Valid as of version 01.06.zz (Device firmware) Products Solutions

Services

# Operating Instructions **Proline Promass S 500**

Coriolis flowmeter Modbus RS485







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

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# 1 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.

#### **A** 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	
$\overline{}$	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
<b></b>	Wireless Local Area Network (WLAN) Communication via a wireless, local network.
•	LED Light emitting diode is off.

Symbol	Meaning
举	<b>LED</b> Light emitting diode is on.
	<b>LED</b> Light emitting diode is flashing.

# 1.2.4 Tool symbols

Symbol	Meaning
0	Torx screwdriver
06	Phillips head screwdriver
Ó	Open-ended wrench

# 1.2.5 Symbols for certain types of information

Symbol	Meaning
<b>✓</b>	Permitted Procedures, processes or actions that are permitted.
<b>✓</b> ✓	Preferred Procedures, processes or actions that are preferred.
X	Forbidden Procedures, processes or actions that are forbidden.
i	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
<b>•</b>	Notice or individual step to be observed
1., 2., 3	Series of steps
L	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:
  - *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
  - *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the matrix code on the nameplate

#### 1.3.1 Document function

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 guide These Operating Instructions contain all the information that is required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.
Description of Device Parameters (GP)	Reference for your parameters The document provides a detailed explanation of each individual parameter. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.
Safety Instructions (XA)	Depending on the approval, safety instructions for electrical equipment in hazardous areas are also supplied with the device. They are an integral part of the Operating Instructions.  The nameplate indicates which Safety Instructions (XA) apply to
	the device in question.
Supplementary device-dependent documentation	Additional documents are supplied depending on the device version ordered: Always comply strictly with the instructions in the supplementary documentation. The supplementary documentation is an integral part of the device documentation.

# 1.4 Registered trademarks

#### **Modbus**®

Registered trademark of SCHNEIDER AUTOMATION, INC.

#### TRI-CLAMP®

Registered trademark of Ladish & Co., Inc., Kenosha, USA

# 2 Safety instructions

# 2.1 Requirements for the personnel

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

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

The operating personnel must fulfill the following requirements:

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

#### 2.2 Intended use

#### Application and media

The measuring device described in this manual is intended only for the flow measurement of liquids.

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 in applications where there is an increased risk due to process pressure, are marked 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-designated use.

#### **WARNING**

#### Danger of breakage due to corrosive or abrasive fluids and ambient conditions!

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

#### NOTICE

#### Verification for borderline cases:

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

#### Residual risks

#### **A** WARNING

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

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

# 2.3 Workplace safety

When working on and with the device:

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

# 2.4 Operational safety

Risk of injury!

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

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

Furthermore, 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

# 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 inoperation safety if used correctly. An overview of the most important functions is provided in the following section:

Function/interface	Factory setting	Recommendation
Write protection via hardware write protection switch $\Rightarrow \stackrel{ riangle}{=} 11$	Not enabled	On an individual basis following risk assessment
Access code (also applies for Web server login or FieldCare connection) → 🖺 12	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 → 🗎 13	-	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  $\rightarrow \triangleq 148$ .

#### 2.7.2 Protecting access via a password

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

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

#### User-specific access code

Write access to the device parameters via the local display, Web browser or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code ( $\rightarrow \boxtimes 146$ ).

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

#### WLAN passphrase: Operation as WLAN access point

A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface ( $\rightarrow \boxminus 83$ ), 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  $( \rightarrow \implies 140)$ .

#### 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 → 146

#### 2.7.3 Access via Web server

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.

# 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.

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**

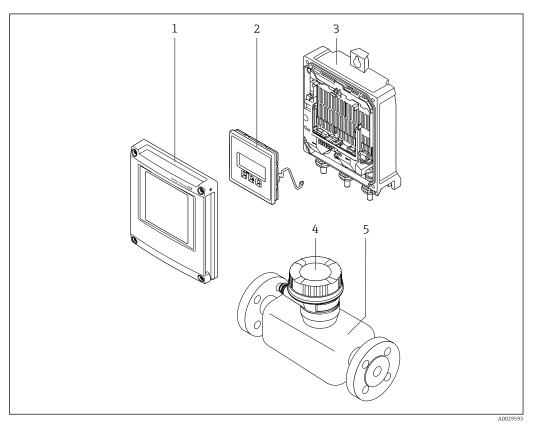
Signal transmission: digital

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.



 $\blacksquare$  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 Sensoi

#### 3.1.2 Proline 500

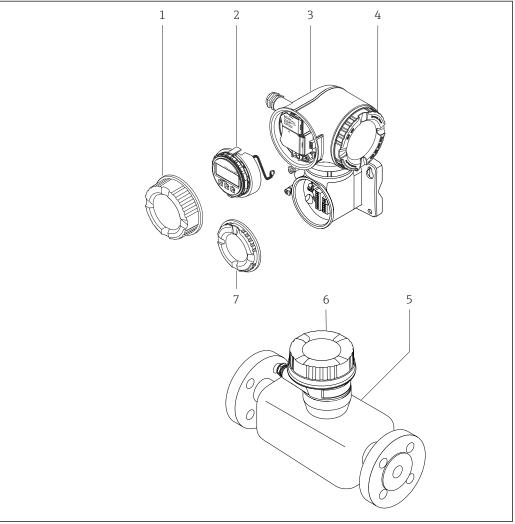
Signal transmission: analog

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:

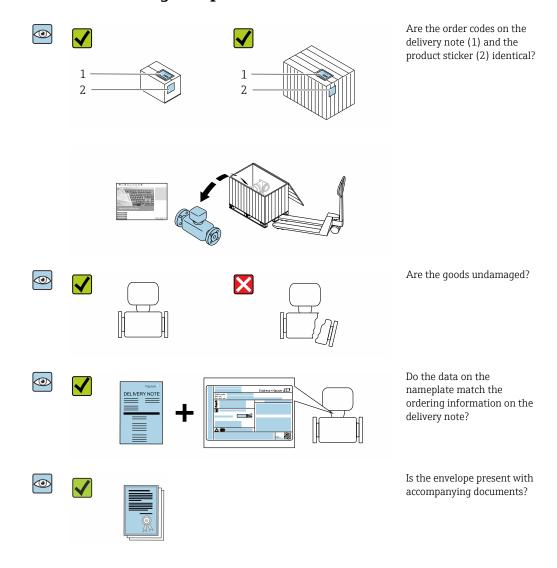
- Strong vibrations at the sensor.
- Sensor operation in underground installations.
- Permanent sensor immersion in water.



- **₽** 2 Important components of a measuring device
- Connection compartment cover
- Display module
- *Transmitter housing with integrated ISEM electronics*
- Electronics compartment cover
- Sensor
- Sensor connection housing: connecting cable connection
- Connection compartment cover: connecting cable connection

# 4 Incoming acceptance and product identification

# 4.1 Incoming acceptance



- If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.

#### 4.2 Product identification

The following options are available for identification of the device:

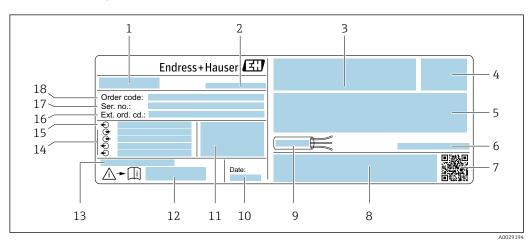
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter the serial numbers from the nameplates in the *Device Viewer* (www.endress.com/deviceviewer): all the information about the device is displayed.
- Enter the serial numbers from the nameplates into 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

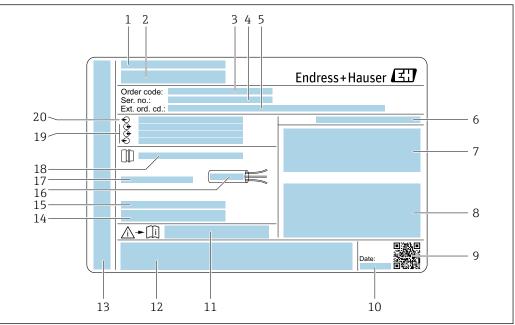
#### Proline 500 - digital



■ 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



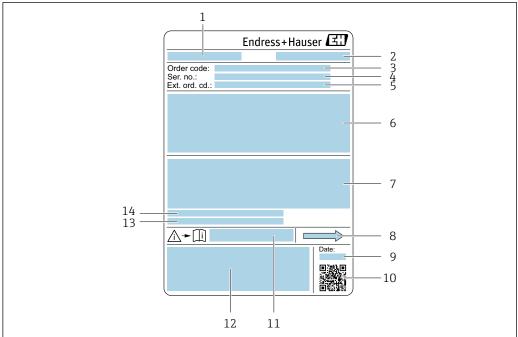
A0029192

#### ■ 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

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#### 4.2.2 Sensor nameplate



A0029199

#### ■ 5 Example of a 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 Nominal diameter of the sensor; flange nominal diameter/nominal pressure; sensor test pressure; medium temperature range; material of measuring tube and manifold; sensor-specific information: e.g. pressure range of sensor housing, wide-range density specification (special density calibration)
- 7 Approval information for explosion protection, Pressure Equipment Directive and degree of protection
- 8 Flow direction
- 9 Manufacturing date: year-month
- 10 2-D matrix code
- 11 Document number of safety-related supplementary documentation
- 12 CE mark, RCM-Tick mark
- 13 Surface roughness
- 14 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 approvalrelated 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
$\triangle$	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.
[ji	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

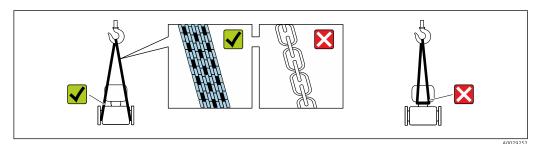
Observe the following notes for storage:

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

Storage temperature  $\rightarrow \triangleq 210$ 

# 5.2 Transporting the product

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



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.

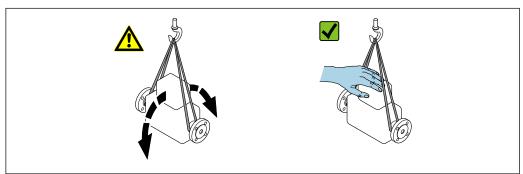
#### 5.2.1 Measuring devices without lifting lugs

#### **A** 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

#### **A** 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.

# 5.3 Packaging disposal

All packaging materials are environmentally friendly and 100 % recyclable:

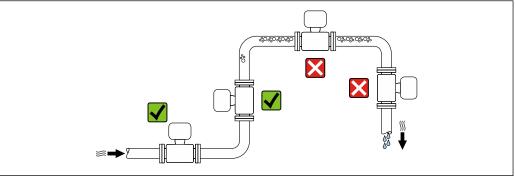
- Outer packaging of device
   Polymer stretch wrap, complying with EU Directive 2002/95/EC (RoHS)
- Packaging
  - Wooden crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
  - Cardboard box in accordance with European packaging guideline 94/62EC, recyclability confirmed by Resy 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



A00287

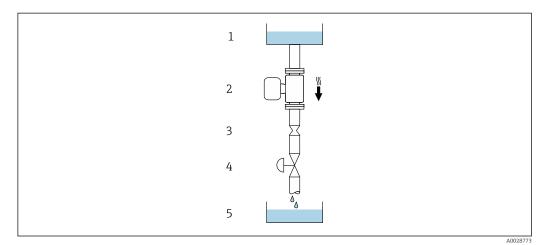
To prevent measuring errors arising from accumulation of gas bubbles in the measuring pipe, avoid the following mounting locations in the piping:

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

22

#### Installation in down pipes

However, the following installation suggestion allows for installation in an open vertical pipeline. Pipe restrictions or the use of an orifice with a smaller cross-section than the nominal diameter prevent the sensor running empty while measurement is in progress.



 $\blacksquare$  6 Installation in a down pipe (e.g. for batching applications)

- 1 Supply tank
- 2 Sensor
- 3 Orifice plate, pipe restriction
- 4 Valve
- 5 Batching tank

DN		Ø orifice plate, pipe restriction		
[mm]	[in]	[mm]	[in]	
8	3/8	6	0.24	
15	1/2	10	0.40	
25	1	14	0.55	
40	1½	22	0.87	
50	2	28	1.10	

#### Orientation

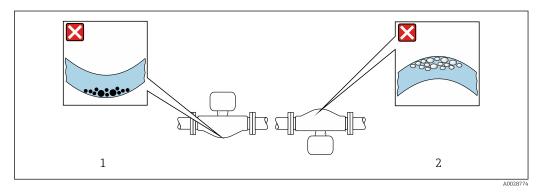
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

	Orientation		
A	Vertical orientation	A0015591	<b>✓ ✓</b> 1)
В	Horizontal orientation, transmitter at top	A0015589	Exception: $\rightarrow \bigcirc 7, \bigcirc 24$

	Orientatio	n	Recommendation
С	Horizontal orientation, transmitter at bottom	A0015590	Exception: $\rightarrow \bigcirc 7, \bigcirc 24$
D	Horizontal orientation, transmitter at side	A0015592	<b>V V</b>

- 1) This orientation is recommended to ensure self-draining.
- 2) Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
- 3) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.

If a sensor is installed horizontally with a curved measuring tube, match the position of the sensor to the fluid properties.



- $\blacksquare$  7 Orientation of sensor with curved measuring tube
- 1 Avoid this orientation for fluids with entrained solids: Risk of solids accumulating.
- 2 Avoid this orientation for outgassing fluids: Risk of gas accumulating.

#### Inlet and outlet runs



#### **Dimensions**

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

# 6.1.2 Environment and process requirements

#### Ambient temperature range

Measuring device	<ul> <li>-40 to +60 °C (-40 to +140 °F)</li> <li>Order code for "Test, certificate", option JP:</li> <li>-50 to +60 °C (-58 to +140 °F)</li> </ul>
Readability of the local display	-20 to $+60$ °C ( $-4$ to $+140$ °F) The readability of the display may be impaired at temperatures outside the temperature range.

- Page Dependency of ambient temperature on medium temperature → 🖺 212
- ► If operating outdoors: Avoid direct sunlight, particularly in warm climatic regions.
- You can order a weather protection cover from Endress+Hauser. → 🖺 194.

#### System pressure

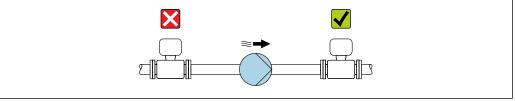
It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas.

Cavitation is caused if the pressure drops below the vapor pressure:

- In liquids that have a low boiling point (e.g. hydrocarbons, solvents, liquefied gases)
- In suction lines
- ► Ensure the system pressure is sufficiently high to prevent cavitation and outgassing.

For this reason, the following mounting locations are recommended:

- At the lowest point in a vertical pipe
- Downstream from pumps (no danger of vacuum)



A002877

#### Thermal insulation

In the case of some fluids, it is important to keep the heat radiated from the sensor to the transmitter to a low level. A wide range of materials can be used for the required insulation.

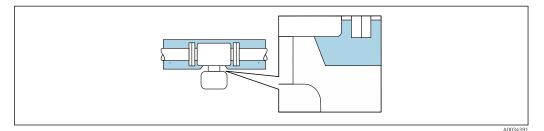
The following device versions are recommended for versions with thermal insulation: Version with extended neck for insulation:

Order code for "Sensor option", option CG with an extended neck length of  $105\ mm$  (4.13 in).

#### **NOTICE**

#### Electronics overheating on account of thermal insulation!

- Recommended orientation: horizontal orientation, sensor connection housing pointing downwards.
- ▶ Do not insulate the sensor connection housing.
- ▶ Maximum permissible temperature at the lower end of the sensor connection housing:  $80 \,^{\circ}\text{C} (176 \,^{\circ}\text{F})$
- ► Thermal insulation with not isolated extended neck: We recommend that you do not insulate the extended neck in order to ensure optimum dissipation of heat.



■ 8 Thermal insulation with not isolated extended neck

#### Heating

#### **NOTICE**

#### Electronics can overheat due to elevated ambient temperature!

- ▶ Observe maximum permitted ambient temperature for the transmitter.
- ▶ Depending on the medium temperature, take the device orientation requirements into account.

#### NOTICE

#### Danger of overheating when heating

- ▶ Ensure that the temperature at the lower end of the transmitter housing does not exceed 80  $^{\circ}$ C (176  $^{\circ}$ F).
- ► Ensure that sufficient convection takes place at the transmitter neck.
- ► Ensure that a sufficiently large area of the transmitter neck remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.
- ▶ When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation. For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.

#### Heating options

If a fluid requires that no heat loss should occur at the sensor, users can avail of the following heating options:

- Electrical heating, e.g. with electric band heaters <sup>1)</sup>
- Via pipes carrying hot water or steam
- Via heating jackets

#### **Vibrations**

The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by plant vibrations.

<sup>1)</sup> The use of parallel electric band heaters is generally recommended (bidirectional electricity flow). Particular considerations must be made if a single-wire heating cable is to be used. Additional information is provided in the document EA01339D "Installation instructions for electrical trace heating systems".

# 6.1.3 Special mounting instructions

#### **Drainability**

When installed vertically, the measuring tubes can be drained completely and protected against buildup.

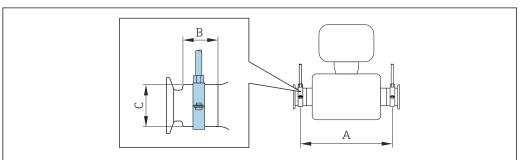
#### Hygienic compatibility

i

#### Securing with mounting clamp in the case of hygiene connections

It is not necessary to provide additional support for the sensor for operational performance purposes. If, however, additional support is required for installation purposes, the following dimensions must be observed.

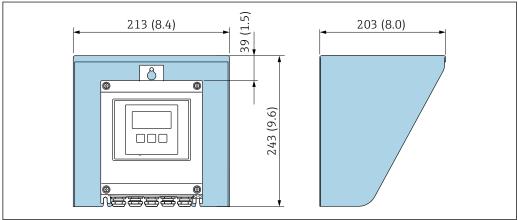
Use mounting clamp with lining between clamp and measuring instrument.



A0030298

DN		A	A	В		С	
[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]
8	3/8	298	11.73	33	1.3	28	1.1
15	1/2	402	15.83	33	1.3	28	1.1
25	1	542	21.34	33	1.3	38	1.5
40	1 ½	658	25.91	36.5	1.44	56	2.2
50	2	772	30.39	44.1	1.74	75	2.95

#### Weather protection cover

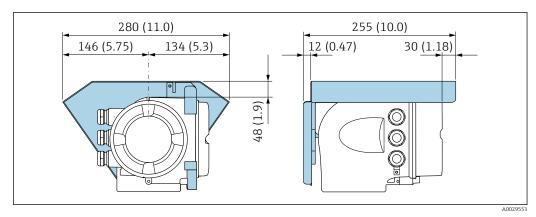


■ 9 Weather protection cover for Proline 500 – digital; engineering unit mm (in)

Endress+Hauser

A002959

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■ 10 Weather protection cover for Proline 500; engineering unit mm (in)

# 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.

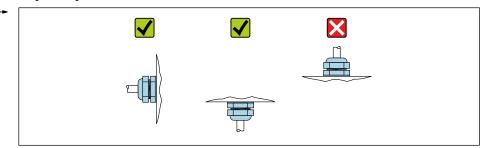
#### 6.2.3 Mounting the measuring device

#### **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 nameplate of the sensor matches the flow direction of the medium.

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



#### 6.2.4 Mounting the transmitter housing: Proline 500 – digital

#### **A** CAUTION

#### Ambient temperature too high!

Danger of electronics overheating and housing deformation.

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

#### **A** CAUTION

#### Excessive force can damage the housing!

► Avoid excessive mechanical stress.

The transmitter can be mounted in the following ways:

- Post mounting
- Wall mounting

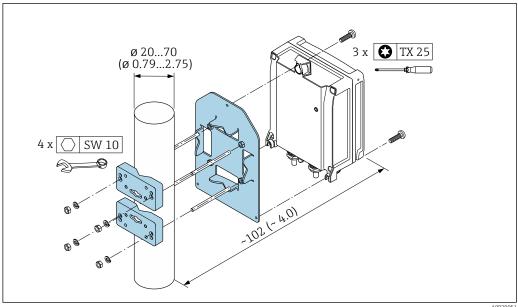
#### Post mounting

#### **▲** WARNING

#### Excessive tightening torque applied to the fixing screws!

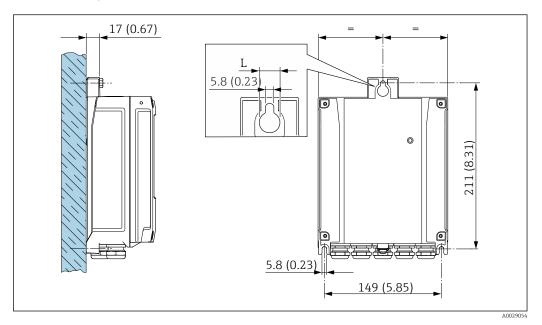
Risk of damaging the plastic transmitter.

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



■ 11 Engineering unit mm (in)

#### Wall mounting



■ 12 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

#### **A** CAUTION

#### Ambient temperature too high!

Danger of electronics overheating and housing deformation.

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

#### **A** CAUTION

#### Excessive force can damage the housing!

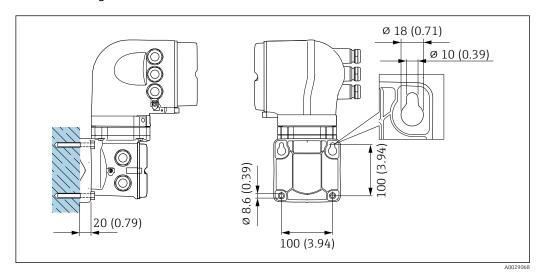
► Avoid excessive mechanical stress.

The transmitter can be mounted in the following ways:

- Post mounting
- Wall mounting

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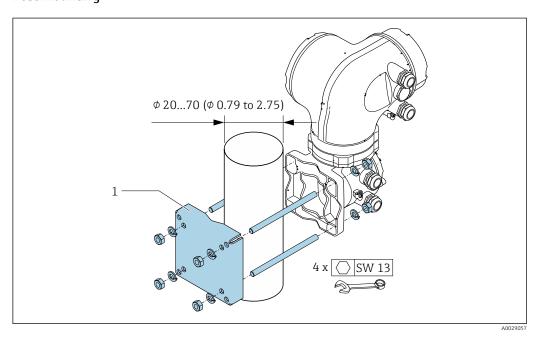
#### Wall mounting



■ 13 Engineering unit mm (in)

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

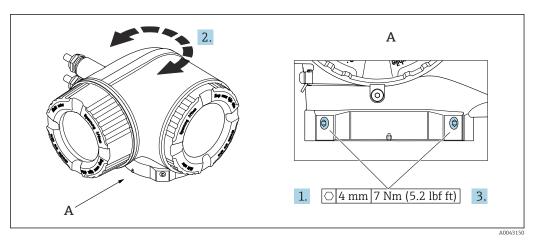
#### Post mounting



■ 14 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.

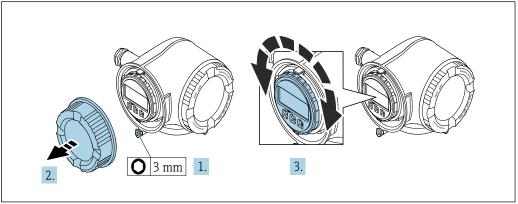


■ 15 Ex housing

- 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.



A00300

- 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.  $8 \times 45^{\circ}$  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 → 🗎 212  Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document)  Ambient temperature  Measuring range	
Has the correct orientation for the sensor been selected?  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 direction of flow of the fluid through the piping $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	
Are the measuring point identification and labeling correct (visual inspection)?	
Is the device adequately protected from precipitation and direct sunlight?	
Are the securing screw and securing clamp tightened securely?	

### 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<sup>2</sup> (14 AWG)

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

The grounding impedance must be less than 2  $\Omega$ .

#### Permitted temperature range

- The installation quidelines 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

Modbus RS485

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

Cable type	A
Characteristic impedance	135 to 165 $\Omega$ at a measuring frequency of 3 to 20 MHz
Cable capacitance	< 30 pF/m
Wire cross-section	> 0.34 mm <sup>2</sup> (22 AWG)

Cable type	Twisted pairs
Loop resistance	≤110 Ω/km
Signal damping	Max. 9 dB over the entire length of the cable cross-section
Shield	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

Current output 0/4 to 20 mA

Standard installation cable is sufficient

*Pulse / frequency / switch output* 

Standard installation cable is sufficient

Double pulse output

Standard installation cable is sufficient

Relay output

Standard installation cable is sufficient.

Current input 0/4 to 20 mA

Standard installation cable is sufficient

Status input

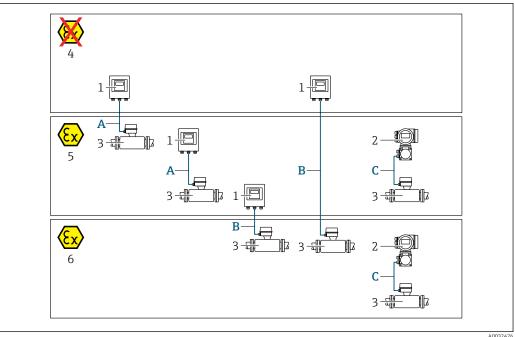
Standard installation cable is sufficient

#### Cable diameter

- Cable glands supplied: M20 × 1.5 with cable 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<sup>2</sup> (24 to 12 AWG).

#### Choice of connecting cable between the transmitter and sensor

Depends on the type of transmitter and the installation zones



- 1 Proline 500 digital transmitter
- 2 Proline 500 transmitter
- 3 Sensor Promass
- Non-hazardous area 4
- Hazardous area: Zone 2; Class I, Division 2
- Hazardous area: Zone 1; Class I, Division 1 6
- Standard cable to 500 digital transmitter → 🖺 36 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
- В Standard cable to 500 digital transmitter → 🖺 37 Transmitter installed in the hazardous area: Zone 2; Class I, Division 2 / sensor installed in the hazardous area: Zone 1; Class I, Division 1
- Signal cable to 500 transmitter  $\rightarrow \implies 39$ Transmitter and sensor installed in the hazardous area: Zone 2; Class I, Division 2 or Zone 1; Class I, Division 1

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

#### Standard cable

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

Design	4 cores (2 pairs); uninsulated stranded CU wires; pair-stranded with common shield
Shielding	Tin-plated copper braid, optical cover ≥ 85 %
Loop resistance	Power supply line (+, –): maximum $10 \Omega$
Cable length	Maximum 300 m (900 ft), see the following table.

Cross-section	Cable length [max.]
0.34 mm <sup>2</sup> (AWG 22)	80 m (240 ft)
0.50 mm <sup>2</sup> (AWG 20)	120 m (360 ft)
0.75 mm <sup>2</sup> (AWG 18)	180 m (540 ft)
1.00 mm <sup>2</sup> (AWG 17)	240 m (720 ft)
1.50 mm <sup>2</sup> (AWG 15)	300 m (900 ft)

#### Optionally available connecting cable

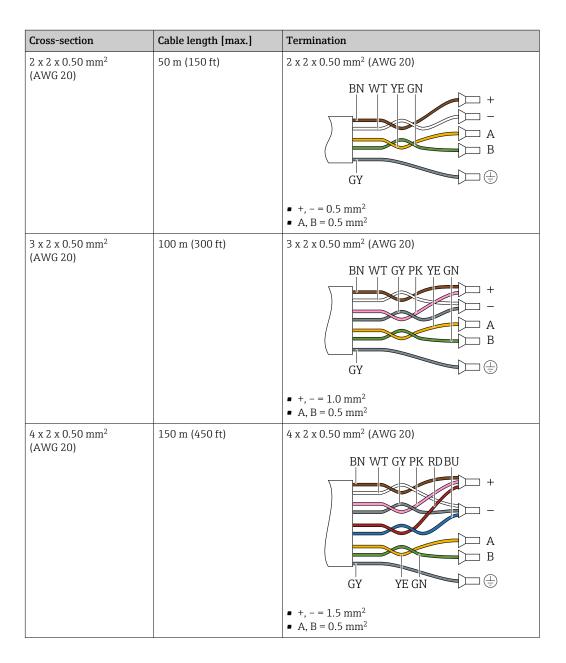
Design	$2 \times 2 \times 0.34~\text{mm}^2$ (AWG 22) PVC cable $^{1)}$ with common shield (2 pairs, uninsulated stranded CU wires; pair-stranded)
Flame resistance	According to DIN EN 60332-1-2
Oil-resistance	According to DIN EN 60811-2-1
Shielding	Tin-plated copper braid, optical cover ≥ 85 %
Operating temperature	When mounted in a fixed position: $-50$ to $+105$ °C ( $-58$ to $+221$ °F); when cable can move freely: $-25$ to $+105$ °C ( $-13$ to $+221$ °F)
Available cable length	Fixed: 20 m (60 ft); variable: up to maximum 50 m (150 ft)

 $1) \qquad \text{UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where possible.}$ 

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

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

Design	4, 6, 8 cores (2, 3, 4 pairs); uninsulated stranded CU wires; pair-stranded with common shield
Shielding	Tin-plated copper braid, optical cover $\geq$ 85 %
Capacitance C	Maximum 760 nF IIC, maximum 4.2 μF IIB
Inductance L	Maximum 26 μH IIC, maximum 104 μH IIB
Inductance/resistance ratio (L/R)	Maximum 8.9 $\mu H/\Omega$ IIC, maximum 35.6 $\mu H/\Omega$ IIB (e.g. according to IEC 60079-25)
Loop resistance	Power supply line (+, –): maximum 5 $\Omega$
Cable length	Maximum 150 m (450 ft), see the following table.



#### Optionally available connecting cable

Connecting cable for	Zone 1; Class I, Division 1
Standard cable	$2\times2\times0.5~\text{mm}^2$ (AWG 20) PVC cable $^{1)}$ with common shield (2 pairs, pair-stranded)
Flame resistance	According to DIN EN 60332-1-2
Oil-resistance	According to DIN EN 60811-2-1
Shielding	Tin-plated copper braid, optical cover $\geq$ 85 %
Operating temperature	When mounted in a fixed position: $-50$ to $+105$ °C ( $-58$ to $+221$ °F); when cable can move freely: $-25$ to $+105$ °C ( $-13$ to $+221$ °F)
Available cable length	Fixed: 20 m (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.

#### C: Connecting cable between sensor and transmitter: Proline 500

Design	$6\times0.38~\text{mm}^2$ PVC cable $^{1)}$ with individual shielded cores and common copper shield
Conductor resistance	$\leq$ 50 $\Omega$ /km (0.015 $\Omega$ /ft)
Capacitance: core/shield	≤ 420 pF/m (128 pF/ft)
Cable length (max.)	20 m (60 ft)
Cable lengths (available for order)	5 m (15 ft), 10 m (30 ft), 20 m (60 ft)
Cable diameter	11 mm (0.43 in) ± 0.5 mm (0.02 in)
Continuous operating temperature	Max. 105 °C (221 °F)

<sup>1)</sup> UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where 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 (B)	27 (A)	24 (+)	25 (-)	22 (+)	23 (-)	20 (+)	21 (-)
		Device-specific terminal assignment: adhesive label in terminal cover.							

#### Transmitter and sensor connection housing: connecting cable

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

Terminal assignment and connection of the connecting cable:

- Proline 500 digital → 🖺 41
- Proline 500 → 🖺 48

#### 7.2.4 Shielding and grounding

#### Shielding and grounding concept

- 1. Maintain electromagnetic compatibility (EMC).
- 2. Take explosion protection into consideration.
- 3. Pay attention to the protection of persons.
- 4. Comply with national installation regulations and guidelines.
- 5. Observe cable specifications .
- 6. Keep the stripped and twisted lengths of cable shield to the ground terminal as short as possible.
- 7. Shield cables fully.

#### Grounding of the cable shield

#### **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.

To comply with EMC requirements:

- 1. Ensure the cable shield is grounded to the potential matching line at multiple points.
- 2. Connect every local ground terminal to the potential matching line.

#### 7.2.5 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.

# 7.3 Connecting the measuring device: Proline 500 – digital

#### **NOTICE**

#### Limitation of electrical safety due to incorrect connection!

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

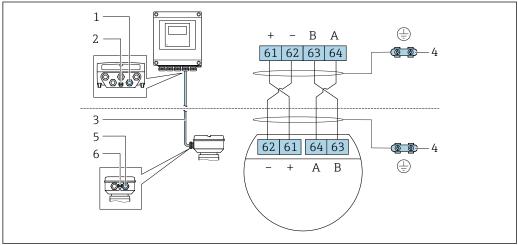
#### 7.3.1 Connecting the connecting cable

#### **A** 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.

#### Connecting cable terminal assignment



A002819

- 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

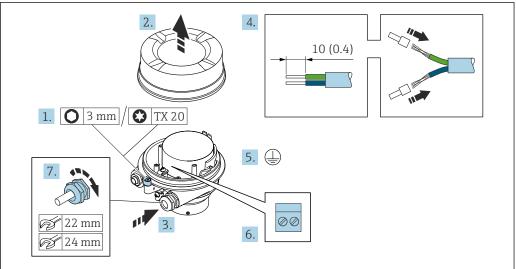
- Connection via terminals with order code for "Sensor connection housing":
  - Option **A** "Aluminum, coated" → 🖺 42
  - Option **B** "Stainless"  $\rightarrow$  🖺 43

#### Connecting the connecting cable to the transmitter

The cable is connected to the transmitter via terminals  $\rightarrow \triangleq 45$ .

#### Connecting the sensor connection housing via terminals

For the device version with the order code for "Sensor connection housing": Option  ${\bf A}$  "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.

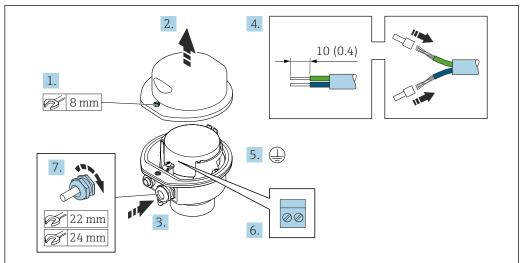
#### **MARNING**

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

- ► Screw in the thread on the cover without using any lubricant. The thread on the cover is coated with a dry lubricant.
- 8. Screw on the housing cover.
- 9. Tighten the securing clamp of the housing cover.

#### Connecting the sensor connection housing via terminals

For the device version with the order code for "Sensor connection housing": Option  ${\bf B}$  "Stainless"

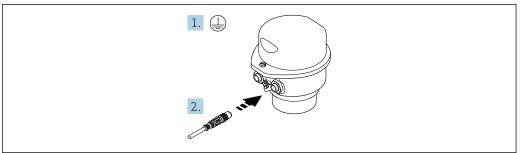


Δ0029613

- 1. Release the securing screw of the housing cover.
- 2. Open the housing cover.
- 3. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 4. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
- 5. Connect the protective ground.
- 6. Connect the cable in accordance with the connecting cable terminal assignment.
- 7. Firmly tighten the cable glands.
  - ightharpoonup This concludes the process for connecting the connecting cable.
- 8. Close the housing cover.
- 9. Tighten the securing screw of the housing cover.

#### Connecting the sensor connection housing via the connector

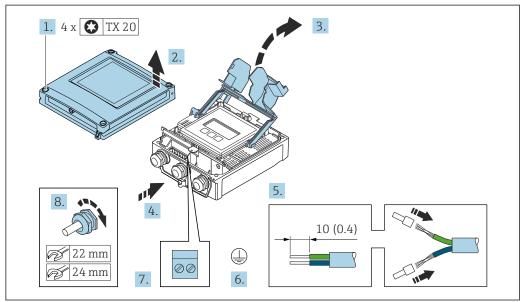
For the device version with the order code for "Sensor connection housing": Option  ${\bf C}$  "Ultra-compact hygienic, stainless"



A002961

- 1. Connect the protective ground.
- 2. Connect the connector.

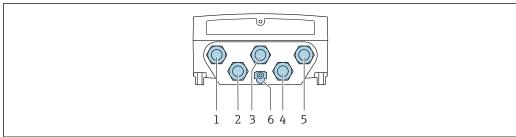
## Connecting the connecting cable to the transmitter $% \left( \mathbf{r}\right) =\left( \mathbf{r}\right)$



- 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.
- 8. Firmly tighten the cable glands.
  - ► This concludes the process for connecting the connecting cable.
- 9. Close the housing cover.
- 10. Tighten the securing screw of the housing cover.
- 11. After connecting the connecting cable:Connect the signal cable and the supply voltage cable → 

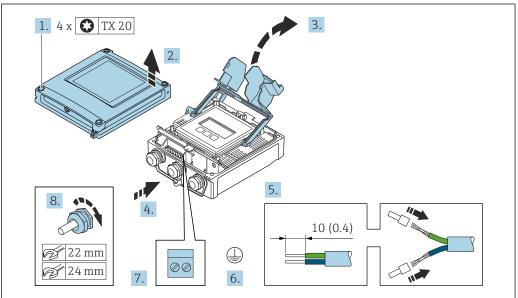
  46.

#### 7.3.2 Connecting the signal cable and the supply voltage cable



A002820

- 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)



A002959

- 1. Loosen the 4 fixing screws on the housing cover.
- 2. Open the housing cover.
- 3. Fold open the terminal cover.
- 4. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 5. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
- 6. Connect the protective ground.
- 7. Connect the cable in accordance with the terminal assignment .
  - Signal cable terminal assignment: The device-specific terminal assignment is documented on an adhesive label in the terminal cover.

**Supply voltage terminal assignment:** Adhesive label in the terminal cover or  $\Rightarrow \implies 39$ .

- 8. Firmly tighten the cable glands.
  - ► This concludes the cable connection process.
- 9. Close the terminal cover.
- 10. Close the housing cover.

#### **A** WARNING

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

► Screw in the screw without using any lubricant.

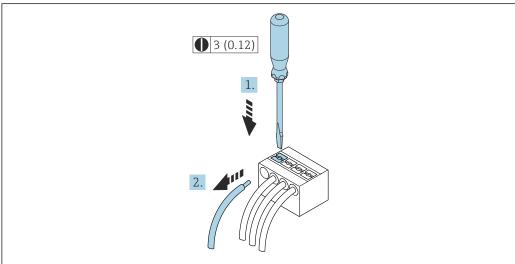
#### **A** WARNING

Excessive tightening torque applied to the fixing screws!

Risk of damaging the plastic transmitter.

- ► Tighten the fixing screws as per the tightening torque: 2 Nm (1.5 lbf ft)
- 11. Tighten the 4 fixing screws on the housing cover.

#### Removing a cable



A002959

- **■** 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.

## 7.4 Connecting the measuring device: Proline 500

#### NOTICE

#### Limitation of electrical safety due to incorrect connection!

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

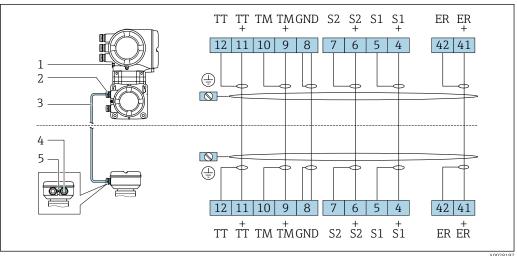
#### 7.4.1 Connecting the connecting cable

#### **A** 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.

#### Connecting cable terminal assignment

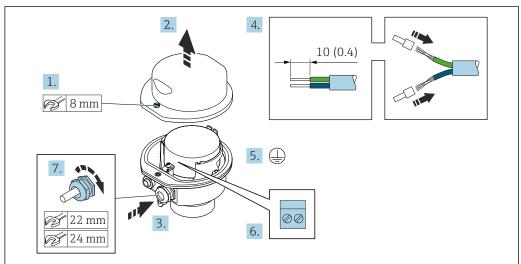


- 1 Protective earth (PE)
- 2 Cable entry for connecting cable on transmitter connection housing
- 3 Connecting cable
- 4 Cable entry for connecting cable on sensor connection housing
- 5 Protective earth (PE)

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

#### Connecting the sensor connection housing via terminals

For the device version with the order code for "Housing": Option  ${\bf B}$  "Stainless"



A0029613

- 1. Release the securing screw of the housing cover.
- 2. Open the housing cover.
- 3. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 4. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
- 5. Connect the protective ground.
- 6. Connect the cable in accordance with the connecting cable terminal assignment.
- 7. Firmly tighten the cable glands.
  - ► This concludes the process for connecting the connecting cable.
- 8. Close the housing cover.
- 9. Tighten the securing screw of the housing cover.

# 4. 10 (0.4) 5. 1. O 3 mm 6. 2.

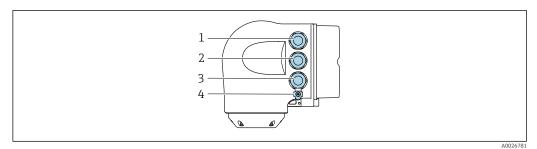
#### Attaching the connecting cable to the transmitter

A002959

- 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.
- 7. Firmly tighten the cable glands.
  - This concludes the process for attaching the connecting cable.
- 8. Screw on the connection compartment cover.
- 9. Tighten the securing clamp of the connection compartment cover.
- 10. After connecting the connecting cable:Connect the signal cable and the supply voltage cable → 

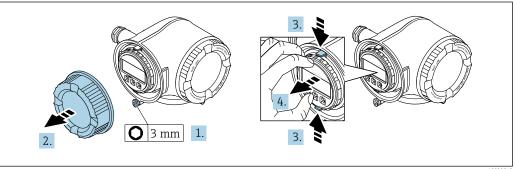
  51.

### 7.4.2 Connecting the signal cable and the supply voltage cable



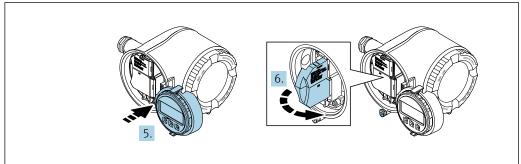
l Terminal connection for supply voltage

- 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)



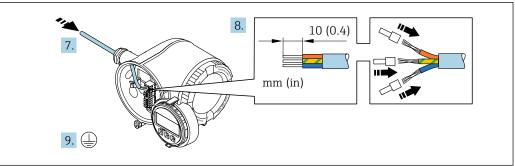
A002981

- 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.



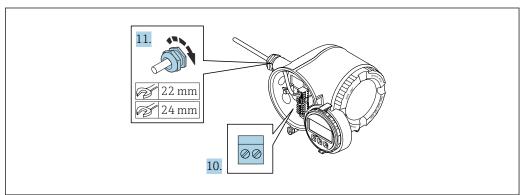
A002981

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



A00298

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

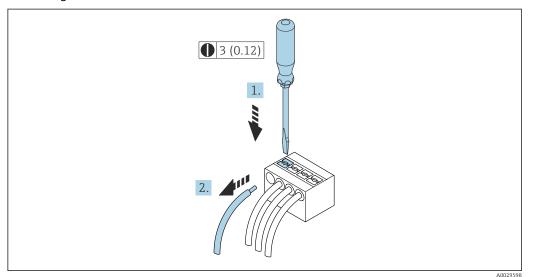


A002981

- 10. 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.

- 11. Firmly tighten the cable glands.
  - ► This concludes the cable connection process.
- 12. Close the terminal cover.
- 13. Fit the display module holder in the electronics compartment.
- 14. Screw on the connection compartment cover.
- 15. Secure the securing clamp of the connection compartment cover.

#### Removing a cable



■ 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.

# 7.5 Potential equalization

#### 7.5.1 Requirements

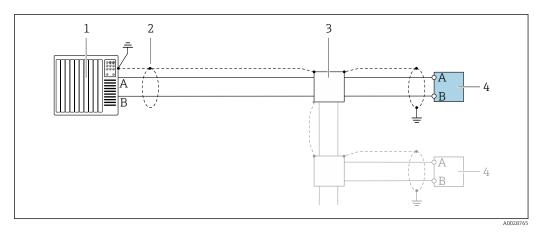
For potential equalization:

- Pay attention to in-house grounding concepts
- Take account of operating conditions like the pipe material and grounding
- Connect the medium, sensor and transmitter to the same electrical potential
- Use a ground cable with a minimum cross-section of 6 mm² (0.0093 in²) and a cable lug for potential equalization connections
- For devices intended for use in hazardous locations, please observe the guidelines in the Ex documentation (XA).

# 7.6 Special connection instructions

#### 7.6.1 Connection examples

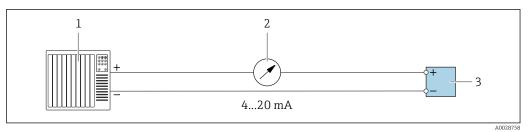
#### Modbus RS485



■ 18 Connection example for Modbus RS485, non-hazardous area and Zone 2; Class I, Division 2

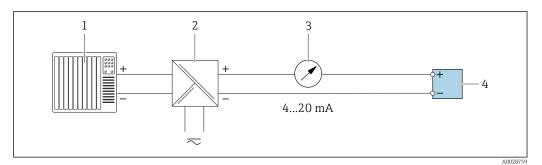
- 1 Control system (e.g. PLC)
- 2 Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 3 Distribution box
- 4 Transmitter

#### Current output 4-20 mA



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

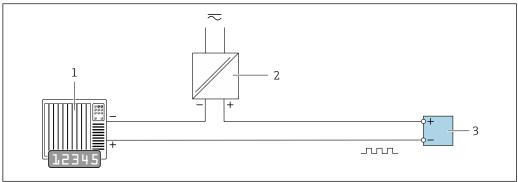
- Automation system with current input (e.g. PLC)
- 2 Analog display unit: observe maximum load
- 3 Transmitter



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

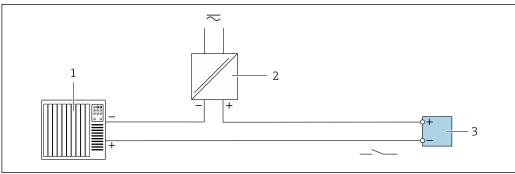
#### Pulse/frequency output



Δ0028761

- 21 Connection example for pulse/frequency output (passive)
- 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* → **2**00

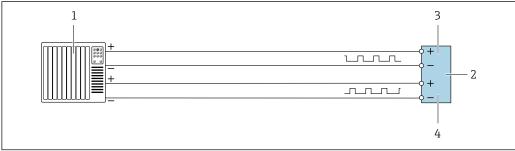
#### Switch output



A0028760

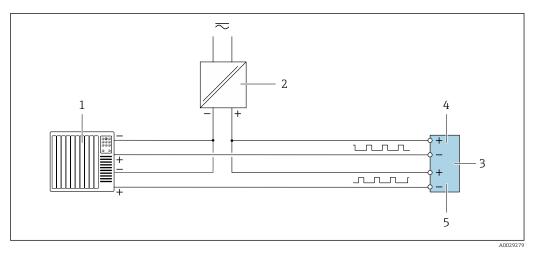
- 22 Connection example for switch output (passive)
- Automation system with switch input (e.g. PLC with a 10 k $\Omega$  pull-up or pull-down resistor)
- 2 Power supply
- 3 Transmitter: observe input values → 🖺 200

#### Double pulse output



A0029280

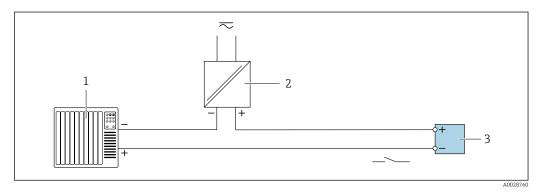
- **■** 23 Connection example for double pulse output (active)
- 1 Automation system with double pulse input (e.g. PLC)
- 2 Transmitter: observe input values → 🖺 202
- 3 Double pulse output
- 4 Double pulse output (slave), phase-shifted



■ 24 Connection example for double pulse output (passive)

- 1 Automation system with double pulse input (e.g. PLC with a 10 k $\Omega$  pull-up or pull-down resistor)
- 2 Power supply
- *3 Transmitter: observe input values* → 🖺 202
- 4 Double pulse output
- 5 Double pulse output (slave), phase-shifted

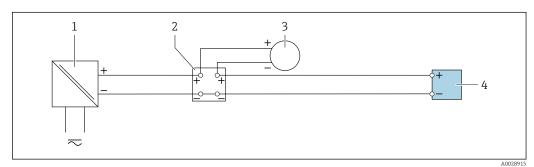
#### Relay output



25 Connection example for relay output (passive)

- 1 Automation system with relay input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: observe input values  $\rightarrow \triangleq 202$

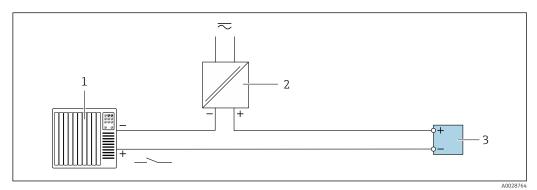
#### **Current input**



■ 26 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



27 Connection example for status input

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

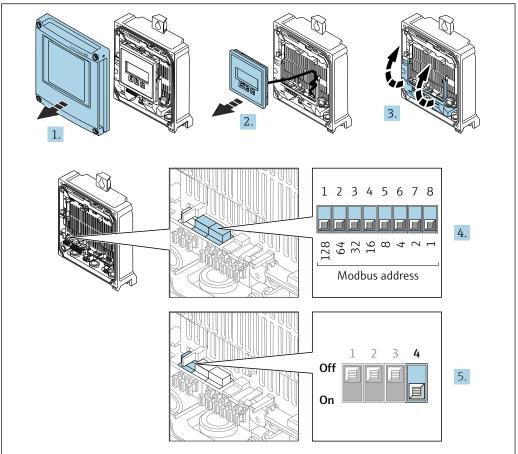
# 7.7 Hardware settings

#### 7.7.1 Setting the device address

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

#### Proline 500 - digital transmitter

Hardware addressing



A0029677

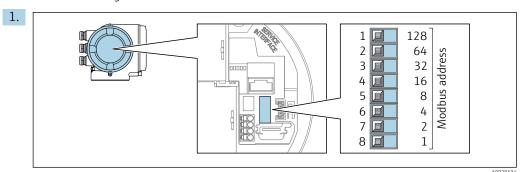
- 1. Open the housing cover.
- 2. Remove the display module.
- 3. Fold open the terminal cover.
- 4. Set the desired device address using the DIP switches.
- 5. To switch addressing from software addressing to hardware addressing: set the DIP switch to **On**.
  - └ The change of device address takes effect after 10 seconds.

#### Software addressing

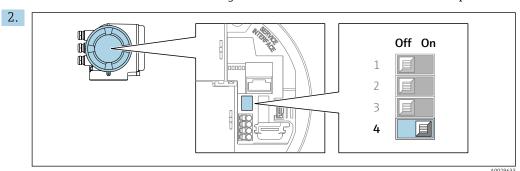
- ► To switch addressing from hardware addressing to software addressing: set the DIP switch to Off.
  - The device address configured in the **Device address** parameter takes effect after 10 seconds.

#### Proline 500 transmitter

Hardware addressing



Set the desired device address using the DIP switches in the connection compartment.



To switch addressing from software addressing to hardware addressing: set the DIP switch to  ${\bf On}$ .

► The change of device address takes effect after 10 seconds.

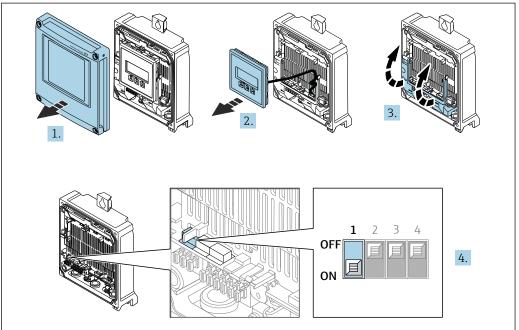
#### Software addressing

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

#### 7.7.2 Activating the terminating resistor

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

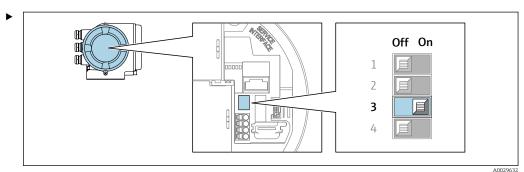
#### Proline 500 - digital transmitter



A0029675

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

#### Proline 500 transmitter



Switch DIP switch no. 3 to **On**.

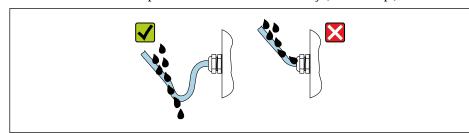
# 7.8 Ensuring the degree of protection

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").



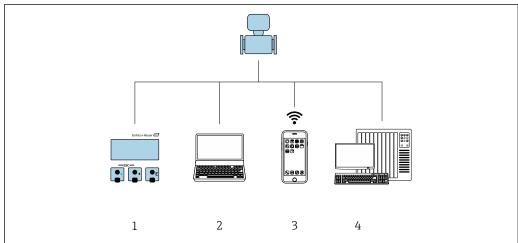
6. Insert dummy plugs (corresponding to the housing degree of protection) into unused cable entries.

# 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" $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	
Is the terminal assignment correct ?	
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



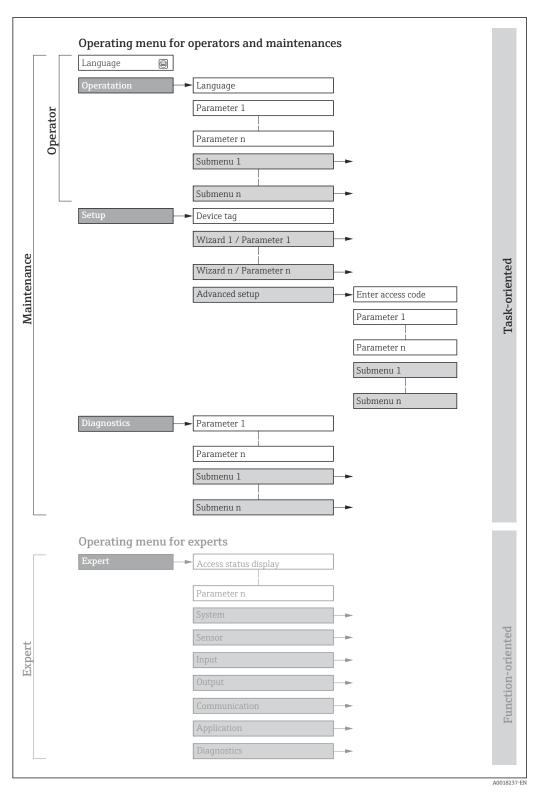
A003021

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

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# 8.2 Structure and function of the operating menu

#### 8.2.1 Structure of the operating menu



 $\blacksquare$  28 Schematic structure of the operating menu

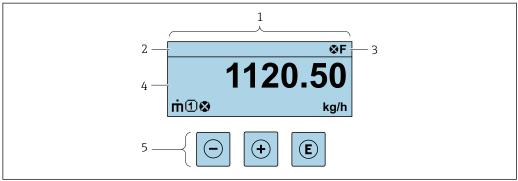
# 8.2.2 Operating philosophy

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	<ul> <li>Defining the operating language</li> <li>Defining the Web server operating language</li> <li>Resetting and controlling totalizers</li> </ul>		
Operation		display  Reading measured values	<ul> <li>Configuring the operational display (e.g. display format, display contrast)</li> <li>Resetting and controlling totalizers</li> </ul>		
Setup		"Maintenance" role Commissioning:  Configuration of the measurement  Configuration of the inputs and outputs  Configuration of the communication interface	Wizards for fast commissioning:  Configuration of the system units  Configuration of the communication interface  Definition of the medium  Displaying 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 the detection of partially filled and empty pipes  Advanced setup  For more customized configuration of the measurement (adaptation to special measuring conditions)  Configuration of totalizers  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



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- 1 Operational display
- 2 Device tag
- 3 Status area
- 4 Display area for measured values (4-line)
- 5 *Operating elements* → 🖺 70

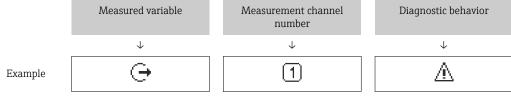
#### Status area

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

- Status signals → 🗎 171
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
  - **M**: Maintenance required
- Diagnostic behavior → 🖺 172
  - Alarm
  - <u>M</u>: Warning
- 🖆: Locking (the device is locked via the hardware )
- ←: Communication (communication via remote operation is active)

#### Display area

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



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

#### Measured variables

Symbol	Meaning
ṁ	Mass flow
Ü	<ul><li>Volume flow</li><li>Corrected volume flow</li></ul>

ρ	<ul><li>Density</li><li>Reference density</li></ul>
4	Temperature
Σ	Totalizer  The measurement channel number indicates which of the three totalizers is displayed.
<b>(-)</b>	Output  The measurement channel number indicates which of the outputs is displayed.
€	Status input

#### Measurement channel numbers

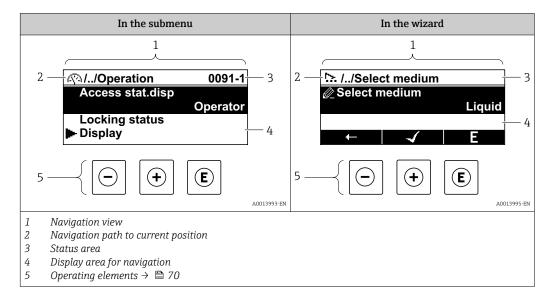
Symbol	Meaning
14	Measurement channel 1 to 4

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

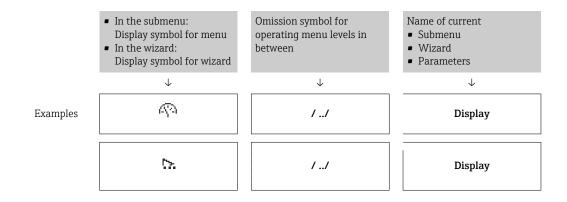
The number and display format of the measured values can be configured via the **Format display** parameter ( $\rightarrow \implies 120$ ).

#### 8.3.2 Navigation view



#### Navigation path

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



For more information about the icons in the menu, refer to the "Display area" section  $\Rightarrow \implies 67$ 

#### 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  $\ensuremath{\mathsf{S}}$ 

- For information on the diagnostic behavior and status signal → 🖺 171

#### Display area

#### Menus

Symbol	Meaning
শ্ৰ	Operation Appears: In the menu next to the "Operation" selection At the left in the navigation path in the Operation menu
۶	Setup Appears: In the menu next to the "Setup" selection At the left in the navigation path in the Setup menu
્ટ.	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
55.	Wizard
	Parameters within a wizard  No display symbol exists for parameters in submenus.

#### Locking

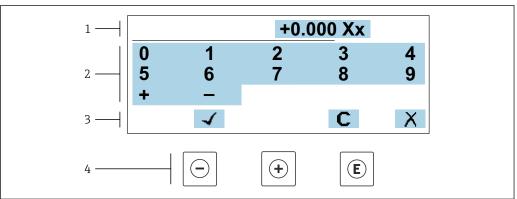
Symbol	Meaning
â	Parameter locked  When displayed in front of a parameter name, indicates that the parameter is locked.  ■ By a user-specific access code  ■ By the hardware write protection switch

#### Wizard operation

Symbol	Meaning
<del>-</del>	Switches to the previous parameter.
4	Confirms the parameter value and switches to the next parameter.
E	Opens the editing view of the parameter.

#### 8.3.3 **Editing view**

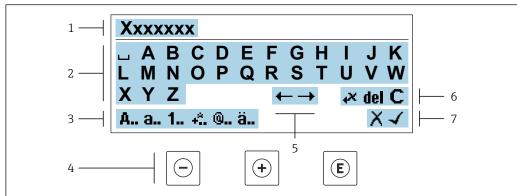
#### Numeric editor



 $\blacksquare$  29 For entering values in parameters (e.g. limit values)

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

#### Text editor



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**■** 30 For entering text in parameters (e.g. tag name)

- l 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.
<b>(+)</b>	Plus key Move the entry position to the right.
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
Α	Upper case
a	Lower case
1	Numbers
+*	Punctuation marks and special characters: = + - * / $^2$ $^3$ $^1$ /4 $^1$ /2 $^3$ /4 ( ) [ ] < > { }
<b>@</b>	Punctuation marks and special characters: ' " ` ^ . , ; : ? ! % $\mu$ ° € \$ £ ¥ § @ # / \ I ~ & _
ä	Umlauts and accents

## Controlling data entries

Symbol	Meaning
←→	Move entry position
X	Reject entry
4	Confirm entry
**	Delete character immediately to the left of the entry position
del	Delete character immediately to the right of the entry position
С	Clear all the characters entered

# 8.3.4 Operating elements

Кеу	Meaning
	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.
+	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.
	Enter key
E	For operational display Pressing the key briefly opens the operating menu.
	<ul> <li>In menu, submenu</li> <li>Pressing the key briefly:</li> <li>Opens the selected menu, submenu or parameter.</li> <li>Starts the wizard.</li> <li>If help text is open, closes the help text of the parameter.</li> <li>Pressing the key for 2 s in a parameter:</li> <li>If present, opens the help text for the function of the parameter.</li> </ul>
	With a wizard Opens the editing view of the parameter.
	<ul> <li>For text and numeric editor</li> <li>Pressing the key briefly confirms the selection.</li> <li>Pressing the key for 2 s confirms your entry.</li> </ul>

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Key	Meaning
-++	Escape key combination (press keys simultaneously)
	<ul> <li>In menu, submenu</li> <li>Pressing the key briefly:</li> <li>Exits the current menu level and takes you to the next level up.</li> <li>If help text is open, closes the help text of the parameter.</li> <li>Pressing the key for 2 s returns you to the operational display ("home position").</li> </ul>
	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.
	Minus/Enter key combination (press and hold down the keys simultaneously)
-+E	<ul> <li>If the keypad lock is enabled:         Pressing the key for 3 s disables the keypad lock.</li> <li>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.</li> </ul>

#### 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  $\Box$  and  $\Box$  keys for longer than 3 seconds.
  - ► The context menu opens.



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- 2. Press  $\Box$  +  $\pm$  simultaneously.
  - └ The context menu is closed and the operational display appears.

#### Calling up the menu via the context menu

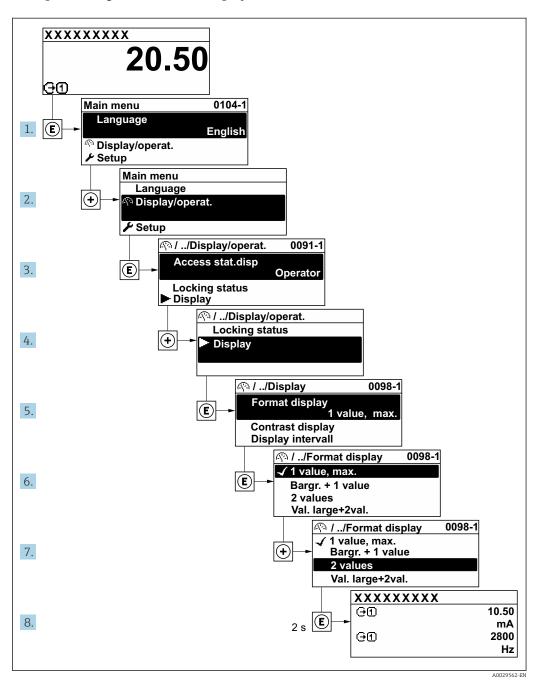
- 1. Open the context menu.
- 2. Press 🛨 to navigate to the desired menu.
- 3. Press 🗉 to confirm the selection.
  - ► The selected menu opens.

#### 8.3.6 Navigating and selecting from list

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

For an explanation of the navigation view with symbols and operating elements  $\rightarrow \stackrel{\triangle}{=} 66$ 

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



#### 8.3.7 Calling the parameter directly

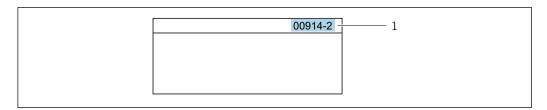
A parameter number is assigned to every parameter to be able to access a parameter directly via the onsite display. Entering this access code in the **Direct access** parameter calls up the desired parameter directly.

#### Navigation path

Expert → Direct access

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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

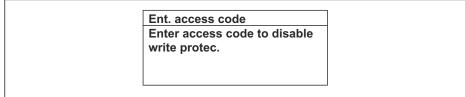
# 8.3.8 Calling up help text

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 E for 2 s.
  - ► The help text for the selected parameter opens.



A0014002-EI

- 31 Example: Help text for parameter "Enter access code"
- 2. Press  $\Box$  +  $\pm$  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

A0014040 E

For a description of the editing view - consisting of the text editor and numeric editor - with symbols  $\rightarrow \triangleq 68$ , for a description of the operating elements  $\rightarrow \triangleq 70$ 

### 8.3.10 User roles and related access authorization

### 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).	V	V
After an access code has been defined.	V	<b>✓</b> 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.	V	_ 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
- The user role with which the user is currently logged on is indicated by the **Access** status parameter. Navigation path: Operation  $\rightarrow$  Access status

### 8.3.11 Disabling write protection via access code

If the  $\widehat{\mbox{$\mathbb B$}}$ -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  $\rightarrow \mbox{$\mathbb B$}$  146.

Parameter write protection via local operation can be disabled by entering the user-specific access code in the **Enter access code** parameter ( $\rightarrow \implies 126$ ) via the respective access option.

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

- 2. Enter the access code.
  - The \( \bar{\text{\alpha}}\) -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 the operating menu via the Web browser

### 8.4.1 Function scope

Thanks to the integrated Web server the device can be operated and configured via a Web browser and via 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.

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

For additional information on the Web server, refer to the Special Documentation for the device  $\rightarrow \stackrel{\triangle}{=} 226$ 

# 8.4.2 Requirements

# Computer hardware

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

# Computer software

Software	Interface	
	CDI-RJ45	WLAN
Recommended operating systems	<ul> <li>Microsoft Windows 8 or higher.</li> <li>Mobile operating systems:         <ul> <li>iOS</li> <li>Android</li> </ul> </li> <li>Microsoft Windows XP is supported.</li> <li>Microsoft Windows 7 is supported.</li> </ul>	
Web browsers supported	<ul> <li>Microsoft Internet Explorer 8 or higher</li> <li>Microsoft Edge</li> <li>Mozilla Firefox</li> <li>Google Chrome</li> <li>Safari</li> </ul>	

# Computer settings

Settings	Interface	
	CDI-RJ45	WLAN
User rights	Appropriate user rights (e.g. administrator rights) for TCP/IP and proxy server settings are necessary (for adjusting the IP address, subnet mask etc.).	
Proxy server settings of the Web browser	The Web browser setting <i>Use proxy server for LAN</i> must be <b>disabled</b> .	
JavaScript	JavaScript must be enabled.	
		elet/basic.html in the address bar of the ut simplified version of the operating browser.
	<b>  <u>       </u>  </b>	version: To enable correct data display, he) of the Web browser under <b>Internet</b>
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:  $\rightarrow \stackrel{\triangle}{=} 166$ 

### 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 $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	

### 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 $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $

# 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 connecting 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. 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 connecting 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)

- 1. Switch on the measuring device.
- 2. Connect to the computer using a cable  $\rightarrow \triangleq 82$ .
- 3. If a 2nd network card is not used, close all the applications on the notebook.
  - Applications requiring Internet or a network, such as e-mail, SAP applications, Internet or Windows Explorer.
- 4. Close any open Internet browsers.
- 5. Configure the properties of the Internet protocol (TCP/IP) as defined in the table:

IP address	192.168.1.XXX; for XXX all numerical sequences except: 0, 212 and 255 $\rightarrow$ 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**

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

- ▶ Only activate one service interface (CDI-RJ45 service interface or WLAN interface).
- ▶ If simultaneous communication is necessary: configure different IP address ranges, e.g. 192.168.0.1 (WLAN interface) and 192.168.1.212 (CDI-RJ45 service interface).

Preparing the mobile terminal

► Enable WLAN reception on the mobile terminal.

Establishing a 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\_Promass\_500\_A802000).
- 2. If necessary, select the WPA2 encryption method.
- 3. Enter the password: serial number of the measuring device ex-works (e.g. L100A802000).
  - LED on display module flashes: it is now possible to operate the measuring device with a 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.

#### Disconnecting

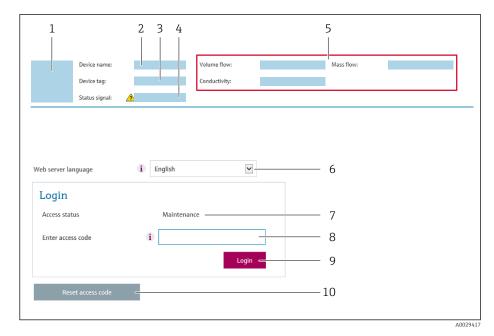
► After configuring the device:

Terminate the WLAN connection between the operating unit and measuring device.

#### Starting the Web browser

1. Start the Web browser on the computer.

- 2. Enter the IP address of the web server in the address line of the web browser: 192.168.1.212
  - ► The login page appears.



- 1 Picture of device
- 2 Device name
- 3 Device tag
- 4 Status signal
- 5 Current measured values
- 6 Operating language
- 7 User role
- 8 Access code
- ) Login
- 10 Reset access code ( $\rightarrow \equiv 143$ )
- If a login page does not appear, or if the page is incomplete  $\rightarrow \triangleq 166$

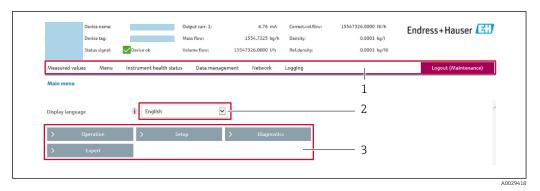
# 8.4.4 Logging on

- 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 (default 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  $\rightarrow$  🖺 174
- Current measured values

### **Function row**

Functions	Meaning
Measured values	Displays the measured values of the device
Menu	<ul> <li>Access to the operating menu from the measuring device</li> <li>The structure of the operating menu is the same as for the local display</li> </ul>
Wichu	For detailed information on the structure of the operating menu, see the Operating Instructions for the measuring device
Device status	Displays the diagnostic messages currently pending, listed in order of priority
Data management	Data exchange between PC 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	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

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

### Working area

Depending on the selected function and the related submenus, various actions can be performed in this area:

- Configuring parameters
- Reading measured values
- Calling up help text
- Starting an upload/download

# 8.4.6 Disabling the Web server

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

#### **Navigation**

"Expert" menu  $\rightarrow$  Communication  $\rightarrow$  Web server

#### Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Web server functionality	Switch the Web server on and off.	<ul><li>Off</li><li>HTML Off</li><li>On</li></ul>	On

### Function scope of the "Web server functionality" parameter

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

### 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)  $\rightarrow \blacksquare 77$ .

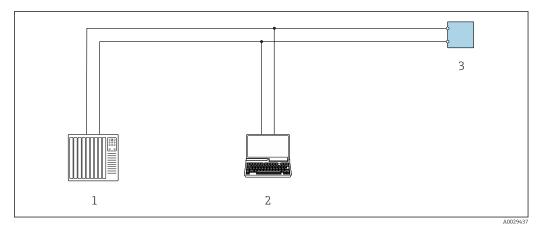
# 8.5 Access to the operating menu via the operating tool

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

# 8.5.1 Connecting the operating tool

### Via Modbus RS485 protocol

This communication interface is available in device versions with a Modbus-RS485 output.



■ 32 Options for remote operation via Modbus-RS485 protocol (active)

- 1 Control system (e.g. PLC)
- 2 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP" or Modbus DTM
- 3 Transmitter

### Service interface

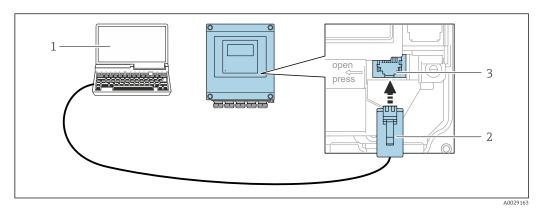
Via service interface (CDI-RJ45)

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.

An adapter for 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 be established via an M12 plug without opening the device.

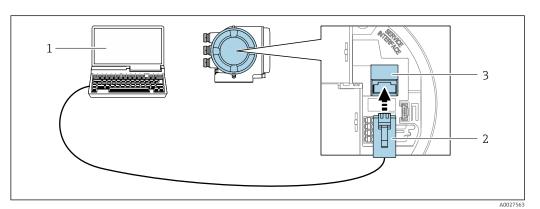
### *Proline* 500 – digital transmitter



■ 33 Connection via service interface (CDI-RJ45)

- 1 Computer with Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated Web server or with "FieldCare", "DeviceCare" operating tool with COM DTM "CDI Communication TCP/IP" or Modbus DTM
- 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

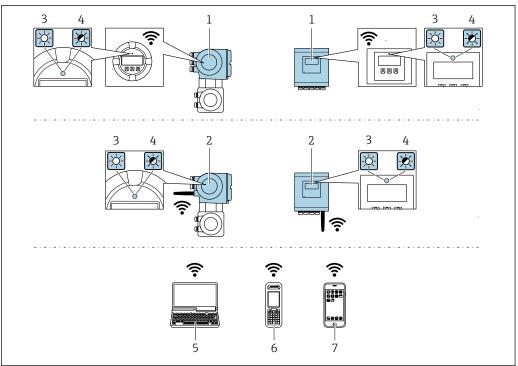


■ 34 Connection via service interface (CDI-RJ45)

- 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" or Modbus DTM
- 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"



A003456

- 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	<ul> <li>Internal antenna</li> <li>External antenna (optional)         In the event of poor transmission/reception conditions at the place of installation.     </li> <li>Only 1 antenna is active at any one time!</li> </ul>	
Range	<ul> <li>Internal antenna: typically 10 m (32 ft)</li> <li>External antenna: typically 50 m (164 ft)</li> </ul>	
Materials (external antenna)	<ul> <li>Antenna: ASA plastic (acrylic ester-styrene-acrylonitrile) and nickel-plated brass</li> <li>Adapter: Stainless steel and nickel-plated brass</li> <li>Cable: Polyethylene</li> <li>Plug: Nickel-plated brass</li> <li>Angle bracket: Stainless steel</li> </ul>	

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

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

- ▶ Only activate one service interface (CDI-RJ45 service interface or WLAN interface).
- ► If simultaneous communication is necessary: configure different IP address ranges, e.g. 192.168.0.1 (WLAN interface) and 192.168.1.212 (CDI-RJ45 service interface).

Preparing the mobile terminal

► Enable WLAN reception on the mobile terminal.

Establishing a connection from the mobile terminal to the measuring device

- In the WLAN settings of the mobile terminal:
   Select the measuring device using the SSID (e.g. EH\_Promass\_500\_A802000).
- 2. If necessary, select the WPA2 encryption method.
- 3. Enter the password: serial number of the measuring device ex-works (e.g. L100A802000).
  - LED on display module flashes: it is now possible to operate the measuring device with a 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.

#### Disconnecting

► After configuring the device: Terminate the WLAN connection between the operating unit and measuring device.

### 8.5.2 FieldCare

#### **Function scope**

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

### Access is via:

- CDI-RJ45 service interface → 🖺 82
- WLAN interface → 🖺 83

#### Typical functions:

- Parameterization 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

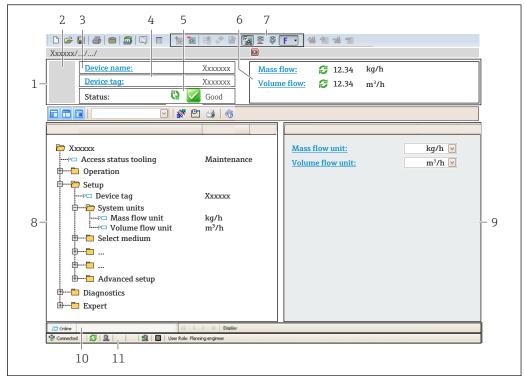
See information  $\rightarrow \blacksquare 87$ 

### Establishing a connection



For additional information, see Operating Instructions BA00027S and BA00059S  $\,$ 

#### User interface



A0021051-EN

- 1 Headei
- 2 Picture of device
- 3 Device name
- 4 Tag name
- 5 Status area with status signal  $\rightarrow \triangleq 174$
- 6 Display area for current measured values
- 7 Edit bar with additional functions such as save/load, event list and document creation
- 8 Navigation area with operating menu structure
- 9 Working area
- 10 Range of action
- 11 Status area

### 8.5.3 DeviceCare

# Function scope

Tool for connecting and configuring Endress+Hauser field devices.

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



For details, see Innovation Brochure INO1047S

#### Source for device description files

See information  $\rightarrow$   $\blacksquare$  87

# 9 System integration

# 9.1 Overview of device description files

### 9.1.1 Current version data for the device

Firmware version	01.06.zz	<ul> <li>On the title page of the Operating Instructions</li> <li>On the transmitter nameplate</li> <li>Firmware version         Diagnostics → Device information → Firmware version     </li> </ul>
Release date of firmware version	08.2022	

# 9.1.2 Operating tools

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

Operating tool via service interface (CDI) or Modbus interface	Sources for obtaining device descriptions
FieldCare	<ul> <li>www.endress.com → Download Area</li> <li>CD-ROM (contact Endress+Hauser)</li> <li>DVD (contact Endress+Hauser)</li> </ul>
DeviceCare	<ul> <li>www.endress.com → Download Area</li> <li>CD-ROM (contact Endress+Hauser)</li> <li>DVD (contact Endress+Hauser)</li> </ul>

# 9.2 Compatibility with earlier model

If the device is replaced, the measuring device Promass 500 supports the compatibility of the Modbus registers for the process variables and the diagnostic information with the previous model Promass 83. It is not necessary to change the engineering parameters in the automation system.

Compatible Modbus registers: process variables

Process variable	Compatible Modbus registers
Mass flow	2007
Volume flow	2009
Corrected volume flow	2011
Density	2013
Reference density	2015
Temperature	2017
Totalizer 1	2610
Totalizer 2	2810
Totalizer 3	3010

# Compatible Modbus registers: diagnostic information

Diagnostic information	Compatible Modbus registers	
Diagnostic code (data type: String), e.g. F270	6821	
Diagnostic number (data type: Integer), e.g. 270	6859	

# 9.3 Modbus RS485 information

# 9.3.1 Function codes

Function codes are used to define which read or write action is carried out via the Modbus protocol. The measuring device supports the following function codes:

Code	Name	Description	Application
03	Read holding register	Master reads one or more Modbus registers from the device.  A maximum of 125 consecutive registers can be read with 1 telegram: 1 register = 2 bytes  The measuring device does not make a distinction between function codes 03 and 04; these codes therefore yield the same result.	Read device parameters with read and write access Example: Read mass flow
04	Read input register	Master reads one or more Modbus registers from the device.  A maximum of 125 consecutive registers can be read with 1 telegram: 1 register = 2 bytes  The measuring device does not make a distinction between function codes 03 and 04; these codes therefore yield the same result.	Read device parameters with read access Example: Read totalizer value
06	Write single registers	Master writes a new value to <b>one</b> Modbus register of the measuring device.  Use function code 16 to write multiple registers with just 1 telegram.	Write only 1 device parameter Example: reset totalizer
08	Diagnostics	Master checks the communication connection to the measuring device.  The following "Diagnostics codes" are supported: ■ Sub-function 00 = Return query data (loopback test) ■ Sub-function 02 = Return diagnostics register	

Code	Name	Description	Application
16	Write multiple registers	Master writes a new value to multiple Modbus registers of the device.  A maximum of 120 consecutive registers can be written with 1 telegram.	Write multiple device parameters  Example:  Mass flow unit  Mass unit
		If the required device parameters are not available as a group, yet must nevertheless be addressed with a single telegram, use Modbus data map → 🖺 90	
23	Read/Write multiple registers	Master reads and writes a maximum of 118 Modbus registers of the measuring device simultaneously with 1 telegram. Write access is executed <b>before</b> read access.	Write and read multiple device parameters  Example:  Read mass flow  Reset totalizer

Broadcast messages are only allowed with function codes 06, 16 and 23.

#### 9.3.2 **Register information**



For an overview of device parameters with their respective Modbus register information, please refer to the "Modbus RS485 register information" section in the 

#### 9.3.3 Response time

Response time of the measuring device to the request telegram of the Modbus master: typically 3 to 5 ms

#### 9.3.4 Data types

The measuring device supports the following data types:

FLOAT (floating po Data length = 4 byt	int number IEEE 754) es (2 registers)				
Byte 3	3 Byte 2 Byte 1 Byte 0				
SEEEEEE EMMMMMM MMMMMMM MMMMMMMM					
S = sign, E = exponent, M = mantissa					

INTEGER Data length = 2 bytes (1 register)	
Byte 1	Byte 0
Most significant byte (MSB)	Least significant byte (LSB)

STRING Data length = depends on the bytes (9 registers)	device parameter, e	e.g. presentatio	on of a device para	meter with a data length = 18		
Byte 17 Byte 16 Byte 1 Byte 0						
Most significant byte (MSB)				Least significant byte (LSB)		

# 9.3.5 Byte transmission sequence

Byte addressing, i.e. the transmission sequence of the bytes, is not specified in the Modbus specification. For this reason, it is important to coordinate or match the addressing method between the master and slave during commissioning. This can be configured in the measuring device using the **Byte order** parameter.

The bytes are transmitted depending on the selection in the **Byte order** parameter:

FLOAT				
	Sequence			
Options	1.	2.	3.	4.
1-0-3-2*	Byte 1 (MMMMMMMM)	Byte 0 (MMMMMMMM)	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM)
0 - 1 - 2 - 3	Byte 0 (MMMMMMMM)	Byte 1 (MMMMMMMM)	Byte 2 (EMMMMMMM)	Byte 3 (SEEEEEEE)
2 - 3 - 0 - 1	Byte 2 (EMMMMMMM)	Byte 3 (SEEEEEEE)	Byte 0 (MMMMMMM)	Byte 1 (MMMMMMM)
3 - 2 - 1 - 0	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM)	Byte 1 (MMMMMMMM)	Byte 0 (MMMMMMMM)
* = factory setting, S = sign, E = exponent, M = mantissa				

INTEGER			
	Sequence		
Options	1.	2.	
1-0-3-2* 3-2-1-0	Byte 1 (MSB)	Byte 0 (LSB)	
0-1-2-3 2-3-0-1	Byte 0 (LSB)	Byte 1 (MSB)	
* = factory setting, MSB = most significant byte, LSB = least significant byte			

<b>STRING</b> Presentation taking the example of a device parameter with a data length of 18 bytes.						
	Sequence					
Options	1.	2.		17.	18.	
1 - 0 - 3 - 2 * 3 - 2 - 1 - 0	Byte 17 (MSB) Byte 16 Byte 1 Byte 0 (LSB)					
0 - 1 - 2 - 3       Byte 16       Byte 17        Byte 0       Byte 1         2 - 3 - 0 - 1       (MSB)       (LSB)						
* = factory setting, MSB = most significant byte, LSB = least significant byte						

# 9.3.6 Modbus data map

### Function of the Modbus data map

The device offers a special memory area, the Modbus data map (for a maximum of 16 device parameters), to allow users to call up multiple device parameters via Modbus RS485 and not only individual device parameters or a group of consecutive device parameters.

Grouping of device parameters is flexible and the Modbus master can read or write to the entire data block simultaneously with a single request telegram.

### Structure of the Modbus data map

The Modbus data map consists of two data sets:

- Scan list: Configuration area
   The device parameters to be grouped are defined in a list by entering their Modbus RS485 register addresses in the list.
- Data area

The measuring device reads out the register addresses entered in the scan list cyclically and writes the associated device data (values) to the data area.



### Scan list configuration

For configuration, the Modbus RS485 register addresses of the device parameters to be grouped must be entered in the scan list. Please note the following basic requirements of the scan list:

Max. entries	16 device parameters
Supported device parameters	Only parameters with the following characteristics are supported:  • Access type: read or write access  • Data type: float or integer

Configuration of the scan list via FieldCare or DeviceCare

Carried out using the operating menu of the measuring device: Expert  $\rightarrow$  Communication  $\rightarrow$  Modbus data map  $\rightarrow$  Scan list register 0 to 15

Scan list		
No.	Configuration register	
0	Scan list register 0	
15	Scan list register 15	

Configuration of the scan list via Modbus RS485

Carried out using register addresses 5001 - 5016

Scan list	Scan list				
No. Modbus RS485 register Data type Configuration register					
0	5001	Integer	Scan list register 0		
		Integer			
15	5016	Integer	Scan list register 15		

### Reading out data via Modbus RS485

The Modbus master accesses the data area of the Modbus data map to read out the current values of the device parameters defined in the scan list.

Master access to data area	Via register addresses 5051-5081
----------------------------	----------------------------------

Data area						
Device parameter value	rice parameter value Modbus RS485 register		Data type*	Access**		
	Start register	End register (Float only)				
Value of scan list register 0	5051	5052	Integer/float	Read/write		
Value of scan list register 1	5053	5054	Integer/float	Read/write		
Value of scan list register						
Value of scan list register 15	5081	5082	Integer/float	Read/write		

<sup>\*</sup> Data type depends on the device parameters entered in the scan list.

\*\* Data access depends on the device parameters entered in the scan list. If the device parameter entered supports read and write access, the parameter can also be accessed via the data area.

# 10 Commissioning

# 10.1 Function check

Before commissioning the measuring device:

- ▶ Make sure that the post-installation and post-connection checks have been performed.
- Checklist for "Post-connection check"  $\rightarrow \triangleq 61$

# 10.2 Switching on the measuring device

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

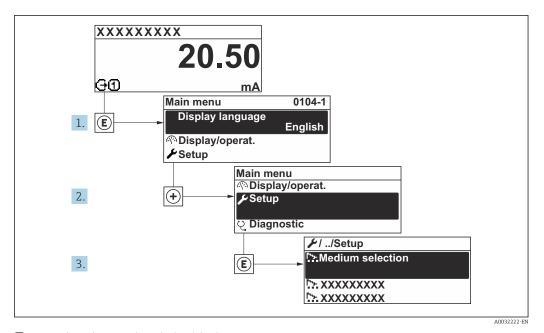
# 10.3 Setting the operating language

Factory setting: English or ordered local language

The operating language can be set in FieldCare or DeviceCare: Operation  $\rightarrow$  Display language

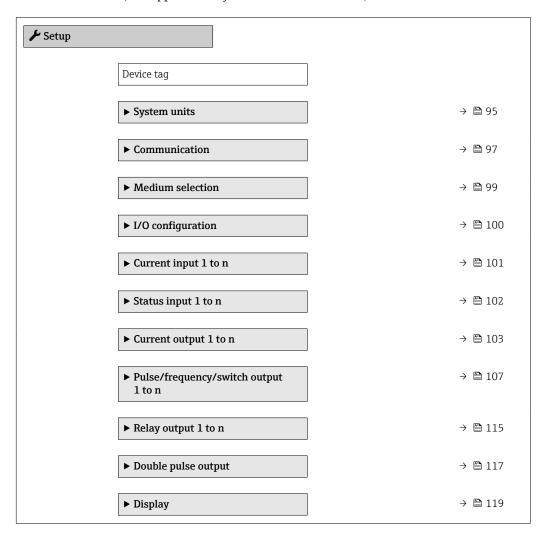
# 10.4 Configuring the measuring device

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



35 Taking the example of the local display

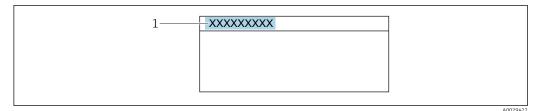
The number of submenus and parameters can vary depending on the device version. Certain submenus and parameters in these submenus are not described in the Operation Instructions. Instead a description is provided in the Special Documentation for the device (→ "Supplementary documentation" section).



► Low flow cut off	→ 🖺 123
▶ Partially filled pipe detection	→ 🗎 124
► Advanced setup	→ 🖺 125

# 10.4.1 Defining the tag name

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



■ 36 Header of the operational display with tag name

1 Tag name

 $\blacksquare$  Enter the tag name in the "FieldCare" operating tool  $\rightarrow$   $\blacksquare$  86

#### **Navigation**

"Setup" menu → Device tag

### Parameter overview with brief description

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

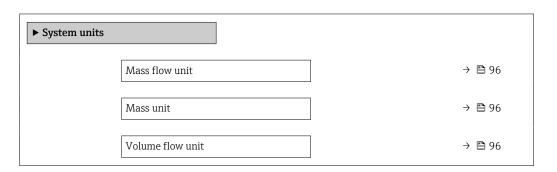
# 10.4.2 Setting the system units

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

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  $\rightarrow$  System units



Volume unit	→ 🖺 96
Corrected volume flow unit	→ 🖺 96
Corrected volume unit	→ 🗎 96
Density unit	→ 🖺 96
Reference density unit	→ 🖺 97
Density 2 unit	→ 🖺 97
Temperature unit	→ 🖺 97
Pressure unit	→ 🖺 97

# Parameter overview with brief description

Parameter	Description	Selection	Factory setting
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
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:  • I/h  • gal/min (us)
Volume unit	Select volume unit.	Unit choose list	Country-specific:  • 1 (DN > 150 (6"): m³ option)  • gal (us)
Corrected volume flow unit	Select corrected volume flow unit.  **Result** The selected unit applies for:  **Corrected volume flow parameter* (→ 🖺 152)	Unit choose list	Country-specific:  NI/h Sft³/min
Corrected volume unit	Select corrected volume unit.	Unit choose list	Country-specific: NI Sft³
Density unit	Select density unit.  Effect  The selected unit applies for:  Output Simulation process variable Density adjustment (Expert menu)	Unit choose list	Country-specific:  • kg/l  • lb/ft <sup>3</sup>

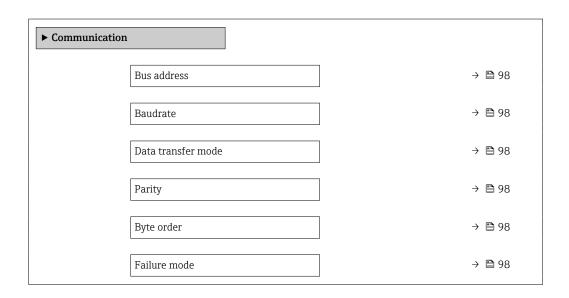
Parameter	Description	Selection	Factory setting
Reference density unit	Select reference density unit.	Unit choose list	Country-dependent • kg/Nl • lb/Sft³
Density 2 unit	Select second density unit.	Unit choose list	Depends on country:  • kg/l • lb/ft³
Temperature unit	Select temperature unit.  Effect  The selected unit applies for:  • Electronic temperature parameter (6053)  • Maximum value parameter (6051)  • Minimum value parameter (6052)  • External temperature parameter (6080)  • Maximum value parameter (6108)  • Minimum value parameter (6109)  • Carrier pipe temperature parameter (6027)  • Maximum value parameter (6030)  • Reference temperature parameter (1816)  • Temperature parameter	Unit choose list	Country-specific:  © °C  © F
Pressure unit	Select process pressure unit.  **Result**  The unit is taken from:  • Pressure value parameter (→ 🖺 100)  • External pressure parameter (→ 🖺 100)  • Pressure value	Unit choose list	Country-specific:  bar a  psi a

# 10.4.3 Configuring the communication interface

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

## Navigation

"Setup" menu  $\rightarrow$  Communication



# Parameter overview with brief description

Parameter	Description	User entry / Selection	Factory setting
Bus address	Enter device address.	1 to 247	247
Baudrate	Define data transfer speed.	<ul> <li>1200 BAUD</li> <li>2400 BAUD</li> <li>4800 BAUD</li> <li>9600 BAUD</li> <li>19200 BAUD</li> <li>38400 BAUD</li> <li>57600 BAUD</li> <li>115200 BAUD</li> </ul>	19200 BAUD
Data transfer mode	Select data transfer mode.	• ASCII • RTU	RTU
Parity	Select parity bits.	Picklist ASCII option:  • 0 = Even option  • 1 = Odd option  Picklist RTU option:  • 0 = Even option  • 1 = Odd option  • 2 = None / 1 stop bit option  • 3 = None / 2 stop bits option	Even
Byte order	Select byte transmission sequence.	<ul> <li>0-1-2-3</li> <li>3-2-1-0</li> <li>1-0-3-2</li> <li>2-3-0-1</li> </ul>	1-0-3-2
Failure mode	Select measured value output behavior when a diagnostic message occurs via Modbus communication.  NaN <sup>1)</sup>	NaN value     Last valid value	NaN value

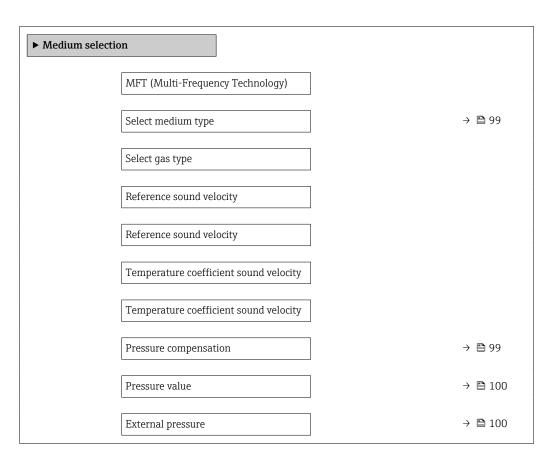
1) Not a Number

# 10.4.4 Selecting and setting the medium

The **Select medium** wizard submenu contains parameters that must be configured in order to select and set the medium.

### Navigation

"Setup" menu  $\rightarrow$  Medium selection



# Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Select medium type	-	Use this function to select the type of medium: "Gas" or "Liquid". Select the "Other" option in exceptional cases in order to enter the properties of the medium manually (e.g. for highly compressive liquids such as sulfuric acid).	<ul><li>Liquid</li><li>Gas</li><li>Other</li></ul>	Liquid
Pressure compensation	-	Select pressure compensation type.	<ul> <li>Off</li> <li>Fixed value</li> <li>External value</li> <li>Current input 1*</li> <li>Current input 2*</li> <li>Current input 3*</li> </ul>	Off

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Pressure value	In the <b>Pressure compensation</b> parameter, the <b>Fixed value</b> option is selected.	Enter process pressure to be used for pressure correction.	Positive floating- point number	1.01325 bar
External pressure	In the Pressure compensation parameter, the External value option or the Current input 1n option is selected.	Shows the external process pressure value.		-

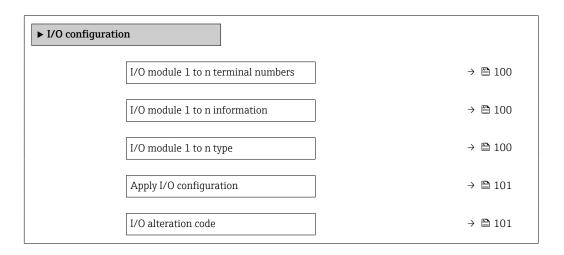
Visibility depends on order options or device settings

# 10.4.5 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  $\rightarrow$  I/O configuration



# Parameter overview with brief description

Parameter	Description	User interface / Selection / User entry	Factory setting
I/O module 1 to n terminal numbers	Shows the terminal numbers used by the I/O module.	<ul> <li>Not used</li> <li>26-27 (I/O 1)</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> <li>20-21 (I/O 4)*</li> </ul>	-
I/O module 1 to n information	Shows information of the plugged I/O module.	<ul><li>Not plugged</li><li>Invalid</li><li>Not configurable</li><li>Configurable</li><li>MODBUS</li></ul>	-
I/O module 1 to n type	Shows the I/O module type.	<ul> <li>Off</li> <li>Current output *</li> <li>Current input *</li> <li>Status input *</li> <li>Pulse/frequency/switch output *</li> <li>Double pulse output *</li> <li>Relay output *</li> </ul>	Off

Parameter	Description	User interface / Selection / User entry	Factory setting
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

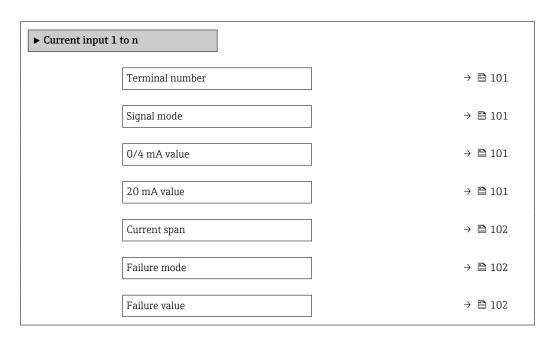
<sup>\*</sup> Visibility depends on order options or device settings

# 10.4.6 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  $\rightarrow$  Current input



## Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	-	Shows the terminal numbers used by the current input module.	<ul> <li>Not used</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> <li>20-21 (I/O 4)*</li> </ul>	-
Signal mode	The measuring device is <b>not</b> 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

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Current span	-	Select current range for process value output and upper/lower level for alarm signal.	■ 420 mA (4 20.5 mA) ■ 420 mA NE (3.820.5 mA) ■ 420 mA US (3.920.8 mA) ■ 020 mA (0 20.5 mA)	Country-specific:  420 mA NE (3.820.5 mA)  420 mA US (3.920.8 mA)
Failure mode	-	Define input behavior in alarm condition.	<ul><li>Alarm</li><li>Last valid value</li><li>Defined value</li></ul>	Alarm
Failure value	In the <b>Failure mode</b> parameter, the <b>Defined value</b> option is selected.	Enter value to be used by the device if input value from external device is missing.	Signed floating-point number	0

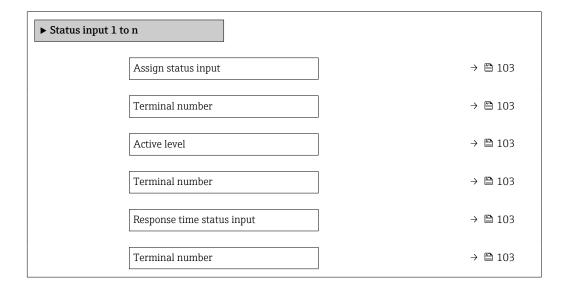
<sup>\*</sup> Visibility depends on order options or device settings

# 10.4.7 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  $\rightarrow$  Status input 1 to n



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## Parameter overview with brief description

Parameter	Description	Selection / User interface / User entry	Factory setting
Assign status input	Select function for the status input.	<ul> <li>Off</li> <li>Reset totalizer 1</li> <li>Reset totalizer 2</li> <li>Reset totalizer 3</li> <li>Reset all totalizers</li> <li>Flow override</li> <li>Zero adjustment</li> <li>Reset weighted averages *</li> <li>Reset weighted averages + totalizer 3 *</li> </ul>	Off
Terminal number	Shows the terminal numbers used by the status input module.	<ul> <li>Not used</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> <li>20-21 (I/O 4)*</li> </ul>	-
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

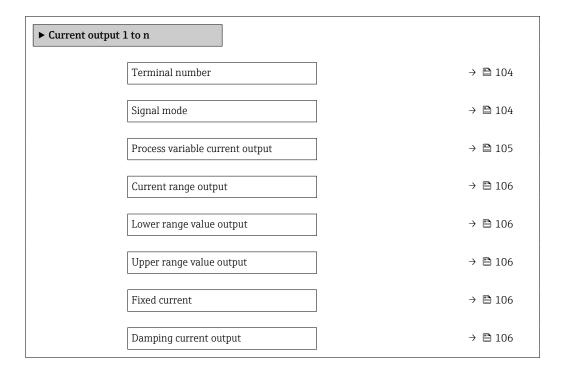
<sup>\*</sup> Visibility depends on order options or device settings

# 10.4.8 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  $\rightarrow$  Current output



Failure behavior current output  $\rightarrow \stackrel{\cong}{=} 106$ Failure current  $\rightarrow \stackrel{\cong}{=} 106$ 

# 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.	<ul> <li>Not used</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> <li>20-21 (I/O 4)*</li> </ul>	-
Signal mode	-	Select the signal mode for the current output.	<ul><li>Active *</li><li>Passive *</li></ul>	Active

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Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Process variable current output		Select the process variable for the current output.	Mass flow Volume flow Corrected volume flow* Density Reference density* Temperature Target mass flow* Carrier mass flow* Carrier mass flow* Target volume flow* Carrier corrected volume flow * Concentration * Application specific output 0 * Application specific output 1* Inhomogeneous medium index Suspended bubbles index * Raw value mass flow Exciter current 0 Oscillation damping 0 Oscillation damping fluctuation 0 * Oscillation frequency 0 Frequency fluctuation 0 * Signal asymmetry Torsion signal asymmetry Torsion signal asymmetry Torsion signal asymmetry Carrier pipe temperature * Frequency fluctuation 0 * Oscillation amplitude 0 * Oscillation damping fluctuation 0 * Oscillation amplitude 0 * Oscillation damping fluctuation 0 * Sensor index coil asymmetry Test point 0 Test point 1	Mass flow

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Current range output	-	Select current range for process value output and upper/lower level for alarm signal.	<ul> <li>420 mA NE (3.820.5 mA)</li> <li>420 mA US (3.920.8 mA)</li> <li>420 mA (4 20.5 mA)</li> <li>020 mA (0 20.5 mA)</li> <li>Fixed value</li> </ul>	Depends on country:  420 mA NE (3.820.5 mA)  420 mA US (3.920.8 mA)
Lower range value output	One of the following options is selected in the <b>Current span</b> parameter (→ 🗎 106):  • 420 mA NE (3.820.5 mA)  • 420 mA US (3.920.8 mA)  • 420 mA (4 20.5 mA)  • 020 mA (0 20.5 mA)	Enter lower range value for the measured value range.	Signed floating-point number	Depends on country:  • 0 kg/h  • 0 lb/min
Upper range value output	One of the following options is selected in the <b>Current span</b> parameter (→ 🗎 106):  • 420 mA NE (3.820.5 mA)  • 420 mA US (3.920.8 mA)  • 420 mA (4 20.5 mA)  • 020 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 <b>Fixed current</b> option is selected in the <b>Current span</b> parameter $(\rightarrow \boxminus 106)$ .	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 (→ 🗎 105) and one of the following options is selected in the Current span parameter (→ 🖺 106):  • 420 mA NE (3.820.5 mA)  • 420 mA US (3.920.8 mA)  • 420 mA (4 20.5 mA)  • 020 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
Failure behavior current output	A process variable is selected in the <b>Assign current output</b> parameter (→ 🗎 105) and one of the following options is selected in the <b>Current span</b> parameter (→ 🗎 106):  ■ 420 mA NE (3.820.5 mA)  ■ 420 mA US (3.920.8 mA)  ■ 420 mA (4 20.5 mA)  ■ 020 mA (0 20.5 mA)	Define output behavior in alarm condition.	<ul> <li>Min.</li> <li>Max.</li> <li>Last valid value</li> <li>Actual value</li> <li>Fixed value</li> </ul>	Max.
Failure current	The <b>Defined value</b> option is selected in the <b>Failure mode</b> parameter.	Enter current output value in alarm condition.	0 to 22.5 mA	22.5 mA

Visibility depends on order options or device settings

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# 10.4.9 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  $\rightarrow$  Advanced setup  $\rightarrow$  Pulse/frequency/switch output



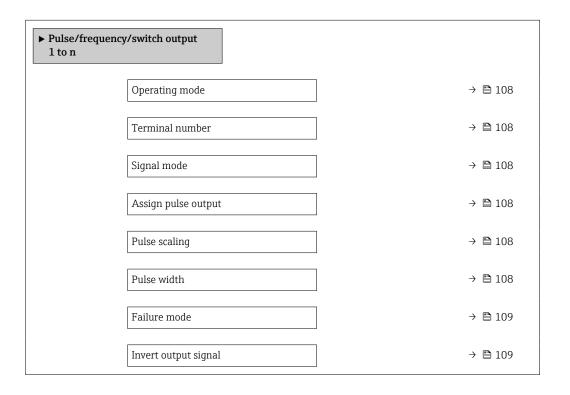
### Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Operating mode	Define the output as a pulse, frequency or switch output.	<ul><li>Pulse</li><li>Frequency</li><li>Switch</li></ul>	Pulse

## Configuring the pulse output

#### Navigation

"Setup" menu → Pulse/frequency/switch output



# Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	-	Define the output as a pulse, frequency or switch output.	<ul><li>Pulse</li><li>Frequency</li><li>Switch</li></ul>	Pulse
Terminal number	-	Shows the terminal numbers used by the PFS output module.	<ul> <li>Not used</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> <li>20-21 (I/O 4)*</li> </ul>	-
Signal mode	-	Select the signal mode for the PFS output.	<ul> <li>Passive</li> <li>Active *</li> <li>Passive NE</li> </ul>	Passive
Assign pulse output	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter.	Select process variable for pulse output.	Off     Mass flow     Volume flow     Corrected volume flow*     Target mass flow *     Carrier mass flow *     Carrier volume flow *     Carrier volume flow *     Carrier corrected volume flow *     Carrier corrected volume flow *     Carrier corrected volume flow *     Carrier sorrected volume flow *     Carrier corrected volume flow *     Carrier corrected volume flow *     Carrier corrected volume flow *     Oil mass flow *     Vater mass flow *     Oil volume flow *     Oil corrected volume flow *     Vater corrected volume flow *     Water corrected volume flow *     Volume flow *     Volume flow *     Water corrected volume flow *     Vol	Off
Pulse scaling	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 107) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🖺 108).	Enter quantity for measured value at which a pulse is output.	Positive floating point number	Depends on country and nominal diameter
Pulse width	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ 🗎 107) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🖺 108).	Define time width of the output pulse.	0.05 to 2 000 ms	100 ms

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Failure mode	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 107) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🖺 108).	Define output behavior in alarm condition.	<ul><li>Actual value</li><li>No pulses</li></ul>	No pulses
Invert output signal	_	Invert the output signal.	■ No ■ Yes	No

<sup>\*</sup> Visibility depends on order options or device settings

## Configuring the frequency output

## Navigation

"Setup" menu  $\rightarrow$  Pulse/frequency/switch output

► Pulse/frequency/switch output 1 to n	
Operating mode	→ 🖺 110
Terminal number	→ 🖺 110
Signal mode	→ 🖺 110
Assign frequency output	→ 🖺 111
Minimum frequency value	→ 🖺 111
Maximum frequency value	→ 🖺 112
Measuring value at minimum frequency	→ 🖺 112
Measuring value at maximum frequency	→ 🖺 112
Failure mode	→ 🖺 112
Failure frequency	→ 🖺 112
Invert output signal	→ 🖺 112

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

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Assign frequency output	In the <b>Operating mode</b> parameter (→ 🖺 107), the <b>Frequency</b> option is selected.	Select process variable for frequency output.	■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow* ■ Density ■ Reference density* ■ Time period signal frequency (TPS)* ■ Temperature ■ Pressure ■ Concentration* ■ Target mass flow* ■ Carrier mass flow* ■ Carrier wolume flow* ■ Carrier volume flow* ■ Carrier corrected volume flow ■ Carrier corrected volume flow ■ Target corrected volume flow ■ Application specific output 0* ■ Application specific output 1* ■ Inhomogeneous medium index ■ Suspended bubbles index* ■ HBSI* ■ Raw value mass flow ■ Exciter current 0 ■ Oscillation damping 0 ■ Oscillation damping fluctuation 0* ■ Oscillation frequency 0 ■ Frequency fluctuation 0 frequency 1 Carrier pipe temperature ■ Electronics temperature ■ Electronics temperature ■ Sensor index coil asymmetry ■ Test point 0 ■ Test point 1	Off
Minimum frequency value	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 107) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 111).	Enter minimum frequency.	0.0 to 10 000.0 Hz	0.0 Hz

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Maximum frequency value	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 107) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 111).	Enter maximum frequency.	0.0 to 10 000.0 Hz	10 000.0 Hz
Measuring value at minimum frequency	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 107) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 111).	Enter measured value for minimum frequency.	Signed floating-point number	Depends on country and nominal diameter
Measuring value at maximum frequency	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 107) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 111).	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 107) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 111).	Define output behavior in alarm condition.	<ul><li>Actual value</li><li>Defined value</li><li>0 Hz</li></ul>	0 Hz
Failure frequency	In the <b>Operating mode</b> parameter (→ 🖺 107), the <b>Frequency</b> option is selected, in the <b>Assign frequency output</b> parameter (→ 🖺 111) a process variable is selected, and in the <b>Failure mode</b> parameter, the <b>Defined value</b> 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.	<ul><li>No</li><li>Yes</li></ul>	No

<sup>\*</sup> Visibility depends on order options or device settings

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## Configuring the switch output

## Navigation

"Setup" menu → Pulse/frequency/switch output

Pulse/free 1 to n	quency/switch output	
	Operating mode	→ 🖺 113
	Terminal number	→ 🖺 113
	Signal mode	→ 🖺 113
	Switch output function	→ 🗎 114
	Assign diagnostic behavior	→ 🗎 114
	Assign limit	→ 🗎 114
	Assign flow direction check	→ 🗎 114
	Assign status	→ 🗎 114
	Switch-on value	→ 🗎 115
	Switch-off value	→ 🗎 115
	Switch-on delay	→ 🖺 115
	Switch-off delay	→ 🖺 115
	Failure mode	→ 🖺 115
	Invert output signal	→ 🖺 115

## Parameter overview with brief description

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

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch output function	The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.	Select function for switch output.	<ul> <li>Off</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit</li> <li>Flow direction check</li> <li>Status</li> </ul>	Off
Assign diagnostic behavior	<ul> <li>In the Operating mode parameter, the Switch option is selected.</li> <li>In the Switch output function parameter, the Diagnostic behavior option is selected.</li> </ul>	Select diagnostic behavior for switch output.	<ul><li>Alarm</li><li>Alarm or warning</li><li>Warning</li></ul>	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.	Mass flow Volume flow Corrected volume flow* Target mass flow Target volume flow Carrier mass flow Target volume flow Carrier corrected volume flow* Carrier corrected volume flow Density Reference density Concentration* Temperature Totalizer 1 Totalizer 2 Totalizer 3 Oscillation damping Pressure Application specific output 0* Application specific output 1 Inhomogeneous medium index Suspended bubbles index*	Volume flow
Assign flow direction check	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Flow direction check option is selected in the Switch output function parameter.</li> </ul>	Select process variable for flow direction monitoring.	<ul> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow*</li> </ul>	Mass flow
Assign status	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Status option is selected in the Switch output function parameter.</li> </ul>	Select device status for switch output.	<ul><li>Partially filled pipe detection</li><li>Low flow cut off</li></ul>	Partially filled pipe detection

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch-on value	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Limit option is selected in the Switch output function parameter.</li> </ul>	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific:  • 0 kg/h  • 0 lb/min
Switch-off value	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Limit option is selected in the Switch output function parameter.</li> </ul>	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific:  • 0 kg/h  • 0 lb/min
Switch-on delay	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Limit option is selected in the Switch output function parameter.</li> </ul>	Define delay for the switch-on of status output.	0.0 to 100.0 s	0.0 s
Switch-off delay	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Limit option is selected in the Switch output function parameter.</li> </ul>	Define delay for the switch-off of status output.	0.0 to 100.0 s	0.0 s
Failure mode	-	Define output behavior in alarm condition.	<ul><li>Actual status</li><li>Open</li><li>Closed</li></ul>	Open
Invert output signal	-	Invert the output signal.	■ No ■ Yes	No

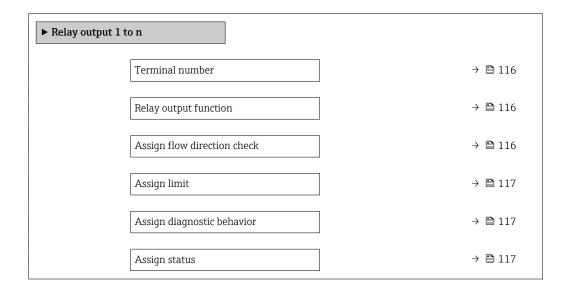
<sup>\*</sup> Visibility depends on order options or device settings

## 10.4.10 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  $\rightarrow$  Relay output 1 to n



Switch-off value	→ 🖺 117
Switch-off delay	→ 🖺 117
Switch-on value	→ 🗎 117
Switch-on delay	→ 🖺 117
Failure mode	→ 🗎 117

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	-	Shows the terminal numbers used by the relay output module.	<ul> <li>Not used</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> <li>20-21 (I/O 4)</li> </ul>	-
Relay output function	-	Select the function for the relay output.	<ul> <li>Closed</li> <li>Open</li> <li>Diagnostic behavior</li> <li>Limit</li> <li>Flow direction check</li> <li>Digital Output</li> </ul>	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.	<ul> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow*</li> </ul>	Mass flow

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Assign limit	The Limit option is selected in the Relay output function parameter.	Select process variable for limit function.	Mass flow Volume flow Corrected volume flow* Target mass flow Target volume flow Carrier mass flow Target volume flow Carrier volume flow Carrier corrected volume flow Apelication damping Pressure Application specific output 0 Application specific output 1 Inhomogeneous medium index Suspended bubbles index	Mass flow
Assign diagnostic behavior	In the <b>Relay output function</b> parameter, the <b>Diagnostic behavior</b> option is selected.	Select diagnostic behavior for switch output.	<ul><li>Alarm</li><li>Alarm or warning</li><li>Warning</li></ul>	Alarm
Assign status	In the <b>Relay output function</b> parameter, the <b>Digital Output</b> option is selected.	Select device status for switch output.	<ul><li>Partially filled pipe detection</li><li>Low flow cut off</li></ul>	Partially filled pipe detection
Switch-off value	In the <b>Relay output function</b> parameter, the <b>Limit</b> option is selected.	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific:  Okg/h Olb/min
Switch-off delay	In the <b>Relay output function</b> parameter, the <b>Limit</b> 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 <b>Limit</b> option is selected in the <b>Relay output function</b> parameter.	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific:  Okg/h Olb/min
Switch-on delay	In the <b>Relay output function</b> parameter, the <b>Limit</b> option is selected.	Define delay for the switch-on of status output.	0.0 to 100.0 s	0.0 s
Failure mode	-	Define output behavior in alarm condition.	<ul><li>Actual status</li><li>Open</li><li>Closed</li></ul>	Open

<sup>\*</sup> Visibility depends on order options or device settings

## 10.4.11 Configuring the double pulse output

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

 $\begin{array}{l} \textbf{Navigation} \\ \text{"Setup" menu} \rightarrow \textbf{Double pulse output} \end{array}$ 

▶ Double pulse output		
Signal mode		→ 🖺 118
Master terminal numb	er	→ 🖺 118
Assign pulse output		→ 🖺 118
Measuring mode		→ 🖺 119
Value per pulse		→ 🖺 119
Pulse width		→ 🖺 119
Failure mode		→ 🗎 119
Invert output signal		→ 🖺 119

## Parameter overview with brief description

Parameter	Description	Selection / User interface / User entry	Factory setting
Signal mode	Select the signal mode for the double pulse output.	<ul> <li>Passive</li> <li>Active*</li> <li>Passive NE</li> </ul>	Passive
Master terminal number	Shows the terminal numbers used by the master of the double pulse output module.	<ul><li>Not used</li><li>24-25 (I/O 2)</li><li>22-23 (I/O 3)</li></ul>	-
Assign pulse output	Select process variable for pulse output.	Off     Mass flow     Volume flow     Corrected volume flow*     Target mass flow*     Carrier mass flow*     Carrier volume flow*     Carrier volume flow*     Carrier corrected volume flow*     Carrier corrected volume flow*     Carrier tolume flow*     Carrier corrected volume flow*     SV flow*     SV flow alternative*     NSV flow alternative*     NSV flow alternative*     S&W volume flow*     Oil mass flow*     Water mass flow*     Water volume flow*     Oil corrected volume flow*     Water corrected volume flow*     Water corrected volume flow*	Off

Parameter	Description	Selection / User interface / User entry	Factory setting
Measuring mode	Select measuring mode for pulse output.	<ul> <li>Forward flow</li> <li>Forward/Reverse flow</li> <li>Reverse flow</li> <li>Reverse flow compensation</li> </ul>	Forward flow
Value per pulse	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	Define time width of the output pulse.	0.5 to 2 000 ms	0.5 ms
Failure mode	Define output behavior in alarm condition.	<ul><li>Actual value</li><li>No pulses</li></ul>	No pulses
Invert output signal	Invert the output signal.	■ No ■ Yes	No

<sup>\*</sup> Visibility depends on order options or device settings

## 10.4.12 Configuring the local display

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

## Navigation

"Setup" menu  $\rightarrow$  Display

► Display		
	Format display	→ 🖺 120
	Value 1 display	→ 🖺 121
	0% bargraph value 1	→ 🖺 121
	100% bargraph value 1	→ 🖺 121
	Value 2 display	→ 🖺 122
	Value 3 display	→ 🖺 122
	0% bargraph value 3	→ 🖺 122
	100% bargraph value 3	→ 🖺 122
	Value 4 display	→ 🖺 122
	Value 5 display	→ 🖺 122
	Value 6 display	→ 🖺 122
	Value 7 display	→ 🖺 122
	Value 8 display	→ 🖺 122

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	<ul> <li>1 value, max. size</li> <li>1 bargraph + 1</li> <li>value</li> <li>2 values</li> <li>1 value large + 2</li> <li>values</li> <li>4 values</li> </ul>	1 value, max. size

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	Mass flow Volume flow Corrected volume flow Density Reference density Temperature Pressure Totalizer 1 Totalizer 2 Totalizer 3 Concentration Target mass flow Carrier mass flow Target volume flow Carrier volume flow Carrier corrected volume flow Application specific output 0 Application specific output 1 Inhomogeneous medium index Suspended bubbles index HBSI Raw value mass flow Exciter current 0 Oscillation damping 0 Oscillation damping 0 Oscillation frequency 0 Frequency fluctuation 0 Signal asymmetry Torsion signal asymmetry Torsion signal asymmetry Carrier pipe temperature Sensor index coil asymmetry Test point 0 Test point 1 Current output 2 Current output 3 Current output 3 Current output 3 Current output 4	Mass flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  Okg/h Olb/min
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

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the <b>Value 1 display</b> parameter (→ 🖺 121)	None
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the <b>Value 1 display</b> parameter (→ 🖺 121)	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:  Okg/h Olb/min
100% bargraph value 3	A selection was made in the <b>Value 3 display</b> parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 1 display parameter (→ 🖺 121)	None
Value 5 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 (→ 🖺 121)	None
Value 6 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 (→ 🖺 121)	None
Value 7 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 (→ 🖺 121)	None
Value 8 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 (→ 🖺 121)	None

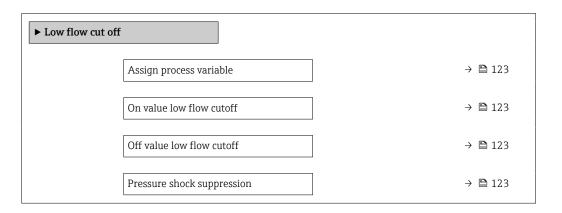
Visibility depends on order options or device settings

## 10.4.13 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  $\rightarrow$  Low flow cut off



## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	-	Select process variable for low flow cut off.	<ul> <li>Off</li> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow *</li> </ul>	Mass flow
On value low flow cutoff	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow  ext{ }  ext{ } $	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 <b>Assign process variable</b> parameter ( $\rightarrow \implies 123$ ).	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 123).	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

<sup>\*</sup> Visibility depends on order options or device settings

## 10.4.14 Configuring partially filled pipe detection

The **Partial filled pipe detection** wizard guides you systematically through all parameters that have to be set for configuring the monitoring of the pipe filling.

### Navigation

"Setup" menu  $\rightarrow$  Partially filled pipe detection

▶ Partially filled pipe detection	
Assign process variable	→ 🖺 124
Low value partial filled pipe detection	→ 🗎 124
High value partial filled pipe detection	→ 🗎 124
Response time part. filled pipe detect.	→ 🖺 124

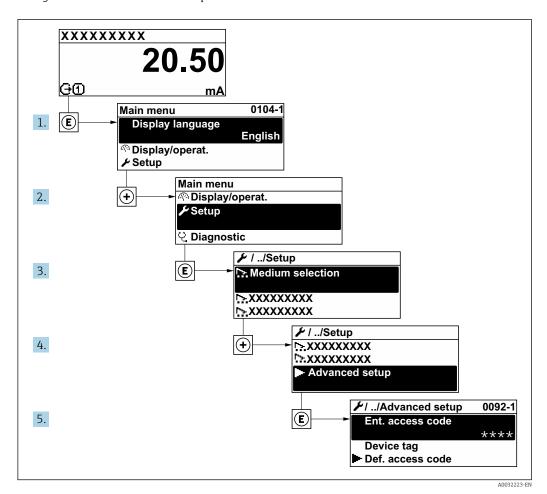
## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	-	Select process variable for partially filled pipe detection.	<ul><li> Off</li><li> Density</li><li> Calculated reference density</li></ul>	Off
Low value partial filled pipe detection	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \implies 124$ ).	Enter lower limit value for deactivating partialy filled pipe detection.	Signed floating-point number	Depends on country:  • 200 kg/m³  • 12.5 lb/ft³
High value partial filled pipe detection	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \implies 124$ ).	Enter upper limit value for deactivating partialy filled pipe detection.	Signed floating-point number	Depends on country:  • 6 000 kg/m <sup>3</sup> • 374.6 lb/ft <sup>3</sup>
Response time part. filled pipe detect.	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \implies 124$ ).	Use this function to enter the minimum time (hold time) the signal must be present before diagnostic message S962 "Pipe only partly filled" is triggered in the event of a partially filled or empty measuring pipe.	0 to 100 s	1s

## 10.5 Advanced settings

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

Navigation to the "Advanced setup" submenu

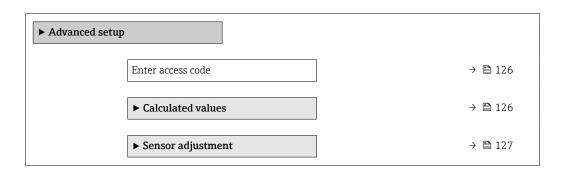


The number of submenus and parameters can vary depending on the device version and the available application packages. These submenus and their parameters are explained in the Special Documentation for the device and not in Operating Instructions.

For detailed information on the parameter descriptions for application packages: Special Documentation for the device  $\Rightarrow \triangleq 226$ 

## Navigation

"Setup" menu → Advanced setup



► Totalizer 1 to n	→ 🖺 131
► Display	→ 🖺 133
► WLAN settings	→ 🖺 139
► Configuration backup	→ 🖺 140
► Administration	→ 🖺 142

## 10.5.1 Using the parameter to enter the access code

### **Navigation**

"Setup" menu → Advanced setup

### Parameter overview with brief description

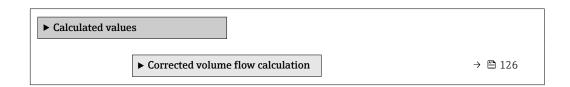
Parameter	Description	User entry
Enter access code	1	Max. 16-digit character string comprising numbers, letters and special characters

## 10.5.2 Calculated process variables

The **Calculated values** submenu contains parameters for calculating the corrected volume flow.

#### **Navigation**

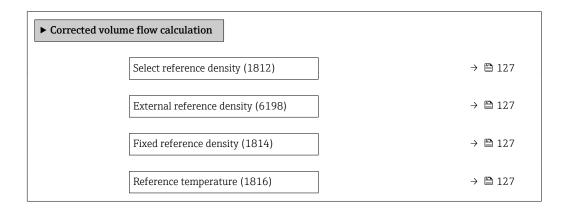
"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Calculated values



#### "Corrected volume flow calculation" submenu

#### Navigation

"Setup" menu → Advanced setup → Calculated values → Corrected volume flow calculation



Linear expansion coefficient (1817)	→ 🖺 127
Square expansion coefficient (1818)	→ 🖺 127

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Select reference density	-	Select reference density for calculating the corrected volume flow.	<ul> <li>Fixed reference density</li> <li>Calculated reference density</li> <li>Current input 1 *</li> <li>Current input 2 *</li> <li>Current input 3 *</li> </ul>	Calculated reference density
External reference density	In the Corrected volume flow calculation parameter, the External reference density option is selected.	Shows external reference density.	Floating point number with sign	-
Fixed reference density	The Fixed reference density option is selected in the Corrected volume flow calculation parameter parameter.	Enter fixed value for reference density.	Positive floating- point number	1 kg/Nl
Reference temperature	The Calculated reference density option is selected in the Corrected volume flow calculation parameter parameter.	Enter reference temperature for calculating the reference density.	−273.15 to 99999°C	Country-specific:  +20 °C  +68 °F
Linear expansion coefficient	The Calculated reference density option is selected in the Corrected volume flow calculation parameter parameter.	Enter linear, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0 1/K
Square expansion coefficient	The Calculated reference density option is selected in the Corrected volume flow calculation parameter parameter.	For media with a non-linear expansion pattern: enter the quadratic, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0 1/K <sup>2</sup>

<sup>\*</sup> Visibility depends on order options or device settings

## 10.5.3 Carrying out a sensor adjustment

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

## Navigation

"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Sensor adjustment





Parameter	Description	Selection	Factory setting
Installation direction	Select sign of flow direction.	<ul><li>Forward flow</li><li>Reverse flow</li></ul>	Forward flow

### Zero point verification and zero adjustment

Experience shows that zero adjustment is advisable only in special cases:

- To achieve maximum measuring accuracy even with low flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).

To get a representative zero point, ensure that:

- any flow in the device is prevented during the adjustment
- the process conditions (e.g. pressure, temperature) are stable and representative

Zero point verification and zero adjustment cannot be performed if the following process conditions are present:

- Gas pockets
   Ensure that the system has been sufficiently flushed with the medium. Repeat flushing can help to eliminate gas pockets
- Thermal circulation
  In the event of temperature differences (e.g. between the measuring tube inlet and outlet section), induced flow can occur even if the valves are closed due to thermal circulation in the device
- Leaks at the valves
   If the valves are not leak-tight, flow is not sufficiently prevented when determining the zero point

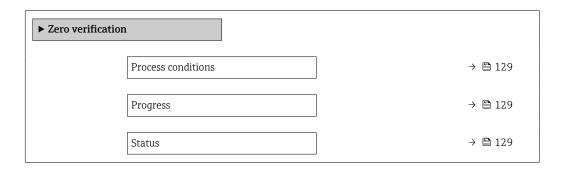
If these conditions cannot be avoided, it is advisable to keep the factory setting for the zero point.

Zero point verification

The zero point can be verified with the **Zero verification** wizard.

#### **Navigation**

"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Sensor adjustment  $\rightarrow$  Zero verification



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Additional information	→ 🖺 129
Recommendation:	→ 🖺 129
Root cause	→ 🖺 129
Abort cause	→ 🖺 129
Zero point measured	→ 🖺 129
Zero point standard deviation	→ 🗎 129

Parameter	Description	Selection / User interface	Factory setting
Process conditions	Ensure process conditions as follows.	<ul> <li>Tubes are completely filled</li> <li>Process operational pressure applied</li> <li>No-flow conditions (closed valves)</li> <li>Process and ambient temperatures stable</li> </ul>	-
Progress	Shows the progress of the process.	0 to 100 %	-
Status	Shows the status of the process.	<ul><li>Busy</li><li>Failed</li><li>Done</li></ul>	-
Additional information	Indicate whether to display additional information.	<ul><li>Hide</li><li>Show</li></ul>	Hide
Recommendation:	Indicates whether an adjustment is recommended. Only recommended if the measured zero point deviates significantly from the current zero point.	<ul><li>Do not adjust zero point</li><li>Adjust zero point</li></ul>	-
Abort cause	Indicates why the wizard was aborted.	Check process conditions!     A technical issue has occurred	-
Root cause	Shows the diagnostic and remedy.	<ul> <li>Zero point too high. Ensure no-flow.</li> <li>Zero point is unstable. Ensure no-flow.</li> <li>Fluctuation high. Avoid 2-phase medium.</li> </ul>	-
Zero point measured	Shows the zero point measured for the adjustment.	Signed floating-point number	-
Zero point standard deviation	Shows the standard deviation of the zero point measured.	Positive floating-point number	-

## Zero adjust

The zero point can be adjusted with the **Zero adjustment** wizard.



- A zero point verification should be performed before a zero adjustment.
   The zero point can also be adjusted manually: Expert → Sensor → Calibration

 $\begin{tabular}{ll} \textbf{Navigation} \\ \begin{tabular}{ll} \textbf{"Setup" menu} \to \textbf{Advanced setup} \to \textbf{Sensor adjustment} \\ \end{tabular} \to \textbf{Zero adjustment} \\ \end{tabular}$ 

► Zero adjus	tment	
	Process conditions	→ 🖺 130
	Progress	→ 🖺 130
	Status	→ 🗎 130
	Root cause	→ 🖺 130
	Abort cause	→ 🖺 130
	Root cause	→ 🖺 130
	Reliability of measured zero point	→ 🗎 131
	Additional information	→ 🗎 131
	Reliability of measured zero point	→ 🖺 131
	Zero point measured	→ 🖺 131
	Zero point standard deviation	→ 🖺 131
	Select action	→ 🖺 131

Parameter	Description	Selection / User interface	Factory setting
Process conditions	Ensure process conditions as follows.	<ul> <li>Tubes are completely filled</li> <li>Process operational pressure applied</li> <li>No-flow conditions (closed valves)</li> <li>Process and ambient temperatures stable</li> </ul>	-
Progress	Shows the progress of the process.	0 to 100 %	-
Status	Shows the status of the process.	<ul><li>Busy</li><li>Failed</li><li>Done</li></ul>	-
Abort cause	Indicates why the wizard was aborted.	Check process conditions!     A technical issue has occurred	-
Root cause	Shows the diagnostic and remedy.	<ul> <li>Zero point too high. Ensure no-flow.</li> <li>Zero point is unstable.         Ensure no-flow.     </li> <li>Fluctuation high. Avoid 2-phase medium.</li> </ul>	-

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Parameter	Description	Selection / User interface	Factory setting
Reliability of measured zero point	Indicates the reliability of the zero point measured.	<ul><li>Not done</li><li>Good</li><li>Uncertain</li></ul>	-
Additional information	Indicate whether to display additional information.	<ul><li>Hide</li><li>Show</li></ul>	Hide
Zero point measured	Shows the zero point measured for the adjustment.	Signed floating-point number	-
Zero point standard deviation	Shows the standard deviation of the zero point measured.	Positive floating-point number	-
Select action	Select the zero point value to apply.	<ul> <li>Keep current zero point</li> <li>Apply zero point measured</li> <li>Apply factory zero point*</li> </ul>	Keep current zero point

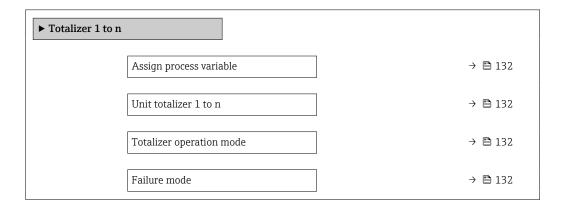
<sup>\*</sup> Visibility depends on order options or device settings

## 10.5.4 Configuring the totalizer

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

### Navigation

"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Totalizer 1 to n



Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable	-	Select process variable for totalizer.	Off     Mass flow     Volume flow     Corrected volume flow*     Target mass flow*     Carrier mass flow*     Target volume flow*     Carrier volume flow*     Carrier corrected volume flow*     Raw value mass flow	Mass flow
Unit totalizer 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	Select the unit for the process variable of the totalizer.	Unit choose list	Depends on country:  • kg • lb
Totalizer operation mode	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 132) of the <b>Totalizer 1 to n</b> submenu.	Select totalizer calculation mode.	<ul><li>Net</li><li>Forward</li><li>Reverse</li></ul>	Net
Failure mode	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \boxminus 132$ ) of the <b>Totalizer 1 to n</b> submenu.	Select totalizer behavior in the event of a device alarm.	<ul><li> Hold</li><li> Continue</li><li> Last valid value + continue</li></ul>	Hold

<sup>\*</sup> Visibility depends on order options or device settings

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# 10.5.5 Carrying out additional display configurations

In the  ${\bf Display}$  submenu you can set all the parameters associated with the configuration of the local display.

## Navigation

"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Display

► Display		
	Format display	→ 🖺 135
	Value 1 display	→ 🖺 136
	0% bargraph value 1	→ 🖺 136
	100% bargraph value 1	→ 🖺 136
	Decimal places 1	→ 🖺 137
	Value 2 display	→ 🖺 137
	Decimal places 2	→ 🖺 137
	Value 3 display	→ 🖺 137
	0% bargraph value 3	→ 🖺 137
	100% bargraph value 3	→ 🖺 137
	Decimal places 3	→ 🖺 137
	Value 4 display	→ 🖺 137
	Decimal places 4	→ 🖺 137
	Value 5 display	→ 🖺 137
	0% bargraph value 5	→ 🖺 137
	100% bargraph value 5	→ 🖺 137
	Decimal places 5	→ 🖺 138
	Value 6 display	→ 🖺 138
	Decimal places 6	→ 🖺 138
	Value 7 display	→ 🖺 138
	value / albpiuj	

0% bargraph value 7	→ 🖺 138
100% bargraph value 7	→ 🖺 138
Decimal places 7	→ 🖺 138
Value 8 display	→ 🖺 138
Decimal places 8	→ 🖺 138
Display language	→ 🖺 139
Display interval	→ 🖺 139
Display damping	→ 🖺 139
Header	→ 🖺 139
Header text	→ 🖺 139
Separator	→ 🖺 139
Backlight	→ 🖺 139

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	<ul> <li>1 value, max. size</li> <li>1 bargraph + 1 value</li> <li>2 values</li> <li>1 value large + 2 values</li> <li>4 values</li> </ul>	1 value, max. size

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	Mass flow Volume flow Corrected volume flow* Density Reference density* Temperature Pressure Totalizer 1 Totalizer 2 Totalizer 3 Concentration* Target mass flow* Carrier mass flow* Carrier wolume flow* Carrier volume flow* Carrier corrected volume flow* Carrier corrected volume flow * Application specific output 0* Application specific output 1* Inhomogeneous medium index Suspended bubbles index* HBSI* Raw value mass flow Exciter current 0 Oscillation damping 0 Oscillation damping 0 Oscillation damping 0 Oscillation of requency 0 Frequency fluctuation 0* Oscillation amplitude 0* Signal asymmetry Torsion signal asymmetry Torsion signal asymmetry Carrier pipe temperature Electronics temperature Sensor index coil asymmetry Test point 0 Test point 1 Current output 2 Current output 3 Current output 4 Current output 4 Current output 4	Mass flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  Okg/h Olb/min
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

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Decimal places 1	A measured value is specified in the <b>Value 1 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXXX     X.XXXXX	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 <b>Value 1 display</b> parameter (→ 🖺 121)	None
Decimal places 2	A measured value is specified in the <b>Value 2 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXXX     X.XXXXX	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 <b>Value 1 display</b> parameter (→ 🖺 121)	None
0% bargraph value 3	A selection was made in the <b>Value 3 display</b> parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  Okg/h Olb/min
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 <b>Value 3 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXX     X.XXXXX	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 <b>Value 1 display</b> parameter (→ 🖺 121)	None
Decimal places 4	A measured value is specified in the <b>Value 4 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXXX     X.XXXXX	x.xx
Value 5 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 (→ 🖺 121)	None
0% bargraph value 5	An option was selected in the <b>Value 5 display</b> parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Depends on country:  Okg/h Olb/min
100% bargraph value 5	An option was selected in the Value 5 display parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Decimal places 5	A measured value is specified in the <b>Value 5 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXXX     X.XXXXX	x.xx
Value 6 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the <b>Value 1 display</b> parameter (→ 🖺 121)	None
Decimal places 6	A measured value is specified in the <b>Value 6 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXXX     X.XXXXX	x.xx
Value 7 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 (→ 🖺 121)	None
0% bargraph value 7	An option was selected in the <b>Value 7 display</b> parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Depends on country:  Okg/h Olb/min
100% bargraph value 7	An option was selected in the <b>Value 7 display</b> parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 7	A measured value is specified in the <b>Value 7 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXXX     X.XXXXX	x.xx
Value 8 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 (→ 🖺 121)	None
Decimal places 8	A measured value is specified in the <b>Value 8 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXXX     X.XXXXXX	x.xx

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Display language	A local display is provided.	Set display language.	<ul> <li>English</li> <li>Deutsch</li> <li>Français</li> <li>Español</li> <li>Italiano</li> <li>Nederlands</li> <li>Portuguesa</li> <li>Polski</li> <li>pусский язык (Russian)</li> <li>Svenska</li> <li>Türkçe</li> <li>中文 (Chinese)</li> <li>日本語 (Japanese)</li> <li>한국어 (Korean)</li> <li>tiếng Việt (Vietnamese)</li> <li>čeština (Czech)</li> </ul>	English (alternatively, the ordered language is preset in the device)
Display interval	A local display is provided.	Set time measured values are shown on display if display alternates between values.	1 to 10 s	5 s
Display damping	A local display is provided.	Set display reaction time to fluctuations in the measured value.	0.0 to 999.9 s	0.0 s
Header	A local display is provided.	Select header contents on local display.	<ul><li>Device tag</li><li>Free text</li></ul>	Device tag
Header text	The <b>Free text</b> option is selected in the <b>Header</b> 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.	<ul><li>. (point)</li><li>, (comma)</li></ul>	. (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.	<ul><li>Disable</li><li>Enable</li></ul>	Enable

<sup>\*</sup> Visibility depends on order options or device settings

## 10.5.6 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  $\rightarrow$  Advanced setup  $\rightarrow$  WLAN settings



WLAN passphrase	→ 🖺 140
Assign SSID name	→ 🖺 140
SSID name	→ 🖺 140
Apply changes	→ 🖺 140

Parameter	Prerequisite	Description	User entry / Selection	Factory setting
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
Network security	-	Select the security type of the WLAN network.	<ul> <li>Unsecured</li> <li>WPA2-PSK</li> <li>EAP-PEAP with MSCHAPv2*</li> <li>EAP-PEAP MSCHAPv2 no server authentic.*</li> <li>EAP-TLS*</li> </ul>	WPA2-PSK
WLAN passphrase	The WPA2-PSK option is selected in the Security type parameter.	Enter the network key (8 to 32 characters).  The network key supplied with the device should be changed during commissioning for security reasons.	8 to 32-digit character string comprising numbers, letters and special characters (without spaces)	Serial number of the measuring device (e.g. L100A802000)
Assign SSID name	-	Select which name will be used for SSID: device tag or user-defined name.	<ul><li>Device tag</li><li>User-defined</li></ul>	User-defined
SSID name	<ul> <li>The User-defined option is selected in the Assign SSID name parameter.</li> <li>The WLAN access point option is selected in the WLAN mode parameter.</li> </ul>	Enter the user-defined SSID name (max. 32 characters).  The user-defined SSID name may only be assigned once. If the SSID name is assigned more than once, the devices can interfere with one another.	Max. 32-digit character string comprising numbers, letters and special characters	EH_device designation_last 7 digits of the serial number (e.g. EH_Promass_500_A 802000)
Apply changes	-	Use changed WLAN settings.	<ul><li>Cancel</li><li>Ok</li></ul>	Cancel

<sup>\*</sup> Visibility depends on order options or device settings

## 10.5.7 Configuration management

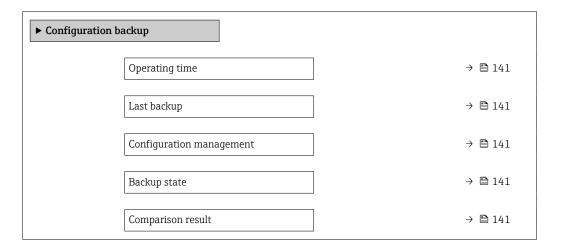
After commissioning, you can save the current device configurationor restore the previous device configuration.

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

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## Navigation

"Setup" menu → Advanced setup → Configuration backup



## Parameter overview with brief description

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

<sup>\*</sup> 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.

Options	Description
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.

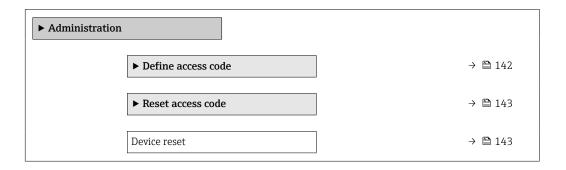
While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

## 10.5.8 Using parameters for device administration

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

#### **Navigation**

"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Administration

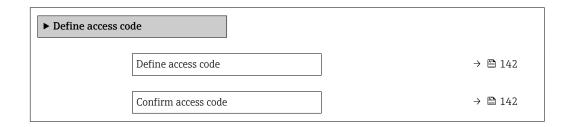


### Using the parameter to define the access code

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

#### **Navigation**

"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Administration  $\rightarrow$  Define access code



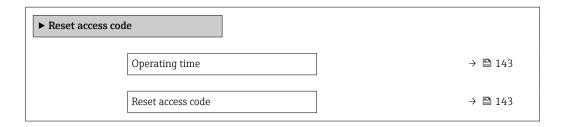
### Parameter overview with brief description

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  $\rightarrow$  Advanced setup  $\rightarrow$  Administration  $\rightarrow$  Reset access code



### Parameter overview with brief description

Parameter	Description	User interface / User entry	Factory setting
Operating time	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)	-
Reset access code	Reset access code to factory settings.  For a reset code, contact your Endress+Hauser service organization.  The reset code can only be entered via:  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  $\rightarrow$  Advanced setup  $\rightarrow$  Administration

### Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Device reset	Reset the device configuration - either entirely or in part - to a defined state.	<ul> <li>Cancel</li> <li>To delivery settings</li> <li>Restart device</li> <li>Restore S-DAT backup *</li> </ul>	Cancel

<sup>\*</sup> Visibility depends on order options or device settings

## 10.6 Simulation

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

 $\begin{tabular}{ll} \textbf{Navigation} \\ "Diagnostics" menu $\rightarrow$ Simulation \\ \end{tabular}$ 

		_	
► Simulation			
	Assign simulation process variable		→ 🖺 145
	Process variable value		→ 🖺 145
	Current output 1 to n simulation		→ 🖺 145
	Current output value		→ 🖺 145
	Frequency output 1 to n simulation		→ 🖺 145
	Frequency output 1 to n value		→ 🖺 145
	Pulse output simulation 1 to n		→ 🖺 145
	Pulse value 1 to n		→ 🖺 145
	Switch output simulation 1 to n		→ 🗎 145
	Switch state 1 to n		→ 🖺 145
	Relay output 1 to n simulation		→ 🖺 145
	Switch state 1 to n		→ 🖺 145
	Pulse output simulation		→ 🖺 146
	Pulse value		→ 🖺 146
	Device alarm simulation		→ 🖺 146
	Diagnostic event category		→ 🗎 146
	Diagnostic event simulation		→ 🗎 146
	Current input 1 to n simulation		→ 🖺 146
	Value current input 1 to n		→ 🖺 146
	Status input 1 to n simulation		→ 🖺 146
	Input signal level 1 to n		→ 🖺 146
		•	

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign simulation process variable		Select a process variable for the simulation process that is activated.	Off     Mass flow     Volume flow     Corrected volume flow*     Target mass flow *     Carrier mass flow *     Carrier volume flow *     Carrier volume flow *     Carrier corrected volume flow *     Temperature toncentration *     Time period signal frequency (TPS) *	Off
Process variable value	A process variable is selected in the <b>Assign simulation process variable</b> parameter (→ 🖺 145).	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 <b>Current output 1 to n simulation</b> parameter, the <b>On</b> 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 <b>Operating mode</b> parameter, the <b>Frequency</b> option is selected.	Switch the simulation of the frequency output on and off.	• Off • On	Off
Frequency output 1 to n value	In the <b>Frequency simulation 1 to n</b> parameter, the <b>On</b> option is selected.	Enter the frequency value for the simulation.	0.0 to 12 500.0 Hz	0.0 Hz
Pulse output simulation 1 to n	In the <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected.	Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter (→  108) defines the pulse width of the pulses output.	<ul><li>Off</li><li>Fixed value</li><li>Down-counting value</li></ul>	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 <b>Operating mode</b> parameter, the <b>Switch</b> 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.	<ul><li>Open</li><li>Closed</li></ul>	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 <b>On</b> option is selected in the <b>Switch output simulation 1 to n</b> parameter parameter.	Select status of the relay output for the simulation.	■ Open ■ Closed	Open

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Pulse output simulation	-	Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter defines the pulse width of the pulses output.	<ul><li>Off</li><li>Fixed value</li><li>Down-counting value</li></ul>	Off
Pulse value	In the Pulse output simulation parameter, the Down-counting value option is selected.	Set and switch off the pulse output simulation.	0 to 65 535	0
Device alarm simulation	-	Switch the device alarm on and off.	Off On	Off
Diagnostic event category	-	Select a diagnostic event category.	<ul><li>Sensor</li><li>Electronics</li><li>Configuration</li><li>Process</li></ul>	Process
Diagnostic event simulation	-	Select a diagnostic event to simulate this event.	<ul> <li>Off</li> <li>Diagnostic event picklist (depends on the category selected)</li> </ul>	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 <b>Current input 1 to n simulation</b> parameter, the <b>On</b> 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 <b>Status input simulation</b> parameter, the <b>On</b> 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

# 10.7 Protecting settings from unauthorized access

The following write protection options exist in order to protect the configuration of the measuring device from unintentional modification:

- Protect access to parameters via access code → 

  ☐ 146

# 10.7.1 Write protection via access code

The effects of the user-specific access code are as follows:

- Via local operation, the parameters for the measuring device configuration are writeprotected 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 ( $\rightarrow \triangleq 142$ ).

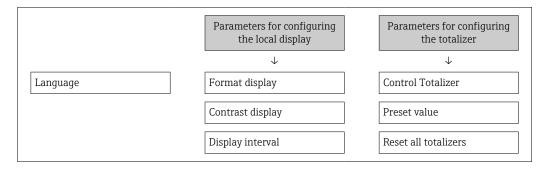
- 2. Define a max. 16-digit character string comprising numbers, letters and special characters as the access code.
- 3. Enter the access code again in the **Confirm access code** parameter ( $\rightarrow \triangleq 142$ ) to confirm the code.
  - ightharpoonup The ealson-symbol appears in front of all write-protected parameters.

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

- If parameter write protection is activated via an access code, it can also only be deactivated via this access code → 🗎 74.
  - The user role with which the user is currently logged on via the local display
    - $\rightarrow$   $\stackrel{\triangle}{=}$  74 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.



### Defining the access code via the Web browser

- 1. Navigate to the **Define access code** parameter ( $\Rightarrow \triangleq 142$ ).
- 2. Define a max. 16-digit numeric code as an access code.
- 3. Enter the access code again in the **Confirm access code** parameter (→ 🖺 142) 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.
- - 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 ( $\rightarrow \equiv 143$ ).
  - The access code has been reset to the factory setting **0000**. It can be redefined → ■ 146.
- 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.

#### 10.7.2 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 MODBUS RS485 protocol

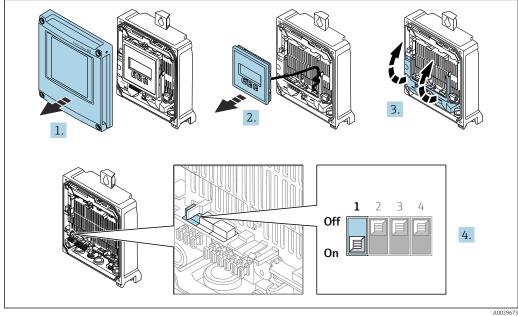
# Proline 500 - digital

### **A** WARNING

# Excessive tightening torque applied to the fixing screws!

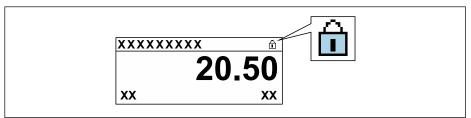
Risk of damaging the plastic transmitter.

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



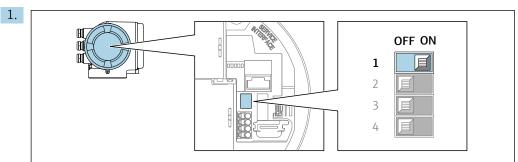
1. Open the housing cover.

- 2. Remove the display module.
- 3. Fold open the terminal cover.
- 4. Setting the write protection (WP) switch on the main electronics module to the **ON** position enables hardware write protection.
  - └ In the **Locking status** parameter, the **Hardware locked** option is displayed  $\rightarrow \blacksquare$  150. In addition, on the local display the \(\textit{\omega}\) symbol appears in front of the parameters in the header of the operational display and in the navigation view.



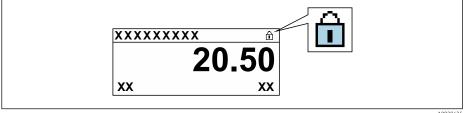
- 5. Setting the write protection (WP) switch on the main electronics module to the **OFF** position (factory setting) disables hardware write protection.
  - No option is displayed in the **Locking status** parameter  $\rightarrow \implies 150$ . On the local display, the 
    symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

### Proline 500



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  $\rightarrow$   $\stackrel{\triangle}{=}$  150. In addition, on the local display the  $\stackrel{\triangle}{=}$  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.
  - ightharpoonup No option is displayed in the **Locking status** parameter ightharpoonup 150. 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 <b>Access status</b> parameter applies → 🖺 74. Only appears on local display.
Hardware locked	The DIP switch for hardware locking is activated on the PCB board. This locks write access to the parameters (e.g. via local display or operating tool) $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
Temporarily locked	Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset, etc.). Once the internal processing has been completed, the parameters can be changed once again.

# 11.2 Adjusting the operating language



Detailed information:

- To configure the operating language → 🗎 93
- $\bullet$  For information on the operating languages supported by the measuring device  $\rightarrow~\cong~217$

# 11.3 Configuring the display

Detailed information:

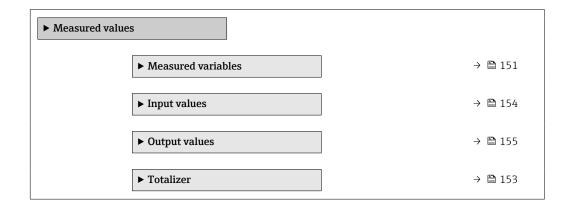
- On the basic settings for the local display  $\rightarrow$  🗎 119
- On the advanced settings for the local display  $\rightarrow \implies 133$

# 11.4 Reading measured values

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

### **Navigation**

"Diagnostics" menu → Measured values



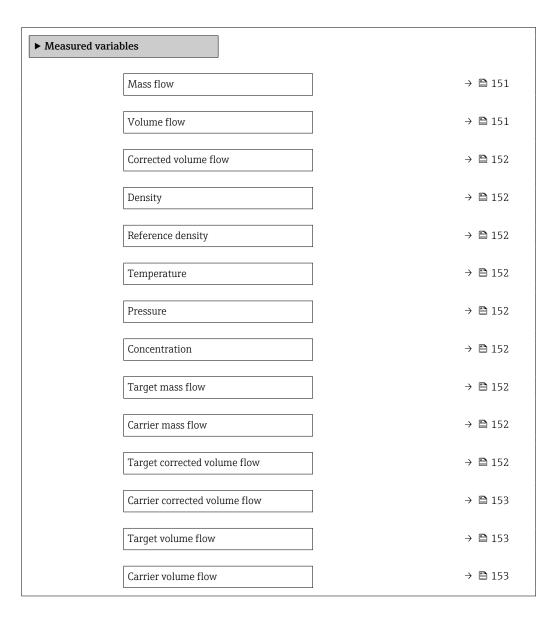
150

# 11.4.1 "Measured variables" submenu

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

### Navigation

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Measured variables



# Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Mass flow	-	Displays the mass flow that is currently measured.	Signed floating-point number
		Dependency The unit is taken from: <b>Mass flow unit</b> parameter (→ 🖺 96)	
Volume flow	-	Displays the volume flow that is currently calculated.	Signed floating-point number
		Dependency The unit is taken from the Volume flow unit parameter $(\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	

Parameter	Prerequisite	Description	User interface
Corrected volume flow	-	Displays the corrected volume flow that is currently calculated.  Dependency The unit is taken from: Corrected volume flow unit parameter (→   96)	Signed floating-point number
Density	-	Shows the density currently measured. Dependency The unit is taken from the Density unit parameter $( \rightarrow )$ 96).	Signed floating-point number
Reference density	-	Displays the reference density that is currently calculated.  Dependency The unit is taken from: Reference density unit parameter (→ 197)	Signed floating-point number
Temperature	-	Shows the medium temperature currently measured.  Dependency The unit is taken from: Temperature unit parameter (→ 🖺 97)	Signed floating-point number
Pressure	-	Displays either a fixed or external pressure value.  Dependency The unit is taken from the Pressure unit parameter (→   97).	Signed floating-point number
Concentration	For the following order code: Order code for "Application package", option ED "Concentration"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the concentration that is currently calculated.  Dependency The unit is taken from the Concentration unit parameter.	Signed floating-point number
Target mass flow	With the following conditions: Order code for "Application package", option ED "Concentration"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the mass flow that is currently measured for the target medium.  Dependency The unit is taken from the Mass flow unit parameter (→   96).	Signed floating-point number
Carrier mass flow	With the following conditions: Order code for "Application package", option ED "Concentration"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the mass flow of the carrier medium that is currently measured.  Dependency The unit is taken from: Mass flow unit parameter (→ 월 96)	Signed floating-point number
Target corrected volume flow	With the following conditions:  Order code for "Application package", option ED "Concentration"  The Ethanol in water option or %mass / %volume option is selected in the Liquid type parameter.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the corrected volume flow that is currently measured for the target fluid.  Dependency The unit is taken from the Volume flow unit parameter (→   96).	Signed floating-point number

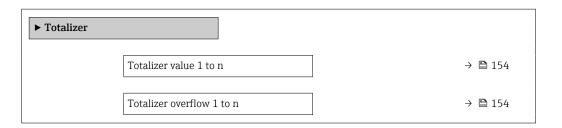
Parameter	Prerequisite	Description	User interface
Carrier corrected volume flow	With the following conditions:  Order code for "Application package", option ED "Concentration"  In the Liquid type parameter, the Ethanol in water option or %mass / %volume option is selected.	Displays the corrected volume flow currently measured for the carrier fluid.  Dependency The unit is taken from the Volume flow unit parameter (→   96).	Signed floating-point number
	The software options currently enabled are displayed in the Software option overview parameter.		
Target volume flow	With the following conditions:  Order code for "Application package", option ED "Concentration"  The Ethanol in water option or %mass / %volume option is selected in the Liquid type parameter.  The %vol option is selected in the Concentration unit parameter.	Displays the volume flow currently measured for the target medium.  Dependency The unit is taken from the Volume flow unit parameter (→ 🖺 96).	Signed floating-point number
	The software options currently enabled are displayed in the Software option overview parameter.		
Carrier volume flow	With the following conditions:  Order code for "Application package", option ED "Concentration"  The Ethanol in water option or %mass / %volume option is selected in the Liquid type parameter.  The %vol option is selected in the Concentration unit parameter.	Displays the volume flow currently measured for the carrier medium.  Dependency The unit is taken from the Volume flow unit parameter (→ 🖺 96).	Signed floating-point number
	The software options currently enabled are displayed in the Software option overview parameter.		

# 11.4.2 "Totalizer" submenu

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

# Navigation

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Totalizer



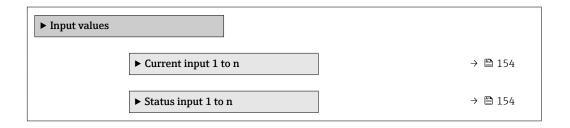
Parameter	Prerequisite	Description	User interface
Totalizer value 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 132) of the <b>Totalizer 1 to n</b> submenu.	Displays the current totalizer counter reading.	Signed floating-point number
Totalizer overflow 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 132) of the <b>Totalizer 1 to n</b> submenu.	Displays the current totalizer overflow.	Integer with sign

# 11.4.3 "Input values" submenu

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

# **Navigation**

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Input values

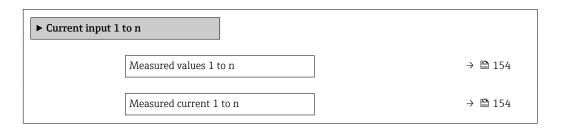


# Input values of current input

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  $\rightarrow$  Measured values  $\rightarrow$  Input values  $\rightarrow$  Current input 1 to n



### 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  $\rightarrow$  Measured values  $\rightarrow$  Input values  $\rightarrow$  Status input 1 to n



# Parameter overview with brief description

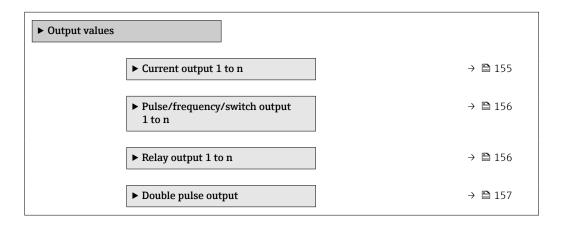
Parameter	Description	User interface
Value status input	Shows the current input signal level.	■ High ■ Low

# 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

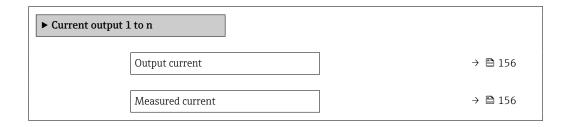


### Output values of current output

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

# Navigation

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Output values  $\rightarrow$  Value current output 1 to n



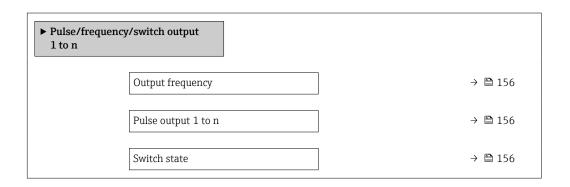
Parameter	Description	User interface
Output current	Displays the current value currently calculated for the current output.	3.59 to 22.5 mA
Measured current	Displays the current value currently measured for the current output.	0 to 30 mA

### 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.

### Navigation

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Output values  $\rightarrow$  Pulse/frequency/switch output 1 to n



# Parameter overview with brief description

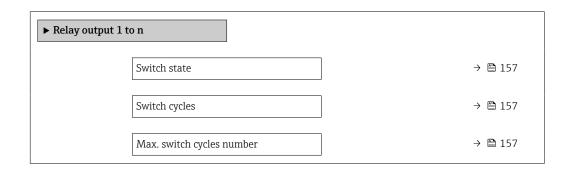
Parameter	Prerequisite	Description	User interface
Output frequency	In the <b>Operating mode</b> parameter, the <b>Frequency</b> option is selected.	Displays the value currently measured for the frequency output.	0.0 to 12 500.0 Hz
Pulse output 1 to n	The <b>Pulse</b> option is selected in the <b>Operating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

# Output values for relay output

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

# Navigation

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Output values  $\rightarrow$  Relay output 1 to n



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

# Output values for double pulse output

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

# **Navigation**

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Output values  $\rightarrow$  Double pulse output



### Parameter overview with brief description

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

# 11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu ( $\rightarrow$  **\Begin{aligned}** 93)
- Advanced settings using the **Advanced setup** submenu (→ 🖺 125)

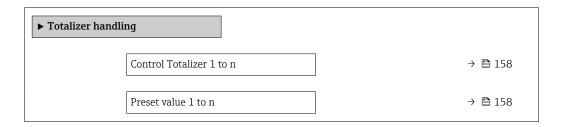
# 11.6 Performing a totalizer reset

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

- Control Totalizer
- Reset all totalizers

### **Navigation**

"Operation" menu → Totalizer handling



Totalizer value 1 to n	→ 🖺 158
Reset all totalizers	→ 🗎 158

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Control Totalizer 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 132) of the <b>Totalizer 1 to n</b> submenu.	Control totalizer value.	<ul> <li>Totalize</li> <li>Reset + hold*</li> <li>Preset + hold*</li> <li>Reset + totalize</li> <li>Preset + totalize*</li> <li>Hold*</li> </ul>	Totalize
Preset value 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 132) of the <b>Totalizer 1 to n</b> submenu.	Specify start value for totalizer.  Dependency  The unit of the selected process variable is specified for the totalizer in the Unit totalizer parameter (→   132).	Signed floating-point number	Country-specific:  • 0 kg  • 0 lb
Totalizer value 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter $(\rightarrow \boxminus 132)$ of the <b>Totalizer 1 to n</b> submenu.	Displays the current totalizer counter reading.	Signed floating-point number	-
Reset all totalizers	_	Reset all totalizers to 0 and start.	<ul><li>Cancel</li><li>Reset + totalize</li></ul>	Cancel

<sup>\*</sup> Visibility depends on order options or device settings

# 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 <b>Preset value</b> 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 <b>Preset value</b> parameter and the totaling process is restarted.
Hold	Totalizing is stopped.

<sup>1)</sup> 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.

#### Show data logging 11.7

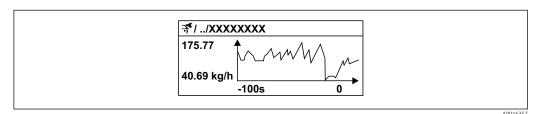
The **Extended HistoROM** application package must be enabled in the device (order option) for the Data logging submenu to appear. This contains all the parameters for the measured value history.



Pata logging is also available via:

### **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



**№** 37 Chart of a measured value trend

- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.
- 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	→ 🖺 161
Assign channel	2	→ 🖺 162
Assign channel	3	→ 🖺 162
Assign channel	4	→ 🖺 162
Logging interva	1	→ 🖺 162
Clear logging d	ata	→ 🖺 162
Data logging		→ 🖺 162
Logging delay		→ 🖺 162
Data logging co	ntrol	→ 🗎 162

Data logging status	→ 🖺 162
Entire logging duration	→ 🖺 162
▶ Display channel 1	
▶ Display channel 2	
▶ Display channel 3	
▶ Display channel 4	

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 ■ Mass flow ■ Volume flow ■ Corrected volume flow* ■ Density ■ Reference density* ■ Temperature ■ Pressure ■ Concentration* ■ Target mass flow* ■ Carrier mass flow* ■ Carrier wolume flow* ■ Carrier volume flow* ■ Carrier corrected volume flow * ■ Application specific output 0* ■ Application specific output 1* ■ Inhomogeneous medium index ■ Suspended bubbles index* ■ HBSI* ■ Raw value mass flow ■ Exciter current 0 ■ Oscillation damping 0 ■ Oscillation damping fluctuation 0* ■ Oscillation frequency 0 ■ Frequency fluctuation 0 * ■ Oscillation amplitude 1 ■ Signal asymmetry ■ Torsion index coil asymmetry ■ Test point 0 ■ Test point 1 ■ Current output 1 ■ Current output 2 ■ Current output 3 ■ Current output 4	Off

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign channel 2	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 <b>Assign channel</b> 1 parameter (→ 🖺 161)	Off
Assign channel 3	The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter.	Assign a process variable to logging channel.	For the picklist, see the <b>Assign channel</b> 1 parameter (→ 🖺 161)	Off
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 <b>Assign channel</b> 1 parameter (→ 🖺 161)	Off
Logging interval	The <b>Extended HistoROM</b> 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 <b>Extended HistoROM</b> application package is available.	Clear the entire logging data.	Clear data	Cancel
Data logging	-	Select the type of data logging.	<ul><li>Overwriting</li><li>Not overwriting</li></ul>	Overwriting
Logging delay	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> option is selected.	Enter the time delay for measured value logging.	0 to 999 h	0 h
Data logging control	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> option is selected.	Start and stop measured value logging.	<ul><li>None</li><li>Delete + start</li><li>Stop</li></ul>	None
Data logging status	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> option is selected.	Displays the measured value logging status.	<ul><li>Done</li><li>Delay active</li><li>Active</li><li>Stopped</li></ul>	Done
Entire logging duration	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> option is selected.	Displays the total logging duration.	Positive floating- point number	0 s

Visibility depends on order options or device settings

# 11.8 Gas Fraction Handler

The Gas Fraction Handler improves measurement stability and repeatability in the event of two-phase media and provides valuable diagnostic information for the process.

The function continuously checks for the presence of gas bubbles in liquids or droplets in gases, as this second phase influences the output values for flow and density.

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In the case of two-phase media, the Gas Fraction Handler stabilizes the output values and enables better readability for operators and easier interpretation by the distributed control system. The level of smoothing is adjusted according to the severity of the disturbances introduced by the second phase. In the case of single-phase media, the Gas Fraction Handler does not have any influence on the output values.

Possible options in the Gas Fraction Handler parameter:

- Off: Disables the Gas Fraction Handler. When a second phase is present, large fluctuations in the values output for flow and density will occur.
- Moderate: Use for applications with low levels or intermittent levels of second phase.
- Powerful: Use for applications with very significant levels of second phase.

The Gas Fraction Handler is cumulative to any fixed damping constants applied to flow and density that are set elsewhere in the instrument parameterization.



For detailed information on the parameter descriptions of the Gas Fraction Handler, see the Special Documentation for the device  $\rightarrow$   $\stackrel{\triangle}{=}$  226

#### 11.8.1 "Measurement mode" submenu

# Navigation

"Expert" menu → Sensor → Measurement mode



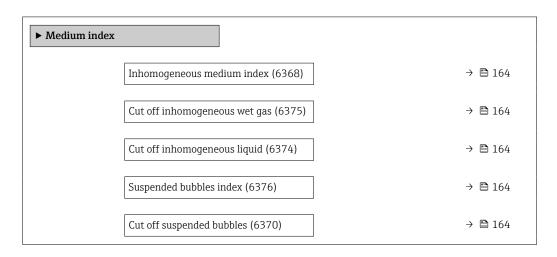
### Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Gas Fraction Handler	Activates the Gas Fraction Handler function for two phase media.	<ul><li>Off</li><li>Moderate</li><li>Powerful</li></ul>	Moderate

#### 11.8.2 "Medium index" submenu

### Navigation

"Expert" menu → Application → Medium index



Parameter	Prerequisite	Description	User interface / User entry	Factory setting
Inhomogeneous medium index	-	Shows the degree of inhomogeneity of the medium.	Signed floating-point number	-
Cut off inhomogeneous wet gas	-	Enter cut off value for wet gas applications. Below this value the 'Inhomogeneous medium index' is set to 0.	Positive floating- point number	0.25
Cut off inhomogeneous liquid	-	Enter cut off value for liquid applications. Below this value the 'Inhomogeneous medium index' is set to 0.	Positive floating- point number	0.05
Suspended bubbles index	The diagnostic index is only available for Promass Q.	Shows the relative amount of suspended bubbles in the medium.	Signed floating-point number	-
Cut off suspended bubbles	The parameter is only available for Promass Q.	Enter the cut off value for suspended bubbles. Below this value the Index for suspended bubbles' is set to 0.	Positive floating- point number	0.05

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# 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 → 🖺 51→ 🖺 46.
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 → 🖺 192.
Local display dark and no output signals	The connector between the main electronics module and display module is not plugged in correctly.	Check the connection and correct if necessary.
Local display dark and no output signals	The connecting cable is not plugged in correctly.	Check the connection of the electrode cable and correct if necessary.     Check the connection of the coil current cable and correct if necessary.
Local display is dark, but signal output is within the valid range	Display is set too bright or too dark.	<ul> <li>Set the display brighter by simultaneously pressing ± + €.</li> <li>Set the display darker by simultaneously pressing □ + €.</li> </ul>
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 → 🖺 192.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures → 🖺 177
Text on local display appears in a foreign language and cannot be understood.	Incorrect operating language is configured.	1. Press 2 s □ +
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	<ul> <li>Check the cable and the connector between the main electronics module and display module.</li> <li>Order spare part →   192.</li> </ul>

# For output signals

Error	Possible causes	Remedial action
Signal output outside the valid range	Main electronics module is defective.	Order spare part $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
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.	Check and correct parameter configuration.     Observe limit values specified in the "Technical Data".

# For access

Error	Possible causes	Remedy
No write access to parameters	Hardware write protection enabled	Set the write protection switch on the main electronics module to the <b>OFF</b> position → 🗎 148.
No write access to parameters	Current user role has limited access authorization	<ol> <li>Check user role → □ 74.</li> <li>Enter correct customer-specific access code → □ 74.</li> </ol>
No connection via Modbus RS485	Modbus RS485 bus cable connected incorrectly	Check the terminal assignment $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
No connection via Modbus RS485	Modbus RS485 cable incorrectly terminated	Check the terminating resistor $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
No connection via Modbus RS485	Incorrect settings for the communication interface	Check the Modbus RS485 configuration  → 🖺 97.
No connection to Web server	Web server disabled	Using the "FieldCare" or "DeviceCare" operating tool, check whether the Web server of the measuring device is enabled, and enable it if necessary→   81.
	Incorrect settings for the Ethernet interface of the computer	1. Check the properties of the Internet protocol (TCP/IP) → 🖺 77 → 🗎 77.  2. Check the network settings with the IT manager.
No connection to Web server	Incorrect IP address	Check the IP address: 192.168.1.212  → 🖺 77→ 🗎 77
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 →  77.
	WLAN communication disabled	-
Not connecting to Web server, FieldCare or DeviceCare	No WLAN network available	<ul> <li>Check if WLAN reception is present: LED on display module is lit blue</li> <li>Check if WLAN connection is enabled: LED on display module flashes blue</li> <li>Switch on instrument function.</li> </ul>
Network connection not present or unstable	WLAN network is weak.	<ul> <li>Operating device is outside of reception range: Check network status on operating device.</li> <li>To improve network performance, use an external WLAN antenna.</li> </ul>
	Parallel WLAN and Ethernet communication	<ul> <li>Check network settings.</li> <li>Temporarily enable only the WLAN as an interface.</li> </ul>
Web browser frozen and operation no longer possible	Data transfer active	Wait until data transfer or current action is finished.

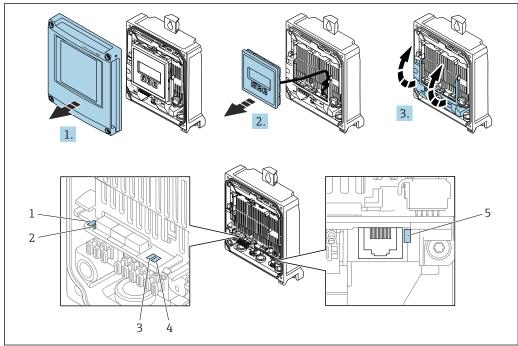
Error	Possible causes	Remedy
	Connection lost	Check cable connection and power supply.     Refresh the Web browser and restart if necessary.
Content of Web browser incomplete or difficult to read	Not using optimum version of Web server.	<ol> <li>Use the correct Web browser version</li> <li>→ ₱ 76.</li> <li>Clear the Web browser cache and restart the Web browser.</li> </ol>
	Unsuitable view settings.	Change the font size/display ratio of the Web browser.
No or incomplete display of contents in the Web browser	<ul><li> JavaScript not enabled</li><li> JavaScript cannot be enabled</li></ul>	Enable JavaScript.     Enter http://XXX.XXX.X.X.X.X.X./servlet/basic.html as the IP address.
Operation with FieldCare or DeviceCare 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)	Firewall of computer or network is preventing communication	Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access.

# 12.2 Diagnostic information via light emitting diodes

# 12.2.1 Transmitter

# Proline 500 - digital

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

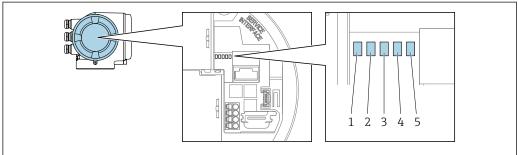


- Supply voltage Device status 1
- 2
- 3 Not used
- Communication
- Service interface (CDI) active
- 1. Open the housing cover.
- Remove the display module.
- 3. Fold open the terminal cover.

LED		Color	Meaning
1	Supply voltage	Off	Supply voltage is off or too low.
		Green	Supply voltage is ok.
2	Device status (normal	Off	Firmware error
	operation)	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.
2	Device status (during	Flashes red slowly	If > 30 seconds: problem with the boot loader.
	start-up)	Flashes red quickly	If > 30 seconds: compatibility problem when reading the firmware.
3	Not used	_	-
4	Communication	Off	Communication not active.
		White	Communication active.
5	Service interface (CDI)	Off	Not connected or no connection established.
		Yellow	Connected and connection established.
		Flashing yellow	Service interface active.

# Proline 500

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



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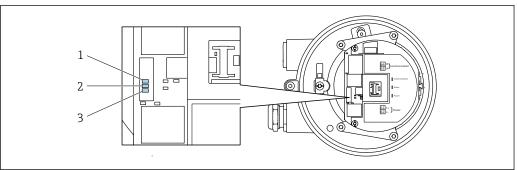
- 1 Supply voltage
- 2 Device status
- 3 Not used
- 4 Communication
- 5 Service interface (CDI) active

LED		Color	Meaning
1	Supply voltage	Off	Supply voltage is off or too low.
		Green	Supply voltage is ok.
2	Device status (normal	Off	Firmware error
	operation)	Green	Device status is ok.
		Flashing green	Device is not configured.
		Red	A diagnostic event with "Alarm" diagnostic behavior has occurred.
		Flashing red	A diagnostic event with "Warning" diagnostic behavior has occurred.
		Flashing red/green	The device restarts.
2	Device status (during	Flashes red slowly	If > 30 seconds: problem with the boot loader.
	start-up)	Flashes red quickly	If > 30 seconds: compatibility problem when reading the firmware.
3	Not used	-	-
4	Communication	Off	Communication not active.
		White	Communication active.
5	Service interface (CDI)	Off	Not connected or no connection established.
		Yellow	Connected and connection established.
		Flashing yellow	Service interface active.

# 12.2.2 Sensor connection housing

# Proline 500 - digital

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



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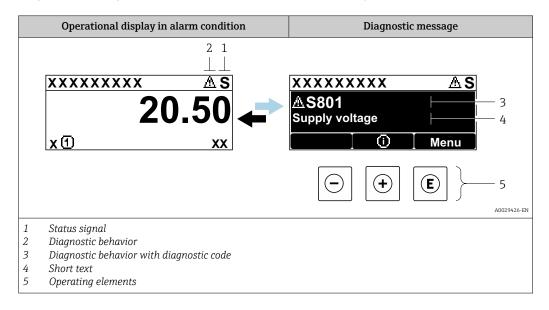
- 1 Communication
- 2 Device status
- 3 Supply voltage

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.



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 → 🗎 182
  - Via submenus  $\rightarrow$  🗎 182

# 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

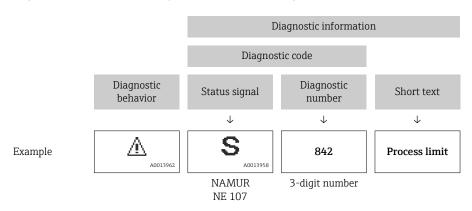
Symbol	Meaning
F	Failure A device error has occurred. The measured value is no longer valid.
С	Function check The device is in service mode (e.g. during a simulation).
S	Out of specification The device is operated: Outside its technical specification limits (e.g. outside the process temperature range)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

# Diagnostic behavior

Symbol	Meaning
8	<ul> <li>Alarm</li> <li>Measurement is interrupted.</li> <li>Signal outputs and totalizers assume the defined alarm condition.</li> <li>A diagnostic message is generated.</li> </ul>
Δ	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
<b>(+)</b>	Plus key In a menu, submenu Opens the message about remedy information.
E	Enter key In a menu, submenu Opens the operating menu.

# XXXXXXXX AS XXXXXXXX **AS801** Supply voltage x ① 1. $(\mathbf{+})$ Diagnostic list $\triangle$ S Diagnostics 1 ∆ S801 Supply voltage Diagnostics 2 **Diagnostics 3** 2. Œ Supply voltage (ID:203) △ S801 0d00h02m25s **—** 5 Increase supply voltage 3. $| \ominus | + | \oplus |$

# 12.3.2 Calling up remedial measures

A0029431-EN

- 38 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 ± (① symbol).

- The **Diagnostic list** submenu opens.
- 2. Select the desired diagnostic event with  $\pm$  or  $\Box$  and press  $\Box$ .
  - ► The message about the remedial measures opens.
- 3. Press  $\Box$  +  $\pm$  simultaneously.
  - ► The message about the remedial measures closes.

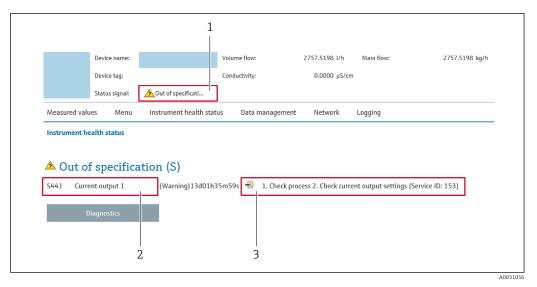
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or **Previous diagnostics** parameter.

- 1. Press E.
  - └ The message for the remedial measures for the selected diagnostic event opens.
- 2. Press  $\Box$  +  $\pm$  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.



- 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 submenu → 🗎 182

### 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
8	Failure A device error has occurred. The measured value is no longer valid.
<b>W</b>	Function check The device is in the service mode (during a simulation, for example).
<u>^</u> ?	Out of specification The device is being operated: Outside its technical specification limits (e.g. outside the process temperature range)
<b>&amp;</b>	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.

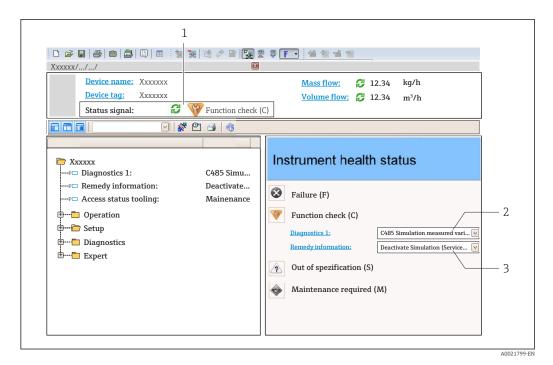
# 12.4.2 Calling up remedy information

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

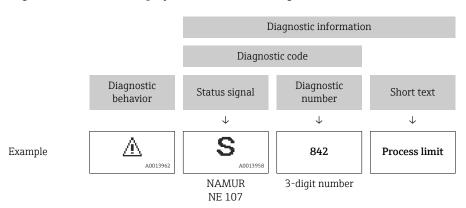
Any faults detected by the measuring device are displayed on the home page of the operating tool once the connection has been established.



- 1 Status area with status signal → \( \bigsim 171 \)
- 2 Diagnostics information  $\rightarrow \implies 172$
- 3 Remedial measures with service ID
- In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
  - Via parameter  $\rightarrow$  🗎 182
  - Via submenu → 🖺 182

### **Diagnostic information**

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



# 12.5.2 Calling up remedy information

Remedy information is provided for every diagnostic event to ensure that problems can be rectified quickly:

- On the home page Remedy information is displayed in a separate field below the diagnostics information.
- In the **Diagnostics** menu
   Remedy information can be called up in the working area of the user interface.

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

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

# 12.6 Diagnostic information via communication interface

# 12.6.1 Reading out diagnostic information

Diagnostic information can be read out via Modbus RS485 register addresses.

- Via register address **6821** (data type = string): diagnosis code, e.g. F270
- Via register address **6859** (data type = integer): diagnosis number, e.g. 270

# 12.6.2 Configuring error response mode

The error response mode for Modbus RS485 communication can be configured in the **Communication** submenu using 2 parameters.

### Navigation path

Setup → Communication

Parameter overview with brief description

Parameters	Description	Selection	Factory setting
Failure mode	Select measured value output behavior when a diagnostic message occurs via Modbus communication.  The effect of this parameter depends on the option selected in the Assign diagnostic behavior parameter.	<ul> <li>NaN value</li> <li>Last valid value</li> <li>NaN = not a number</li> </ul>	NaN value

# 12.7 Adapting the diagnostic information

# 12.7.1 Adapting the diagnostic behavior

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

Expert  $\rightarrow$  System  $\rightarrow$  Diagnostic handling  $\rightarrow$  Diagnostic behavior

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

Options	Description
Alarm	The device stops measurement. The measured value output via Modbus RS485 and the totalizers assume the defined alarm condition. A diagnostic message is generated. The background lighting changes to red.
Warning	The device continues to measure. The measured value output via Modbus RS485 and the totalizers are not affected. A diagnostic message is generated.

Options	Description
Logbook entry only	The device continues to measure. The diagnostic message is displayed only in the <b>Event logbook</b> submenu ( <b>Event list</b> submenu) and is not displayed in alternation with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

# 12.8 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  $\rightarrow \implies 176$

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]	
Diagnostic of	Diagnostic of sensor				
002	Sensor unknown	Check if the correct sensor is mounted     Check if the 2-D matrix code on the sensor is undamaged	F	Alarm	
022	Temperature sensor defective	If available: Check connection cable between sensor and transmitter     Check or replace sensor electronic module (ISEM)     Replace sensor	F	Alarm	
046	Sensor limit exceeded	Check process conditions     Check sensor	S	Warning 1)	
062	Sensor connection faulty	If available: Check connection cable between sensor and transmitter     Check or replace sensor electronic module (ISEM)     Replace sensor	F	Alarm	
063	Exciter current faulty	If available: Check connection cable between sensor and transmitter     Check or replace sensor electronic module (ISEM)     Replace sensor	F	Alarm	
082	Data storage inconsistent	Check module connections	F	Alarm	
083	Memory content inconsistent	Restart device     Restore S-DAT data     Replace S-DAT	F	Alarm	
119	Sensor initialization active	Sensor initialization in progress, please wait	С	Warning	
140	Sensor signal asymmetrical	I. If available: Check connection cable between sensor and transmitter     Check or replace sensor electronic module (ISEM)     Replace sensor	S	Alarm 1)	
141	Zero adjustment failed	Check process conditions     Repeat commissioning procedure     Check sensor	F	Alarm	
142	Sensor index coil asymmetry too high	Check sensor	S	Warning 1)	

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
144	Measurement error too high	Check process conditions     Check or change sensor	F	Alarm 1)
Diagnostic of	electronic			
201	Electronics faulty	Restart device     Replace electronics	F	Alarm
242	Firmware incompatible	Check firmware version     Flash or replace electronic module	F	Alarm
252	Module incompatible	Check electronic modules     Check if correct modules are available (e.g. NEx, Ex)     Replace electronic modules	F	Alarm
262	Module connection interrupted	Check or replace connection cable between sensor electronic module (ISEM) and main electronics     Check or replace ISEM or main electronics	F	Alarm
270	Main electronics defective	Restart device     Replace main electronic module	F	Alarm
271	Main electronics faulty	Restart device     Replace main electronic module	F	Alarm
272	Main electronics faulty	Restart device	F	Alarm
273	Main electronics defective	Pay attention to display emergency operation     Replace main electronics	F	Alarm
275	I/O module defective	Change I/O module	F	Alarm
276	I/O module faulty	Restart device     Change I/O module	F	Alarm
283	Memory content inconsistent	Restart device	F	Alarm
302	Device verification active	Device verification active, please wait.	С	Warning 1)
303	I/O 1 to n configuration changed	Apply I/O module configuration (parameter 'Apply I/O configuration')     Afterwards reload device description and check wiring	М	Warning
304	Device verification failed	Check verification report     Repeat commissioning procedure     Check sensor	F	Alarm 1)
311	Sensor electronics (ISEM) faulty	Maintenance required! Do not reset device	M	Warning
330	Flash file invalid	Update firmware of device     Restart device	М	Warning
331	Firmware update failed	Update firmware of device     Restart device	F	Warning
332	Writing in HistoROM backup failed	Replace user interface board     Ex d/XP: replace transmitter	F	Alarm
361	I/O module 1 to n faulty	Restart device     Check electronic modules     Change I/O module or main electronics	F	Alarm
369	Matrix code scanner defective	Replace matrix code scanner	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
371	Temperature sensor defective	Contact service	М	Warning
372	Sensor electronics (ISEM) faulty	Restart device     Check if failure recurs     Replace sensor electronic module (ISEM)	F	Alarm
373	Sensor electronics (ISEM) faulty	Transfer data or reset device	F	Alarm
374	Sensor electronics (ISEM) faulty	Restart device     Check if failure recurs     Replace sensor electronic module     (ISEM)	S	Warning 1)
375	I/O- 1 to n communication failed	Restart device     Check if failure recurs     Replace module rack inclusive electronic modules	F	Alarm
378	Supply voltage ISEM faulty	If available: Check connection cable between sensor and transmitter     Replace main electronic module     Replace sensor electronic module (ISEM)	F	Alarm
382	Data storage	1. Insert T-DAT 2. Replace T-DAT	F	Alarm
383	Memory content	Reset device	F	Alarm
387	HistoROM data faulty	Contact service organization	F	Alarm
Diagnostic of	configuration			
410	Data transfer failed	Retry data transfer     Check connection	F	Alarm
412	Processing download	Download active, please wait	С	Warning
431	Trim 1 to n required	Carry out trim	С	Warning
437	Configuration incompatible	Update firmware     Execute factory reset	F	Alarm
438	Dataset different	Check data set file     Check device parameterization     Download new device     parameterization	M	Warning
441	Current output 1 to n faulty	Check process     Check current output settings	S	Warning 1)
442	Frequency output faulty	Check process     Check frequency output settings	S	Warning 1)
443	Pulse output 1 to n faulty	Check process     Check pulse output settings	S	Warning 1)
444	Current input 1 to n faulty	Check process     Check current input settings	S	Warning 1)
453	Flow override active	Deactivate flow override	С	Warning
484	Failure mode simulation active	Deactivate simulation	С	Alarm
485	Process variable simulation active	Deactivate simulation	С	Warning
486	Current input simulation active	Deactivate simulation	С	Warning

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
491	Current output 1 to n simulation active	Deactivate simulation	С	Warning
492	Frequency output simulation active	Deactivate simulation frequency output	С	Warning
493	Pulse output simulation active	Deactivate simulation pulse output	С	Warning
494	Switch output simulation active	Deactivate simulation switch output	С	Warning
495	Diagnostic event simulation active	Deactivate simulation	С	Warning
496	Status input simulation active	Deactivate simulation status input	С	Warning
502	CT activation/ deactivation failed	Follow the sequence of the custody transfer activation/deactivation: First authorized user login, then set the DIP switch on the main electonic module	С	Warning
520	I/O 1 to n hardware configuration invalid	Check I/O hardware configuration     Replace wrong I/O module     Plug the module of double pulse output on correct slot	F	Alarm
528	Concentration calculation not possible	Out of valid range of the selected calculation algorithm  1. Check concentration settings 2. Check measured values, e.g. density or temperature	S	Alarm
529	Concentration calculation not accurate	Out of valid range of the selected calculation algorithm  1. Check concentration settings 2. Check measured values, e.g. density or temperature	S	Warning
537	Configuration	Check IP addresses in network     Change IP address	F	Warning
540	Custody transfer mode failed	Power off device and toggle DIP switch     Deactivate custody transfer mode     Reactivate custody transfer mode     Check electronic components	F	Alarm
543	Double pulse output	Check process     Check pulse output settings	S	Warning 1)
593	Double pulse output simulation	Deactivate simulation pulse output	С	Warning
594	Relay output simulation	Deactivate simulation switch output	С	Warning
599	Custody transfer logbook full	Deactivate custody transfer mode     Clear custody transfer logbook (all 30 entries)     Activate custody transfer mode	F	Warning 1)
Diagnostic of	process			
803	Loop current 1 faulty	1. Check wiring 2. Change I/O module	F	Alarm
830	Ambient temperature too high	Reduce ambient temp. around the sensor housing	S	Warning 1)
831	Ambient temperature too low	Increase ambient temp. around the sensor housing	S	Warning <sup>1)</sup>

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
832	Electronics temperature too high	Reduce ambient temperature	S	Warning 1)
833	Electronics temperature too low	Increase ambient temperature	S	Warning 1)
834	Process temperature too high	Reduce process temperature	S	Warning 1)
835	Process temperature too low	Increase process temperature	S	Warning 1)
842	Process value below limit	Decrease process value     Check application     Check sensor	S	Warning 1)
862	Partly filled pipe	Check for gas in process     Adjust detection limits	S	Warning 1)
882	Input signal faulty	Check input signal parameterization     Check external device     Check process conditions	F	Alarm
910	Tubes not oscillating	If available: Check connection cable between sensor and transmitter     Check or replace sensor electronic module (ISEM)     Check sensor	F	Alarm
912	Medium inhomogeneous	Check process cond.     Increase system pressure	S	Warning 1)
913	Medium unsuitable	Check process conditions     Check electronic modules or sensor	S	Warning 1)
915	Viscosity ouf of specification	Avoid 2-phase flow     Increase system pressure     Verify viscosity and density are within range     Check process conditions	S	Warning 1)
941	API/ASTM temperature out of specificat.	Check process temperature with selected API/ASTM commodity group     Check API/ASTM-related parameters	S	Warning <sup>1)</sup>
942	API/ASTM density out of specification	Check process density with selected     API/ASTM commodity group     Check API/ASTM-related parameters	S	Warning 1)
943	API pressure out of specification	Check process pressure with selected     API commodity group     Check API related parameters	S	Warning 1)
944	Monitoring failed	Check process conditions for Heartbeat Monitoring	S	Warning 1)
948	Oscillation damping too high	Check process conditions	S	Warning 1)
984	Condensation risk	Decrease ambient temperature     Increase medium temperature	S	Warning 1)

1) Diagnostic behavior can be changed.

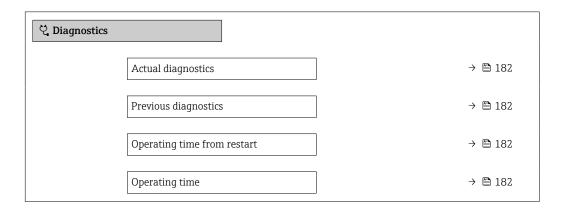
# 12.9 Pending diagnostic events

The **Diagnostics** menu allows the user to view the current diagnostic event and the previous diagnostic event separately.

- To call up the measures to rectify a diagnostic event:
- Via local display → 173
  - Via web browser  $\rightarrow \implies 174$
  - Via "FieldCare" operating tool → 🗎 175
  - Via "DeviceCare" operating tool → 175
- Other pending diagnostic events can be displayed in the **Diagnostic list** submenu  $\rightarrow \stackrel{ riangle}{=} 182$

#### **Navigation**

"Diagnostics" menu



#### Parameter overview with brief description

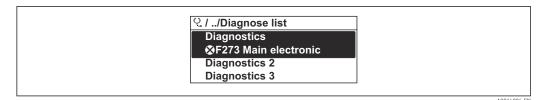
Parameter	Prerequisite	Description	User interface
Actual diagnostics	A diagnostic event has occurred.	Shows the current occured diagnostic event along with its diagnostic information.	Symbol for diagnostic behavior, diagnostic code and short message.
		If two or more messages occur simultaneously, the message with the highest priority is shown on the display.	
Previous diagnostics	Two diagnostic events have already occurred.	Shows the diagnostic event that occurred prior to the current diagnostic event along with its diagnostic information.	Symbol for diagnostic behavior, diagnostic code and short message.
Operating time from restart	-	Shows the time the device has been in operation since the last device restart.	Days (d), hours (h), minutes (m) and seconds (s)
Operating time	-	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)

# 12.10 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



39 Taking the example of the local display

To call up the measures to rectify a diagnostic event:

- Via web browser  $\rightarrow$  🖺 174
- Via "FieldCare" operating tool → 🖺 175
- Via "DeviceCare" operating tool → 

  175

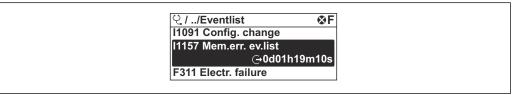
# 12.11 Event logbook

### 12.11.1 Reading out the event logbook

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

#### Navigation path

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



A0014008-EN

40 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 → 🖺 177
- Information events  $\rightarrow$  🗎 184

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
  - ①: 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 web browser  $\rightarrow \triangleq 174$

# 12.11.2 Filtering the event logbook

Using the **Filter options** parameter you can define which category of event message is displayed in the **Events list** submenu.

# Navigation path

 $Diagnostics \rightarrow Event logbook \rightarrow Filter options$ 

# Filter categories

- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information (I)

# 12.11.3 Overview of information events

Unlike a diagnostic event, an information event is displayed in the event logbook only and not in the diagnostic list.

Info number	Info name	
I1000	(Device ok)	
I1079	Sensor changed	
I1089	Power on	
I1090	Configuration reset	
I1091	Configuration changed	
I1092	HistoROM backup deleted	
I1111	Density adjust failure	
I11280	ZeroPT verified and adjustm. recommended	
I11281	ZeroPT verif. and adjust. not recommend.	
I1137	Electronics changed	
I1151	History reset	
I1155	Reset electronics temperature	
I1156	Memory error trend	
I1157	Memory error event list	
I1209	Density adjustment ok	
I1221	Zero point adjust failure	
I1222	Zero point adjustment ok	
I1256	Display: access status changed	
I1278	I/O module restarted	
I1335	Firmware changed	
I1361	Web server: login failed	
I1397	Fieldbus: access status changed	
I1398	CDI: access status changed	
I1444	Device verification passed	
I1445	Device verification failed	
I1447	Record application reference data	
I1448	Application reference data recorded	
I1449	Recording application ref. data failed	

Info number	Info name	
I1450	Monitoring off	
I1451	Monitoring on	
I1457	Measurement error verification failed	
I1459	I/O module verification failed	
I1460	HBSI verification failed	
I1461	Sensor verification failed	
I1462	Sensor electronic module verific. failed	
I1512	Download started	
I1513	Download finished	
I1514	Upload started	
I1515	Upload finished	
I1517	Custody transfer active	
I1518	Custody transfer inactive	
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	
I1643	Custody transfer logbook cleared	
I1649	Hardware write protection activated	
I1650	Hardware write protection deactivated	
I1651	Custody transfer parameter changed	
I1712	New flash file received	
I1725	Sensor electronic module (ISEM) changed	
I1726	Configuration backup failed	

# 12.12 Resetting the measuring device

The entire device configuration or some of the configuration can be reset to a defined state with the **Device reset** parameter ( $\Rightarrow \triangleq 143$ ).

# 12.12.1 Function scope of "Device reset" parameter

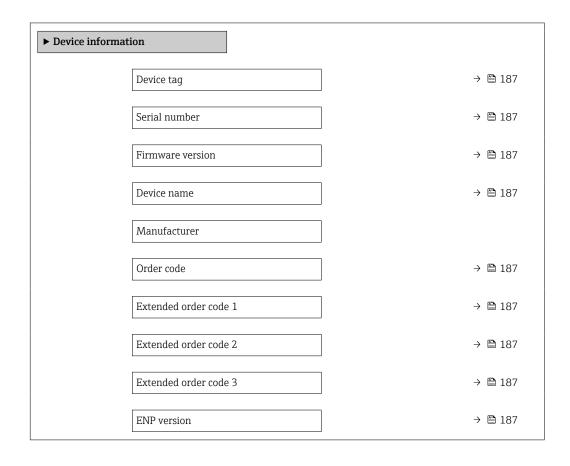
Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to the customer-specific value. All other parameters are reset to the factory setting.
Restart device	The restart resets every parameter with data stored in volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.
Restore S-DAT backup	Restores the data that is saved on the S-DAT. Additional information: This function can be used to resolve the memory issue "083 Memory content inconsistent" or to restore the S-DAT data when a new S-DAT has been installed.  This option is displayed only in an alarm condition.

# 12.13 Device information

The **Device information** submenu contains all parameters that display different information for device identification.

#### Navigation

"Diagnostics" menu  $\rightarrow$  Device information



# Parameter overview with brief description

Parameter Description		User interface	Factory setting	
Device tag	Shows name of measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).	Promass	
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.	Promass 300/500	-	
Order code	Shows the device order code.  The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field.	Character string composed of letters, numbers and certain punctuation marks (e.g. /).	-	
Extended order code 1	Shows the 1st part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-	
Extended order code 2	Shows the 2nd part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-	
Extended order code 3	Shows the 3rd part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-	
ENP version	Shows the version of the electronic nameplate (ENP).	Character string	2.02.00	

# 12.14 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
08.2022	01.06.zz	Option 58	<ul> <li>New gas type: methane with hydrogen</li> <li>Eight display values on local display</li> <li>Zero point verification and zero adjustment wizard</li> <li>New density unit: "API</li> <li>New diagnostic parameters</li> <li>Additional languages for Heartbeat Technology Reports</li> </ul>	Operating Instructions	BA01546D/06/EN/05.22
09.2019	01.05.zz	Option 64	<ul> <li>Gas Fraction         Handler         Adaptive Filter,         Gas         Entrainment         Index</li> <li>Application-         specific Input         module</li> <li>Upgrading of         the Petroleum         application         package</li> </ul>	Operating Instructions	BA01546D/06/EN/03.19

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
10.2017	01.01.zz	Option 70	■ Petroleum new Concentration update Local display - enhanced performance and data entry via text editor Optimized keypad lock for local display Improvements and enhancements with regard to custody transfer measurement Web server feature update Support for trend data function Heartbeat function enhanced to include detailed results (page 3/4 of the report) Device configuration as PDF (parameter log, similar to FDT print) Network capability of Ethernet (service) interface Comprehensive Heartbeat feature update Local display - support for WLAN infrastructure mode Implementation of reset code	Operating Instructions	BA01546D/06/EN/02.17
08.2016	01.00.zz	Option <b>76</b>	Original firmware	Operating Instructions	BA01546D/06/EN/01.16

For the compatibility of the firmware version with the previous version, the installed device description files and operating tools, observe the information about the device in the "Manufacturer's information" document.

The manufacturer's information is available:

- ullet In the Download Area of the Endress+Hauser web site: www.endress.com oDownloads
- Specify the following details:
  - Product root: e.g. 8S5B The product root is the first part of the order code: see the nameplate on the
  - Text search: Manufacturer's information
  - Media type: Documentation Technical Documentation

# 12.15 Device history and compatibility

The device model is documented in the order code on the nameplate of the device (e.g. 8F3BXX-XXX....XXXA1-XXXXXX).

Device model	Release	Change compared with earlier model	Compatibility with earlier model
A2	09.2019	I/O module with enhanced performance and functionality: see device firmware 01.05.zz → 🖺 188	No
A1	08.2016	-	-

# 13 Maintenance

# 13.1 Maintenance tasks

No special maintenance work is required.

### 13.1.1 Exterior cleaning

When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing or the seals.

### 13.1.2 Interior cleaning

Observe the following points for CIP and SIP cleaning:

- Use only cleaning agents to which the process-wetted materials are adequately resistant.

Observe the following point for cleaning with pigs:

Observe the inside diameter of the measuring tube and process connection.

# 13.2 Measuring and test equipment

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

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

List of some of the measuring and testing equipment:  $\rightarrow \implies 194 \rightarrow \implies 195$ 

#### 13.3 Endress+Hauser services

Endress+Hauser offers a wide variety of services for maintenance such as recalibration, maintenance service or device tests.

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

# 14 Repair

# 14.1 General 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 (→ 187) 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.

### **A** 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

### **A** 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: 8X5BXX-******** Proline 500 transmitter: Order number: 8X5BXX-********  Proline 500 transmitter: Order number: 8X5BXX-********  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 →   ■ 83.  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.  Order number: 71228792  Installation Instructions EA01093D
Connecting cable Proline 500 – digital Sensor – Transmitter	The connecting cable can be ordered directly with the measuring device (order code for "Cable, sensor connection) or as an accessory (order number DK8012).  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  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 DK8012).  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)  Possible cable length for a Proline 500 connecting cable: max. 20 m (65 ft)

# 15.1.2 For the sensor

Accessories	Description	
Heating jacket	Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids.	
	If using oil as a heating medium, please consult with Endress+Hauser.	
	Jse the order code with the product root DK8003.	
	Special Documentation SD02162D	

# 15.2 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

Accessory	Description
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.  Operating Instructions BA00027S and BA00059S
DeviceCare	Tool for connecting and configuring Endress+Hauser field devices.  Innovation brochure IN01047S

# 15.3 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.
	<ul> <li>Technical Information TI00133R</li> <li>Operating Instructions BA00247R</li> </ul>
Cerabar M	The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.
	<ul> <li>Technical Information TI00426P and TI00436P</li> <li>Operating Instructions BA00200P and BA00382P</li> </ul>
Cerabar S	The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.  Technical Information TI00383P Operating Instructions BA00271P
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.  [i] "Fields of Activity" document FA00006T

# 16 Technical data

# 16.1 Application

The measuring device is only suitable for the flow measurement of liquids.

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	Mass flow measurement based on the Coriolis measuring principle
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 $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $

# **16.3** Input

#### Measured variable

#### Direct measured variables

- Mass flow
- Density
- Temperature

#### Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

#### Measuring range

#### Measuring range for liquids

DN		Measuring range full scal	e values $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$
[mm]	[in]	[kg/h]	[lb/min]
8	3/8	0 to 2 000	0 to 73.50
15	1/2	0 to 6500	0 to 238.9
25	1	0 to 18 000	0 to 661.5
40	1½	0 to 45 000	0 to 1654
50	2	0 to 70 000	0 to 2 573

#### Recommended measuring range



Flow limit → 🗎 214

# Operable flow range

Over 1000:1.

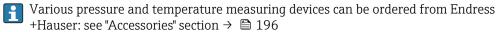
Flow rates above the preset full scale value do not override the electronics unit, with the result that the totalizer values are registered correctly.

#### Input signal

#### External measured values

To increase the accuracy of certain measured variables, the automation system can continuously write various measured values to the measuring device:

- Operating pressure to increase accuracy (Endress+Hauser recommends the use of a pressure measuring device for absolute pressure, e.g. Cerabar M or Cerabar S)
- Medium temperature to increase accuracy (e.g. iTEMP)



### Current input

#### Digital communication

The measured values are written by the automation system via Modbus RS485.

# Current input 0/4 to 20 mA

Current input	0/4 to 20 mA (active/passive)
Current span	<ul><li>4 to 20 mA (active)</li><li>0/4 to 20 mA (passive)</li></ul>
Resolution	1 μΑ
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	<ul><li>Pressure</li><li>Temperature</li><li>Density</li></ul>

# Status input

Maximum input values	■ DC −3 to 30 V ■ If status input is active (ON): R <sub>i</sub> >3 kΩ
Response time	Configurable: 5 to 200 ms
Input signal level	<ul> <li>Low signal: DC -3 to +5 V</li> <li>High signal: DC 12 to 30 V</li> </ul>
Assignable functions	<ul> <li>Off</li> <li>Reset the individual totalizers separately</li> <li>Reset all totalizers</li> <li>Flow override</li> </ul>

# 16.4 Output

# Output signal

# Modbus RS485

Physical interface	RS485 in accordance with EIA/TIA-485 standard
Terminating resistor	Integrated, can be activated via DIP switches

# 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 $700~\Omega$
Resolution	0.38 μΑ
Damping	Configurable: 0 to 999.9 s
Assignable measured variables	<ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Electronics temperature</li> <li>Oscillation frequency 0</li> <li>Oscillation damping 0</li> <li>Signal asymmetry</li> <li>Exciter current 0</li> <li>The range of options increases if the measuring device has one or more application packages.</li> </ul>

# Pulse/frequency/switch output

Function	Can be configured as pulse, frequency or switch output
Version	Open collector
	Can be set to:  Active Passive Passive Line 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	<ul><li>Mass flow</li><li>Volume flow</li><li>Corrected volume flow</li></ul>
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	<ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Electronics temperature</li> <li>Oscillation frequency 0</li> <li>Oscillation damping 0</li> <li>Signal asymmetry</li> <li>Exciter current 0</li> </ul>
	The range of options increases if the measuring device has one or more application packages.
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	<ul> <li>Off</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit value <ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Totalizer 1-3</li> </ul> </li> <li>Flow direction monitoring</li> <li>Status <ul> <li>Partially filled pipe detection</li> <li>Low flow cut off</li> </ul> </li> <li>The range of options increases if the measuring device has one or more application packages.</li> </ul>

# Double pulse output

Function	Double pulse
Version	Open collector
	Can be set to:  Active Passive Passive NAMUR
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Voltage drop	For 22.5 mA: ≤ DC 2 V
Output frequency	Configurable: 0 to 1000 Hz
Damping	Configurable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> </ul>
	The range of options increases if the measuring device has one or more application packages.

# 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)	<ul> <li>DC 30 V, 0.1 A</li> <li>AC 30 V, 0.5 A</li> </ul>
Assignable functions	<ul> <li>Off</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit value</li> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Totalizer 1-3</li> <li>Flow direction monitoring</li> <li>Status</li> <li>Partially filled pipe detection</li> <li>Low flow cut off</li> <li>The range of options increases if the measuring device has one or more application packages.</li> </ul>

# User-configurable input/output

One specific input or output is assigned to a user-configurable input/output (configurable I/O) during device commissioning.

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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:

#### Modbus RS485

Failure mode	Choose from:
	■ NaN value instead of current value
	■ Last valid value

# Current output 0/4 to 20 mA

#### 4 to 20 mA

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  Freely 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
	■ Freely 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  O Hz  Defined value (f max 2 to 12 500 Hz)
Switch output	
Failure mode	Choose from:  Current status  Open Closed

# Relay output

Failure mode	Choose from:  Current status
	<ul><li>Open</li><li>Closed</li></ul>

# Local display

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



Status signal as per NAMUR recommendation NE 107

# Interface/protocol

- Via digital communication: Modbus RS485
- Via service interface
  - CDI-RJ45 service interface
  - WLAN interface

Plain text display	With information on cause and remedial measures
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#### 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
	Diagnostic information via light emitting diodes → 🖺 167

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	Modbus Applications Protocol Specification V1.1
Response times	<ul> <li>Direct data access: typically 25 to 50 ms</li> <li>Auto-scan buffer (data range): typically 3 to 5 ms</li> </ul>
Device type	Slave
Slave address range	1 to 247
Broadcast address range	0
Function codes	<ul> <li>03: Read holding register</li> <li>04: Read input register</li> <li>06: Write single registers</li> <li>08: Diagnostics</li> <li>16: Write multiple registers</li> <li>23: Read/write multiple registers</li> </ul>

Broadcast messages	Supported by the following function codes:  O6: Write single registers  16: Write multiple registers  23: Read/write multiple registers
Supported baud rate	<ul> <li>1200 BAUD</li> <li>2400 BAUD</li> <li>4800 BAUD</li> <li>9600 BAUD</li> <li>19200 BAUD</li> <li>38400 BAUD</li> <li>57600 BAUD</li> <li>115200 BAUD</li> </ul>
Data transfer mode	• ASCII • RTU
Data access	Each device parameter can be accessed via Modbus RS485.  For Modbus register information
Compatibility with earlier model	If the device is replaced, the measuring device Promass 500 supports the compatibility of the Modbus registers for the process variables and the diagnostic information with the previous model Promass 83. It is not necessary to change the engineering parameters in the automation system.
System integration	Information on system integration → ■ 88.  Modbus RS485 information Function codes Register information Response time Modbus data map

# 16.5 Power supply

Terminal assignment

→ 🖺 39

#### Supply voltage

Order code for "Power supply"	Terminal voltage		Frequency range
Option <b>D</b>	DC 24 V	±20%	_
Option <b>E</b>	AC 100 to 240 V	-15 to +10%	50/60 Hz
Option I	DC 24 V	±20%	_
	AC 100 to 240 V	-15 to +10%	50/60 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 memoryor in the pluggable data memory (HistoROM DAT).
- Error messages (incl. total operated hours) are stored.

Overcurrent protection
element

The device must be operated with a dedicated circuit breaker, as it does not have an  $\mathsf{ON}/\mathsf{OFF}$  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

- **■** → **□** 48

### Potential equalization

→ 🖺 53

#### **Terminals**

Spring-loaded terminals: Suitable for strands and strands with ferrules. Conductor cross-section 0.2 to  $2.5\ mm^2$  (24 to 12 AWG).

#### Cable entries

- Cable gland: M20  $\times$  1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
  - NPT ½"
  - G ½"
  - M20
- Device plug for connecting cable: M12

A device plug is always used for the device version with the order code for "Sensor connection housing", option  $\bf C$  "Ultra-compact, hygienic, stainless".

#### Cable specification

→ 🖺 34

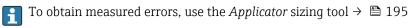
### Overvoltage protection

Mains voltage fluctuations	→ 🖺 205
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 based on ISO 11631
- Water with +15 to +45 °C (+59 to +113 °F) at 2 to 6 bar (29 to 87 psi)
- Specifications as per calibration protocol
- Accuracy based on accredited calibration rigs that are traced to ISO 17025.



#### Maximum measured error

o.r. = of reading;  $1 \text{ g/cm}^3 = 1 \text{ kg/l}$ ; T = medium temperature

#### Base accuracy



Design fundamentals → 🖺 209

Mass flow and volume flow (liquids)

±0.10 % o.r.

# Density (liquids)

Under reference conditions	Standard density calibration 1)	Wide-range Density specification <sup>2) 3)</sup>
[g/cm³]	[g/cm³]	[g/cm³]
±0.0005	±0.01	±0.002

- 1) Valid over the entire temperature and density range
- Valid range for special density calibration: 0 to 2  $g/cm^3$ , +10 to +80 °C (+50 to +176 °F)
- 3) order code for "Application package", option EE "Special density"

# Temperature

 $\pm 0.5~^{\circ}\text{C} \pm 0.005 \cdot \text{T}~^{\circ}\text{C} \ (\pm 0.9~^{\circ}\text{F} \pm 0.003 \cdot (\text{T} - 32)~^{\circ}\text{F})$ 

# Zero point stability

DN		Zero point stability		
[mm]	[in]	[kg/h] [lb/min]		
8	3/8	0.20	0.007	
15	1/2	0.65	0.024	
25	1	1.80	0.066	
40	1½	4.50	0.165	
50	2	7.0	0.257	

#### Flow values

Flow values as turndown parameters depending on the nominal diameter.

#### SI units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[mm]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
8	2 000	200	100	40	20	4
15	6 500	650	325	130	65	13
25	18 000	1800	900	360	180	36
40	45 000	4500	2 250	900	450	90
50	70 000	7 000	3 500	1 400	700	140

#### US units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[inch]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
3/8	73.50	7.350	3.675	1.470	0.735	0.147
1/2	238.9	23.89	11.95	4.778	2.389	0.478
1	661.5	66.15	33.08	13.23	6.615	1.323
11/2	1654	165.4	82.70	33.08	16.54	3.308
2	2 5 7 3	257.3	128.7	51.46	25.73	5.146

#### Accuracy of outputs

The outputs have the following base accuracy specifications.

Current output

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

Pulse/frequency output

o.r. = of reading

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

#### Repeatability

o.r. = of reading;  $1 \text{ g/cm}^3 = 1 \text{ kg/l}$ ; T = medium temperature

#### Base repeatability



Design fundamentals → 🖺 209

Mass flow and volume flow (liquids)

±0.05 % o.r.

Density (liquids)

 $\pm 0.00025 \text{ g/cm}^3$ 

**Temperature** 

 $\pm 0.25 \,^{\circ}\text{C} \pm 0.0025 \cdot \text{T} \,^{\circ}\text{C} \, (\pm 0.45 \,^{\circ}\text{F} \pm 0.0015 \cdot (\text{T}-32) \,^{\circ}\text{F})$ 

#### Response time

The response time depends on the configuration (damping).

# Influence of ambient temperature

#### **Current output**

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

#### Pulse/frequency output

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

# Influence of medium temperature

#### Mass flow and volume flow

o.f.s. = of full scale value

If there is a difference between the temperature during zero adjustment and the process temperature, the additional measured error of the sensors is typically  $\pm 0.0002$  %o.f.s./°C ( $\pm 0.0001$  % o.f.s./°F).

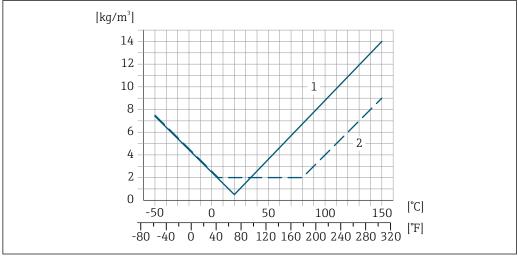
The influence is reduced when the zero adjustment is performed at process temperature.

### **Density**

If there is a difference between the density calibration temperature and the process temperature, the measured error of the sensors is typically  $\pm 0.0001 \text{ g/cm}^3/^{\circ}\text{C}$  ( $\pm 0.00005 \text{ g/cm}^3/^{\circ}\text{F}$ ). Field density adjustment is possible.

### Wide-range density specification (special density calibration)

If the process temperature is outside the valid range ( $\rightarrow \stackrel{\triangle}{=} 206$ ) the measured error is  $\pm 0.0001 \text{ g/cm}^3 \text{ /°C } (\pm 0.00005 \text{ g/cm}^3 \text{ /°F})$ 



- Field density adjustment, for example at +20 °C (+68 °F)
- 2 Special density calibration

#### Temperature

 $\pm 0.005 \cdot \text{T} \,^{\circ}\text{C} \, (\pm 0.005 \cdot (\text{T} - 32) \,^{\circ}\text{F})$ 

Influence of medium pressure

The tables below show the effect that a difference in pressure between the calibration pressure and the process pressure has on the accuracy in the case of the mass flow and density.

o.r. = of reading



It is possible to compensate for the effect by:

- Reading in the current pressure measured value via the current input or a digital input.
- Specifying a fixed value for the pressure in the device parameters.



Operating Instructions .

DN		[% o.r./bar]	[% o.r./psi]	
[mm]	[in]			
8	3/8	-0.002	-0.0001	
15	1/2	-0.006	-0.0004	
25	1	-0.005	-0.0003	
40	1½	-0.007	-0.0005	
50	2	-0.006	-0.0004	

Design fundamentals

o.r. = of reading, o.f.s. = of full scale value

BaseAccu = base accuracy in % o.r., BaseRepeat = base repeatability in % o.r.

MeasValue = measured value; ZeroPoint = zero point stability

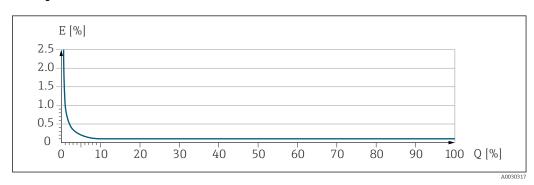
### Calculation of the maximum measured error as a function of the flow rate

Flow rate	Maximum measured error in % o.r.
$\geq \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$	± BaseAccu
A0021332	AUU21337
$< \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$	± ZeroPoint MeasValue · 100
A0021333	A0021334

#### Calculation of the maximum repeatability as a function of the flow rate

Flow rate	Maximum repeatability in % o.r.
$\geq \frac{\frac{1}{2} \cdot ZeroPoint}{BaseRepeat} \cdot 100$	± BaseRepeat
A0021335	A0021340
$<\frac{\frac{1}{2} \cdot ZeroPoint}{BaseRepeat} \cdot 100$	$\pm \frac{1}{2} \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$
A0021336	A0021337

#### Example of maximum measured error



- E Maximum measured error in % o.r. (example)
- Q Flow rate in % of maximum full scale value

# 16.7 Installation

Installation conditions

→ 🖺 22

# 16.8 Environment

Ambient temperature range

→ 🖺 25

#### Temperature tables

- Observe the interdependencies between the permitted ambient and fluid temperatures when operating the device in hazardous areas.
- For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.

Storage temperature

-50 to +80 °C (−58 to +176 °F)

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Climate class	DIN EN 60068-2-38 (test Z/AD)
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
	<ul> <li>Display module: IP20, Type 1 enclosure, suitable for pollution degree 2</li> <li>Sensor</li> <li>IP66/67, Type 4X enclosure, suitable for pollution degree 4</li> <li>When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2</li> </ul>
	Optional
	Order code for "Sensor options", option CM "IP69  External WLAN antenna  IP67

# Vibration- and shock-resistance

### Vibration sinusoidal, in accordance with IEC 60068-2-6

#### Sensor

- 2 to 8.4 Hz, 3.5 mm peak
- 8.4 to 2 000 Hz, 1 g peak

#### Transmitter

- 2 to 8.4 Hz, 7.5 mm peak
- 8.4 to 2000 Hz, 2 g peak

#### Vibration broad-band random, according to IEC 60068-2-64

#### Sensor

- 10 to 200 Hz,  $0.003 \text{ g}^2/\text{Hz}$
- 200 to 2000 Hz,  $0.001 g^2/Hz$
- Total: 1.54 g rms

#### Transmitter

- 10 to 200 Hz,  $0.01 \text{ g}^2/\text{Hz}$
- 200 to 2000 Hz, 0.003 g<sup>2</sup>/Hz
- Total: 2.70 g rms

#### Shock half-sine, according to IEC 60068-2-27

- Sensor
  - 6 ms 30 g
- Transmitter6 ms 50 g

# Rough handling shocks, according to IEC 60068-2-31

#### Interior cleaning

- Cleaning in place (CIP)
- Sterilization in place (SIP)
- Cleaning with pigs

#### **Options**

Oil- and grease-free version for wetted parts, without declaration Order code for "Service", option HA

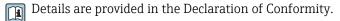
#### Mechanical load

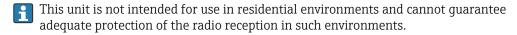
Transmitter housing and sensor connection housing:

- Protect against mechanical effects, such as shock or impact
- Do not use as a ladder or climbing aid

# Electromagnetic compatibility (EMC)

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



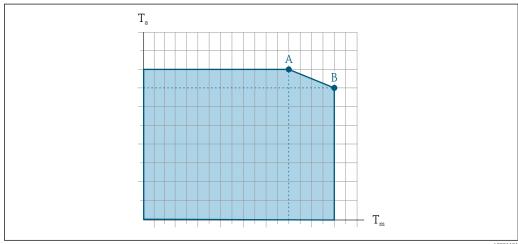


# 16.9 Process

Medium temperature range

 $-50 \text{ to } +150 ^{\circ}\text{C} (-58 \text{ to } +302 ^{\circ}\text{F})$ 

#### Dependency of ambient temperature on medium temperature



A003112

- lacktriangledown 41 Exemplary representation, values in the table below.
- *T<sub>a</sub>* Ambient temperature
- $T_m$  Medium temperature
- A Maximum permitted medium temperature  $T_m$  at  $T_{a max}$  = 60 °C (140 °F); higher medium temperatures  $T_m$  require a reduction in the ambient temperature  $T_a$
- B Maximum permitted ambient temperature  $T_a$  for the maximum specified medium temperature  $T_m$  of the sensor
- Values for devices that are used in the hazardous area: Separate Ex documentation (XA) for the device  $\Rightarrow \triangleq 225$ .

Not insulated				Insulated				
	A		В		A		В	
Version	Ta	T <sub>m</sub>	Ta	T <sub>m</sub>	Ta	T <sub>m</sub>	Ta	T <sub>m</sub>
Promass S 500 – digital	60 °C (140 °F)	150 °C (302 °F)	-	-	60 °C (140 °F)	90 ℃ (194 ℉)	45 °C (113 °F)	150 °C (302 °F)
Promass S 500								

Density

0 to  $5000 \text{ kg/m}^3$  (0 to 312 lb/cf)

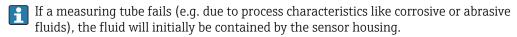
Pressure-temperature ratings



For an overview of the pressure-temperature ratings for the process connections, see the Technical Information

#### Sensor housing

The sensor housing is filled with dry nitrogen gas and protects the electronics and mechanics inside.



If the sensor is to be purged with gas (gas detection), it should be equipped with purge connections.

Do not open the purge connections unless the containment can be filled immediately with a dry, inert gas. Use only low pressure to purge.

Maximum pressure: 5 bar (72.5 psi)

#### Burst pressure of the sensor housing

The following sensor housing burst pressures are only valid for standard devices and/or devices equipped with closed purge connections (not opened/as delivered).

If a device fitted with purge connections (order code for "Sensor option", option CH "Purge connection") is connected to the purge system, the maximum pressure is determined by the purge system itself or by the device, depending on which component has the lower pressure classification.

The sensor housing burst pressure refers to a typical internal pressure which is reached prior to mechanical failure of the sensor housing and which was determined during type testing. The corresponding type test declaration can be ordered with the device (order code for "Additional approval", option LN "Sensor housing burst pressure, type test").

D	N	Sensor housing burst pressure		
[mm]	[in]	[bar]	[psi]	
8	3/8	190	2755	
15	1/2	175	2538	
25	1	165	2 3 9 2	
40	1½	152	2204	
50	2	103	1494	

For information on the dimensions: see the "Mechanical construction" section of the "Technical Information" document

#### Flow limit

Select the nominal diameter by optimizing between the required flow range and permissible pressure loss.

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
- In most applications, 20 to 50 % of the maximum full scale value can be considered ideal
- A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity < 1 m/s (< 3 ft/s).</li>
- To calculate the flow limit, use the *Applicator* sizing tool  $\rightarrow \triangleq 195$

Pressure loss

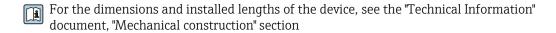
To calculate the pressure loss, use the Applicator sizing tool  $\rightarrow \stackrel{\triangle}{=} 195$ 

System pressure

→ 🖺 25

# 16.10 Mechanical construction

Design, dimensions



Weight

All values (weight exclusive of packaging material) refer to devices with EN/DIN PN 40 flanges.

#### Transmitter

- Proline 500 digital polycarbonate: 1.4 kg (3.1 lbs)
- Proline 500 digital aluminum: 2.4 kg (5.3 lbs)
- Proline 500 aluminum: 6.5 kg (14.3 lbs)

#### Sensor

Sensor with aluminum connection housing version:

#### Weight in SI units

DN [mm]	Weight [kg]
8	11
15	13
25	19
40	35
50	58

#### Weight in US units

DN [in]	Weight [lbs]
3/8	24
1/2	29
1	42

DN [in]	Weight [lbs]
1½	77
2	128

#### Materials

#### Transmitter housing

Housing of Proline 500 – digital transmitter

Order code for "Transmitter housing":

- Option A "Aluminum coated": aluminum, AlSi10Mq, coated
- Option **D** "Polycarbonate": polycarbonate

Housing of Proline 500 transmitter

Order code for "Transmitter housing":

Option A "Aluminum coated": aluminum, AlSi10Mq, coated

Window material

Order code for "Transmitter housing":

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

Fastening components for mounting on a post

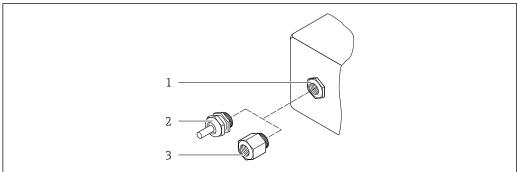
- Screws, threaded bolts, washers, nuts: stainless A2 (chrome-nickel steel)
- Metal plates: stainless steel, 1.4301 (304)

#### Sensor connection housing

Order code for "Sensor connection housing":

- Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
- Option **B** "Stainless":
  - Stainless steel 1.4301 (304)
  - Optional: Order code for "Sensor feature", option **CC** "Hygienic version, for maximum corrosion resistance": stainless steel, 1.4404 (316L)
- Option **C** "Ultra-compact, stainless":
  - Stainless steel 1.4301 (304)
  - Optional: Order code for "Sensor feature", option **CC** "Hygienic version, for maximum corrosion resistance": stainless steel, 1.4404 (316L)

#### Cable entries/cable glands



A002064

 $\blacksquare$  42 Possible cable entries/cable glands

- 1 Female thread M20  $\times$  1.5
- 2 Cable gland  $M20 \times 1.5$
- 3 Adapter for cable entry with female thread G  $\frac{1}{2}$ " or NPT  $\frac{1}{2}$ "

Cable entries and adapters	Material
Cable gland M20 × 1.5	Plastic
<ul> <li>Adapter for cable entry with female thread G ½"</li> <li>Adapter for cable entry with female thread NPT ½"</li> </ul>	Nickel-plated brass
Only available for certain device versions: Order code for "Transmitter housing": Option A "Aluminum, coated" Option D "Polycarbonate" Order code for "Sensor connection housing": Proline 500 – digital: Option A "Aluminum coated" Option B "Stainless" Proline 500: Option B "Stainless"	

#### 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

- Acid and alkali-resistant outer surface
- Stainless steel 1.4301 (304)

#### Measuring tubes

Stainless steel, 1.4435 (316L)

#### **Process connections**

Flange according to EN 1092-1 (DIN 2501)/ASME B16.5/JIS B2220:	Stainless steel, 1.4404 (316/316L)
All other process connections:	Stainless steel, 1.4435 (316L)



Available process connections→ 🗎 217

#### Seals

Welded process connections without internal seals

### Accessories

Protective cover

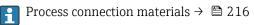
Stainless steel, 1.4404 (316L)

### External WLAN antenna

- Antenna: ASA plastic (acrylic ester-styrene-acrylonitrile) and nickel-plated brass
- Adapter: Stainless steel and nickel-plated brass
- Cable: Polyethylene
- Plug: Nickel-plated brass
- Angle bracket: Stainless steel

### Process connections

- Fixed flange connections:
  - EN 1092-1 (DIN 2501) flange
  - EN 1092-1 (DIN 2512N) flange
  - ASME B16.5 flange
  - JIS B2220 flange
  - DIN 11864-2 Form A flange, DIN 11866 series A, flange with notch
- Clamp connections:
  - Tri-Clamp (OD tubes), DIN 11866 series C
  - DIN 11864-3 Form A clamp, DIN 11866 series A, with notch
  - DIN 32676 clamp, DIN 11866 series A
  - ISO 2852 clamp, ISO 2037
- Thread:
  - DIN 11851 thread, DIN 11866 series A
  - SMS 1145 thread
  - ISO 2853 thread, ISO 2037
  - DIN 11864-1 Form A thread, DIN 11866 series A



# Surface roughness

All data refer to parts in contact with the medium. The following surface roughness categories can be ordered.

- $Ra_{max} = 0.76 \mu m (30 \mu in)$
- $Ra_{max} = 0.38 \mu m (15 \mu in)$

# 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

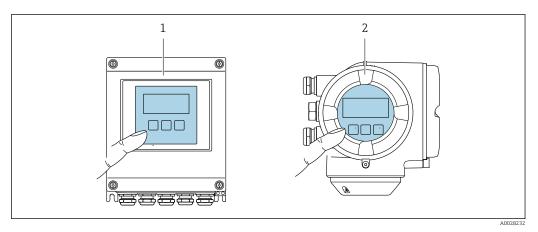
## Local operation

## 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"

Information about WLAN interface → 🖺 83



■ 43 Operation with touch control

- 1 Proline 500 digital
- 2 Proline 500

# Display elements

- 4-line, illuminated, graphic display
- White background lighting; switches to red in event of device errors
- Format for displaying measured variables and status variables can be individually configured
- Permitted ambient temperature for the display: -20 to +60 °C (-4 to +140 °F) The readability of the display may be impaired at temperatures outside the temperature range.

# Operating elements

- External operation via touch control (3 optical keys) without opening the housing: ±, □, ■
- Operating elements also accessible in the various zones of the hazardous area

# Supported operating tools

Different operating tools can be used for local or remote access to the measuring device. Depending on the operating tool used, access is possible with different operating units and via a variety of interfaces.

Supported operating tools	Operating unit	Interface	Additional information
Web browser	Notebook, PC or tablet with Web browser	<ul><li>CDI-RJ45 service interface</li><li>WLAN interface</li></ul>	Special Documentation for the device → 🖺 226
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	<ul><li>CDI-RJ45 service interface</li><li>WLAN interface</li><li>Fieldbus protocol</li></ul>	→ 🖺 195
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	<ul><li>CDI-RJ45 service interface</li><li>WLAN interface</li><li>Fieldbus protocol</li></ul>	→ 🖺 195

Supported operating tools	Operating unit	Interface	Additional information
Field Xpert	SMT70/77/50	<ul> <li>All fieldbus protocols</li> <li>WLAN interface</li> <li>Bluetooth</li> <li>CDI-RJ45 service interface</li> </ul>	Operating Instructions BA01202S Device description files: Use update function of handheld terminal
SmartBlue app	Smart phone or tablet with iOs or Android	WLAN	→ 🖺 195



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 → Downloads

#### Web server

Thanks to the integrated Web server the device can be operated and configured via a Web browser and via 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.

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
- 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  $\rightarrow \triangleq 223$ )



Web server special documentation  $\rightarrow \triangleq 226$ 

**HistoROM** data management The measuring device features HistoROM data management. HistoROM data management comprises both the storage and import/export of key device and process data, making operation and servicing far more reliable, secure and efficient.



When the device is delivered, the factory settings of the configuration data are stored as a backup in the device memory. This memory can be overwritten with an updated data record, for example after commissioning.

# Additional information on the data storage concept

There are different types of data storage units in which device data are stored and used by the device:

	HistoROM backup	T-DAT	S-DAT
Available data	<ul> <li>Event logbook such as diagnostic events for example</li> <li>Parameter data record backup</li> <li>Device firmware package</li> </ul>	<ul> <li>Measured value logging ("Extended HistoROM" order option)</li> <li>Current parameter data record (used by firmware at run time)</li> <li>Maximum indicators (min/max values)</li> <li>Totalizer values</li> </ul>	<ul> <li>Sensor data: nominal diameter etc.</li> <li>Serial number</li> <li>Calibration data</li> <li>Device configuration (e.g. SW options, fixed I/O or multi I/O)</li> </ul>
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 Historous Moskup 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)

### 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 1000 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 <a href="https://www.endress.com">www.endress.com</a>:

- 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

RCM mark

The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Ex approval

The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.

# Hygienic compatibility

- 3-A approval
  - Only measuring devices with the order code for "Additional approval", option LP "3A" have 3-A approval.
  - The 3-A approval refers to the measuring device.
  - When installing the measuring device, ensure that no liquid can accumulate on the outside of the measuring device.
    - A remote display module must be installed in accordance with the 3-A Standard.
  - Accessories (e.g. heating jacket, weather protection cover, wall holder unit) must be installed in accordance with the 3-A Standard.
    - Each accessory can be cleaned. Disassembly may be necessary under certain circumstances.
- EHEDG-tested

Only devices with the order code for "Additional approval", option LT "EHEDG" have been tested and meet the requirements of the EHEDG.

To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy cleanable Pipe couplings and Process connections" (www.ehedq.org).

- FDA
- Food Contact Materials Regulation (EC) 1935/2004

# Pharmaceutical compatibility

- FDA 21 CFR 177
- USP <87>
- USP <88> Class VI 121 °C
- TSE/BSE Certificate of Suitability
- cGMP

Devices with the order code for "Test, certificate", option JG "Conformity with cGMP-derived requirements, declaration" comply with the requirements of cGMP with regard to the surfaces of parts in contact with the medium, design, FDA 21 CFR material conformity, USP Class VI tests and TSE/BSE conformity.

A serial number-specific declaration is generated.

# Pressure Equipment Directive

- With the marking:
  - a) PED/G1/x (x = category) or
  - b) UK/G1/x (x = category)

on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements"  $\,$ 

- a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or
- b) Schedule 2 of Statutory Instruments 2016 No. 1105.
- Devices not bearing this marking (without PED or UKCA) are designed and manufactured according to sound engineering practice. They meet the requirements of
  - a) Art. 4 Para. 3 of the Pressure Equipment Directive 2014/68/EU or
  - b) Part 1, Para. 8 of Statutory Instruments 2016 No. 1105.

The scope of application is indicated

- a) in diagrams 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU or
- b) Schedule 3, Para. 2 of Statutory Instruments 2016 No. 1105.

# Radio approval

The measuring device has radio approval.



### Additional certification

# **CRN** approval

Some device versions have CRN approval. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device.

### Tests and certificates

- EN10204-3.1 material certificate, wetted parts and sensor housing
- Pressure test, internal process, inspection certificate
- PMI test (XRF), internal procedure, wetted parts, test report
- Compliance with requirements derived from cGMP, Declaration
- EN10204-2.1 confirmation of compliance with the order and EN10204-2.2 test report

# Other standards and quidelines

■ EN 60529

Degrees of protection provided by enclosures (IP code)

■ IEC/EN 60068-2-6

Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal).

■ IEC/EN 60068-2-31

Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.

■ 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 80

The application of the pressure equipment directive to process control devices

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

■ NAMUR NE 132

Coriolis mass meter

# 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.



Detailed information on the application packages: Special Documentation for the device  $\rightarrow \stackrel{\triangle}{=} 225$ 

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. corrosion, abrasion, formation of buildup etc.) have on measuring performance over time.
- Schedule servicing in time.
- Monitor the process or product quality, e.g. gas pockets.



For detailed information, see the Special Documentation for the device.

# Concentration measurement

Order code for "Application package", option ED "Concentration"

Calculation and outputting of fluid concentrations.

The measured density is converted to the concentration of a substance of a binary mixture using the "Concentration" application package:

- Choice of predefined fluids (e.g. various sugar solutions, acids, alkalis, salts, ethanol
- Common or user-defined units ("Brix, "Plato, % mass, % volume, mol/l etc.) for standard applications.
- Concentration calculation from user-defined tables.



For detailed information, see the Special Documentation for the device.

## Special density

Order code for "Application package", option EE "Special density"

Many applications use density as a key measured value for monitoring quality or controlling processes. The device measures the density of the fluid as standard and makes this value available to the control system.

The "Special Density" application package offers high-precision density measurement over a wide density and temperature range particularly for applications subject to varying process conditions.



For detailed information, see the Operating Instructions for the device.

# 16.14 Accessories



Overview of accessories available for order  $\rightarrow \implies 194$ 

#### Supplementary documentation 16.15



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

- Device Viewer (www.endress.com/deviceviewer): Enter serial number from 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 Promass S	KA01287D

# *Brief Operating Instructions for the transmitter*

Measuring device	Documentation code
Proline 500 – digital	KA01319D
Proline 500	KA01318D

# **Technical Information**

Measuring device	Documentation code
Promass S 500	TI01288D

### **Description of Device Parameters**

Measuring device	Documentation code
Promass 500	GP01062D

Supplementary devicedependent documentation

# Safety instructions

Safety instructions for electrical equipment for hazardous areas.

Contents	Documentation code
	Measuring device
ATEX/IECEx Ex i	XA01473D
ATEX/IECEx Ex ec	XA01474D

Contents	Documentation code
	Measuring device
cCSAus IS	XA01475D
cCSAus Ex i	XA01509D
cCSAus Ex nA	XA01510D
INMETRO Ex i	XA01476D
INMETRO Ex ec	XA01477D
NEPSI Ex i	XA01478D
NEPSI Ex nA	XA01479D
NEPSI Ex i	XA01658D
NEPSI Ex nA	XA01659D
JPN	XA01780D

# **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	SD01667D
Heartbeat Technology	SD01704D
Concentration measurement	SD01710D

# **Installation Instructions**

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