmware version for device firmware upgrade, for instance
- Download driver for system integration
- Visualize up to 1000 saved measured values (only available with the **Extended HistoROM** application package → 🖹 254)

📖 Web server special documentation → 🖹 256

| 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. |

ℹ When the device is delivered, the factory settings of the configuration data are stored as a backup in the device memory. This memory can be overwritten with an updated data record, for example after commissioning.

Additional information on the data storage concept

There are different types of data storage units in which device data are stored and used by the device:

	HistoROM backup	T-DAT	S-DAT
Available data	• Event logbook such as diagnostic events for example • Parameter data record backup • Device firmware package • Driver for system integration for exporting via Web server, e.g: GSDML for PROFINET	• Measured value logging ("Extended HistoROM" order option) • Current parameter data record (used by firmware at run time) • Peakhold indicator (min/max values) • Totalizer values	• Sensor data: nominal diameter etc. • Serial number • 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	Attachable to 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
- If exchanging the electronics module (e.g. I/O electronics module): Once the electronics module has been replaced, the software of the module is compared against the current device firmware. The module software is upgraded or downgraded where necessary. The electronics module is available for use immediately afterwards and no compatibility problems occur.

Manual
Additional parameter data record (complete parameter settings) in the integrated device memory HistoROM backup for:
- Data backup function
  Backup and subsequent restoration of a device configuration in the device memory HistoROM backup
- Data comparison function
  Comparison of the current device configuration with the device configuration saved in the device memory HistoROM backup

Data transmission

Manual
- Transfer of a device configuration to another device using the export function of the specific operating tool, e.g. with FieldCare, DeviceCare or Web server: to duplicate the configuration or to store in an archive (e.g. for backup purposes)
- Transmission of the drivers for system integration via Web server, e.g.:
  GSDML for PROFINET

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

16.12   Certificates and approvals

Current certificates and approvals that are available for the product can be selected via the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

CE mark	The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.
	Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
UKCA marking	The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.
	Contact address Endress+Hauser UK: Endress+Hauser Ltd. Floats Road Manchester M23 9NF United Kingdom www.uk.endress.com
Ex approval	The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.

Drinking water approval	• ACS • KTW/W270 • NSF 61 • WRAS BS 6920

Certification PROFINET with Ethernet-APL	**PROFINET interface**
	
	The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V. / PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:
	• Certified according to:
	  • Test specification for PROFINET devices
	  • PROFINET PA Profile 4
	  • PROFINET Netload Robustness Class 2 10 Mbps
	  • APL conformance test
	• The device can also be operated with certified devices of other manufacturers (interoperability)
	• The device supports PROFINET S2 system redundancy.

Radio approval	The measuring device has radio approval. For detailed information on the radio approval, see the Special Documentation
Measuring instrument approval	The measuring device is (optionally) approved as a cold water meter (MI-001) for volume measurement in service subject to legal metrological control in accordance with the European Measuring Instruments Directive 2014/32/EU (MID). The measuring device is qualified according to OIML R49: 2013.
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 61326-2-3 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
- ETSI EN 300 328
  Guidelines for 2.4 GHz radio components.
- EN 301489
  Electromagnetic compatibility and radio spectrum matters (ERM).

16.13 Application packages

Many different application packages are available to enhance the functionality of the device. Such packages might be needed to address safety aspects or specific application requirements.

The application packages can be ordered with the device or subsequently from Endress+Hauser. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

| Diagnostic functionality | Order code for "Application package", option EA "Extended HistoROM"

Comprises extended functions concerning the event log and the activation of the measured value memory.

Event log:
Memory volume is extended from 20 message entries (standard version) to up to 100 entries.

Data logging (line recorder):
- Memory capacity for up to 1000 measured values is activated.
- 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user.
- Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server.

For detailed information, see the Operating Instructions for the device.

| Heartbeat Technology | Order code for "Application package", option EB "Heartbeat Verification + Monitoring"

Heartbeat Verification
Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".
- Functional testing in the installed state without interrupting the process.
- Traceable verification results on request, including a report.
- Simple testing process via local operation or other operating interfaces.
- Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk assessment.

Heartbeat Monitoring
Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:
- Draw conclusions - using these data and other information - about the impact the process influences (e.g. formation of buildup, magnetic field interference etc.) have on measuring performance over time.
- Schedule servicing in time.
- Monitor the process or product quality.

For detailed information, see the Special Documentation for the device.

Cleaning

Order code for "Application package", option EC "ECC electrode cleaning "

The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite (Fe_3O_4) deposits frequently occur (e.g. hot water). Since magnetite is highly conductive this build up leads to measuring errors and ultimately to the loss of signal. The application package is designed to avoid build-up of very conductive matter and thin layers (typical of magnetite).

📖 For detailed information, see the Operating Instructions for the device.

16.14 Accessories

📖 Overview of accessories available for order → 🕮 215

16.15 Supplementary documentation

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

Standard documentation

Brief Operating Instructions

Brief Operating Instructions for the sensor

Measuring device	Documentation code
Proline Promag W	KA01266D

Brief Operating Instructions for the transmitter

Measuring device	Documentation code
Proline 500	KA01518D
Proline 500 – digital	KA01519D

Technical Information

Measuring device	Documentation code
Promag W 500	TI01227D

Description of Device Parameters

Measuring device	Documentation code
Promag 500	GP01169D

Supplementary device-dependent documentation	**Safety instructions** Safety instructions for electrical equipment for hazardous areas.

Contents	Documentation code
ATEX/IECEx Ex i	XA01522D
ATEX/IECEx Ex ec	XA01523D
cCSAus IS	XA01524D
cCSAus Ex e ia/Ex d ia	XA01525D
cCSAus Ex nA	XA01526D
INMETRO Ex i	XA01527D
INMETRO Ex ec	XA01528D
NEPSI Ex i	XA01529D
NEPSI Ex nA	XA01530D
EAC Ex i	XA01658D
EAC Ex nA	XA01659D
JPN	XA01776D

Special Documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Radio approvals for WLAN interface for A309/A310 display module	SD01793D
Web server	SD02760D

Contents	Documentation code
Heartbeat Technology	SD02730D
Web server	SD02760D

Installation Instructions

Contents	Comment
Installation instructions for spare part sets and accessories	■ Access the overview of all the available spare part sets via *Device Viewer* → 🖹 213 ■ Accessories available for order with Installation Instructions → 🖹 215

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