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

Services

Operating Instructions **Proline Promass I 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 organization will supply you with current information and updates to this manual.

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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 potentially dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

A CAUTION

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

NOTICE

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

1.2.2 Electrical symbols

Symbol	Meaning	
	Direct current	
~	Alternating current	
$\overline{\sim}$	Direct current and alternating current	
<u></u>	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.	
	Protective earth (PE) 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: protective earth is connected to the mains supply. Exterior ground terminal: device is connected to the plant grounding system.	

1.2.3 Communication-specific symbols

Symbol	Meaning
Wireless Local Area Network (WLAN) Communication via a wireless, local area network	
•	LED LED is off.

Symbol	Meaning
<u>-</u>	LED is on.
	LED flashing.

1.2.4 Tool symbols

Symbol	Meaning
0	Torx screwdriver
96	Phillips screwdriver
Ó	Open-end wrench

1.2.5 Symbols for certain types of information

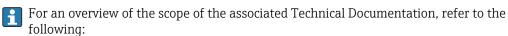
Symbol	Meaning
✓	Permitted Procedures, processes or actions that are permitted.
✓ ✓	Preferred Procedures, processes or actions that are preferred.
X	Forbidden Procedures, processes or actions that are forbidden.
i	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
•	Notice or individual step to be observed
1., 2., 3	Series of steps
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



- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

The following document types are available in the Downloads area of the Endress+Hauser website (www.endress.com/downloads), depending on the device version:

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

1.4 Registered trademarks

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 instrument described in this manual is intended only for the flow measurement of liquids and gases.

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

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

To ensure that the measuring instrument remains in proper condition during the operating time:

- ▶ Only use the measuring instrument in full compliance with the data on the nameplate and the general conditions listed in the manual and supplementary documentation.
- ▶ Using the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area (e.g. explosion protection, pressure vessel safety).
- ▶ Use the measuring instrument only for media against which the materials in contact with the process are sufficiently resistant.
- ▶ Keep within the specified pressure and temperature range.
- ► Keep within the specified ambient temperature range.
- ► Protect the measuring instrument permanently against corrosion from environmental influences.

Incorrect use

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

▲ WARNING

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

- ▶ Verify the compatibility of the process fluid with the sensor material.
- ▶ Ensure the resistance of all wetted materials during 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

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

► Mount suitable touch protection.

2.3 Workplace safety

For work on and with the device:

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

2.4 Operational safety

Damage to the device!

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

Modifications to the device

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

▶ If modifications are nevertheless required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability:

- ► Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to the repair of an electrical device.
- ▶ Use only original spare parts and accessories.

2.5 Product safety

This state-of-the-art device is designed and tested in accordance with good engineering practice to meet operational safety standards. It left the factory in a condition in which it is safe to operate.

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

2.6 IT security

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

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

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.

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

Local display, web browser and operating tool (e.g. FieldCare, DeviceCare)

- 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 → 152.
- When delivered, the device does not have an access code; the default value is 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 ($\rightarrow \triangleq 86$), 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 $(\rightarrow \blacksquare 145).$

Infrastructure mode

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

General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning for security reasons.
- 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 "Write protection via access code" $\rightarrow \implies 152$.

2.7.3 Access via web server

The integrated web server can be used to operate and configure the device via a web browser $\rightarrow \stackrel{\triangle}{=} 77$. The connection is via the service interface (CDI-RI45) or the WLAN interface.

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

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



For detailed information on device parameters, see: Description of Device Parameters.

2.7.4 Access via service interface (port 2): CDI-RJ45

The device can be connected to a network via the service interface. Device-specific functions quarantee the secure operation of the device in a network.

The use of relevant industrial standards and quidelines 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.



For detailed information on connecting transmitters with an Ex de approval, see separate document "Safety instructions" (XA) for the device.

Product description 3

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

3.1 Product design

Two versions of the transmitter are available.

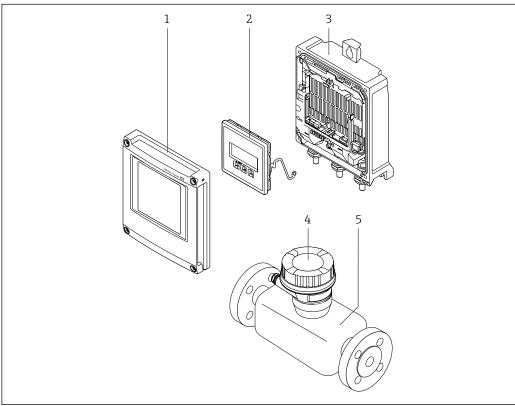
3.1.1 Proline 500 - digital

Signal transmission: digital

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

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

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



₽ 1 Important components of a measuring device

- Electronics compartment cover
- Display module
- 3 Transmitter housing
- Sensor connection housing with integrated ISEM electronics: connecting cable connection
- Sensor

Proline 500 3.1.2

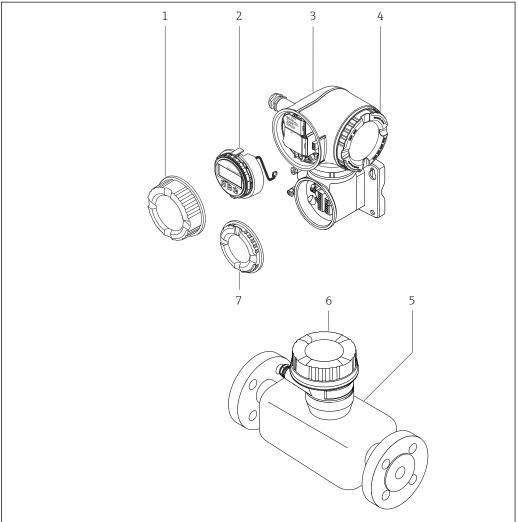
Signal transmission: analog

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.



A002958

- \blacksquare 2 Important components of a measuring device
- 1 Connection compartment cover
- 2 Display module
- 3 Transmitter housing with integrated ISEM electronics
- 4 Electronics compartment cover
- 5 Sensor
- 6 Sensor connection housing: connecting cable connection
- 7 Connection compartment cover: connecting cable connection

4 Incoming acceptance and product identification

4.1 Incoming acceptance

On receipt of the delivery:

- 1. Check the packaging for damage.
 - Report all damage immediately to the manufacturer. Do not install damaged components.
- 2. Check the scope of delivery using the delivery note.
- 3. Compare the data on the nameplate with the order specifications on the delivery note.
- 4. Check the technical documentation and all other necessary documents, e.g. certificates, to ensure they are complete.
- If one of the conditions is not satisfied, contact the manufacturer.

4.2 Product identification

The device can be identified in the following ways:

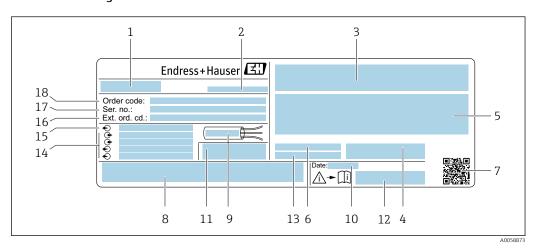
- Nameplate
- Order code with details of the device features on the delivery note
- Enter the serial numbers from the nameplates in the *Device Viewer* (www.endress.com/deviceviewer): all the information about the device is displayed.
- Enter the serial numbers from the nameplates into the *Endress+Hauser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

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

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

4.2.1 Transmitter nameplate

Proline 500 - digital

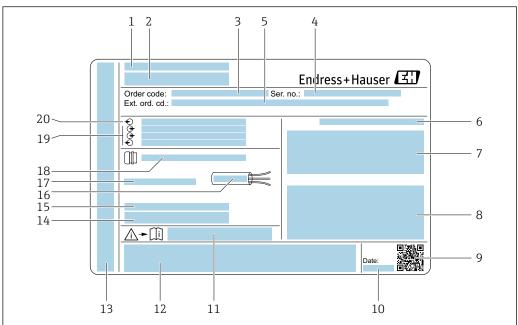


■ 3 Example of a transmitter nameplate

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

16

Proline 500

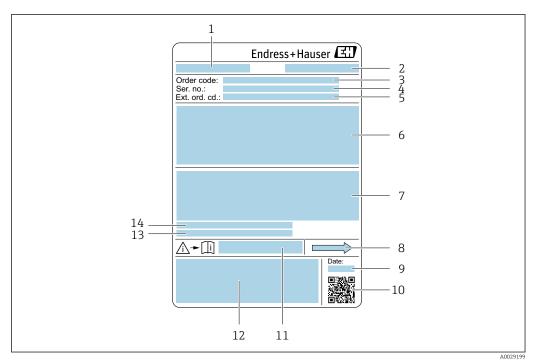


A0058872

■ 4 Example of a transmitter nameplate

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

4.2.2 Sensor nameplate



₩ 5 Example of a sensor nameplate

- Name of sensor 2 Manufacturer/certificate holder
- 3 Order code

1

- Serial number (Ser. no.) 4
- Extended order code (Ext. ord. cd.)
- 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
- Flow direction 8
- 9 Manufacturing date: year-month
- 10 2-D matrix code
- 11 Document number of safety-related supplementary documentation
- CE mark, RCM symbol 12
- 13 Surface roughness
- 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 the 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. Please consult the documentation for the measuring instrument to discover the type of potential danger and measures to avoid it.
(i	Reference to documentation Refers to the corresponding device documentation.
	Protective ground connection A terminal that must be connected to the ground prior to establishing any other connections.

5 Storage and transport

5.1 Storage conditions

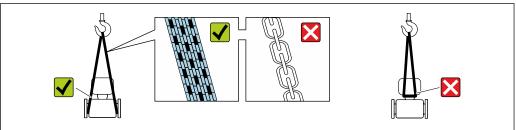
Observe the following notes for storage:

- ► Store in the original packaging to ensure protection from shock.
- ▶ Do not remove protective covers or protective caps installed on process connections. They prevent mechanical damage to the sealing surfaces and contamination in the measuring tube.
- ▶ Protect from direct sunlight. Avoid unacceptably high surface temperatures.
- ► Store in a dry and dust-free place.
- ▶ Do not store outdoors.

Storage temperature $\rightarrow \triangleq 219$

5.2 Transporting the product

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



A002925

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.

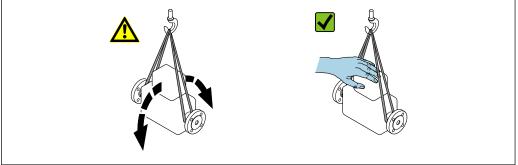
5.2.1 Measuring devices without lifting lugs

MARNING

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:

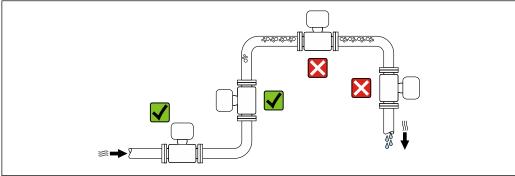
- Outer packaging of device Stretch wrap made of polymer in accordance with EU Directive 2002/95/EC (RoHS)
- Packaging
 - Wood crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
 - Cardboard box in accordance with European packaging guideline 94/62/EC, recyclability confirmed by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

6 Installation

6.1 Installation requirements

6.1.1 Installation position

Mounting location



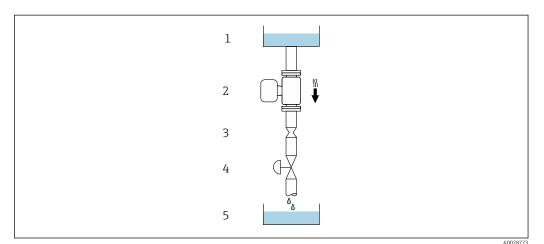
A0028772

To avoid measurement errors caused by gas bubble formation in the measuring tube, avoid the following installation locations in the pipe:

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

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.



■ 6 Installation in a down pipe (e.g. for batching applications)

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

DN/NPS		Ø orifice plate, pipe restriction		
[mm]	[in]	[mm]	[in]	
8	³ / ₈	6	0.24	
15	1/2	10	0.40	
15 FB	½ FB	15	0.60	
25	1	14	0.55	
25 FB	1 FB	24	0.95	
40	1 1/2	22	0.87	
40 FB	1½ FB	35	1.38	
50	2	28	1.10	
50 FB	2 FB	54	2.13	
80	3	50	1.97	
FB = Full bore				

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).

	Recommendation		
A	Vertical orientation		
		A0015591	2)
В	Horizontal orientation, transmitter at top		✓ ✓ ²⁾
		A0015589	
С	Horizontal orientation, transmitter at bottom		⊘ ⊘ 3)
		A0015590	
D	Horizontal orientation, transmitter at side		
		A0015592	

- 1) This orientation is recommended to ensure self-draining.
- 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.

Inlet and outlet runs



Installation dimensions

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

6.1.2 Environmental and process requirements

Ambient temperature range

Measuring instrument	 -40 to +60 °C (-40 to +140 °F) Order code for "Test, certificate", option JP: -50 to +60 °C (-58 to +140 °F)
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.

ho Dependency of ambient temperature on medium temperature ho ho 220

► If operating outdoors: Avoid direct sunlight, particularly in warm climatic regions.

You can order a weather protection cover from Endress+Hauser. $\rightarrow \triangleq 201$.

Static pressure

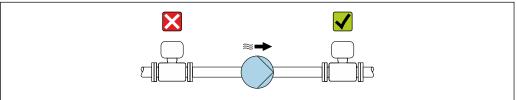
It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas.

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 static 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)



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.

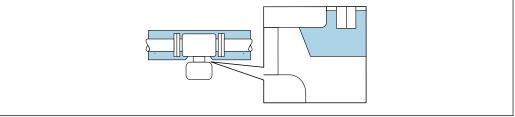
The following device versions are recommended for applications with thermal insulation: Version with extended neck for insulation:

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°C (176°F)
- ▶ Thermal insulation with exposed extension neck: We recommend that you do not insulate the extension neck in order to ensure optimum dissipation of heat.



₽ 7 Thermal insulation with exposed extension 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.
- Consider the behavior of the process diagnostics "830 Ambient temperature too high" and "832 Electronics temperature too high" if overheating cannot be avoided by a suitable system design.

Heating options

If a medium 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 ¹⁾
- 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.

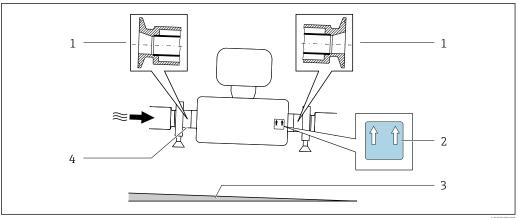
6.1.3 Special installation instructions

Drainability

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

When the sensor is installed in a horizontal line, eccentric clamps can be used to ensure complete drainability. When the system is pitched in a specific direction and at a specific slope, gravity can be used to achieve complete drainability. The sensor must be mounted in the correct position to ensure full drainability in the horizontal position. Markings on the sensor show the correct mounting position to optimize drainability.

¹⁾ 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".



A0030297

- 1 Eccentric clamp connection
- 2 "This side up" label indicates which side is up
- 3 Slope the device in accordance with the hygiene guidelines. Slope: approx. 2 % or 21 mm/m (0.24 in/feet)
- 4 Line on the underside indicates the lowest point of the eccentric process connection.

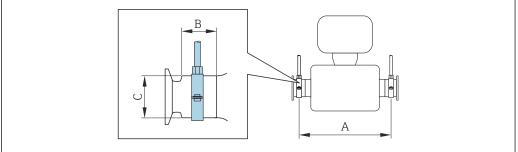
Hygienic compatibility

When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section $\Rightarrow \triangleq 231$

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		В		С	
[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]
8	8	373	14.69	20	0.79	40	1.57
15	15	409	16.1	20	0.79	40	1.57
15 FB	15 FB	539	21.22	30	1.18	44.5	1.75
25	25	539	21.22	30	1.18	44.5	1.75
25 FB	25 FB	668	26.3	28	1.1	60	2.36
40	40	668	26.3	28	1.1	60	2.36
40 FB	40 FB	780	30.71	35	1.38	80	3.15
50	50	780	30.71	35	1.38	80	3.15
50 FB	50 FB	1152	45.35	57	2.24	90	3.54
80	80	1152	45.35	57	2.24	90	3.54

Zero point verification and zero adjustment

All measuring instruments are calibrated in accordance with state-of-the-art technology. in the field is generally not required.

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

- To achieve maximum measurement accuracy even with low flow rates.
- Under extreme process or operating conditions (e.q. very high process temperatures or very high-viscosity media).
- For gas applications with low pressure.
- To achieve the highest possible measurement accuracy at low flow rates, the installation must protect the sensor from mechanical stress during operation.

To get a representative zero point, ensure that

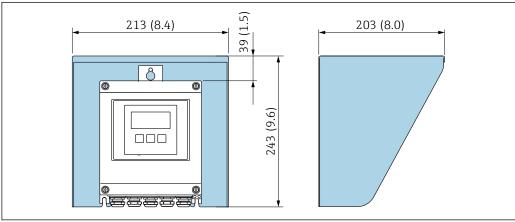
- any flow in the device is prevented during the adjustment
- the process conditions (e.g. pressure, temperature) are stable and representative

Verification and 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.

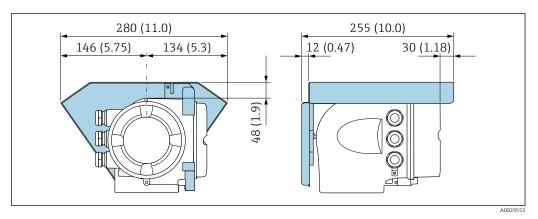
Protective cover



₽8 Weather protection cover for Proline 500 – digital; unit mm (in)

Endress+Hauser 27

A0029552



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

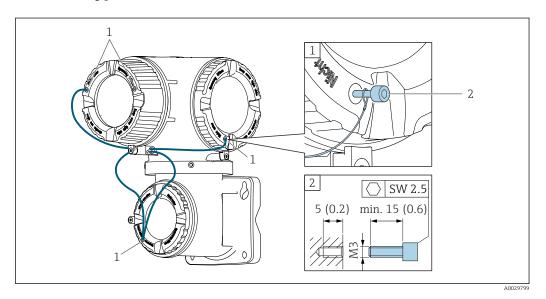
Cover locking: Proline 500

NOTICE

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

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

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



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

6.2 Installing the 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 instrument

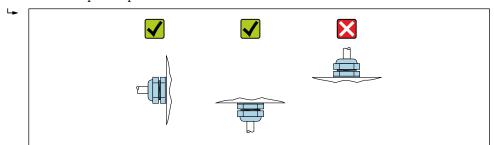
- 1. Remove all remaining transport packaging.
- 2. Remove any protective covers or protective caps present from the sensor.
- 3. Remove stick-on label on the electronics compartment cover.

6.2.3 Installing the measuring instrument

A 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 and sealing surfaces 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 instrument or turn the transmitter housing so that the cable entries do not point upwards.



A0029263

6.2.4 Installing the transmitter housing: Proline 500 – digital

NOTICE

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.

NOTICE

Excessive force can damage the housing!

► Avoid excessive mechanical stress.

The transmitter can be mounted in the following ways:

- Post mounting
- Wall mounting

Pipe mounting

Required tools:

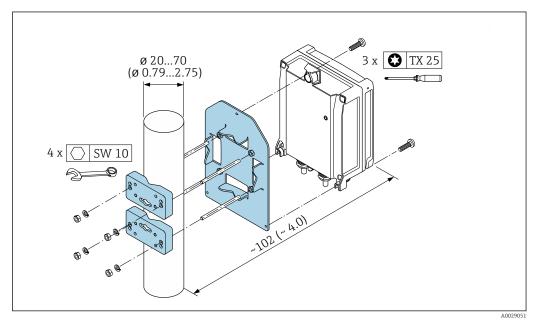
- Open-ended wrench AF 10
- Torx screwdriver TX 25

NOTICE

Excessive tightening torque applied to the fixing screws!

Risk of damaging the plastic transmitter.

► Tighten the fixing screws as per the tightening torque: 2.5 Nm (1.8 lbf ft)



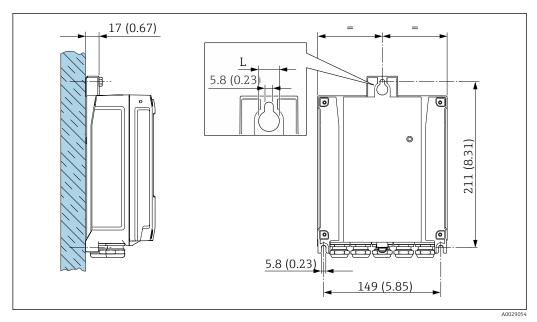
■ 10 Unit mm (in)

Wall mounting

Required tools:

Drill with drill bit \emptyset 6.0 mm

30



■ 11 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 loosely.
- 4. Fit the transmitter housing over the securing screws and mount in place.
- 5. Tighten the securing screws.

6.2.5 Installing the transmitter housing: Proline 500

NOTICE

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.

NOTICE

Excessive force can damage the housing!

► Avoid excessive mechanical stress.

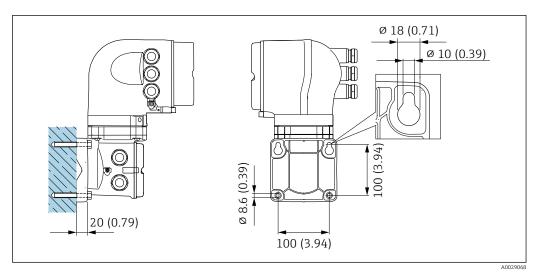
The transmitter can be mounted in the following ways:

- Post mounting
- Wall mounting

Wall mounting

Required tools

Drill with drill bit Ø 6.0 mm



■ 12 Unit mm (in)

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

Pipe mounting

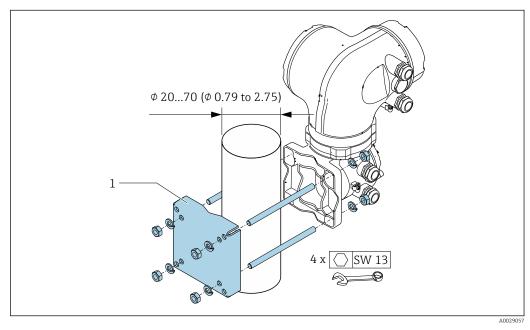
Required tools Open-ended wrench AF 13

▲ WARNING

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

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

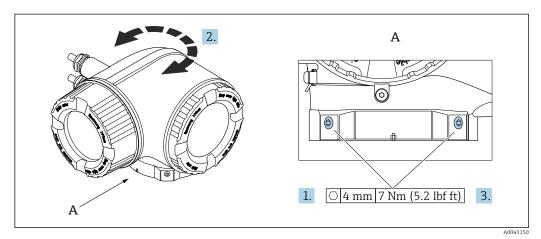
▶ Only mount the transmitter on a secure, fixed post on a stable surface.



■ 13 Unit mm (in)

6.2.6 Turning the transmitter housing: Proline 500

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

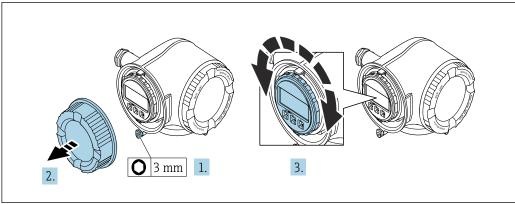


■ 14 Ex housing

- 1. Loosen the fixing screws.
- 2. Turn the housing to the desired position.
- 3. Tighten the securing screws.

6.2.7 Turning the display module: Proline 500

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



- A003003
- 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 instrument correspond to the measuring point specifications? For example: Process temperature → 🖺 220 Pressure (refer to the "Pressure-temperature ratings" section of the "Technical Information" document). Ambient temperature Measuring range		
Has the correct orientation for the sensor been selected → 🗎 22? • According to sensor type • According to medium temperature • According to medium properties (outgassing, with entrained solids)		
Does the arrow on the sensor match the direction of flow of the medium? \rightarrow $\ \ \ \ \ \ \ \ \ \ \ \ \ $		
Is the tag name and labeling correct (visual inspection)?		
Is the device sufficiently 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 appropriate tool
- For securing clamp: Allen key 3 mm
- Wire stripper
- When using stranded cables: crimper for wire end ferrule
- For removing cables from terminal: flat blade screwdriver ≤ 3 mm (0.12 in)

7.2.2 Requirements for connection cable

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

Protective grounding cable for the outer ground terminal

Conductor cross-section < 6 mm² (10 AWG)

Larger cross-sections can be connected using a cable lug.

The grounding impedance must be less than 2 Ω .

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

4 to 20 mA current input

Standard installation cable is sufficient.

Pulse/frequency/switch output

Standard installation cable is sufficient.

Relay output

Standard installation cable is sufficient.

Status input

Standard installation cable is sufficient.

Modbus RS485

Shielded twisted-pair cable.



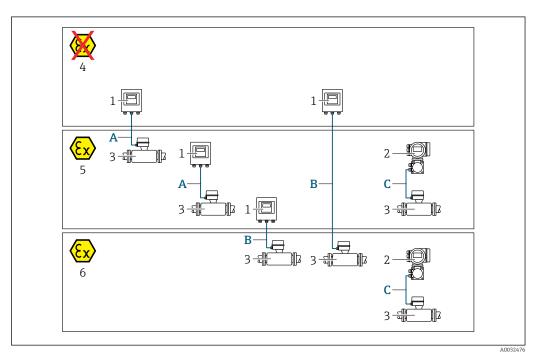
See https://modbus.org "MODBUS over Serial Line Specification and Implementation Guide"

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 mm² (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
- 4 Non-hazardous area
- 5 Hazardous area: Zone 2; Class I, Division 2
- 6 Hazardous area: Zone 1; Class I, Division 1
- Standard cable to 500 digital transmitter → \(\begin{align*}
 \begin{align*}
 \text{ Standard cable to 500 digital transmitter}
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 \text{ Standard cable to 500 digital transmitter}
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 \text{ Standard cable to 500 digital transmitter}
 \text{ } \(\text{ Standard cable to 500 digital transmitter}
 \text{ } \(\text{ Standard cable to 500 digital transmitter}
 \text{ Transmitter installed in the non-hazardous area: Zone 2; Class I, Division 2
 \end{align*}
 \]
 \text{ installed in the hazardous area: Zone 2; Class I, Division 2
 \end{align*}
 \]
- B 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
- C Signal cable to 500 transmitter → 🖺 39 Transmitter and sensor installed in the hazardous area: Zone 2; Class I, Division 2 or Zone 1; Class I, Division 1

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

Standard cable

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

36

Design	4 cores (2 pairs); uninsulated stranded CU wires; pair-stranded with common shield
Shield	Tin-plated copper braid, optical cover ≥ 85 %
Loop resistance	Power supply line (+, –): maximum 10 Ω
Cable length	Maximum 300 m (900 ft), see the following table.
Device plug, side 1	M12 socket, 5-pin, A-coded.
Device plug, side 2	M12 plug, 5-pin, A-coded.
Pins 1+2	Connected cores as twisted pair.
Pins 3+4	Connected cores as twisted pair.

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

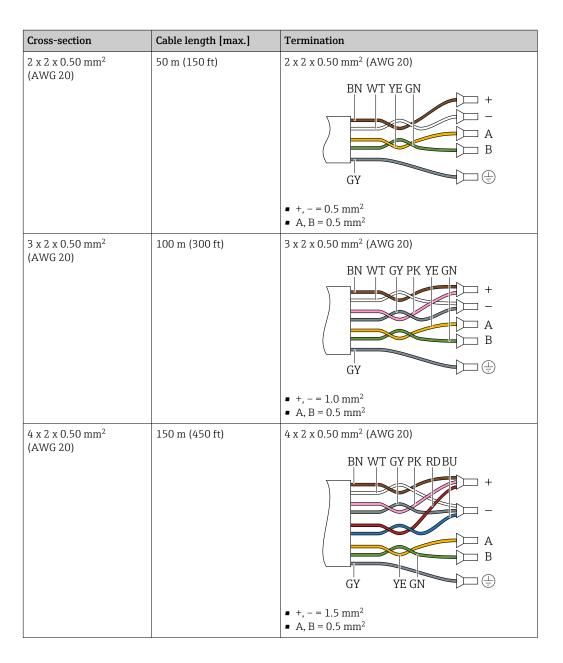
Optionally available connecting cable

Flame resistance	According to DIN EN 60332-1-2
Oil resistance	According to DIN EN 60811-2-1
Shield	Tin-plated copper braid, optical cover ≥ 85 %
Continuous 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)

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

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

Design	4, 6, 8 cores (2, 3, 4 pairs); uninsulated stranded CU wires; pair-stranded with common shield
Shielding	Tin-plated copper braid, optical cover ≥ 85 %
Capacitance C	Maximum 760 nF IIC, maximum 4.2 μF IIB
Inductance L	Maximum 26 μH IIC, maximum 104 μH IIB
Inductance/resistance ratio (L/R)	Maximum 8.9 $\mu H/\Omega$ IIC, maximum 35.6 $\mu H/\Omega$ IIB (e.g. according to IEC 60079-25)
Loop resistance	Power supply line (+, –): maximum 5 Ω
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 ≥ 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	$6\times0.38\ mm^2$ PVC cable $^{1)}$ with individual shielded cores and common copper shield
Conductor resistance	$\leq 50 \Omega/\text{km} (0.015 \Omega/\text{ft})$
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)

¹⁾ 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	Supply voltage Input/output 1 (port 1)		Input/output 2		Input/output 3		Input/output 4 1)		Service interface (Port 2)	
1 (+)	2 (-)	26 (B)	27 (A)	24 (+)	25 (-)	22 (+)	23 (-)	20 (+)	21 (-)	CDI-RJ45
				Device-specific terminal assignment: adhesive label in terminal cover.						

¹⁾ Input/output only available for Proline 500 - digital.

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 \rightarrow 🖺 41
- Proline $500 \rightarrow \stackrel{\triangle}{=} 48$

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 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 instrument is supplied without cable glands: Provide suitable cable gland for corresponding connecting cable.

7.3 Connecting the device: Proline 500 – digital

NOTICE

An incorrect connection compromises electrical safety!

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

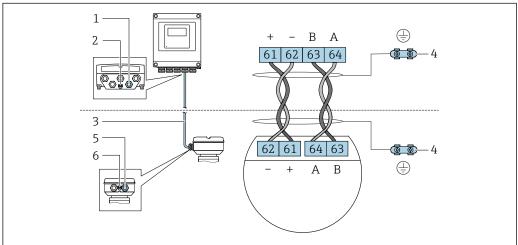
7.3.1 Connecting the connecting cable

NOTICE

Risk of damaging the electronic components!

- ▶ Connect the sensor and transmitter to the same potential equalization.
- ▶ Only connect the sensor to a transmitter with the same serial number.

Connecting cable terminal assignment



Δ0028198

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

Connecting the connecting cable to the sensor connection housing

- Connection via terminals with order code for "Sensor connection housing":
 - Option **A** "Aluminum, coated" $\rightarrow \triangleq 42$
 - Option **B** "Stainless" \rightarrow 🗎 43
 - Option L "Cast, stainless" \rightarrow 🖺 42
- Connection via connectors with order code for "Sensor connection housing":
 Option C "Ultra-compact hygienic, stainless" → 월 44

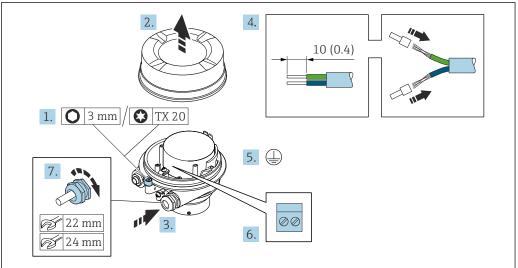
Connecting the connecting cable to the transmitter

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



A0029616

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

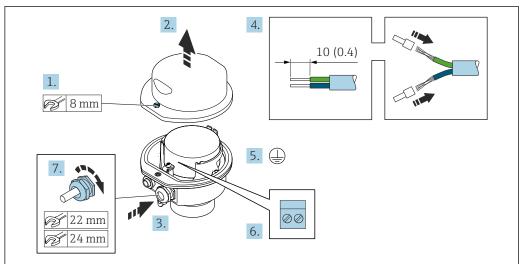
MARNING

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"

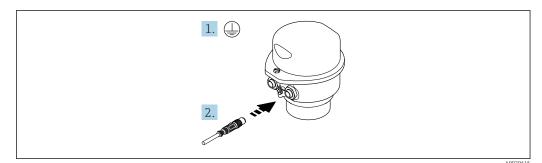


A0029613

- 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.
 - ightharpoonup This concludes the process for connecting the connecting cable.
- 8. Close the housing cover.
- 9. Tighten the securing screw of the housing cover.

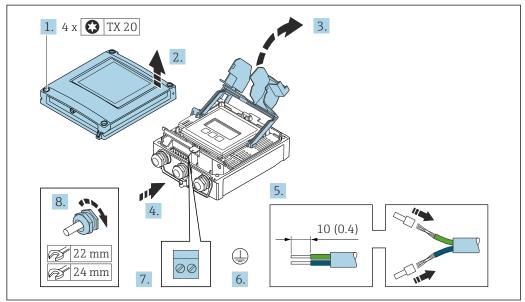
Connecting the sensor connection housing via the connector

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



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

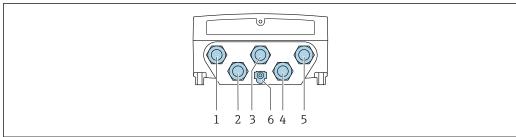
Connecting the connecting cable to the transmitter $% \left(\mathbf{r}\right) =\left(\mathbf{r}\right)$



- 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.
 - ► The process for connecting the connecting cable is now complete.
- 9. Close the housing cover.
- 10. Tighten the securing screw of the housing cover.
- 11. After connecting the connecting cable:Connect the signal cable and the supply voltage cable →

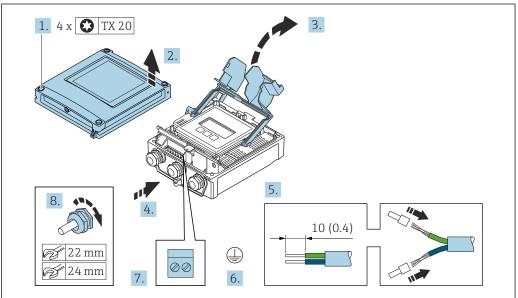
 46.

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 according to the terminal assignment.
 - ► **Signal cable terminal assignment:** The device-specific terminal assignment is documented on an adhesive label in the terminal cover.

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

- 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.

NOTICE

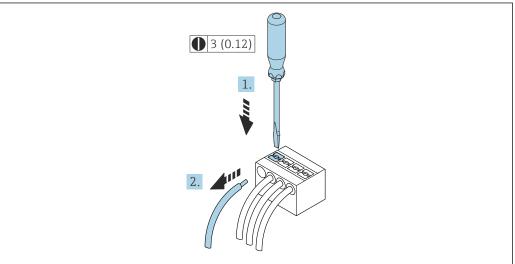
Excessive tightening torque applied to the fixing screws!

Risk of damaging the plastic transmitter.

- ▶ Tighten the fixing screws as per the tightening torque: 2.5 Nm (1.8 lbf ft)
- 11. Tighten the 4 fixing screws on the housing cover.

Removing a cable

To remove a cable from the terminal:



A002959

■ 15 Unit mm(in)

- 1. Use a flat-blade screwdriver to press down on the slot between the two terminal holes.
- 2. Remove the cable end from the terminal.

7.4 Connecting the device: Proline 500

NOTICE

An incorrect connection compromises electrical safety!

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

7.4.1 Connecting the connecting cable

NOTICE

Risk of damaging the electronic components!

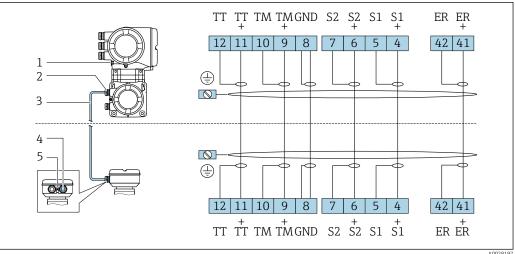
- ► Connect the sensor and transmitter to the same potential equalization.
- ▶ Only connect the sensor to a transmitter with the same serial number.

A CAUTION

Measurement error due to shortening of the connecting cable

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

Connecting cable terminal assignment



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

Connecting the connecting cable to the sensor connection housing

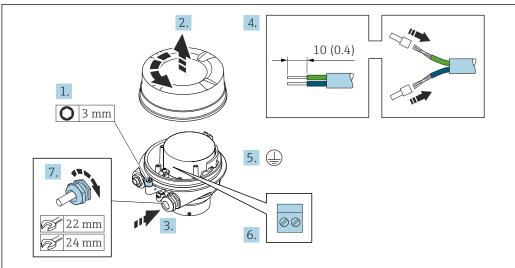
Connection via terminals with order code for "Housing":

- Option **A** "Aluminum coated" → 🗎 49
- Option **B** "Stainless" \rightarrow 🗎 50
- Option **L** "Cast, stainless" \rightarrow 🖺 49

Connecting the sensor connection housing via terminals

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

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



40020612

- 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.
 - ► The process for connecting the connecting cable is now complete.

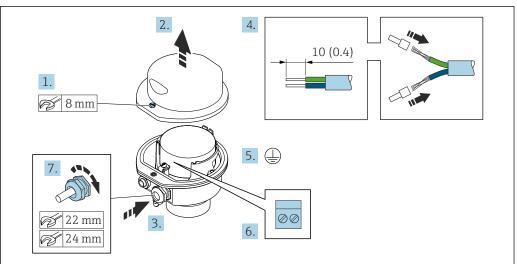
A WARNING

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

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

Connecting the sensor connection housing via terminals

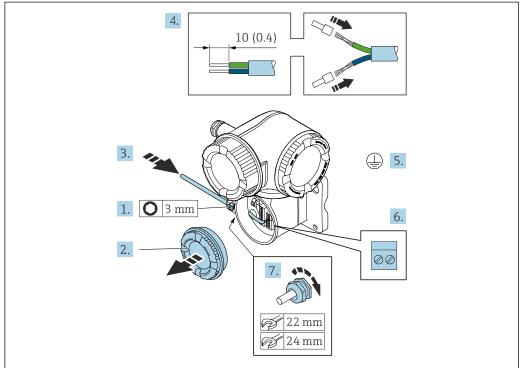
For the device version with the order code for "Housing": Option ${\bf B}$ "Stainless"



VUU306.

- 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.

Attaching the connecting cable to the transmitter

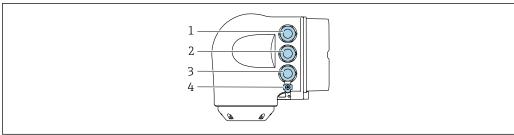


A002959

- 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.
- 6. Connect the cable in accordance with the connecting cable terminal assignment $\rightarrow \implies 48$.
- 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 →

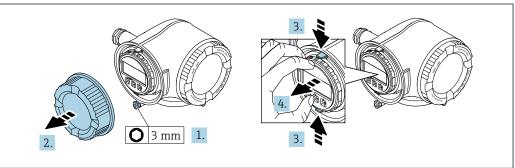
 52.

7.4.2 Connecting the signal cable and the supply voltage cable



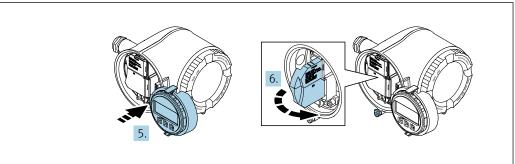
A002678

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



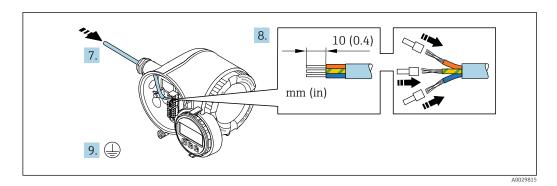
A0029813

- 1. Loosen the securing clamp of the connection compartment cover.
- 2. Unscrew the connection compartment cover.
- 3. Squeeze the tabs of the display module holder together.
- 4. Remove the display module holder.

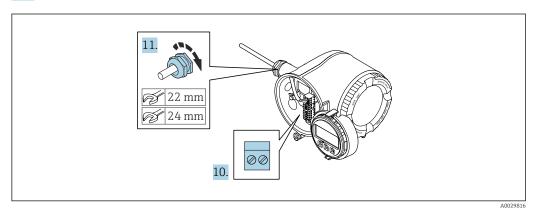


A0029814

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



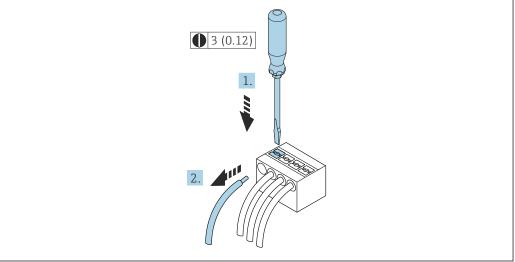
- 7. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 8. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.
- 9. Connect the protective ground.



- 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.
 Supply voltage connection terminal assignment: Adhesive label in the terminal cover or → \$\inspec\$ 39.
- 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

To remove a cable from the terminal:



A002959

■ 16 Unit mm(in)

- 1. Use a flat-blade screwdriver to press down on the slot between the two terminal
- 2. Remove the cable end from the terminal.

7.5 Potential equalization

7.5.1 Requirements

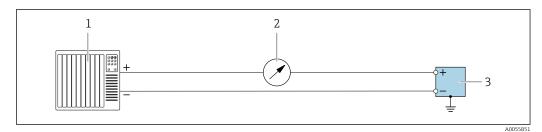
For potential equalization:

- 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 electric potential
- Use a ground cable with a minimum cross-section of 6 mm² (10 AWG) and a cable lug for potential equalization connections

7.6 Special connection instructions

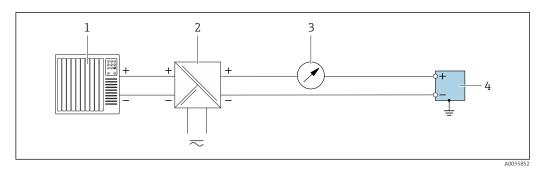
7.6.1 Connection examples

Current output 4 to 20 mA (without HART)



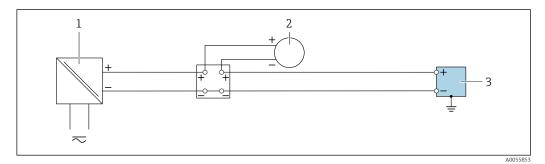
■ 17 Connection example for 4 to 20 mA current output (active)

- 1 Automation system with current input (e.g. PLC)
- 2 Optional additional display unit: Observe maximum load
- *3 Flowmeter with current output (active)*



- 18 Connection example for 4 to 20 mA current output (passive)
- 1 Automation system with current input (e.g. PLC)
- 2 Power supply
- 3 Optional additional display unit: Observe maximum load
- 4 Transmitter with current output (passive)

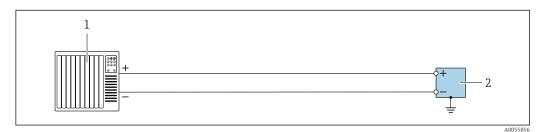
Current input 4 to 20 mA



2 19 Connection example for 4 to 20 mA current input

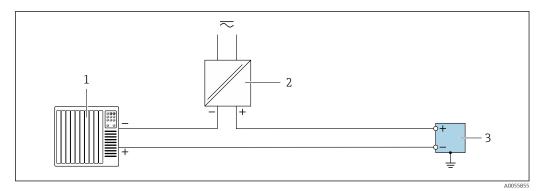
- 1 Power supply
- 2 External measuring instrument with 4 to 20 mA passive current output. e.g. pressure or temperature)
- 3 Transmitter with 4 to 20 mA current input

Pulse output/frequency output/switch output



 \blacksquare 20 Connection example for pulse output/frequency output/switch output (active)

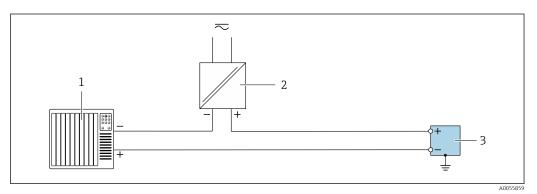
- 1 Automation system with pulse input/frequency input/switch input (e.g. PLC)
- 2 Transmitter with pulse output/frequency output/switch output (active)



 \blacksquare 21 Connection example for pulse output/frequency output/switch output (passive)

- 1 Automation system with pulse input/frequency input/switch input (e.g. PLC)
- 2 Power supply
- 3 Transmitter with pulse output/frequency output/switch output (passive)

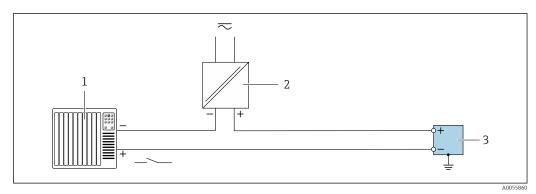
Relay output



■ 22 Connection example for relay output

- 1 Automation system with switch input (e.g. PLC)
- 2 Power supply
- *3 Transmitter with relay output*

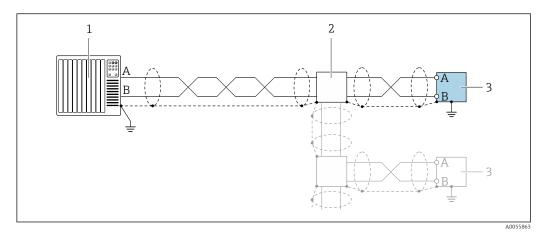
Status input



■ 23 Connection example for status input

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

Modbus RS485



■ 24 Connection example for Modbus RS485

- 1 Automation system with Modbus master (e.g. PLC)
- 2 Optional distribution box
- 3 Transmitter with Modbus RS485

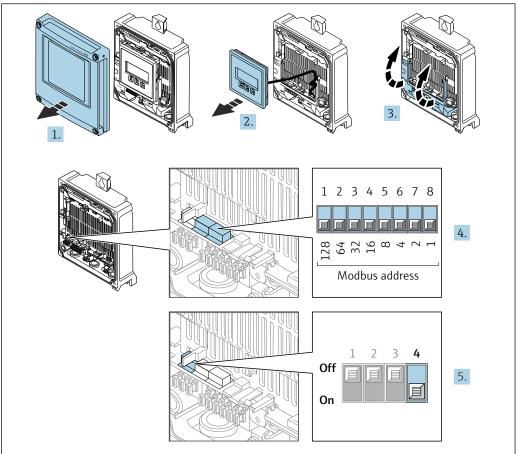
7.7 Hardware settings

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

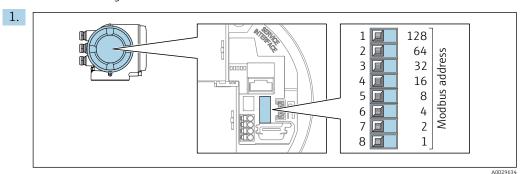
- 1. Open the housing cover.
- 2. Remove the display module.
- 3. Fold open the terminal cover.
- 4. Set the desired device address using the DIP switches.
- 5. To switch addressing from software addressing to hardware addressing: set the DIP switch to **On**.
 - └ The change of device address takes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

Software addressing

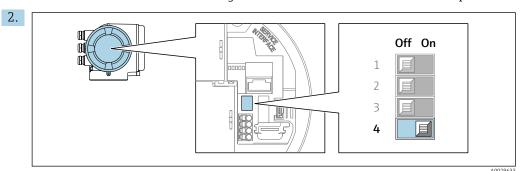
- ► To switch addressing from hardware addressing to software addressing: set the DIP switch to **Off**.
 - The device address configured in the **Device address** parameter takes effect after 10 seconds.

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.

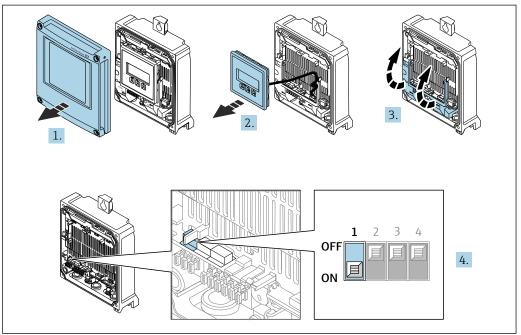
Software addressing

- ► 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.

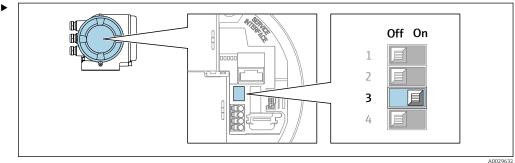
Proline 500 - digital transmitter



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**.

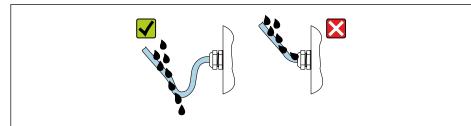
7.8 Ensuring the degree of protection

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

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

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

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



A0029278

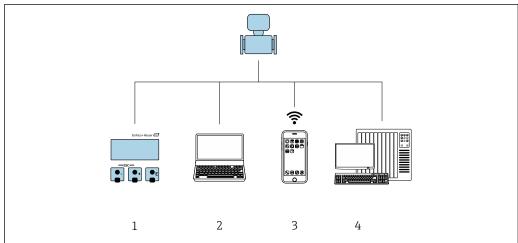
6. The supplied cable glands and plastic dummy plugs used for the threaded cable entries do not ensure degree of protection IP66/67, Type 4X enclosure. To achieve this degree of protection, cable glands and plastic dummy plugs that are not used must be replaced by threaded dummy plugs with the degree of protection IP66/67, Type 4X enclosure.

7.9 Post-connection check

Are the device and cable undamaged (visual inspection)?	
Is the protective earthing established correctly?	
Do the cables used meet the requirements ?	
Are the mounted cables strain-relieved and fixed securely in place?	
Are all cable glands installed, securely tightened and leak-tight? Cable run with "water trap" → 🖺 60?	
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



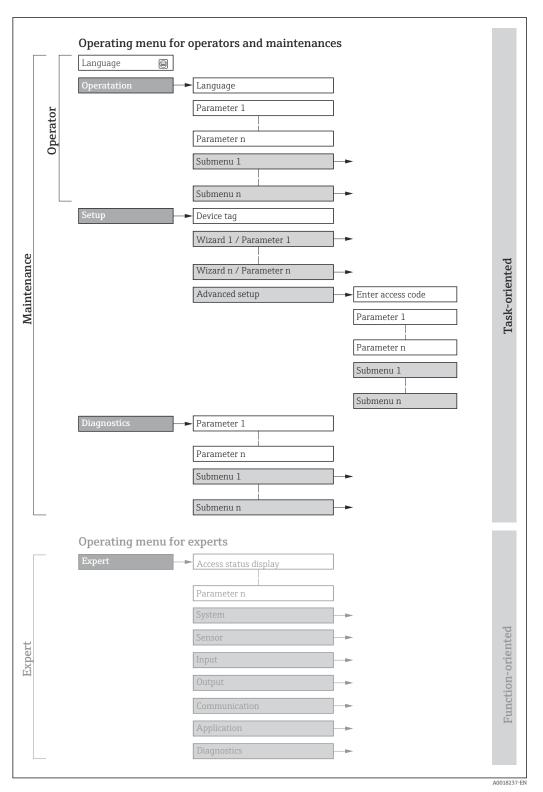
A003021

- 1 Local operation via display module
- 2 Computer with web browser or operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM)
- 3 Mobile handheld terminal with SmartBlue app
- 4 Automation 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 25 Schematic structure of the operating menu

8.2.2 Operating philosophy

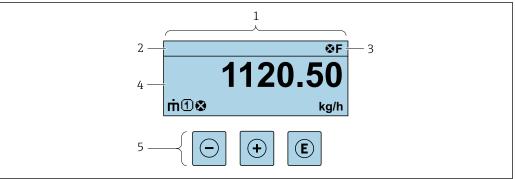
The individual parts of the operating menu are assigned to certain user roles (e.g. operator, maintenance etc.). Each user role contains typical tasks within the device life cycle.

Menu/pa	arameter	User role and tasks	Content/meaning
Language	Task-	Role "Operator", "Maintenance"	Defining the operating language
Operation	oriented	Tasks during operation: Configuring the operational display Reading measured values	 Defining the operating language Defining the web server operating language Resetting and controlling totalizers Configuring the operational display (e.g. display format, display contrast) Resetting and controlling totalizers
Setup		"Maintenance" role Commissioning: Configuring the measurement Configuring the inputs and outputs Configuring the communication interface	Wizard for quick commissioning: Configuring the system units Configuring the communication interface Defining the medium Displaying the I/O configuration Configuring the inputs Configuring the outputs Configuring the operational display Configuring the low flow cut off Configuring the detection of partially filled and empty pipes
			Advanced setup For more customized configuration of the measurement (adaptation to special measuring conditions) Calculated process variables Sensor adjustment Configuring totalizers Configuring the display Configuring the WLAN settings Data backup Administration (define access code, reset measuring instrument)
Diagnostics		"Maintenance" role Troubleshooting: Diagnostics and elimination of process and device errors Measured value simulation	Contains all parameters for error detection and analyzing process and device errors: Diagnostic list Contains up to 5 currently pending diagnostic messages. Event logbook Contains event messages that have occurred. Device information Contains information for identifying the device. Measured values Contains all current measured values. Data logging submenu with the "Extended HistoROM" order option Storage and visualization of measured values Heartbeat Technology The functionality of the device is checked on demand and the verification results are documented. Simulation Used to simulate measured values or output values. Testpoints

Menu/parameter		User role and tasks	Content/meaning		
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 affect measurement or measured value communication. Sensor Configuring the measurement. Input Configuring the status input. Output Configuring the analog current outputs as well as the pulse/frequency and switch output. Communication Configuring the digital communication interface and the web server. Application Configuring 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 the Heartbeat Technology menu.		

8.3 Access to operating menu via local display

8.3.1 Operational display



A002934

- 1 Operational display
- 2 Tag name
- 3 Status area
- 4 Display area for measured values (up to 4 lines)
- 5 Operating elements → 🖺 72

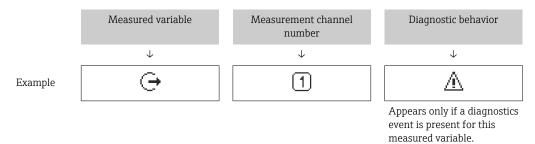
Status area

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

- Status signals → 🗎 178
 - **F**: Failure
 - **C**: Function check
 - **S**: Out of specification
 - **M**: Maintenance required
- Diagnostic behavior → 🖺 179
 - 🐼: Alarm
 - <u></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:



Measured variables

Symbol	Meaning
ṁ	Mass flow
Ü	Volume flowCorrected volume flow
ρ	DensityReference density
4	Temperature

The number and display format of the measured variables can be configured via the **Format display** parameter ($\Rightarrow \triangleq 125$).

Totalizer

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

Output

Symbol	Meaning
(-)	Output The measurement channel number indicates which of the outputs is displayed.

Input

Symbol	Meaning
€	Status input

Measurement channel numbers

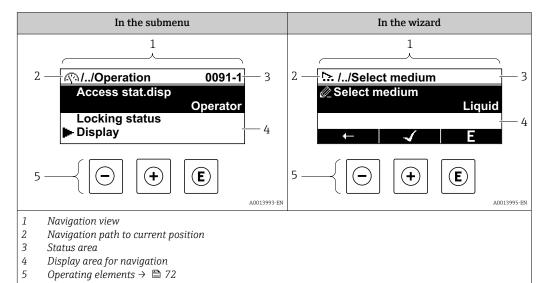
Symbol	Meaning
14	Measurement channel 1 to 4 The measurement channel number is displayed only if more than one channel is present for the same measured variable type (e.g. Totalizer 1 to 3).

Diagnostic behavior

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

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

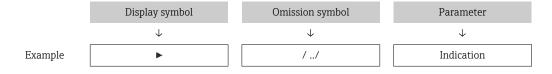
8.3.2 Navigation view



Navigation path

The navigation path to the current position is displayed at the top left in the navigation view and consists of the following elements:

- The display symbol for the menu/submenu (►) or the wizard (►).
- An omission symbol (/ ../) for operating menu levels in between.
- Name of the current submenu, wizard or parameter



Status area

The following appears in the status area of the navigation view in the top right corner:

- In the submenu
 - The direct access code to the parameter (e.g., 0022-1)
 - If a diagnostic event is present, the diagnostic behavior and status signal
- In the wizard

If a diagnostic event is present, the diagnostic behavior and status signal

For information on the diagnostic behavior and status signal → □ 178
 For information on the function and entry of the direct access code → □ 74

Display area

Menus

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

۶	Setup Is displayed: In the menu next to the "Setup" selection At the left in the navigation path in the Setup menu
્ર	Diagnosis Is displayed: ■ In the menu next to the "Diagnostics" selection ■ At the left in the navigation path in the Diagnostics menu
3,€	Expert Is displayed: In the menu next to the "Expert" selection At the left in the navigation path in the Expert menu

Submenus, wizards, parameters

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

Locking procedure

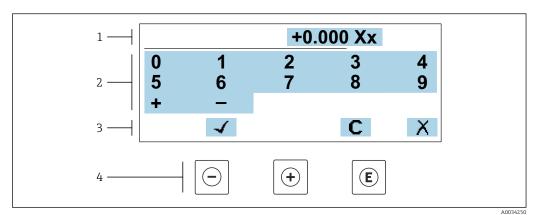
Symbol	Meaning
û	Parameter locked When displayed in front of a parameter name, indicates that the parameter is locked. By a user-specific access code By the hardware write protection switch

Wizards

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

8.3.3 **Editing view**

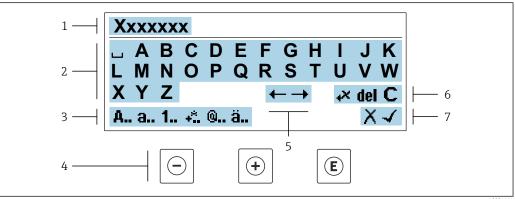
Numeric editor



■ 26 For entering values in parameters (e.g. limit values)

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

Text editor



- \blacksquare 27 For entering text in parameters (e.g. device tag)
- 1 Entry display area
- 2 Current input screen
- 3 Change input screen
- Operating elements
- Move entry position 5
- 6 Delete entry
- Reject or confirm entry

Using the operating elements in the editing view

Operating key	Meaning
	Minus key Move the entry position to the left.
+	Plus key Move the entry position to the right.

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

Input screens

Symbol	Meaning
Α	Upper case
a	Lower case
1	Numbers
+*	Punctuation marks and special characters: = + - * / 2 3 1 /4 1 /2 3 /4 () [] < > { }
@	Punctuation marks and special characters: ' " ` ^ . , ; : ? ! % μ ° € \$ £ ¥ § @ # / \ 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

Operating key	Meaning
	Minus key In menu, submenu Moves the selection bar upwards in a picklist In wizards Goes to previous parameter In the text and numeric editor Move the entry position to the left.
(+)	Plus key In menu, submenu Moves the selection bar downwards in a picklist In wizards Goes to the next parameter In the text and numeric editor Move the entry position to the right.
E	 Enter key In the operational display Pressing the key briefly opens the operating menu. In menu, submenu Pressing the key briefly: Opens the selected menu, submenu or parameter. Starts the wizard. If help text is open, closes the help text of the parameter. Pressing the key for 2 s in a parameter: If present, opens the help text for the function of the parameter. In wizards Opens the editing view of the parameter and confirms the parameter value In the text and numeric editor Pressing the key briefly confirms your selection. Pressing the key for 2 s confirms your entry.
<u></u> ++	Escape key combination (press keys simultaneously) In menu, submenu Pressing the key briefly: Exits the current menu level and takes you to the next higher level. If help text is open, closes the help text of the parameter. Pressing the key for 2 s returns you to the operational display ("home position"). In wizards Exits the wizard and takes you to the next higher level In the text and numeric editor Exits the Editing view without applying the changes.
-+E	 Minus/Enter key combination (press and hold down the keys simultaneously) If keypad lock is active: Pressing the key for 3 s deactivates the keypad lock. If keypad lock is not active: Pressing the key for 3 s opens the context menu including the option for activating the keypad lock.

8.3.5 Opening the context menu

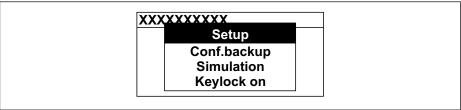
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Data backup
- Simulation

Calling up and closing the context menu

The user is in the operational display.

- 1. Press the \square and \square keys for longer than 3 seconds.
 - └ The context menu opens.



A0034608-F

- 2. Press = + ± simultaneously.
 - ► The context menu is closed and the operational display appears.

Calling up the menu via the context menu

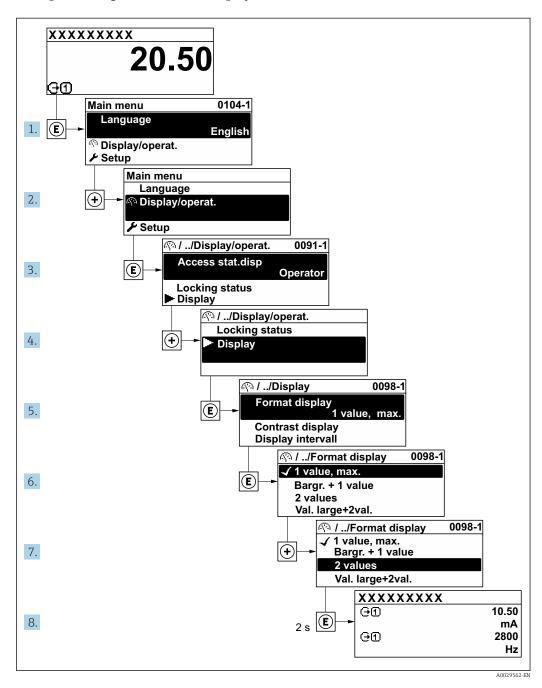
- 1. Open the context menu.
- 2. Press 🛨 to navigate to the desired menu.
- 3. Press 🗉 to confirm the selection.
 - ► The selected menu opens.

8.3.6 Navigating and selecting from list

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

For an explanation of the navigation view with symbols and operating elements $\Rightarrow \triangleq 68$

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



8.3.7 Calling the parameter directly

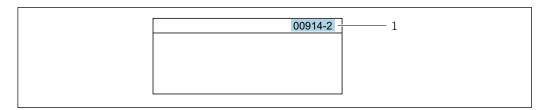
A parameter number is assigned to every parameter to be able to access a parameter directly via the onsite display. Entering this access code in the **Direct access** parameter calls up the desired parameter directly.

Navigation path

Expert → Direct access

74

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

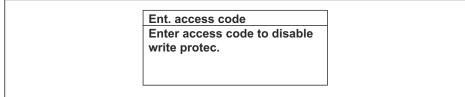
8.3.8 Calling up help text

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

- 28 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

A0014049-E

For a description of the editing view - consisting of the text editor and numeric editor - with symbols $\rightarrow \implies 70$, for a description of the operating elements $\rightarrow \implies 72$

8.3.10 User roles and related access authorization

The two user roles "Operator" and "Maintenance" have different write access to the parameters if the customer defines a user-specific access code. This protects the device configuration via the local display from unauthorized access $\rightarrow \blacksquare 152$.

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	✓ 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)

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

8.3.11 Disabling write protection via access code

If the oxtimes-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 $\rightarrow oxtimes 152$.

Parameter write protection via local operation can be disabled by entering the user-specific access code in the **Enter access code** parameter ($\rightarrow \implies 131$) 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 operating menu via web browser

8.4.1 Function range

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

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

8.4.2 Requirements

Computer hardware

Hardware	Interface	
	RJ45	WLAN
Interface	The computer must have a RJ45 interface. 1)	The operating unit must have a WLAN interface.
Connection	Standard Ethernet cable	Connection via wireless local area network.
Screen	Recommended size: ≥12" (depends on the screen resolution)	

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

Computer software

Software	Interface	
	RJ45	WLAN
Recommended operating systems	 Microsoft Windows 8 or higher. Mobile operating systems: iOS Android Microsoft Windows XP and Windows 7 is supported. 	
Web browsers supported	 Microsoft Edge Mozilla Firefox Google Chrome Safari 	

Computer settings

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

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 Connecting the device

Via service interface (CDI-RJ45)

Preparing the measuring device

Proline 500 - digital

- 1. Loosen the 4 fixing screws on the housing cover.
- 2. Open the housing cover.
- 3. The location of the connection socket depends on the measuring device and the communication protocol.

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

Proline 500

- 1. Depending on the housing version:

 Loosen the securing clamp or fixing screw of the housing cover.
- 2. Depending on the housing version: Unscrew or open the housing cover.
- 3. Connect the computer to the RJ45 plug via the standard Ethernet connecting cable..

Configuring the Internet protocol of the computer

The 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 the computer to the RJ45 plug via the standard Ethernet cable $\rightarrow \triangleq 85$.
- 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 device

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

Please note the following to avoid a network conflict:

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

Preparing the mobile terminal

► Enable WLAN on the mobile terminal.

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

- 1. In the WLAN settings of the mobile terminal:

 Select the measuring device using the SSID (e.g. EH_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).

- The LED on the display module flashes. It is now possible to operate the measuring device with the web browser, FieldCare or DeviceCare.
- 🚹 The serial number can be found on the nameplate.
- To ensure the safe and swift assignment of the WLAN network to the measuring point, it is advisable to change the SSID name. It should be possible to clearly assign the new SSID name to the measuring point (e.g. tag name) because it is displayed as the WLAN network.

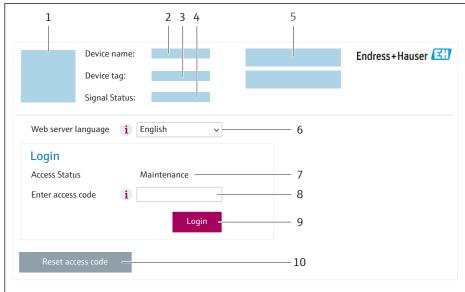
Terminating the WLAN connection

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

Starting the web browser

1. Start the web browser on the computer.

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



A00E2670

- 1 Picture of device
- 2 Device name
- 3 Device tag
- 4 Status signal
- 5 Current measured values
- 6 Operating language
- 7 User role
- 8 Access code
- 9 Login
- 10 Reset access code (→ 🖺 148)
- If a login page does not appear, or if the page is incomplete $\rightarrow \stackrel{\triangle}{=} 174$

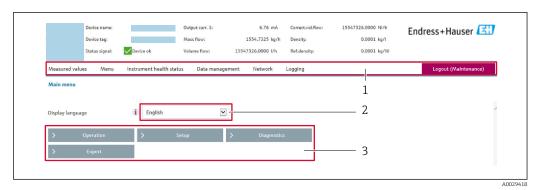
8.4.4 Logging on

- 1. Select the preferred operating language for the Web browser.
- 2. Enter the user-specific access code.
- 3. Press **OK** to confirm your entry.

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

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

8.4.5 User interface



- 1 Function row
- 2 Local display language
- 3 Navigation area

Header

The following information appears in the header:

- Device name
- Device tag
- Device status with status signal \rightarrow 🖺 181
- Current measured values

Function row

Functions	Meaning
Measured values	Displays the measured values of the measuring instrument
Menu	 Access to the operating menu from the measuring instrument The structure of the operating menu is the same as for the local display Detailed information on the "Description of Device Parameters" operating menu
Device status	Displays the diagnostic messages currently pending, listed in order of priority
Data management	Data exchange between computer and measuring instrument: Device configuration: Load settings from the device (XML format, save configuration) Save settings to the device (XML format, restore configuration) Logbook - Export Event logbook (.csv file) Documents - Export documents: Export backup data record (.csv file, create documentation of the measuring point configuration) Verification report (PDF file, only available with the "Heartbeat Verification" application package) Firmware update - Flashing a firmware version
Network	Configuration and checking of all the parameters required for establishing the connection to the measuring instrument: Network settings (e.g. IP address, MAC address) Device information (e.g. serial number, firmware version)
Logout	End the operation and call up the login page

Navigation area

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

Working area

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

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

8.4.6 Disabling the Web server

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

Navigation

"Expert" menu \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.	OffHTML OffOn	On

Function scope of the "Web server functionality" parameter

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

Enabling the Web server

If the Web server is disabled it can only be re-enabled with the **Web server functionality** parameter via the following operating options:

- Via local display
- Via Bedientool "FieldCare"
- Via "DeviceCare" operating tool

8.4.7 Logging out

- Before logging out, perform a data backup via the **Data management** function (upload configuration from device) if necessary.
- 1. Select the **Logout** entry in the function row.
 - ► The home page with the Login box appears.
- 2. Close the Web browser.
- 3. If no longer needed:

Reset the modified properties of the Internet protocol (TCP/IP) \rightarrow \bigcirc 79.

8.5 Operation via SmartBlue app

The device can be operated and configured with the SmartBlue App.

- The SmartBlue app must be downloaded onto a mobile device for this purpose
- For information on the compatibility of the SmartBlue app with mobile devices, see Apple App Store (iOS devices) or Google Play Store (Android devices)
- Incorrect operation by unauthorized persons is prevented by means of encrypted communication and password encryption.
- The Bluetooth® function can be deactivated after initial device setup.



🗷 29 🛮 QR code for free Endress+Hauser SmartBlue App

Download and installation:

- 1. Scan the QR code or enter **SmartBlue** in the search field of the Apple App Store (iOS) or Google Play Store (Android).
- 2. Install and start the SmartBlue app.
- 3. For Android devices: enable location tracking (GPS) (not required for iOS devices).
- 4. Select a device that is ready to receive from the device list displayed.

Login:

- 1. Enter the user name: admin
- 2. Enter the initial password: serial number of the device
- 3. Change the password after logging in for the first time

Information on password and reset code

For devices that meet the requirements of IEC 62443-4-1 "Secure product developement lifecycle management" ("ProtectBlue"):

- If the user-defined password is lost: refer to the user management instructions and the reset button in the operating manual.
- Refer to the associated Security Manual (SD).

For all other devices (without "ProtectBlue"):

- If the user-defined password is lost, access can be restored via a reset code. The reset code is the serial number of the device in reverse. The original password is once again valid after the reset code has been entered.
- The reset code can also be changed in addition to the password.
- If the user-defined reset code is lost, the password can no longer be reset via the SmartBlue app. Contact Endress+Hauser Service in this case.

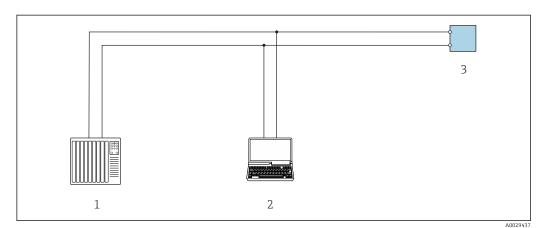
8.6 Access to the operating menu via the operating tool

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

8.6.1 Connecting the operating tool

Via Modbus RS485 protocol

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



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

- 1 Automation system (e.g. PLC)
- 2 Computer with web browser 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)

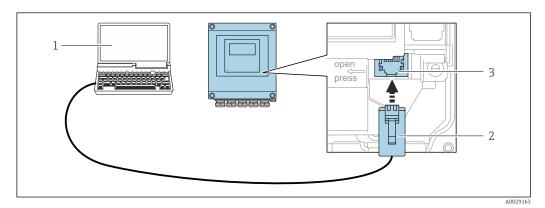
To configure the device on site, a point-to-point connection can be established. The connection is made with the housing open, directly via the device's service interface (CDI-RJ45).

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

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

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

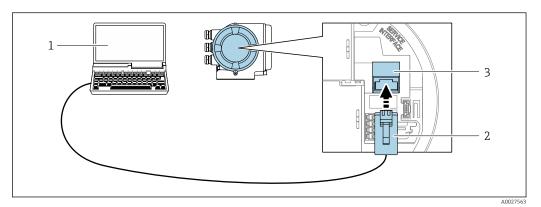
Proline 500 - digital transmitter



■ 31 Connection via service interface (CDI-RJ45)

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

Proline 500 transmitter



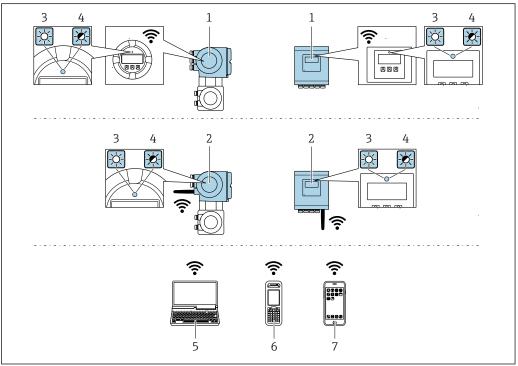
■ 32 Connection via service interface (CDI-RJ45)

- 1 Computer with web browser for accessing integrated web server or with operating tool e.g, "FieldCare", "DeviceCare", with COM DTM "CDI Communication TCP/IP" or Modbus DTM
- 2 Standard Ethernet connecting cable with RJ45 connector
- 3 Service interface (CDI-RJ45) of the measuring instrument 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 instrument
- 4 LED flashing: WLAN connection established between operating unit and measuring instrument
- 5 Computer with WLAN interface and web browser for accessing integrated device web server or with operating tool e.g FieldCare, DeviceCare)
- 6 Mobile handheld terminal with WLAN interface and web browser for accessing integrated device web server or operating tool (e.g. FieldCare, DeviceCare)
- 7 Smartphone 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	IP66/67
Available antennas	 Internal antenna External antenna (optional) In the event of poor transmission/reception conditions at the place of installation. Only 1 antenna is active at any one time!
Range	 Internal antenna: typically 10 m (32 ft) External antenna: typically 50 m (164 ft)
Materials (external antenna)	 Antenna: ASA plastic (acrylonitrile styrene acrylate) and nickel-plated brass Adapter: Stainless steel and nickel-plated brass Cable: Polyethylene Plug: Nickel-plated brass Angle bracket: Stainless steel

Configuring the Internet protocol of the mobile device

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

Please note the following to avoid a network conflict:

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

Preparing the mobile terminal

► Enable WLAN on the mobile terminal.

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

- 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).

- The LED on the display module flashes. It is now possible to operate the measuring device with the web browser, FieldCare or DeviceCare.
- 😭 The serial number can be found on the nameplate.
- To ensure the safe and swift assignment of the WLAN network to the measuring point, it is advisable to change the SSID name. It should be possible to clearly assign the new SSID name to the measuring point (e.g. tag name) because it is displayed as the WLAN network.

Terminating the WLAN connection

► After configuring the device:

Terminate the WLAN connection between the mobile terminal and measuring device.

8.6.2 FieldCare

Function range

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

Access is via:

- CDI-RJ45 service interface → 🖺 85

Typical functions:

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



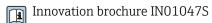
- Operating Instructions BA00027S
- Operating Instructions BA00059S
- Source for device description files $\Rightarrow \triangleq 89$

8.6.3 DeviceCare

Function range

Tool for connecting and configuring Endress+Hauser field devices.

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



Source for device description files $\rightarrow \triangleq 89$

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9 System integration

9.1 Overview of device description files

9.1.1 Current version data for the device

Firmware version	01.06.zz	 On the title page of the manual On the transmitter nameplate Firmware version Diagnostics → Device information → Firmware version
Release date of firmware version	08.2022	-

For an overview of the various firmware versions for the device $\rightarrow \triangleq 195$

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	 www.endress.com → Downloads area USB stick (contact Endress+Hauser) E-mail → Downloads area 	
DeviceCare	 www.endress.com → Downloads area E-mail → Downloads area 	

9.2 Compatibility with previous 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 ModbusRS485 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 instrument supports the following function codes:

Code Name		Description	Application	
03	Read holding register	The controller reads one or more Modbus registers of the measuring instrument. A maximum of 125 consecutive registers can be read with one telegram: 1 register = 2 bytes The measuring instrument 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	The controller reads one or more Modbus registers of the measuring instrument. A maximum of 125 consecutive registers can be read with one telegram: 1 register = 2 bytes The measuring instrument 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	Controller writes a new value to one Modbus register of the measuring instrument. Function code 16 can be used to write multiple registers with a single telegram.	Writing only 1 device parameter Example: Reset totalizer	
08	Diagnostics	Controller checks the communication connection to the measuring instrument. 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	Controller writes a new value to multiple Modbus registers of the measuring instrument. A maximum of 120 consecutive registers can be written with one telegram.	Writing 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 → 🖺 92	
23	Read/Write multiple registers	Controller reads and writes a maximum of 118 Modbus registers of the measuring instrument simultaneously with one telegram. Write access is executed before read access.	Writing and reading multiple device parameters Example: Read mass flow Reset the totalizer

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

9.3.2 **Register information**



For an overview of device parameters and their corresponding Modbus register information, refer to the "ModbusRS485 section in the "Description of Device Parameters" documentation.register information $\rightarrow \triangleq 235 \rightarrow \triangleq 90$.

9.3.3 Response time

Response time of the measuring instrument 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:

	LOAT (floating point number IEEE 754) lata length = 4 bytes (2 registers)				
Byte 3 Byte 2 Byte 1 Byte 0					
SEEEEEE	ЕММММММ	MMMMMMM	MMMMMMM		
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 device parameter, e.g. presentation of a device parameter with a data length = 18 bytes (9 registers)					
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			

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

9.3.6 Modbus data map

Function of the Modbus data map

To ensure that retrieving device parameters via Modbus RS485 is no longer limited to individual device parameters or a group of consecutive device parameters, the measuring instrument provides a special memory area: the Modbus data map for a maximum of 16 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
 ModbusRS485 register addresses in the list.
- Data area

The measuring instrument 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 ModbusRS485 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 instrument: Expert \rightarrow Communication \rightarrow Modbus data map \rightarrow Scan list register 0 to 15

Scan list	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				
No.	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	Modbus RS485	Modbus RS485 register		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	

^{*} 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 Post-installation and post-connection check

Before commissioning the device:

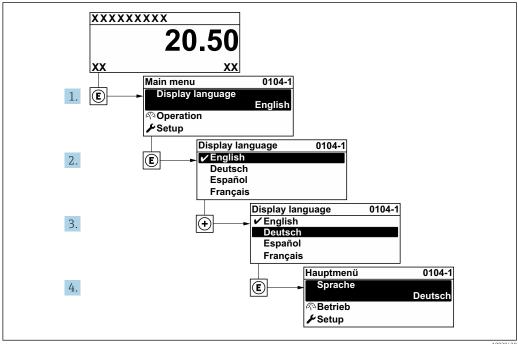
- ▶ Make sure that the post-installation and post-connection checks have been performed successfully.
- Checklist for "Post-installation" check → □ 34
- Checklist for "Post-connection" check → 🗎 61

10.2 Switching on the measuring instrument

- ▶ Switch on the device upon successful completion of the post-mounting and postconnection check.
 - After a successful startup, the local display switches automatically from the startup display to the operational display.
- If nothing appears on the local display or if a diagnostic message is displayed, refer to the section on "Diagnostics and troubleshooting" $\rightarrow \square$ 173.

10.3 Setting the operating language

Factory setting: English or ordered local language



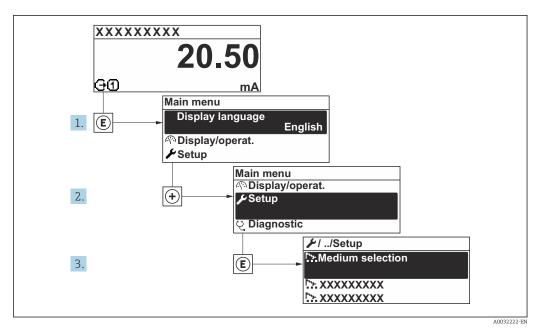
■ 33 Taking the example of the local display

10.4 Configuring the device

The **Setup** menu with its quided wizards contains all the parameters needed for standard operation.

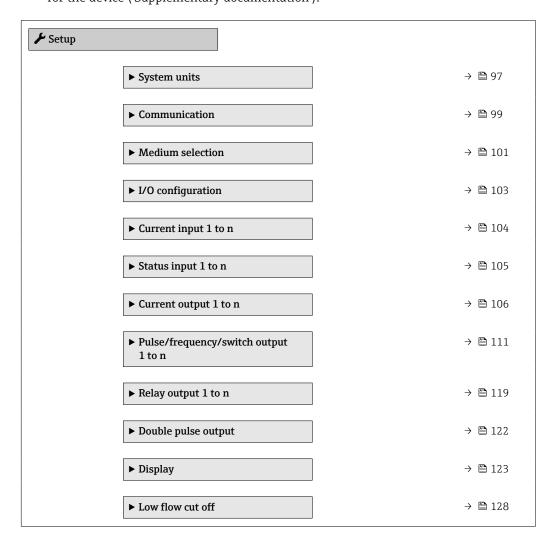
Endress+Hauser 95

A0029420



■ 34 Navigation to the "Setup" menu using the example of the local display

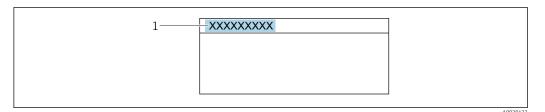
The number of submenus and parameters can vary depending on the device version. Certain submenus and parameters in these submenus are not described in the Operating Instructions. Instead a description is provided in the Special Documentation for the device ("Supplementary documentation").



▶ Partially filled pipe detection	→ 🖺 129
► Advanced setup	→ 🖺 130

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.



 \blacksquare 35 Header of the operational display with tag name

1 Tag name

😭 Enter the tag name in the "FieldCare" operating tool

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

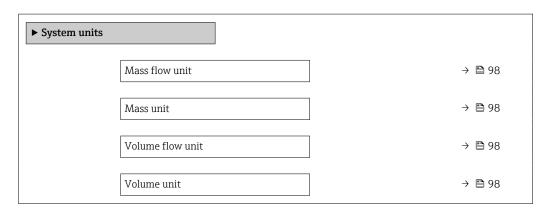
10.4.2 Setting the system units

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 Operating Instructions. Instead a description is provided in the Special Documentation for the device ("Supplementary documentation").

Navigation

"Setup" menu → System units



Corrected volume flow unit	→ 🖺 98
Corrected volume unit	→ 🗎 98
Density unit	→ 🗎 98
Reference density unit	→ 🖺 98
Density 2 unit	→ 🖺 99
Temperature unit	→ 🖺 99
Pressure unit	→ 🖺 99

Parameter	Description	Selection	Factory setting
Mass flow unit	Select mass flow unit. Effect The selected unit applies to: Output Low flow cut off Simulation process variable	Unit choose list	Country-specific: kg/h lb/min
Mass unit	Select mass unit.	Unit choose list	Country-specific: kg lb
Volume flow unit	Select volume flow unit. Effect The selected unit applies to: Output Low flow cut off Simulation process variable	Unit choose list	Country-specific: l/h gal/min (us)
Volume unit	Select volume unit.	Unit choose list	Country-specific: • 1 (DN > 150 (6"): m³ option) • gal (us)
Corrected volume flow unit	Select corrected volume flow unit. Effect The selected unit applies to: Corrected volume flow parameter (→ 158)	Unit choose list	Country-specific: NI/h Sft³/min
Corrected volume unit	Select corrected volume unit.	Unit choose list	Country-specific: NI Sft³
Reference density unit	Select reference density unit.	Unit choose list	Country-specific kg/Nl lb/Sft ³
Density unit	Select density unit. Effect The selected unit applies to: Output Simulation process variable Density adjustment (Expert menu)	Unit choose list	Country-specific: • kg/l • lb/ft ³

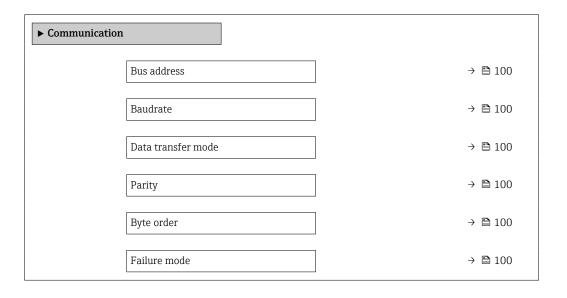
Parameter	Description	Selection	Factory setting
Density 2 unit	Select second density unit.	Unit choose list	Country-specific: kg/l lb/ft³
Temperature unit	Select temperature unit. Effect The selected unit applies to: • Electronic temperature parameter (6053) • Maximum value parameter (6051) • Minimum value parameter (6052) • External temperature parameter (6080) • Maximum value parameter (6108) • Minimum value parameter (6109) • Carrier pipe temperature parameter (6027) • Maximum value parameter (6029) • Minimum value parameter (6030) • Reference temperature parameter (1816) • Temperature parameter	Unit choose list	Country-specific: °C °F
Pressure unit	Select process pressure unit. Effect The unit is taken from: ■ Pressure value parameter (→ 🖺 103) ■ External pressure parameter (→ 🖺 103) ■ 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	Description	User entry / Selection	Factory setting
Bus address	Enter device address.	1 to 247	247
Baudrate	Define data transfer speed.	 1200 BAUD 2400 BAUD 4800 BAUD 9600 BAUD 19200 BAUD 38400 BAUD 57600 BAUD 115200 BAUD 230400 BAUD 	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.	■ 0-1-2-3 ■ 3-2-1-0 ■ 1-0-3-2 ■ 2-3-0-1	1-0-3-2
Failure mode	Select measured value output behavior when a diagnostic message occurs via Modbus communication. NaN ¹⁾	NaN valueLast valid value	NaN value

¹⁾ Not a Number

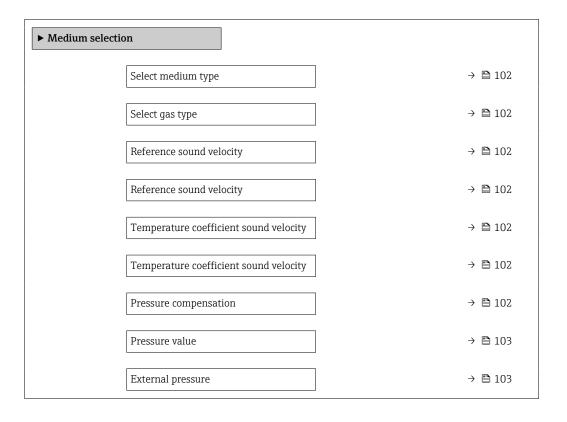
100

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	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).	LiquidGasOther	Liquid
Select gas type	In the Medium selection submenu, the Gas option is selected.	Select measured gas type.	 Air Ammonia NH3 Argon Ar Sulfur hexafluoride SF6 Oxygen O2 Ozone O3 Nitrogen oxide NOx Nitrogen N2 Nitrous oxide N2O Methane CH4 Methane CH4 + 10% Hydrogen H2 Methane CH4 + 20% Hydrogen H2 Methane CH4 + 30% Hydrogen H2 Hydrogen H2 Helium He Hydrogen H2 Helium He Hydrogen sulfide HCI Hydrogen Sulfide HCS Ethylene C2H4 Carbon dioxide CO2 Carbon monoxide CO Chlorine CI2 Butane C4H10 Propane C3H8 Propylene C3H6 Ethane C2H6 Other 	Methane CH4
Reference sound velocity	In the Select gas type parameter, the Other option is selected.	Enter sound velocity of the gas at 0 $^{\circ}$ C (32 $^{\circ}$ F).	1 to 99999.9999 m/s	415.0 m/s
Reference sound velocity	In the Select medium type parameter, the Other option is selected.	Enter sound velocity of the medium at 0 °C (32 °F).	Signed floating-point number	1456 m/s
Temperature coefficient sound velocity	In the Select gas type parameter, the Other option is selected.	Enter the temperature coefficient for the gas sound velocity.	Positive floating point number	0.87 (m/s)/K
Temperature coefficient sound velocity	In the Select medium type parameter, the Other option is selected.	Enter temperature coefficient for the medium sound velocity.	Signed floating-point number	1.3 (m/s)/K
Pressure compensation	-	Select pressure compensation type.	 Off Fixed value External value Current input 1 * Current input 2 * Current input 3 * 	Off

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Pressure value	In the Pressure compensation parameter, the Fixed value 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 process pressure read from the external device.		-

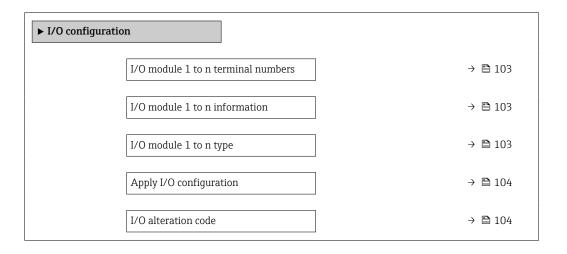
Visibility depends on order options or device settings

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.	 Not used 26-27 (I/O 1) 24-25 (I/O 2) 22-23 (I/O 3) 20-21 (I/O 4)* 	-
I/O module 1 to n information	Shows information of the plugged I/O module.	Not pluggedInvalidNot configurableConfigurableMODBUS	-
I/O module 1 to n type	Shows the I/O module type.	 Off Current output * Current input * Status input * Pulse/frequency/switch output * Double pulse output * Relay output * 	Off

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

^{*} 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

► Current input 1 to n		
Cun	rrent span	→ 🖺 105
Ter	rminal number	→ 🖺 105
Sig	nal mode	→ 🖺 105
Ter	rminal number	→ 🖺 105
0/4	4 mA value	→ 🖺 105
20	mA value	→ 🖺 105
Fai	lure mode	→ 🖺 105
Ter	rminal number	→ 🖺 105
Fai	lure value	→ 🖺 105
Ter	rminal number	→ 🖺 105

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Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Current span	-	Select current range for process value output and upper/lower level for alarm signal.	■ 420 mA (420.5 mA) ■ 420 mA NE (3.820.5 mA) ■ 420 mA US (3.920.8 mA) ■ 020 mA (020.5 mA)	420 mA NE (3.820.5 mA)
Terminal number	-	Shows the terminal numbers used by the current input module.	 Not used 24-25 (I/O 2) 22-23 (I/O 3) 20-21 (I/O 4)* 	-
Signal mode	The measuring device is not approved for use in the hazardous area with type of protection Ex-i.	Select the signal mode for the current input.	• Passive • Active*	Active
0/4 mA value	-	Enter 4 mA value.	Signed floating-point number	0
20 mA value	-	Enter 20 mA value.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	-	Define input behavior in alarm condition.	AlarmLast valid valueDefined value	Alarm
Failure value	In the Failure mode parameter, the Defined value option is selected.	Enter value to be used by the device if input value from external device is missing.	Signed floating-point number	0

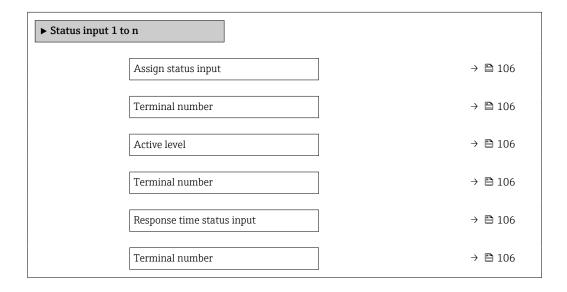
^{*} Visibility depends on order options or device settings

10.4.7 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



Parameter	Description	Selection / User interface / User entry	Factory setting
Assign status input	Select function for the status input.	 Off Reset totalizer 1 Reset totalizer 2 Reset totalizer 3 Reset all totalizers Flow override Zero adjustment Reset weighted averages * Reset weighted averages + totalizer 3 * 	Off
Terminal number	Shows the terminal numbers used by the status input module.	 Not used 24-25 (I/O 2) 22-23 (I/O 3) 20-21 (I/O 4)* 	-
Active level	Define input signal level at which the assigned function is triggered.	■ High ■ Low	High
Response time status input	Define the minimum amount of time the input signal level must be present before the selected function is triggered.	5 to 200 ms	50 ms

^{*} Visibility depends on order options or device settings

10.4.8 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

► Current output 1 to n	
Process variable current output	→ 🖺 108
Terminal number	→ 🖺 107
Current range output	→ 🖺 109
Terminal number	→ 🖺 107
Signal mode	→ 🖺 107
Terminal number	→ 🖺 107
Lower range value output	→ 🖺 109
Upper range value output	→ 🖺 109
Fixed current	→ 🖺 109

Terminal number	→ 🖺 107
Damping current output	→ 🖺 109
Failure behavior current output	→ 🗎 110
Terminal number	→ 🖺 107
Failure current	→ 🖺 110
Terminal number	→ 🖺 107

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

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Process variable current output		Select the process variable for the current output.	■ Off* ■ Mass flow ■ Volume flow ■ Corrected volume flow* ■ Density ■ Reference density* ■ Temperature ■ Target mass flow* ■ Carrier mass flow* ■ Carrier wolume flow* ■ Carrier volume flow* ■ Carrier corrected volume flow ■ Carrier corrected volume flow ■ Carrier corrected volume flow ■ Concentration* ■ Dynamic viscosity* ■ Kinematic viscosity* ■ Temp. compensated dynamic viscosity* ■ Temp. compensated kinematic viscosity* ■ 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 ■ Carrier pipe temperature temperature to Oscillation frequency 1 ■ Frequency fluctuation 0 frequency 1 ■ Frequency fluctuation 0 frequency 1 ■ Frequency fluctuation 1 ■ Oscillation amplitude 1 ■ Frequency fluctuation 1 ■ Oscillation amplitude 1 ■ Frequency fluctuation 1 ■ Oscillation damping 1 ■ Oscillation amplitude 1 ■ Frequency fluctuation 1 ■ Oscillation damping 1	Mass flow

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
			Oscillation damping fluctuation 0* Oscillation damping fluctuation 1* Exciter current 1* HBSI* Pressure* Electronics temperature Sensor index coil asymmetry Test point 0 Test point 1	
Current range output	_	Select current range for process value output and upper/lower level for alarm signal.	 420 mA NE (3.820.5 mA) 420 mA US (3.920.8 mA) 420 mA (420.5 mA) 020 mA (020.5 mA) Fixed value 	Depends on country: 420 mA NE (3.820.5 mA) 420 mA US (3.920.8 mA)
Lower range value output	In Current span parameter (→ 🖺 109), one of the following options is selected: 420 mA NE (3.820.5 mA) 420 mA US (3.920.8 mA) 420 mA (420.5 mA) 020 mA (420.5 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	In Current span parameter (→ 🖺 109), one of the following options is selected: • 420 mA NE (3.820.5 mA) • 420 mA US (3.920.8 mA) • 420 mA (420.5 mA) • 020 mA (020.5 mA)	Enter upper range value for the measured value range.	Signed floating-point number	Depends on country and nominal diameter
Fixed current	The Fixed current option is selected in the Current span parameter $(\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	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 (→ ■ 108) and one of the following options is selected in the Current span parameter (→ ■ 109): • 420 mA NE (3.820.5 mA) • 420 mA US (3.920.8 mA) • 420 mA (420.5 mA) • 020 mA (020.5 mA)	Enter time constant for output damping (PT1 element). Damping reduces the effect of fluctuations in the measured value on the output signal.	0.0 to 999.9 s	1.0 s

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Failure behavior current output	A process variable is selected in the Assign current output parameter (→ 🗎 108) and one of the following options is selected in the Current span parameter (→ 🖺 109): • 420 mA NE (3.820.5 mA) • 420 mA US (3.920.8 mA) • 420 mA (420.5 mA) • 020 mA (020.5 mA)	Select output behavior in the event of a device alarm.	 Min. Max. Last valid value Actual value Fixed value 	Max.
Failure current	The Defined value option is selected in the Failure mode parameter.	Enter current output value in alarm condition.	0 to 22.5 mA	22.5 mA

^{*} Visibility depends on order options or device settings

10.4.9 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



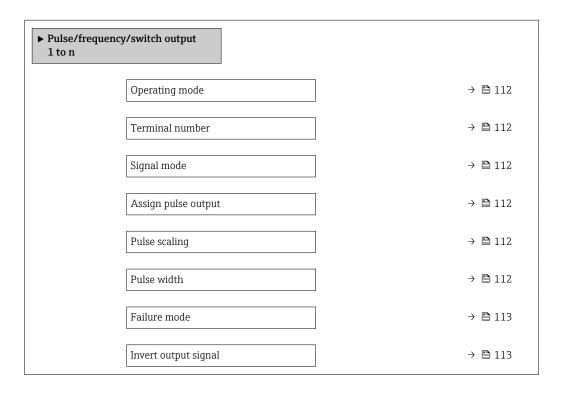
Parameter overview with brief description

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

Configuring the pulse output

Navigation

"Setup" menu → Pulse/frequency/switch output



Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	-	Define the output as a pulse, frequency or switch output.	PulseFrequencySwitch	Pulse
Terminal number	-	Shows the terminal numbers used by the PFS output module.	 Not used 24-25 (I/O 2) 22-23 (I/O 3) 20-21 (I/O 4)* 	-
Signal mode	-	Select the signal mode for the PFS output.	 Passive Active * Passive NE 	Passive
Assign pulse output	The Pulse option is selected in Operating mode 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 dume flow* Carrier corrected volume flow* Carrier corrected volume flow* GSV flow Instruction flow flow flow flow flow flow flow flow	Off
Pulse scaling	The Pulse option is selected in the Operating mode parameter (→ 🗎 111) and a process variable is selected in the Assign pulse output parameter (→ 🖺 112).	Enter quantity for measured value at which a pulse is output.	Positive floating point number	Depends on country and nominal diameter
Pulse width	The Pulse option is selected in the Operating mode parameter (→ 🗎 111) and a process variable is selected in the Assign pulse output parameter (→ 🖺 112).	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 Pulse option is selected in the Operating mode parameter (→ 🖺 111) and a process variable is selected in the Assign pulse output parameter (→ 🖺 112).	Select output behavior in the event of a device alarm.	Actual valueNo pulses	No pulses
Invert output signal	-	Invert the output signal.	■ No ■ Yes	No

^{*} Visibility depends on order options or device settings

Configuring the frequency output

Navigation

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

► Pulse/frequent 1 to n	ncy/switch output	
	Operating mode	→ 🖺 114
	Terminal number	→ 🖺 114
	Signal mode	→ 🖺 114
	Assign frequency output	→ 🖺 115
	Minimum frequency value	→ 🖺 116
	Maximum frequency value	→ 🖺 116
	Measuring value at minimum frequency	→ 🖺 116
	Measuring value at maximum frequency	→ 🖺 116
	Failure mode	→ 🖺 116
	Failure frequency	→ 🖺 116
	Invert output signal	→ 🖺 116

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

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Assign frequency output	The Frequency option is selected in Operating mode parameter (→ 🗎 111).	Select process variable for frequency output.	Off Mass flow Volume flow Corrected volume flow* Density Reference density* Time period signal frequency (TPS)* Temperature Pressure Dynamic viscosity* Kinematic viscosity* Temp. compensated dynamic viscosity* Temp. compensated kinematic viscosity* Concentration* Target mass flow* Carrier mass flow* Carrier wolume flow* Carrier volume flow* Carrier corrected volume flow* Carcier current 0 Application specific output 0* Application specific output 1* Inhomogeneous medium index Suspended bubbles index* HBSI* Raw value mass flow Exciter current 0 Exciter current 0 Exciter current 0 Coscillation damping 0 Oscillation damping 1 Oscillation frequency 0 Oscillation frequency 1* Frequency fluctuation 1* Oscillation of maplitude of amplitude	Off

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
			 Signal asymmetry Torsion signal asymmetry* Carrier pipe temperature* Electronics temperature Sensor index coil asymmetry Test point 0 Test point 1 	
Minimum frequency value	The Frequency option is selected in the Operating mode parameter (→ 🖺 111) and a process variable is selected in the Assign frequency output parameter (→ 🖺 115).	Enter minimum frequency.	0.0 to 10 000.0 Hz	0.0 Hz
Maximum frequency value	The Frequency option is selected in the Operating mode parameter (→ 🗎 111) and a process variable is selected in the Assign frequency output parameter (→ 🗎 115).	Enter maximum frequency.	0.0 to 10 000.0 Hz	10 000.0 Hz
Measuring value at minimum frequency	The Frequency option is selected in the Operating mode parameter (→ 🗎 111) and a process variable is selected in the Assign frequency output parameter (→ 🖺 115).	Enter measured value for minimum frequency.	Signed floating-point number	Depends on country and nominal diameter
Measuring value at maximum frequency	The Frequency option is selected in the Operating mode parameter (→ 🗎 111) and a process variable is selected in the Assign frequency output parameter (→ 🖺 115).	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	The Frequency option is selected in the Operating mode parameter (→ 🗎 111) and a process variable is selected in the Assign frequency output parameter (→ 🗎 115).	Select output behavior in the event of a device alarm.	Actual valueDefined value0 Hz	0 Hz
Failure frequency	In the Operating mode parameter (→ 🖺 111), the Frequency option is selected, in the Assign frequency output parameter (→ 🖺 115) a process variable is selected, and in the Failure mode parameter, the Defined value option is selected.	Enter frequency output value in alarm condition.	0.0 to 12 500.0 Hz	0.0 Hz
Invert output signal	-	Invert the output signal.	■ No ■ Yes	No

Visibility depends on order options or device settings

Configuring the switch output

Navigation

"Setup" menu → Pulse/frequency/switch output

► Pulse/frequ 1 to n	nency/switch output	
	Operating mode	→ 🖺 117
	Terminal number	→ 🖺 117
	Signal mode	→ 🖺 117
	Switch output function	→ 🖺 118
	Assign diagnostic behavior	→ 🖺 118
	Assign limit	→ 🖺 118
	Assign flow direction check	→ 🖺 118
	Assign status	→ 🖺 119
	Switch-on value	→ 🖺 119
	Switch-off value	→ 🖺 119
	Switch-on delay	→ 🖺 119
	Switch-off delay	→ 🖺 119
	Failure mode	→ 🖺 119
	Invert output signal	→ 🖺 119

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.	PulseFrequencySwitch	Pulse
Terminal number	-	Shows the terminal numbers used by the PFS output module.	 Not used 24-25 (I/O 2) 22-23 (I/O 3) 20-21 (I/O 4)* 	-
Signal mode	-	Select the signal mode for the PFS output.	 Passive Active* Passive NE 	Passive

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch output function	The Switch option is selected in the Operating mode parameter.	Select function for switch output.	 Off On Diagnostic behavior Limit Flow direction check Status 	Off
Assign diagnostic behavior	 In the Operating mode parameter, the Switch option is selected. In the Switch output function parameter, the Diagnostic behavior option is selected. 	The output is switched on (closed, conductive), if there is a pending diagnostic event of the assigned behavioral category.	AlarmAlarm or warningWarning	Alarm
Assign limit	The Switch option is selected in Operating mode parameter. The Limit option is selected in Switch output function parameter.	Select the variable to monitor in case the specified limit value is exceeded. If a limit value is exceeded, the output is switched on (conductive).	■ 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* ■ Density ■ Reference density* ■ Dynamic viscosity* ■ Tonamic viscosity* ■ Temp. ■ Compensated dynamic viscosity* ■ Temp. ■ compensated kinematic viscosity* ■ Temp. ■ Totalizer 1 ■ 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	 The Switch option is selected in the Operating mode parameter. The Flow direction check option is selected in the Switch output function parameter. 	Select process variable for flow direction monitoring.		Mass flow

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Assign status	 The Switch option is selected in Operating mode parameter. The Status option is selected in Switch output function parameter. 	Select the device function for which to display the status. If the switch on point is reached, the output is switched on (closed, conductive).	Partially filled pipe detectionLow flow cut off	Partially filled pipe detection
Switch-on value	 The Switch option is selected in the Operating mode parameter. The Limit option is selected in the Switch output function parameter. 	Enter limit value for switch-on point (process variable > switch-on value = closed, conductive).	Signed floating-point number	Depends on country: • 0 kg/h • 0 lb/min
Switch-off value	 The Switch option is selected in the Operating mode parameter. The Limit option is selected in the Switch output function parameter. 	Enter limit value for switch-off point (process variable < switch-off value = open, nonconductive).	Signed floating-point number	Depends on country: • 0 kg/h • 0 lb/min
Switch-on delay	 The Switch option is selected in the Operating mode parameter. The Limit option is selected in the Switch output function parameter. 	Enter a delay before the output is switched on.	0.0 to 100.0 s	0.0 s
Switch-off delay	 The Switch option is selected in the Operating mode parameter. The Limit option is selected in the Switch output function parameter. 	Enter a delay before the output is switched off.	0.0 to 100.0 s	0.0 s
Failure mode	-	Select output behavior in the event of a device alarm.	Actual statusOpenClosed	Open
Invert output signal	-	Invert the output signal.	NoYes	No

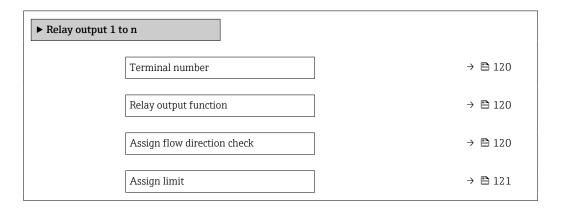
^{*} Visibility depends on order options or device settings

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



Assign diagnostic behavior	→ 🖺 121
Assign status	→ 🖺 121
Switch-off value	→ 🖺 121
Switch-off delay	→ 🗎 121
Switch-on value	→ 🖺 121
Switch-on delay	→ 🖺 122
Failure mode	→ 🖺 122
Switch state	→ 🖺 122
Powerless relay status	→ 🖺 122

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	-	Shows the terminal numbers used by the relay output module.	 Not used 24-25 (I/O 2) 22-23 (I/O 3) 20-21 (I/O 4) 	-
Relay output function	-	Select the function for the relay output.	 Closed Open Diagnostic behavior Limit Flow direction check Status 	Closed
Assign flow direction check	The Flow direction check option is selected in the Relay output function parameter.	Select process variable for flow direction monitoring.		Mass flow

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Assign limit	The Limit option is selected in Relay output function parameter.	Select the variable to monitor in case the specified limit value is exceeded. If a limit value is exceeded, the output is switched on (conductive).	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 Tensity Reference density Concentration Kinematic viscosity Temp. compensated dynamic viscosity Temp. compensated kinematic viscosity Temp. Compensated kinematic viscosity Temperature Totalizer 1 Totalizer 1 Totalizer 2 Totalizer 3 Oscillation damping Pressure Application specific output 0 Application specific output 1 Inhomogeneous medium index Suspended bubbles index Suspended bubbles index	Mass flow
Assign diagnostic behavior	In the Relay output function parameter, the Diagnostic behavior option is selected.	The output is switched on (closed, conductive), if there is a pending diagnostic event of the assigned behavioral category.	 Alarm Alarm or warning Warning	Alarm
Assign status	In the Relay output function parameter, the Digital Output option is selected.	Select the device function for which to display the status. If the switch on point is reached, the output is switched on (closed, conductive).	Partially filled pipe detectionLow flow cut off	Partially filled pipe detection
Switch-off value	The Limit option is selected in the Relay output function parameter.	Enter limit value for switch-off point (process variable < switch-off value = open, nonconductive).	Signed floating-point number	Depends on country: • 0 kg/h • 0 lb/min
Switch-off delay	In the Relay output function parameter, the Limit option is selected.	Enter a delay before the output is switched off.	0.0 to 100.0 s	0.0 s
Switch-on value	The Limit option is selected in the Relay output function parameter.	Enter measured value for the switch-on point.	Signed floating-point number	Depends on country: Okg/h Olb/min

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Switch-on delay	In the Relay output function parameter, the Limit option is selected.	Enter a delay before the output is switched on.	0.0 to 100.0 s	0.0 s
Failure mode	-	Select output behavior in the event of a device alarm.	Actual statusOpenClosed	Open
Switch state	-	Indicates the current switch state of the output.	OpenClosed	-
Powerless relay status	-	Select quiescent state for relay.	OpenClosed	Open

^{*} 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.

Navigation

"Setup" menu \rightarrow Double pulse output

► Double pulse output	
Signal mode	→ 🖺 122
Master terminal number	→ 🖺 122
Assign pulse output	→ 🖺 123
Measuring mode	→ 🖺 123
Value per pulse	→ 🖺 123
Pulse width	→ 🖺 123
Failure mode	→ 🖺 123
Invert output signal	→ 🖺 123

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.	 Passive Active* Passive NE 	Passive
Master terminal number	Shows the terminal numbers used by the master of the double pulse output module.	 Not used 24-25 (I/O 2) 22-23 (I/O 3) 	-

Parameter	Description	Selection / User interface / User entry	Factory setting
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 to volume flow* Carrier corrected volume flow* SV flow* SV flow alternative* NSV flow alternative* S&W volume flow* Oil mass flow* Water mass flow* Oil volume flow* Oil corrected volume flow* Oil corrected volume flow* Water corrected volume flow* Water corrected volume flow*	Off
Measuring mode	Select measuring mode for pulse output.	 Forward flow Forward/Reverse flow Reverse flow Reverse flow compensation 	Forward flow
Value per pulse	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	Define time width of the output pulse.	0.5 to 2 000 ms	0.5 ms
Failure mode	Select output behavior in the event of a device alarm.	Actual valueNo pulses	No pulses
Invert output signal	Invert the output signal.	■ No ■ Yes	No

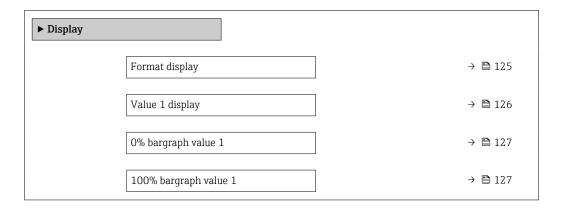
Visibility depends on order options or device settings

10.4.12 Configuring the local display

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

Navigation

"Setup" menu \rightarrow Display



Value 2 display	→ 🗎 127
Value 3 display	→ 🖺 127
0% bargraph value 3	→ 🖺 127
100% bargraph value 3	→ 🖺 127
Value 4 display	→ 🖺 127
Value 5 display	→ 🖺 127
Value 6 display	→ 🖺 127
Value 7 display	→ 🖺 127
Value 8 display	→ 🖺 127

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

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 Dynamic viscosity* Dynamic viscosity* Kinematic viscosity* Temp. compensated dynamic viscosity* Temp. compensated kinematic viscosity* Totalizer 1 Totalizer 2 Totalizer 3 Concentration* Target mass flow* Carrier mass flow Target volume 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 Exciter current 0 Exciter current 0 Exciter current 1 Oscillation damping fluctuation 0 Oscillation damping fluctuation 0 Coscillation damping fluctuation 0 Coscillation frequency 0 Coscillation frequency 1 Frequency fluctuation 0 Frequency fluctuation 0 Frequency fluctuation 1 Coscillation amplitude 0 Coscillation amplitude 1	Mass flow

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
			 Signal asymmetry Torsion signal asymmetry Carrier pipe temperature Electronics temperature Sensor index coil asymmetry Test point 0 Test point 1 Current output 1 Current output 2 Current output 3 Current output 4* 	
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
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see Value 1 display parameter (→ 126)	None
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see Value 1 display parameter (→ 126)	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 Value 3 display parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see Value 1 display parameter (→ 126)	None
Value 5 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see Value 1 display parameter (→ 126)	None
Value 6 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see Value 1 display parameter (→ 🖺 126)	None
Value 7 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see Value 1 display parameter (→ 🖺 126)	None
Value 8 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see Value 1 display parameter (→ 126)	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

► Low flow cut off	
Assign process variable	→ 🗎 128
On value low flow cutoff	→ 🖺 128
Off value low flow cutoff	→ 🖺 128
Pressure shock suppression	→ 🖺 128

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	-	Select process variable for low flow cut off.	 Off Mass flow Volume flow Corrected volume flow* 	Mass flow
On value low flow cutoff	A process variable is selected in the Assign process variable 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 Assign process variable parameter ($\rightarrow \implies 128$).	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	A process variable is selected in the Assign process variable parameter ($\rightarrow \implies 128$).	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

^{*} Visibility depends on order options or device settings

10.4.14 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	→ 🖺 129
Low value partial filled pipe detection	→ 🖺 129
High value partial filled pipe detection	→ 🖺 129
Response time part. filled pipe detect.	→ 🖺 129

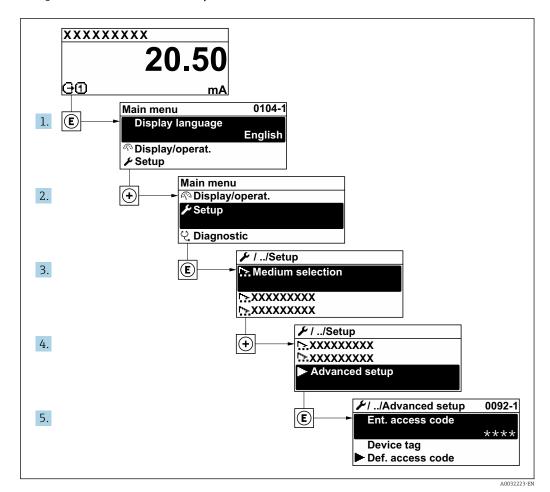
Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	-	Select process variable for partially filled pipe detection.	 Off Density Calculated reference density	Density
Low value partial filled pipe detection	A process variable is selected in the Assign process variable parameter ($\rightarrow ext{ } ext{ } $	Enter lower limit value for deactivating partialy filled pipe detection.	Signed floating-point number	Depends on country: • 200 kg/m ³ • 12.5 lb/ft ³
High value partial filled pipe detection	A process variable is selected in the Assign process variable parameter ($\rightarrow ext{ } ext{ } $	Enter upper limit value for deactivating partialy filled pipe detection.	Signed floating-point number	Depends on country: • 6 000 kg/m ³ • 374.6 lb/ft ³
Response time part. filled pipe detect.	A process variable is selected in the Assign process variable parameter (→ 🖺 129).	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 $\Rightarrow \triangleq 236$

Navigation

"Setup" menu → Advanced setup

➤ Advanced setup	
Enter access code	→ 🖺 131
► Calculated values	→ 🖺 131
► Sensor adjustment	→ 🖺 132

► Totalizer 1 to n	→ 🖺 136
► Display	→ 🖺 138
► WLAN settings	→ 🖺 144
► Configuration backup	→ 🖺 146
► Administration	→ 🖺 147

10.5.1 Using the parameter to enter the access code

Navigation

"Setup" menu → Advanced setup

Parameter overview with brief description

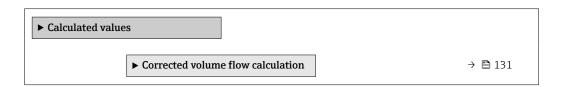
Parameter	Description	User entry
Enter access code	1 1	Max. 16-digit character string comprising numbers, letters and special characters

10.5.2 Calculated process variables

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

Navigation

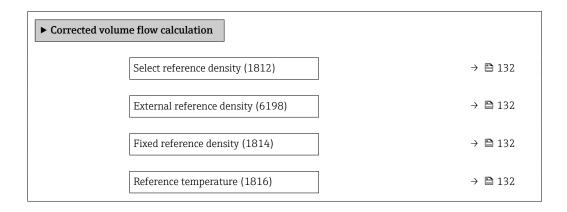
"Setup" menu \rightarrow Advanced setup \rightarrow Calculated values



"Corrected volume flow calculation" submenu

Navigation

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



Linear expansion coefficient (1817) $\Rightarrow \ \ \, \implies \ \, 132$ Square expansion coefficient (1818) $\Rightarrow \ \ \, \implies \ \, \implies \ \, 132$

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Select reference density	-	Select reference density for calculating the corrected volume flow.	 Fixed reference density Calculated reference density Current input 1* Current input 2* Current input 3* 	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 99 999 °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 ²

^{*} 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

► Sensor adjustment	
Installation direction	→ 🖺 133

132

► Zero verification	→ 🗎 133
► Zero adjustment	→ 🖺 134

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

Zero verification and zero adjustment

All measuring instruments are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions $\Rightarrow riangleq 214$. Therefore, a zero adjustment in the field is generally not required.

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

- To achieve maximum measurement accuracy even with low flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity media).
- For gas applications with low pressure.
- To achieve the highest possible measurement accuracy at low flow rates, the installation must protect the sensor from mechanical stress during operation.

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 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

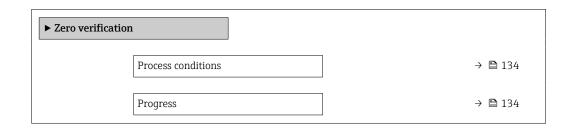
If these conditions cannot be avoided, it is advisable to keep the factory setting for the zero point.

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



Status	→ 🖺 134
Additional information	→ 🖺 134
Recommendation:	→ 🖺 134
Root cause	→ 🖺 134
Abort cause	→ 🖺 134
Zero point measured	→ 🖺 134
Zero point standard deviation	→ 🖺 134

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

Navigation

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

► Zero adjustment	
Process conditions	→ 🗎 135
Progress	→ 🖺 135
Status	→ 🖺 135
Root cause	→ 🖺 135
Abort cause	→ 🖺 135
Root cause	→ 🖺 135
Reliability of measured zero point	→ 🖺 136
Additional information	→ 🖺 136
Reliability of measured zero point	→ 🖺 136
Zero point measured	→ 🖺 136
Zero point standard deviation	→ 🖺 136
Select action	→ 🖺 136

Parameter overview with brief description

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

Parameter	Description	Selection / User interface	Factory setting
Reliability of measured zero point	Indicates the reliability of the zero point measured.	Not doneGoodUncertain	-
Additional information	Indicate whether to display additional information.	■ Hide ■ Show	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.	 Keep current zero point Apply zero point measured Apply factory zero point* 	Keep current zero point

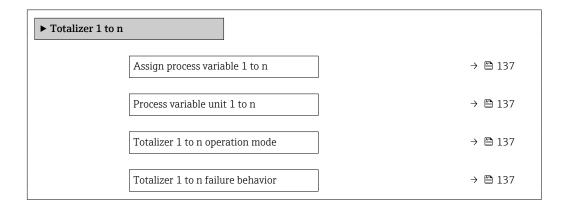
Visibility depends on order options or device settings

10.5.4 Configuring the totalizer

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

Navigation

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



Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable 1 to n	-	Select process variable for totalizer.	Off Mass flow Volume flow Corrected volume flow* Target mass flow* Carrier mass flow* Carrier volume flow* Carrier volume flow* Carrier corrected volume flow* Raw value mass flow	Mass flow
Process variable unit 1 to n	A process variable is selected in the Assign process variable parameter (→ 🖺 137) of the Totalizer 1 to n submenu.	Select the unit for the process variable of the totalizer.	Unit choose list	Depends on country: • kg • lb
Totalizer 1 to n operation mode	A process variable is selected in the Assign process variable parameter ($\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	Select totalizer operation mode, e.g. only totalize forward flow or only totalize reverse flow.	NetForwardReverse	Net
Totalizer 1 to n failure behavior	A process variable is selected in the Assign process variable parameter (→ 🖺 137) of the Totalizer 1 to n submenu.	Select totalizer behavior in the event of a device alarm.	HoldContinueLast valid value + continue	Hold

^{*} Visibility depends on order options or device settings

10.5.5 Carrying out additional display configurations

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

Navigation

"Setup" menu \rightarrow Advanced setup \rightarrow Display

Format display	→ 🖺 140
Value 1 display	→ 🖺 141
0% bargraph value 1	→ 🗎 142
100% bargraph value 1	→ 🖺 142
Decimal places 1	→ 🖺 142
Value 2 display	→ 🗎 142
Decimal places 2	→ 🗎 142
Value 3 display	→ 🗎 142
0% bargraph value 3	→ 🖺 142
100% bargraph value 3	→ 🖺 142
Decimal places 3	→ 🖺 142
Value 4 display	→ 🖺 142
Decimal places 4	→ 🖺 143
Value 5 display	→ 🖺 143
0% bargraph value 5	→ 🖺 143
100% bargraph value 5	→ 🖺 143
Decimal places 5	→ 🖺 143
Value 6 display	→ 🖺 143
Decimal places 6	→ 🖺 143
	→ 🗎 143
	Value 1 display 0% bargraph value 1 100% bargraph value 1 Decimal places 1 Value 2 display Decimal places 2 Value 3 display 0% bargraph value 3 100% bargraph value 3 Decimal places 3 Value 4 display Decimal places 4 Value 5 display 0% bargraph value 5 100% bargraph value 5 Decimal places 5 Value 6 display

0% bargraph value 7	→ 🖺 143
100% bargraph value 7	→ 🖺 143
Decimal places 7	→ 🖺 143
Value 8 display	→ 🗎 143
Decimal places 8	→ 🖺 144
Display language	→ 🖺 144
Display interval	→ 🖺 144
Display damping	→ 🖺 144
Header	→ 🖺 144
Header text	→ 🖺 144
Separator	→ 🖺 144
Backlight	→ 🖺 144

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

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 Dynamic viscosity* Dynamic viscosity Kinematic viscosity* Temp. compensated dynamic viscosity* Temp. compensated kinematic viscosity* Totalizer 1 Totalizer 1 Totalizer 2 Totalizer 3 Concentration* Target mass flow* Carrier mass flow Target volume flow* Carrier volume flow* Carrier corrected volume flow* Carrier corrected volume flow Inhomogeneous medium index Suspended bubbles index* HBSI Raw value mass flow Exciter current 0 Exciter current 0 Exciter current 1 Inhomogeneous medium index Suspended bubbles index* HBSI Raw value mass flow Exciter current 0 Exciter current 1 Oscillation damping 0 Oscillation damping fluctuation 0 Coscillation frequency 0 Coscillation frequency 1 Frequency 1 Frequency fluctuation 1 Oscillation omaplitudin 1	Mass flow

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
			 Signal asymmetry Torsion signal asymmetry Carrier pipe temperature Electronics temperature Sensor index coil asymmetry Test point 0 Test point 1 Current output 1 Current output 2 Current output 3 Current output 4 	
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
Decimal places 1	A measured value is specified in the Value 1 display parameter.	Select the number of decimal places for the display value.	 X X.X X.XX X.XXX X.XXXX X.XXXXX X.XXXXXX 	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 Value 1 display parameter (→ 🖺 126)	None
Decimal places 2	A measured value is specified in the Value 2 display parameter.	Select the number of decimal places for the display value.	X X.X X.XX X.XXX X.XXXX X.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 Value 1 display parameter (→ 🖺 126)	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 Value 3 display parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 3	A measured value is specified in the Value 3 display parameter.	Select the number of decimal places for the display value.	X X.X X.XX X.XXX X.XXXX X.XXXXX 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 Value 1 display parameter (→ 🖺 126)	None

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Decimal places 4	A measured value is specified in the Value 4 display parameter.	Select the number of decimal places for the display value.	X X.X X.XX X.XXX X.XXXX X.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 Value 1 display parameter (→ 🖺 126)	None
0% bargraph value 5	An option was selected in the Value 5 display 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
Decimal places 5	A measured value is specified in the Value 5 display 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
Value 6 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see Value 1 display parameter (→ 126)	None
Decimal places 6	A measured value is specified in the Value 6 display 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 Value 1 display parameter (→ 126)	None
0% bargraph value 7	An option was selected in the Value 7 display 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 Value 7 display parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 7	A measured value is specified in the Value 7 display 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 Value 1 display parameter (→ 🖺 126)	None

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Decimal places 8	A measured value is specified in the Value 8 display 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
Display language	A local display is provided.	Set display language.	 English Deutsch Français Español Italiano Nederlands Portuguesa Polski pусский язык (Russian) Svenska Türkçe 中文 (Chinese) 日本語 (Japanese) 한국어 (Korean) tiếng Việt (Vietnamese) čeština (Czech) 	English (alternatively, the ordered language is preset in the device)
Display interval	A local display is provided.	Set time measured values are shown on display if display alternates between values.	1 to 10 s	5 s
Display damping	A local display is provided.	Set display reaction time to fluctuations in the measured value.	0.0 to 999.9 s	0.0 s
Header	A local display is provided.	Select header contents on local display.	Device tagFree text	Device tag
Header text	The Free text option is selected in the Header parameter.	Enter display header text.	Max. 12 characters, such as letters, numbers or special characters (e.g. @, %, /)	
Separator	A local display is provided.	Select decimal separator for displaying numerical values.	• . (point) • , (comma)	. (point)
Backlight	One of the following conditions is met: Order code for "Display; operation", option F "4-line, illum.; touch control" Order code for "Display; operation", option G "4-line, illum.; touch control +WLAN"	Switch the local display backlight on and off.	DisableEnable	Enable

^{*} 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 settings	
WLAN IP address	→ 🖺 145
Security type	→ 🖺 145
WLAN passphrase	→ 🖺 145
Assign SSID name	→ 🖺 145
SSID name	→ 🖺 145
Apply changes	→ 🖺 145

Parameter overview with brief description

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.	 Unsecured WPA2-PSK EAP-PEAP with MSCHAPv2* EAP-PEAP MSCHAPv2 no server authentic.* EAP-TLS* 	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.	Device tagUser-defined	User-defined
SSID name	 The User-defined option is selected in the Assign SSID name parameter. The WLAN access point option is selected in the WLAN mode parameter. 	Enter the user-defined SSID name (max. 32 characters). 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.	■ Cancel ■ Ok	Cancel

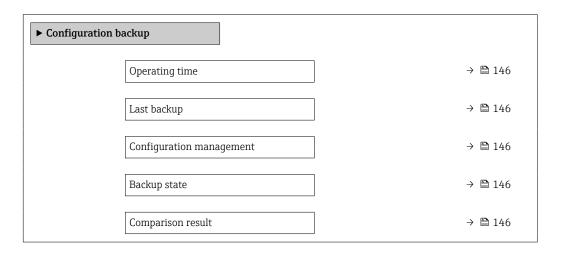
^{*} Visibility depends on order options or device settings

10.5.7 Configuration management

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

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.	 Cancel Execute backup Restore* Compare* Clear backup data 	Cancel
Backup state	Shows the current status of data saving or restoring.	 None Backup in progress Restoring in progress Delete in progress Compare in progress Restoring failed Backup failed 	None
Comparison result	Comparison of current device data with HistoROM backup.	 Settings identical Settings not identical No backup available Backup settings corrupt Check not done Dataset incompatible 	Check not done

Visibility depends on order options or device settings

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Function range of "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 display module from the device memory to the device's HistoROM backup. The backup copy includes the transmitter data of the device.
Compare	The device configuration saved in the device memory is compared with the current device configuration of the HistoROM backup.
Clear backup data	The backup copy of the device configuration is deleted from the memory of the device.

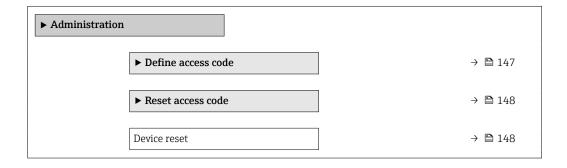
- HistoROM backup
 - $^{ extstyle 2}$ A HistoROM is a "non-volatile" device memory in the form of an EEPROM.
- While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

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 → Advanced setup → Administration

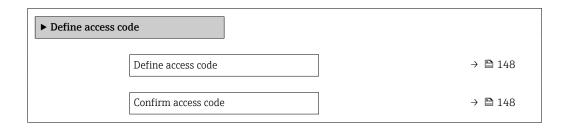


Using the parameter to define the access code

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

Navigation

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



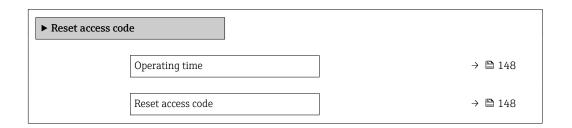
Parameter overview with brief description

Parameter	Description	User entry
Define access code	Specify an access code that is required to obtain the access rights for the Maintenance role.	Max. 16-digit character string comprising numbers, letters and special characters
Confirm access code	Confirm the access code entered for the Maintenance role.	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

Description	User interface / User entry	Factory setting
Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)	_
Enter the code provided by Endress+Hauser Technical Support to reset the Maintenance code. 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)	Character string comprising numbers, letters and special characters	0x00
	Indicates how long the device has been in operation. Enter the code provided by Endress+Hauser Technical Support to reset the Maintenance code. For a reset code, contact your Endress+Hauser service organization. The reset code can only be entered via: Web browser	Indicates how long the device has been in operation. Enter the code provided by Endress+Hauser Technical Support to reset the Maintenance code. For a reset code, contact your Endress+Hauser service organization. The reset code can only be entered via: Web browser Days (d), hours (h), minutes (m) and seconds (s) Character string comprising numbers, letters and special characters numbers, letters and special characters

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.	 Cancel To delivery settings Restart device Restore S-DAT backup * 	Cancel

Visibility depends on order options or device settings

10.6 Simulation

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

Navigation

"Diagnostics" menu \rightarrow Simulation

► Simulation			
Assign simulation pro	cess variable	\rightarrow	🗎 150
Process variable value		\rightarrow	🖺 150
Current input 1 to n s	mulation	\rightarrow	🖺 151
Value current input 1	to n	\rightarrow	🖺 151
Status input 1 to n sin	nulation	\rightarrow	🖺 151
Input signal level 1 to	n	\rightarrow	🖺 151
Current output 1 to n	simulation	\rightarrow	🖺 150
Current output value		\rightarrow	🖺 150
Frequency output 1 to	n simulation	\rightarrow	🖺 150
Frequency output 1 to	n value	\rightarrow	🗎 150
Pulse output simulation	on 1 to n	\rightarrow	🖺 150
Pulse value 1 to n		\rightarrow	🖺 151
Switch output simulat	ion 1 to n	\rightarrow	🖺 151
Switch state 1 to n		\rightarrow	🖺 151
Relay output 1 to n sin	mulation	\rightarrow	🗎 151
Switch state 1 to n		\rightarrow	🖺 151
Pulse output simulation	on	\rightarrow	🖺 151
Pulse value		\rightarrow	🖺 151
Device alarm simulati	on	\rightarrow	🖺 151

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign simulation process variable		Select a process variable for the simulation process that is activated.	Off Mass flow Volume flow Corrected volume flow* Target mass flow * Carrier mass flow * Carrier corrected volume flow * Carrier volume flow * Carrier corrected volume flow * Temperature Dynamic viscosity * Temperature Dynamic viscosity * Temp. compensated dynamic viscosity * Temp. compensated kinematic viscosity * Concentration * Time period signal frequency (TPS) *	Off
Process variable value	A process variable is selected in the Assign simulation process variable parameter (→ 🖺 150).	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Current output 1 to n simulation	-	Switch the simulation of the current output on and off.	Off On	Off
Current output value	In the Current output 1 to n simulation parameter, the On option is selected.	Enter the current value for simulation.	3.59 to 22.5 mA	3.59 mA
Frequency output 1 to n simulation	In the Operating mode parameter, the Frequency option is selected.	Switch the simulation of the frequency output on and off.	• Off • On	Off
Frequency output 1 to n value	In the Frequency simulation 1 to n parameter, the On option is selected.	Enter the frequency value for the simulation.	0.0 to 12 500.0 Hz	0.0 Hz
Pulse output simulation 1 to n	In the Operating mode parameter, the Pulse option is selected.	Set and switch off the pulse output simulation. For Fixed value option: Pulse width parameter (> \exists 112) defines the pulse width of the pulses output.	OffFixed valueDown-counting value	Off

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

^{*} Visibility depends on order options or device settings

10.7 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 →

 ☐ 152
- Protect access to measuring device via write protection switch → 🖺 153

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.

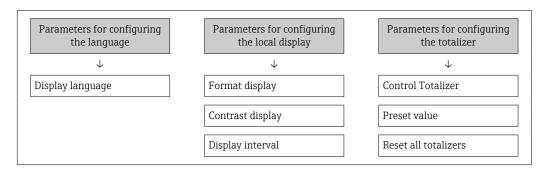
Defining the access code via the local display

- 1. Navigate to the **Define access code** parameter ($\rightarrow \triangleq 148$).
- 2. Maximum of 16-digit character string comprising numbers, letters and special characters as the access code.
- 3. Enter the access code again in the **Confirm access code** parameter (→ 148) to confirm.
 - ► The 🗈 symbol appears in front of all write-protected parameters.
- Disabling parameter write protection via access code \rightarrow $\stackrel{\triangle}{=}$ 76.

 - The user role with which the user is currently logged in is displayed in **Access** status parameter.
 - Navigation path: Operation → Access status
 - User roles and their access rights $\rightarrow \triangleq 76$
- The device automatically locks the write-protected parameters again if a key is not pressed for 10 minutes in the navigation and editing view.
- The device locks the write-protected parameters automatically after 60 s if the user skips back to the operational display mode from the navigation and editing view.

Parameters which can always be modified via the local display

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



Defining the access code via the web browser

- 1. Navigate to the **Define access code** parameter ($\rightarrow \triangleq 148$).
- 2. Define a 16-digit (max.) numeric code as the access code.

- 3. Enter the access code again in the **Confirm access code** parameter (→ 🗎 148) to confirm.
 - ► The web browser switches to the login page.
- Disabling parameter write protection via access code \rightarrow $\stackrel{\triangle}{=}$ 76.
 - If the access code is lost: Resetting the access code \rightarrow $\stackrel{\blacksquare}{=}$ 153.
 - The Access status parameter shows which user role the user is currently logged in with.
 - Navigation path: Operation → Access status

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

Resetting the access code

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

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

- 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 ($\rightarrow \triangleq 148$).
 - The access code has been reset to the factory setting **0000**. It can be redefined $\rightarrow \boxminus 152$.
- 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

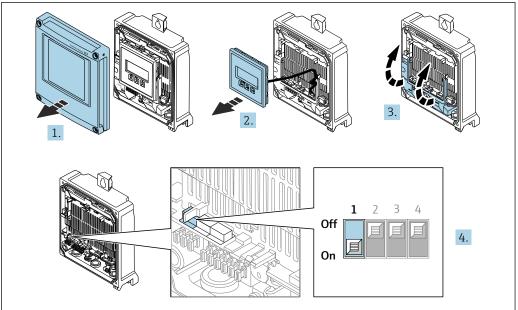
Unlike parameter write protection via a user-specific access code, this allows the user to lock write access to the entire operating menu - apart from the **"Contrast display" parameter**.

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

Enable/disable write protection

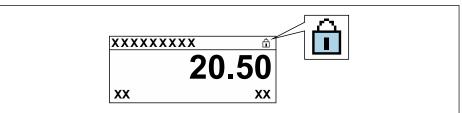


A0029673

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

4. Enable or disable write protection:

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



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- 5. Insert the display module.
- 6. Close the housing cover.

7. NOTICE

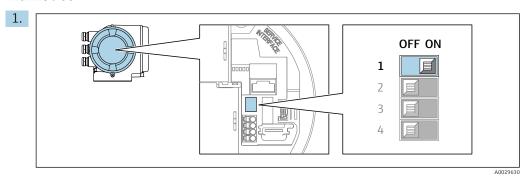
Excessive tightening torque applied to the fixing screws!

Risk of damaging the plastic transmitter.

► Tighten the fixing screws as per the tightening torque: 2.5 Nm (1.8 lbf ft)

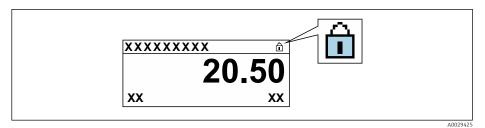
Tighten the fixing screws.

Proline 500



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 $\rightarrow \stackrel{\triangle}{=} 156$. 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.

11 Operation

11.1 Reading the device locking status

Device active write protection: Locking status parameter

Operation → Locking status

Function scope of the "Locking status" parameter

Options	Description
None	The access authorization displayed in the Access status parameter applies → 🖺 76. 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 again.

11.2 Adjusting the operating language



Detailed information:

11.3 Configuring the display

Detailed information:

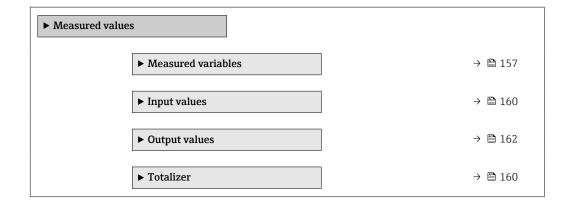
- On the basic settings for the local display $\rightarrow \implies 123$
- On the advanced settings for the local display $\rightarrow \implies 138$

11.4 Reading off measured values

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

Navigation

"Diagnostics" menu → Measured values



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

► Measured varia	ables	
	Mass flow	→ 🖺 158
	Volume flow	→ 🖺 158
	Corrected volume flow	→ 🖺 158
	Density	→ 🖺 158
	Reference density	→ 🖺 158
	Temperature	→ 🖺 158
	Pressure	→ 🖺 158
	Dynamic viscosity	→ 🖺 158
	Kinematic viscosity	→ 🖺 158
	Temp. compensated dynamic viscosity	→ 🖺 158
	Temp. compensated kinematic viscosity	→ 🖺 159
	Concentration	→ 🖺 159
	Target mass flow	→ 🖺 159
	Carrier mass flow	→ 🖺 159
	Target corrected volume flow	→ 🖺 159
	Carrier corrected volume flow	→ 🖺 159
	Target volume flow	→ 🖺 160
	Carrier volume flow	→ 🖺 160

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Mass flow		Displays the mass flow that is currently measured. Dependency The unit is taken from: Mass flow unit parameter (→ 🖺 98)	Signed floating-point number
Volume flow	-	Displays the volume flow that is currently calculated. Dependency The unit is taken from the Volume flow unit parameter (→ 🖺 98).	Signed floating-point number
Corrected volume flow	-	Displays the corrected volume flow that is currently calculated. Dependency The unit is taken from: Corrected volume flow unit parameter (→ 98)	Signed floating-point number
Density	-	Shows the density currently measured. Dependency The unit is taken from the Density unit parameter $(\rightarrow \ \ \ \ \ \)$ 8).	Signed floating-point number
Reference density	-	Displays the reference density that is currently calculated. Dependency The unit is taken from: Reference density unit parameter (→ 198)	Signed floating-point number
Temperature	-	Shows the medium temperature currently measured. Dependency The unit is taken from: Temperature unit parameter (→ 99)	Signed floating-point number
Pressure	-	Displays either a fixed or external pressure value. Dependency The unit is taken from the Pressure unit parameter (→ 🖺 99).	Signed floating-point number
Dynamic viscosity	For the following order code: "Application package", option EG "Viscosity" The software options currently enabled are displayed in the Software option overview parameter.	Displays the dynamic viscosity that is currently calculated. Dependency The unit is taken from: Dynamic viscosity unit parameter	Signed floating-point number
Kinematic viscosity	For the following order code: "Application package", option EG "Viscosity" The software options currently enabled are displayed in the Software option overview parameter.	Displays the kinematic viscosity that is currently calculated. Dependency The unit is taken from: Kinematic viscosity unit parameter	Signed floating-point number
Temp. compensated dynamic viscosity	For the following order code: "Application package", option EG "Viscosity" The software options currently enabled are displayed in the Software option overview parameter.	Displays the temperature compensation that is currently calculated for the viscosity. Dependency The unit is taken from: Dynamic viscosity unit parameter	Signed floating-point number

Parameter	Prerequisite	Description	User interface
Temp. compensated kinematic viscosity	For the following order code: "Application package", option EG "Viscosity" The software options currently	Displays the temperature compensation that is currently calculated for the kinetic viscosity. Dependency	Signed floating-point number
	The software options currently enabled are displayed in the Software option overview parameter.	The unit is taken from: Kinematic viscosity unit parameter (0578)	
Concentration	For the following order code: Order code for "Application package", option ED "Concentration"	Displays the concentration that is currently calculated. Dependency	Signed floating-point number
	The software options currently enabled are displayed in the Software option overview parameter.	The unit is taken from the Concentration unit parameter.	
Target mass flow	With the following conditions: Order code for "Application package", option ED "Concentration"	Displays the mass flow that is currently measured for the target medium. Dependency	Signed floating-point number
	The software options currently enabled are displayed in the Software option overview parameter.	The unit is taken from: Mass flow unit parameter (→ 🖺 98)	
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	Displays the mass flow of the carrier medium that is currently measured. Dependency The unit is taken from: Mass flow unit parameter (→ ■ 98)	Signed floating-point number
Target corrected volume flow	parameter. With the following conditions:	Displays the corrected volume flow that	Signed floating-point
ranger corrected votable now	 Order code for "Application package", option ED "Concentration" The Ethanol in water option or %mass / %volume option is selected in the Liquid type parameter. 	is currently measured for the target fluid. Dependency The unit is taken from the Volume flow unit parameter (→ 98).	number
	The software options currently enabled are displayed in the Software option overview parameter.		
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 (→ 🖺 98).	Signed floating-point number
	The software options currently enabled are displayed in the Software option overview parameter.		

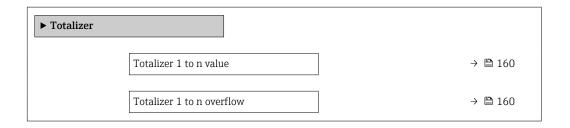
Parameter	Prerequisite	Description	User interface
Target volume flow	With the following conditions: Order code for "Application package", option ED "Concentration" The Ethanol in water option or %mass / %volume option is selected in the Liquid type parameter. The %vol option is selected in the Concentration unit parameter. The software options currently enabled are displayed in the Software option overview parameter.	Displays the volume flow currently measured for the target medium. Dependency The unit is taken from the Volume flow unit parameter (→ ■ 98).	Signed floating-point number
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. The software options currently enabled are displayed in the Software option overview parameter.	Displays the volume flow currently measured for the carrier medium. *Dependency** The unit is taken from the Volume flow unit parameter (→ ● 98).	Signed floating-point number

11.4.2 "Totalizer" submenu

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

Navigation

"Diagnostics" menu \rightarrow Measured values \rightarrow Totalizer



Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Totalizer 1 to n value	A process variable is selected in the Assign process variable parameter (→ 🖺 137) of the Totalizer 1 to n submenu.	Displays the current totalizer counter value.	Signed floating-point number
Totalizer 1 to n overflow	A process variable is selected in the Assign process variable parameter (→ 🖺 137) of the Totalizer 1 to n submenu.	Displays the current totalizer overflow.	Integer with sign

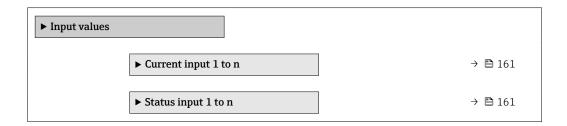
11.4.3 "Input values" submenu

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

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Navigation

"Diagnostics" menu → Measured values → Input values

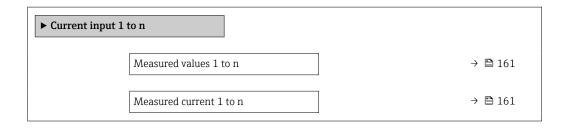


Input values of current input

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

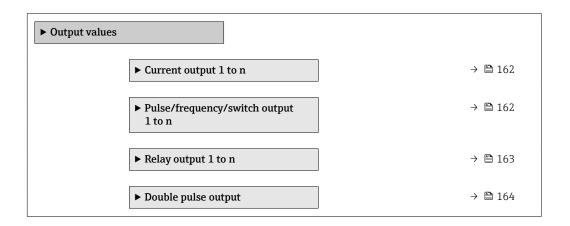
Parameter	Description	User interface
Value status input	Shows the current input signal level.	■ High ■ Low

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 \rightarrow Measured values \rightarrow Output values

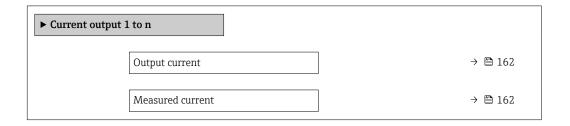


Output values of current output

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 overview with brief description

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

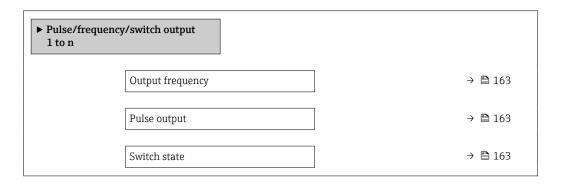
Output values for pulse/frequency/switch output

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

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Navigation

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



Parameter overview with brief description

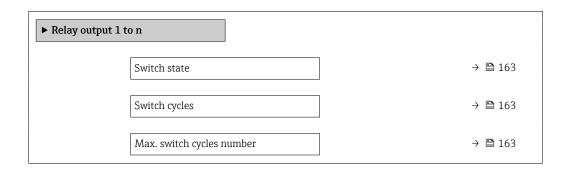
Parameter	Prerequisite	Description	User interface
Output frequency	In the Operating mode parameter, the Frequency option is selected.	Displays the value currently measured for the frequency output.	0.0 to 12 500.0 Hz
Pulse output	The Pulse option is selected in the Operating mode parameter parameter.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

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 overview with brief description

Parameter	Description	User interface
Switch state	Indicates the current switch state of the output.	OpenClosed
Switch cycles	Shows number of all performed switch cycles.	Positive integer
Max. switch cycles number	Shows the maximal number of guaranteed switch cycles.	Positive integer

Output values for double pulse output

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

Navigation

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



Parameter overview with brief description

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

11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Advanced settings using the **Advanced setup** submenu (→ 🖺 130)

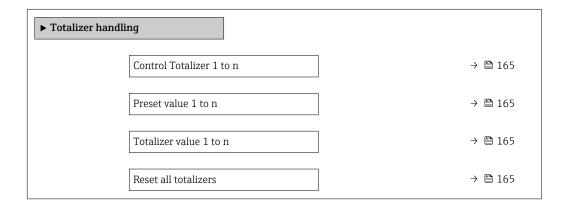
11.6 Performing a totalizer reset

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

- Control Totalizer
- Reset all totalizers

Navigation

"Operation" menu → Totalizer handling



Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Control Totalizer 1 to n	A process variable is selected in the Assign process variable parameter ($\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	Control totalizer value.	 Totalize Reset + hold * Preset + hold * Reset + totalize Preset + totalize * Hold * 	Totalize
Preset value 1 to n	A process variable is selected in the Assign process variable parameter ($\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	Specify start value for totalizer. Dependency The unit of the selected process variable is defined in the Unit totalizer parameter (→ 137) for the totalizer.	Signed floating-point number	Depends on country: • 0 kg • 0 lb
Totalizer 1 to n value	A process variable is selected in the Assign process variable parameter ($\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	Displays the current totalizer counter value.	Signed floating-point number	-
Reset all totalizers	-	Reset all totalizers to 0 and start.	CancelReset + totalize	Cancel

^{*} 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 Preset value parameter.
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.
Preset + totalize 1)	The totalizer is set to the defined start value in the Preset value parameter and the totaling process is restarted.
Hold	Totalizing is stopped.

¹⁾ Visible depending on the order options or device settings

11.6.2 Function range of "Reset all totalizers" parameter

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

11.7 Displaying the measured value history

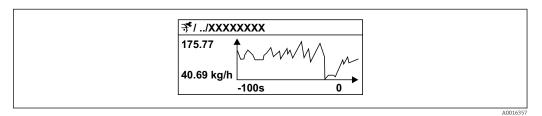
The **Extended HistoROM** application package must be enabled in the device (order option) for the **Data logging** submenu to appear. This contains all the parameters for the measured value history.

- Pata logging is also available via:

 - Web browser

Function scope

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



■ 36 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	→ 🖺 168
Assign channel 2	→ 🖺 169
Assign channel 3	→ 🖺 169
Assign channel 4	→ 🖺 169
Logging interval	→ 🖺 169
Clear logging data	→ 🖺 169
Data logging	→ 🖺 169
Logging delay	→ 🖺 169
Data logging control	→ 🖺 169

Data logging status	→ 🖺 170
Entire logging duration	→ 🖺 170

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign channel 1	The Extended HistoROM application package is available.	Assign process variable to logging channel.	■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow* ■ Density ■ Reference density* ■ Temperature ■ Pressure ■ Dynamic viscosity* ■ Kinematic viscosity* ■ Temp. ■ compensated dynamic viscosity* ■ Temp. ■ compensated kinematic viscosity* ■ Concentration* ■ Target mass flow* ■ Carrier mass flow* ■ Carrier mass flow target 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 ■ Exciter current 0 ■ Exciter current 1 ■ Oscillation damping 0 ■ Oscillation damping fluctuation 0 ■ Oscillation frequency 0 ■ Oscillation frequency 1 ■ Frequency fluctuation 0 ■ Oscillation amplitude* ■ Oscillation amplitude 1	Off

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
			 Oscillation amplitude 1* Signal asymmetry Torsion signal asymmetry* Carrier pipe temperature* Electronics temperature Sensor index coil asymmetry Test point 0 Test point 1 Current output 1 Current output 2 Current output 3 Current output 4* 	
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 Assign channel 1 parameter (→ 168)	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 Assign channel 1 parameter (→ 🖺 168)	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 Assign channel 1 parameter (→ 🖺 168)	Off
Logging interval	The Extended HistoROM application package is available.	Define the logging interval for data logging. This value defines the time interval between the individual data points in the memory.	0.1 to 3 600.0 s	1.0 s
Clear logging data	The Extended HistoROM application package is available.	Clear the entire logging data.	CancelClear data	Cancel
Data logging	-	Select the type of data logging.	OverwritingNot overwriting	Overwriting
Logging delay	In the Data logging parameter, the Not overwriting option is selected.	Enter the time delay for measured value logging.	0 to 999 h	0 h
Data logging control	In the Data logging parameter, the Not overwriting option is selected.	Start and stop measured value logging.	NoneDelete + startStop	None

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Data logging status	In the Data logging parameter, the Not overwriting option is selected.	Displays the measured value logging status.	DoneDelay activeActiveStopped	Done
Entire logging duration	In the Data logging parameter, the Not overwriting option is selected.	Displays the total logging duration.	Positive floating- point number	0 s

Visibility depends on order options or device settings

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.

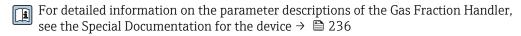
The function continuously checks for the presence of gas bubbles in liquids or droplets in gases, as this second phase influences the output values for flow and density.

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 process 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.

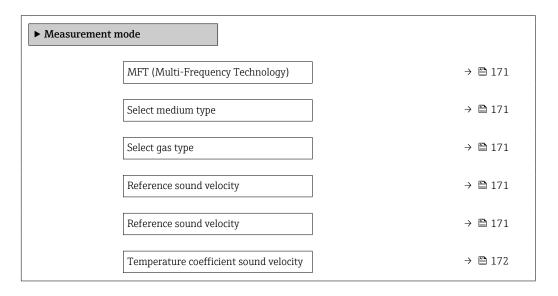
The Gas Fraction Handler is cumulative to any fixed damping constants applied to flow and density that are set elsewhere in the instrument parameterization.



11.8.1 "Measurement mode" submenu

Navigation

"Expert" menu \rightarrow Sensor \rightarrow Measurement mode



→ 🖺 172

Temperature coefficient sound velocity

Gas Fraction Handler \rightarrow 🗎 172

Parameter overview with brief description

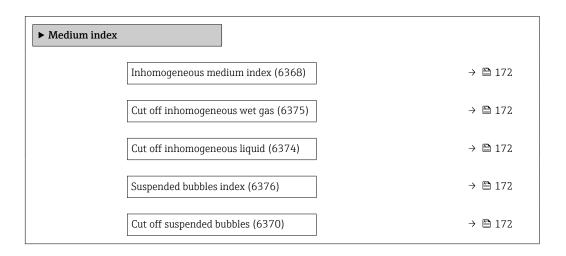
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
MFT (Multi-Frequency Technology)	-	Enable/disable multi- frequency technology to increase the measuring accuracy in the event of microbubbles in the medium.	■ No ■ Yes	Yes
Select medium type	-	Use this function to select the type 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).	LiquidGasOther	Liquid
Select gas type	In the Medium selection submenu, the Gas option is selected.	Select measured gas type.	 Air Ammonia NH3 Argon Ar Sulfur hexafluoride SF6 Oxygen O2 Ozone O3 Nitrogen oxide N2O Nitrogen N2 Nitrogen N2 Nitrogen N2 Nitrogen N2 Methane CH4 Methane CH4 + 10% Hydrogen H2 Methane CH4 + 20% Hydrogen H2 Hydrogen H2 Helium He Hydrogen Sulfide HCI Hydrogen sulfide HCI Hydrogen Sulfide H2S Ethylene C2H4 Carbon dioxide CO2 Carbon monoxide CO Chlorine CI2 Butane C4H10 Propane C3H8 Propylene C3H6 Ethane C2H6 Other 	Methane CH4
Reference sound velocity	In the Select gas type parameter, the Other option is selected.	Enter sound velocity of the gas at 0 $^{\circ}$ C (32 $^{\circ}$ F).	1 to 99 999.9999 m/s	415.0 m/s
Reference sound velocity	In the Select medium type parameter, the Other option is selected.	Enter sound velocity of the medium at 0 $^{\circ}$ C (32 $^{\circ}$ F).	Signed floating-point number	1456 m/s

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Temperature coefficient sound velocity	In the Select gas type parameter, the Other option is selected.	Enter the temperature coefficient for the gas sound velocity.	Positive floating point number	0.87 (m/s)/K
Temperature coefficient sound velocity	In the Select medium type parameter, the Other option is selected.	Enter temperature coefficient for the medium sound velocity.	Signed floating-point number	1.3 (m/s)/K
Gas Fraction Handler	-	Activates the Gas Fraction Handler function for two phase media.	OffModeratePowerful	Moderate

11.8.2 "Medium index" submenu

Navigation

"Expert" menu \rightarrow Application \rightarrow Medium index



Parameter overview with brief description

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

Fault	Possible causes	Remedial action
Local display is dark, but signal output is within the valid range	The cable of the display module is not plugged in correctly.	Insert the plug correctly into the main electronics module and display module.
Local display dark and no output signals	Supply voltage does not match the voltage specified on the nameplate.	Apply the correct supply voltage → 🖺 52→ 🖺 46.
Local display dark and no output signals	Supply voltage has incorrect polarity.	Reverse polarity of supply voltage.
Local display dark and no output signals	No contact between connecting cables and terminals.	Check the electrical contact between the cable and terminals 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 → 🖺 199.
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 cannot be read, but signal output is within the valid range	Display is set too bright or too dark.	■ Set the display brighter by simultaneously pressing
Local display is dark, but signal output is within the valid range	Display module is defective.	Order spare part → 🖺 199.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial actions → 🖺 184
Text on local display appears in a language that cannot be understood.	The selected operating language cannot be understood.	1. Press □ + ⊕ for 2 s ("home position"). 2. Press □. 3. Configure the required language in the Display language parameter (→ □ 144).
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	 Check the cable and the connector between the main electronics module and display module. Order spare part → ■ 199.

For output signals

Fault	Possible causes	Remedial action
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 🖺 199.
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Parameter configuration error	Check and adjust parameter configuration.
Device is measuring 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

Fault	Possible causes	Remedial action
Write access to parameters is not possible.	Hardware write protection is enabled.	Set the write protection switch on the main electronics module to the OFF position → 🗎 153.
Write access to parameters is not possible.	Current user role has limited access authorization.	 Check user role → □ 76. Enter correct customer-specific access code → □ 76.
Connection via Modbus RS485 is not possible.	Modbus RS485 bus cable is connected incorrectly.	Check the terminal assignment $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
Connection via Modbus RS485 is not possible.	Modbus RS485 cable is incorrectly terminated.	Check the terminating resistor \rightarrow $\ \ \ \ \ \ \ \ \ $
Connection via Modbus RS485 is not possible.	Settings for the communication interface are incorrect.	Check the Modbus RS485 configuration → 🖺 99.
Connection to the web server is not possible.	Web server is disabled.	Use the "FieldCare" or "DeviceCare" operating tool to check if the web server of the device is enabled and enable if necessary → 🖺 83.
	The Ethernet interface on the PC is incorrectly configured.	 Check the properties of the Internet protocol (TCP/IP)→ ₱ 79. Check the network settings with the IT manager.
Connection to the web server is not possible.	The IP address on the PC is incorrectly configured.	Check the IP address: 192.168.1.212 → 🖺 79
Connection to the web server is not possible.	WLAN access data are incorrect.	 Check WLAN network status. Log on to the device again using WLAN access data. Check that WLAN is enabled on the measuring instrument and operating unit → ↑ 79.
	WLAN communication is disabled.	-
Unable to connect to web server, FieldCare or DeviceCare.	WLAN network is not available.	 Check if WLAN reception is present: LED on display module is lit blue. Check if WLAN connection is enabled: LED on display module flashes blue. Switch on instrument function.
Network connection not present or unstable	WLAN network is weak.	 Operating unit outside reception range: Check network status on operating unit. To improve network performance, use an external WLAN antenna.
	Parallel WLAN and Ethernet communication	 Check network settings. Temporarily enable only the WLAN as an interface.
Web browser is frozen and operation no longer possible	Data transfer is active.	Wait until data transfer or current action is finished.
	Connection lost	 Check cable connection and power supply. Refresh the web browser and restart if necessary.
Display of web browser content is difficult to read or incomplete.	Web browser version used is not optimal.	 Use correct web browser version → ₱ 78. Empty the web browser cache. Restart the web browser.
	Unsuitable view settings.	Change the font size/display ratio of the web browser.
Incomplete or no display of content in the web browser	JavaScript is not enabled.JavaScript cannot be enabled.	 ► Enable JavaScript. ► Enter http://XXX.XXX.X.X.XX/servlet/basic.html as the IP address.

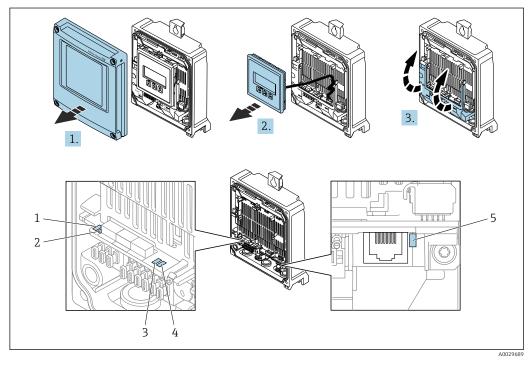
Fault	Possible causes	Remedial action
Operation with FieldCare or DeviceCare via service interface CDI-RJ45 (port 8000) is not possible.	Firewall of the PC or network is blocking communication.	Depending on the settings of the firewall used on the PC or in the network, the firewall must be adapted or disabled to allow FieldCare/ DeviceCare access.
Flashing the firmware with FieldCare or DeviceCare via service interface CDI-RJ45 (port 8000 or TFTP ports) is not possible.	Firewall of the PC or network is blocking communication.	Depending on the settings of the firewall used on the PC or in the network, the firewall must be adapted or disabled to allow FieldCare/ DeviceCare access.

12.2 Diagnostic information via LEDs

12.2.1 Transmitter

Proline 500 - digital

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



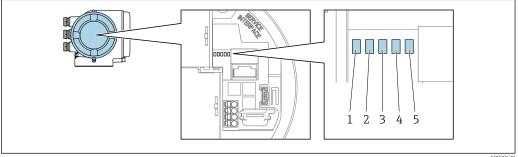
- 1 Supply voltage
- 2 Device status
- 3 Not used4 Communication
- 5 Service interface (CDI) active
- 1. Open the housing cover.
- 2. Remove the display module.
- 3. Fold open the terminal cover.

LED		Color	Meaning
1	Supply voltage	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.	

LED		Color	Meaning
		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 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	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

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



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

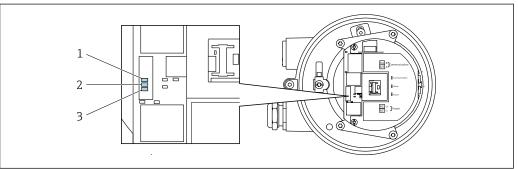
LED		Color	Meaning
1	Supply voltage	Off	Supply voltage is off or too low.
		Green	Supply voltage is OK.
2	Device status (normal	Off	Firmware error
	operation)	Green	Device status is OK.
		Flashing green	Device is not configured.
		Red	A diagnostic event with "Alarm" diagnostic behavior has occurred.
		Flashing red	A diagnostic event with "Warning" diagnostic behavior has occurred.
		Flashing red/green	The device restarts.
2	Device status (during 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.

LED		Color	Meaning
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 LEDs on the ISEM electronics unit (intelligent sensor electronics module) in the sensor connection housing provide information about the device status.



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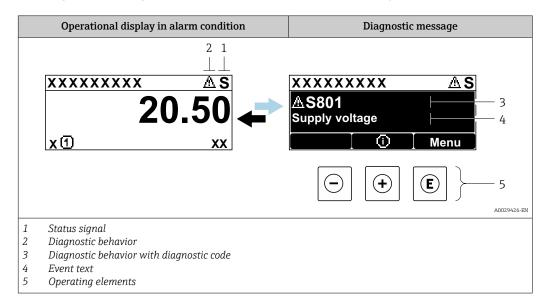
- 1 Communication
- 2 Device status
- 3 Supply voltage

LED		Color	Meaning
1	Communication	White	Communication active.
2 Device state operation)	Device status (normal	Red	Fault
	operation)	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 instrument 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 → 🖺 189
 - Via submenus \rightarrow 🗎 189

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 in accordance with VDI/VDE 2650 and NAMUR Recommendation NE 107:
 - F = Failure
 - C = Function Check
 - S = Out of Specification
 - M = Maintenance Required

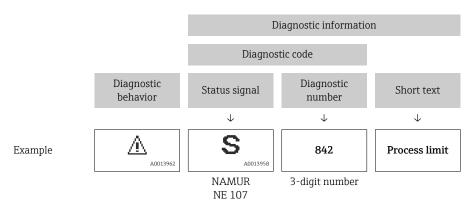
Symbol	Meaning
F	Failure A device error has occurred. The measured value is no longer valid.
С	Function check The device is in the service mode (e.g. during a simulation).
S	Out of specification The device is being operated: Outside its technical specification limits (e.g. outside the process temperature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

Diagnostic behavior

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

Diagnostic information

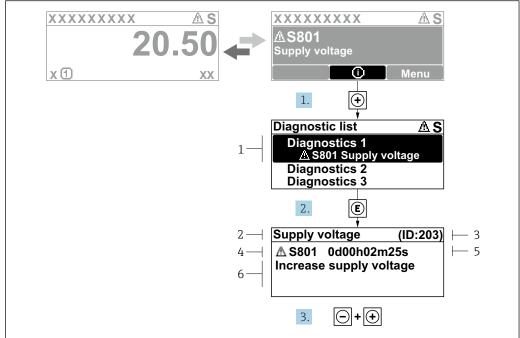
The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.



Operating elements

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

12.3.2 Calling up remedial actions



A0029431-EN

- 37 Message for remedial actions
- 1 Diagnostic information
- 2 Event text
- 3 Service ID
- 4 Diagnostic behavior with diagnostic code
- 5 Operating time of occurrence
- 6 Remedial actions
- 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.

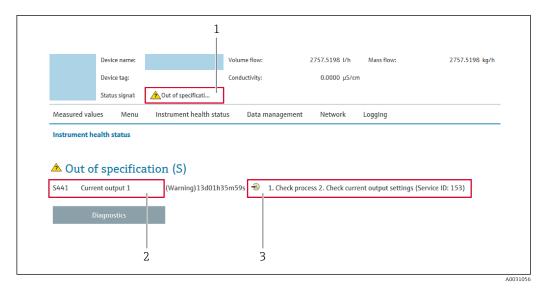
The user is in the **Diagnostics** menu in the **Diagnostic list** submenu. A list of active diagnostics is displayed. The user can select a diagnostic event.

- 1. Press E.
 - ► The message for the remedial actions for the selected diagnostic event opens.
- 2. Press \Box + \pm simultaneously.
 - ► The message about the remedial actions closes.

12.4 Diagnostic information in the web browser

12.4.1 Diagnostic options

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



- 1 Status area with status signal
- 2 Diagnostic information
- 3 Remedial measures with service ID
- In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
 - Via parameter →

 189
 - Via submenu → 🗎 189

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.
V	Function check The device is in service mode (e.g. during a simulation).
<u>^</u>	Out of specification The device is being operated: Outside its technical specification limits (e.g. outside the process temperature range)
&	Maintenance required Maintenance is required. The measured value remains valid.

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

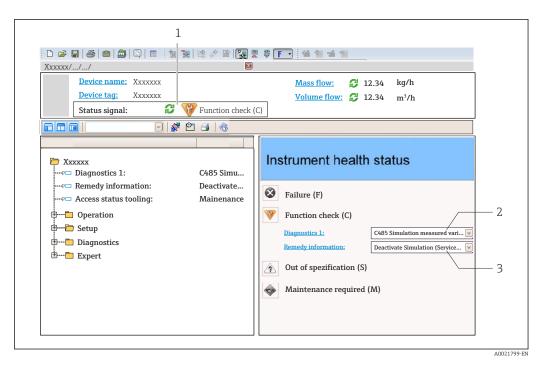
12.4.2 Calling up remedial actions

Remedial actions are provided for each diagnostic event to ensure that problems can be rectified quickly. These actions are displayed 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.

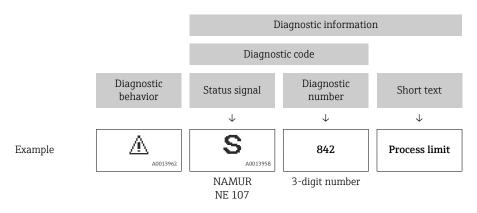


- 3 Remedial actions with service ID
- In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:

 - Via submenu $\rightarrow \implies 189$

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 the ModbusRS485register addresses.

- Via register address **6821** (data type = string): diagnostic code, e.g. F270
- Via register address **6859** (data type = integer): diagnostic number, e.g. 270
- For an overview of diagnostic events with diagnosis number and diagnosis code $\rightarrow \stackrel{\square}{=} 184$

12.6.2 Configuring error response mode

The error response mode for Modbus RS485 communication can be configured in the **Modbus configuration** submenu using 1 parameter.

Navigation path

Setup → Communication

Parameter overview with brief description

Parameter	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.	 NaN value Last valid value NaN = not a number 	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 only displayed in the Event logbook submenu (Event list submenu) and is not displayed in alternating sequence with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

12.8 Overview of diagnostic information

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

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
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	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	M	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	M	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	M	Warning
437	Configuration incompatible	Update firmware Execute factory reset	F	Alarm
438	Dataset different	Check dataset file Check device parameterization Download new device parameterization	М	Warning
441	Current output 1 to n saturated	Check current output settings Check process	S	Warning 1)
442	Frequency output 1 to n saturated	Check frequency output settings Check process	S	Warning 1)
443	Pulse output 1 to n saturated	Check pulse output settings Check process	S	Warning 1)
444	Current input 1 to n saturated	Check current input settings Check connected device Check process	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 1 to n 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 1 to n simulation active	Deactivate simulation frequency output	С	Warning
493	Pulse output simulation active	Deactivate simulation pulse output	С	Warning
494	Switch output 1 to n simulation active	Deactivate simulation switch output	С	Warning
495	Diagnostic event simulation active	Deactivate simulation	С	Warning
496	Status input 1 to n 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	Configuration 1. Check IP addresses in network F 2. Change IP address		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 1 simulation	Deactivate simulation pulse output	С	Warning
594	Relay output 1 to n simulation active	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	Check wiring 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 1)

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	Low flow cut off active! Check low flow cut off configuration	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 1)
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

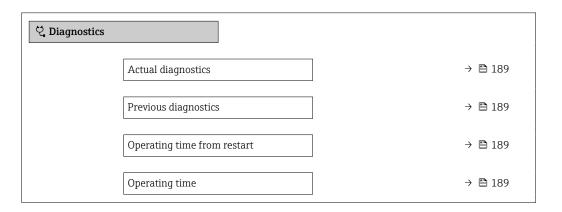
The **Diagnostics** menu allows the user to view the current diagnostic event and the previous diagnostic event separately.

- Accessing the remedial action for a diagnostic event:

 Via local display → 🖺 178
 - Via web browser → 🗎 180
 - Via "FieldCare" operating tool → 🖺 181
 - Via "DeviceCare" operating tool → 🗎 181
- Other pending diagnostic events can be displayed in the **Diagnostic list** submenu $\rightarrow \cong 189$.

Navigation

"Diagnostics" menu



Parameter overview with brief description

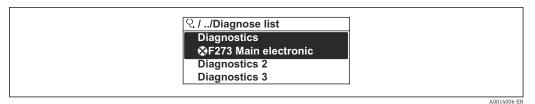
Parameter	Prerequisite	Description	User interface
Actual diagnostics	A diagnostic event has occurred.	Shows the current occured diagnostic event along with its diagnostic information.	Symbol for diagnostic behavior, diagnostic code and short message.
		If two or more messages occur simultaneously, the 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 are displayed in the **Diagnostic list** submenu along with the associated diagnostic information. If more than 5 diagnostic events are pending, the events with the highest priority are shown on the display.

Navigation path

Diagnostics → Diagnostic list



■ 38 Using the example of the local display

Accessing the remedial action for a diagnostic event:

- Via local display →

 178
- Via "FieldCare" operating tool → 🖺 181
- Via "DeviceCare" operating tool → 🖺 181

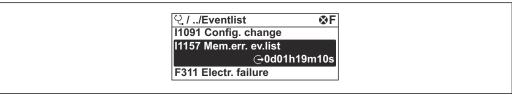
12.11 Event logbook

12.11.1 Reading out the event logbook

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

Navigation path

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



A0014008-EN

■ 39 Using the example of the local display

- A maximum of 20 event messages can be displayed in chronological order.
- If the **Extended HistoROM** application package (order option) is enabled in the device, the event logbook can contain up to 100 entries.

The event history includes entries for:

- Diagnostic events → 🖺 184
- Information events → 🖺 191

In addition to the operating time when the event occurred, each event is also assigned a symbol that indicates whether the event has occurred or is finished:

- Diagnostic event
 - ①: Occurrence of the event
 - 🕒: End of the event
- Information event
 - €: Occurrence of the event
- Accessing the remedial action for a diagnostic event:
 - Via local display \rightarrow 🗎 178
 - Via web browser \rightarrow 🗎 180
 - Via "FieldCare" operating tool → 181
- Filtering the displayed event messages $\rightarrow = 191$

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 device

The entire device configuration or some of the configuration can be reset to a defined state with the **Device reset** parameter ($\rightarrow \triangleq 148$).

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12.12.1 Function scope of the "Device reset" parameter

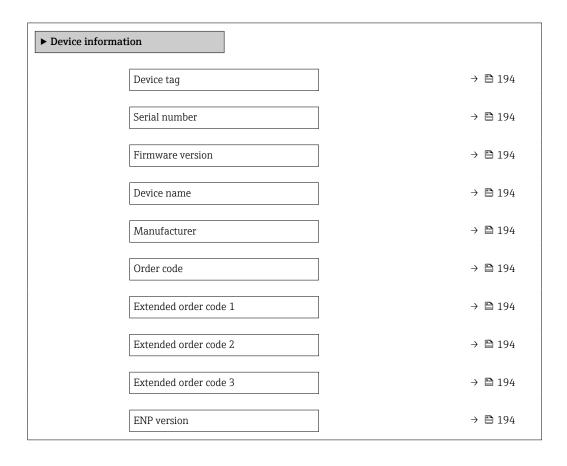
Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to the customer-specific value. All other parameters are reset to the factory setting.
Restart device	The restart 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	-
Manufacturer	Displays the manufacturer.	Character string comprising numbers, letters and special characters	Endress+Hauser
Order code	Shows the device order code. The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field.	Character string composed of letters, numbers and certain punctuation marks (e.g. /).	-
Extended order code 1	Shows the 1st part of the extended order code. The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-
Extended order code 2	Shows the 2nd part of the extended order code. The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-
Extended order code 3	Shows the 3rd part of the extended order code. The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-
ENP version	Shows the version of the electronic nameplate (ENP).	Character string	2.02.00

12.14 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware Changes	Documentation type	Documentation
08.2022	01.06.zz	Option 58	 New gas type: methane with hydrogen Eight display values on local display Zero verification and zero adjustment wizard New density unit: "API New diagnostic parameters Additional languages for Heartbeat Technology Reports 	Operating Instructions	BA01542D/06/EN/05.22
09.2019	01.05.zz	Option 64	 Gas fraction handler Adaptive filter, gas entrainment index Application- specific input module Upgrading of the petroleum application package 	Operating Instructions	BA01542D/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 ■ Viscosity 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 Technology 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 Technology feature update ■ Local display - support for WLAN infrastructure mode ■ Implementation of reset code	Operating Instructions	BA01542D/06/EN/02.17
08.2016	01.00.zz	Option 76	Original firmware	Operating Instructions	BA01542D/06/EN/01.16

It is possible to flash the firmware to the current version or an existing previous version via the service interface. For the compatibility of the firmware version, see the "Device history and compatibility" section



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 \rightarrow Downloads
- Specify the following details:
 - Product root: e.g. 8I5B 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

13 Maintenance

13.1 Maintenance work

No special maintenance work is required.

13.1.1 Cleaning

Cleaning of surfaces not in contact with the medium

- 1. Recommendation: Use a lint-free cloth that is either dry or slightly dampened using water
- 2. Do not use sharp objects or aggressive cleaning agents that could damage surfaces (e.g. displays, housing) and seals.
- 3. Do not use high-pressure steam.
- 4. Ensure compliance with the protection class of the device.

NOTICE

Cleaning agents can damage the surfaces!

Incorrect cleaning agents can damage the surfaces!

▶ Do not use cleaning agents containing concentrated mineral acids, alkalis or organic solvents e.g. benzyl alcohol, methylene chloride, xylene, concentrated glycerol cleaners or acetone.

Cleaning of surfaces in contact with the medium

Note the following for cleaning and sterilization in place (CIP/SIP):

- Use only cleaning agents to which the materials in contact with the medium are sufficiently resistant.
- Observe the permitted maximum medium temperature.

13.2 Measuring and test equipment

Endress+Hauser offers a variety of measuring and testing equipment, such as Netilion or device tests.

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

List of some of the measuring and testing equipment: $\rightarrow \stackrel{\triangle}{=} 202$

13.3 Maintenance services

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

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

14 Repair

14.1 General notes

14.1.1 Repair and conversion concept

The Endress+Hauser repair and conversion concept provides for the following:

- The measuring devices have a modular design.
- Spare parts are grouped into logical kits with the associated Installation Instructions.
- Repairs are carried out by Endress+Hauser Service or by appropriately trained customers.
- Certified devices can only be converted to other certified devices by Endress+Hauser Service or at the factory.

14.1.2 Notes for repair and conversion

For repair and conversion of a measuring device, observe the following notes:

- ▶ Use only original Endress+Hauser spare parts.
- ▶ Carry out the repair according to the Installation Instructions.
- ▶ Observe the applicable standards, federal/national regulations, Ex documentation (XA) and certificates.
- ▶ Document all repairs and conversions and enter the details in Netilion Analytics.

14.2 Spare parts

Device Viewer (www.endress.com/deviceviewer):

All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.

- Measuring device serial number:
 - Is located on the nameplate of the device.

14.3 Repair 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: https://www.endress.com
- 2. If returning the device, pack the device in such a way that it is reliably protected against impact and external influences. The original packaging provides the best protection.

14.5 **Disposal**



If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

14.5.1 Removing the measuring instrument

1. Switch off the device.

WARNING

Danger to persons from process conditions!

- ▶ Beware of hazardous process conditions such as pressure in the measuring instrument, high temperatures or aggressive media.
- 2. Carry out the installation and connection steps from the "Installing the device" and "Connecting the device" sections in reverse order. Observe the safety instructions.

14.5.2 Disposing of the measuring instrument

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.q. 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.

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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

Accessory	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. ■ Further information on the WLAN interface → ■ 86. ■ 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
Protective cover Transmitter Proline 500 – digital Proline 500	Is used to protect the measuring instrument 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 instrument (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 instrument (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.	
	Use the order code with the product root DK8003.	
	Special Documentation SD02158D	

15.2 Service-specific accessories

Accessory	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring instruments: Choice of measuring instruments for industrial requirements Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and measurement accuracy. Graphic display of the calculation results Determining 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
Netilion	lloT ecosystem: Unlock knowledge With the Netilion IIoT ecosystem, Endress+Hauser allows you to optimize your plant performance, digitize workflows, share knowledge, and enhance collaboration. Based on decades of experience in process automation, Endress+Hauser offers the process industry an lloT ecosystem that enables you to gain useful insights from data. These insights can be used to optimize processes, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant. www.netilion.endress.com

Accessory	Description
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all intelligent field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. Operating Instructions BA00027S and BA00059S
DeviceCare	Tool to connect and configure Endress+Hauser field devices.
	Technical Information: TI01134SInnovation 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.
	 Technical Information TI00133R Operating Instructions BA00247R
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.
	 Technical Information TI00426P and TI00436P Operating Instructions BA00200P and BA00382P
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.
	"Fields of Activity" document FA00006T

16 Technical data

16.1 Application

The measuring device is intended only for the flow measurement of liquids and gases.

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.	
	For information on the structure of the measuring instrument $\rightarrow \stackrel{\triangle}{=} 13$	

16.3 Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature
- Viscosity

Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

Measuring range

Measuring range for liquids

DN		Measuring range full scale 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 6 500	0 to 238.9
15 FB	½ FB	0 to 18000	0 to 661.5
25	1	0 to 18000	0 to 661.5
25 FB	1 FB	0 to 45 000	0 to 1654
40	1½	0 to 45 000	0 to 1654
40 FB	1½ FB	0 to 70 000	0 to 2 573
50	2	0 to 70 000	0 to 2 573
50 FB	2 FB	0 to 180 000	0 to 6615
80	3	0 to 180 000	0 to 6615
FB = Full bore		1	

Measuring range for gases

The full scale value depends on the density and the speed of sound of the gas used. The full scale value can be calculated with the following formulas:

- $\dot{m}_{max(G)}$ = minimum ($\dot{m}_{max(F)} \cdot \rho_G : x$)
- $\dot{m}_{max(G)}$ = minimum $(\rho_G \cdot (c_G/2) \cdot d_i^2 \cdot (\pi/4) \cdot 3600 \cdot n)$

m _{max(G)}	Maximum full scale value for gas [kg/h]
m _{max(F)}	Maximum full scale value for liquid [kg/h]
$\dot{m}_{\max(G)} < \dot{m}_{\max(F)}$	$\dot{m}_{\mathrm{max}(G)}$ can never be greater than $\dot{m}_{\mathrm{max}(F)}$
$ ho_{G}$	Gas density in [kg/m³] at operating conditions
х	Limitation constant for max. gas flow [kg/m³]
\mathbf{c}_{G}	Speed of sound (gas) [m/s]
d _i	Measuring tube internal diameter [m]
π	Pi
n = 1	Number of measuring tubes

DN		x
[mm]	[in]	[kg/m³]
8	3/8	60
15	1/2	80
15 FB	½ FB	90
25	1	90
25 FB	1 FB	90
40	1½	90
40 FB	1½ FB	90
50	2	90
50 FB	2 FB	110
80	3	110
FB = Full bore		

If calculating the full scale value using the two formulas:

- 1. Calculate the full scale value with both formulas.
- 2. The smaller value is the value that must be used.

Recommended measuring range

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 measurement accuracy of certain measured variables or to calculate the corrected volume flow for gases, the automation system can continuously write different measured values to the measuring instrument:

- Operating pressure to increase measurement accuracy (Endress+Hauser recommends the use of a pressure measuring instrument for absolute pressure, e.g. Cerabar M or Cerabar S)
- Medium temperature to increase measurement accuracy (e.g. iTEMP)
- Reference density for calculating the corrected volume flow for gases
- Yarious pressure and temperature measuring devices can be ordered from Endress +Hauser: see "Accessories" section → 🗎 203

It is recommended to read in external measured values to calculate the corrected volume flow.

Current input

The measured values are written from the automation system to the measuring device via the current input $\rightarrow \, \cong \, 207$.

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	 4 to 20 mA (active) 0/4 to 20 mA (passive)
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	PressureTemperatureDensity

Status input

Maximum input values	■ DC -3 to 30 V ■ If status input is active (ON): $R_i > 3 \text{ k}\Omega$
Response time	Configurable: 5 to 200 ms
Input signal level	 Low signal: DC -3 to +5 V High signal: DC 12 to 30 V
Assignable functions	 Off Reset the individual totalizers separately Reset all totalizers Flow override

16.4 Output

Output signal

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 range	Can be set to: 4 to 20 mA NAMUR 4 to 20 mA US 4 to 20 mA 0 to 20 mA note is active)
Maximum output values	22.5 mA
Open-circuit voltage	DC 28.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	0 to 700 Ω
Resolution	0.38 μΑ
Damping	Configurable: 0 to 999.9 s
Assignable measured variables	 Mass flow Volume flow Corrected volume flow Density Reference density Temperature Electronics temperature Oscillation frequency 0 Oscillation damping 0 Signal asymmetry Exciter current 0 The range of options increases if the measuring device has one or more application packages.

Pulse/frequency/switch output

Function	Can be configured as pulse, frequency or switch output
Version	Open collector
	Can be set to: ■ Active ■ Passive ■ Passive NAMUR Ex-i, passive
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Voltage drop	For 22.5 mA: ≤ DC 2 V
Pulse output	
Maximum input values	DC 30 V, 250 mA (passive)

Maximum output current	22.5 mA (active)
Open-circuit voltage	DC 28.8 V (active)
Pulse width	Configurable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	•
Assignable measured variables	Configurable Mass flow Volume flow Corrected volume flow
	The range of options increases if the measuring device has one or more application packages.
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 $10000\text{Hz}(f_{\text{max}}=12500\text{Hz})$
Damping	Configurable: 0 to 999.9 s
Pulse/pause ratio	1:1
Assignable measured variables	 Mass flow Volume flow Corrected volume flow Density Reference density Temperature Electronics temperature Oscillation frequency 0 Oscillation damping 0 Signal asymmetry Exciter current 0 The range of options increases if the measuring device has one or more application packages.
Switch output	application packages.
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Switching behavior	Binary, conductive or non-conductive
Switching delay	Configurable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	 Disable On Diagnostic behavior Limit Mass flow Volume flow Corrected volume flow Density Reference density Temperature Totalizer 1-3 Flow direction monitoring Status Partially filled pipe detection Low flow cut off The range of options increases if the measuring device has one or more application packages.

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

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

Current output 4-20 mA	
Failure mode	Configurable: 4 to 20 mA in accordance with NAMUR recommendation NE 43 4 to 20 mA in accordance with US Min. value: 3.59 mA Max. value: 22.5 mA Definable value between: 3.59 to 22.5 mA Actual value Last valid value
Current output 4-20 mA	
Failure mode	Configurable: Maximum alarm: 22 mA Definable value between: 0 to 20.5 mA

Pulse/frequency/switch output

Pulse output		
Failure mode	Configurable: • Actual value • No pulses	
Frequency output		
Failure mode	Configurable: Actual value O Hz Definable value between: 2 to 12 500 Hz	
Switch output		
Failure mode	Configurable: Current status Open Closed	

Relay output

Failure mode	Choose from:
	Current statusOpen
	■ Closed

Local display

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



Status signal as per NAMUR recommendation NE 107

Interface/protocol

- Via digital communication: Modbus RS485
- Via service interface
 - Service interface CDI-RJ45
 - WLAN interface
- Plain text display

With information on cause and remedial actions

Web browser

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

LEDs

Status information	Status indicated by various LEDs	
	The following information is displayed depending on the device version: Supply voltage active Data transmission active Device alarm/error has occurred	
	Diagnostic information via LEDs → 🖺 175	

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 protective ground connection (PE)

Protocol-specific data

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

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Broadcast messages	Supported by the following function codes: O6: Write single registers 16: Write multiple registers 23: Read/write multiple registers	
Supported baud rate	 1 200 BAUD 2 400 BAUD 4 800 BAUD 9 600 BAUD 19 200 BAUD 38 400 BAUD 57 600 BAUD 115 200 BAUD 	
Data transmission mode	• ASCII • RTU	
Data access	Each device parameter can be accessed via Modbus RS485. For Modbus register information	
Compatibility with earlier model		
System integration	Information regarding system integration → ■ 90. Modbus RS485 information Function codes Register information Response time Modbus data map	

16.5 Power supply

Terminal assignment

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Supply voltage

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

Overcurrent	: protection
element	

The device must be operated with a dedicated circuit breaker, as it does not have an ON/OFF switch of its own.

- The circuit breaker must be easy to reach and labeled accordingly.
- Permitted nominal current of the circuit breaker: 2 A up to maximum 10 A.

Electrical connection

- → **1** 41
- **■** → **□** 48

Potential equalization

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Terminals

Spring-loaded terminals: Suitable for strands and strands with ferrules. Conductor cross-section 0.2 to 2.5 mm² (24 to 12 AWG).

Cable entries

- Cable gland: M20 \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

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Overvoltage protection

Mains voltage fluctuations	→ 🖺 213	
Overvoltage category	Overvoltage category II	
Short-term, temporary overvoltage	Between cable and ground up to 1200 V, for max. 5 s	
Long-term, temporary overvoltage	Between cable and ground up to 500 V	

16.6 Performance characteristics

Reference operating conditions

- Error limits based on ISO 11631
- Water
 - +15 to +45 °C (+59 to +113 °F)
 - 2 to 6 bar (29 to 87 psi)
- Data as indicated in the calibration protocol
- Accuracy based on accredited calibration rigs according to ISO 17025
- To obtain measured errors, use the *Applicator* sizing tool $\rightarrow \triangle 202$

Maximum measurement error

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

Base accuracy

Mass flow and volume flow (liquids) ±0.10 % o.r.

Mass flow (gases)

±0.50 % o.r.

Density (liquids)

Under reference conditions	Standard density calibration 1)	Wide-range Density specification ^{2) 3)}
[g/cm³]	[g/cm³]	[g/cm³]
±0.0005	±0.02	±0.004

- 1) Valid over the entire temperature and density range $\,$
- Valid range for special density calibration: 0 to 2 g/cm³, +10 to +80 $^{\circ}$ C (+50 to +176 $^{\circ}$ 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	0.150	0.0055	
15	1/2	0.488	0.0179	
15 FB	½ FB	1.350	0.0496	
25	1	1.350	0.0496	
25 FB	1 FB	3.375	0.124	
40	1½	3.375	0.124	
40 FB	1½ FB	5.25	0.193	
50	2	5.25	0.193	
50 FB	2 FB	13.5	0.496	
80	3	13.5	0.496	
FB = Full bore	1	1	,	

Flow values

Flow values as turndown parameters depending on 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	6500	650	325	130	65	13
15 FB	18 000	1800	900	360	180	36
25	18 000	1800	900	360	180	36
25 FB	45 000	4500	2 2 5 0	900	450	90
40	45 000	4500	2 2 5 0	900	450	90
40 FB	70 000	7 000	3 500	1400	700	140
50	70 000	7 000	3 500	1400	700	140

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]
50 FB	180 000	18000	9000	3 600	1800	360
80	180 000	18000	9000	3 600	1800	360
FB = Full bore	2					

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
½ FB	661.5	66.15	33.08	13.23	6.615	1.323
1	661.5	66.15	33.08	13.23	6.615	1.323
1 FB	1654	165.4	82.70	33.08	16.54	3.308
1½	1654	165.4	82.70	33.08	16.54	3.308
1½ FB	2 573	257.3	128.7	51.46	25.73	5.146
2	2 573	257.3	128.7	51.46	25.73	5.146
2 FB	6 6 1 5	661.5	330.8	132.3	66.15	13.23
3	6 6 1 5	661.5	330.8	132.3	66.15	13.23
FB = Full bore						

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

ightharpoonup Design fundamentals ightarrow ightharpoonup 218

Mass flow and volume flow (liquids)

±0.05 % o.r.

Mass flow (gases)

±0.25 % 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

o.f.s. = of full scale value

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

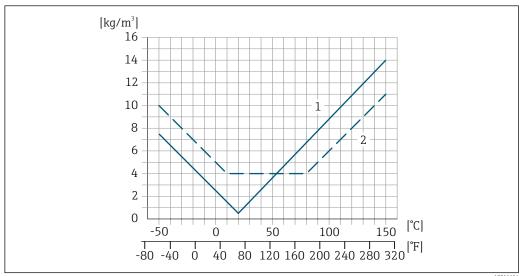
The influence is reduced when the zero adjustment is performed at process temperature.

Density

If there is a difference between the density calibration temperature and the process temperature, the measurement 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 ($\Rightarrow \triangleq 214$) the measurement error is $\pm 0.0001 \text{ g/cm}^3$ /°C ($\pm 0.00005 \text{ g/cm}^3$ /°F)



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- 1 Field density adjustment, for example at +20 $^{\circ}$ C (+68 $^{\circ}$ 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 following shows how the process pressure (gauge pressure) affects the accuracy of the mass flow.

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
- 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	no effect	no effect	
15	1/2	no effect	no effect	
15 FB	½ FB	+0.003	+0.0002	
25	1	+0.003	+0.0002	
25 FB	1 FB	no effect	no effect	
40	11/2	no effect	no effect	
40 FB	1½ FB	no effect	no effect	
50	2	no effect	no effect	
50 FB	2 FB	no effect	no effect	
80	3	no effect	no effect	
FB = Full bore				

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

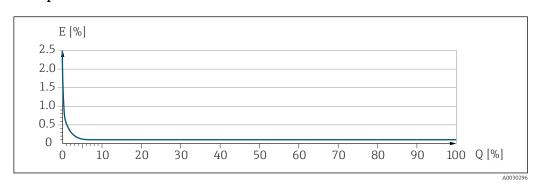
Calculation of the maximum measured error as a function of the flow rate

Flow rate	Maximum measured error in % o.r.
$\geq \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$	± BaseAccu
A0021332	AUU21339
$< \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$	± ZeroPoint MeasValue · 100
A0021333	A0021334

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

Flow rate		Maximum repeatability in % o.r.	
$\geq \frac{\frac{1}{2} \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$		± BaseRepeat	
	A0021335	A00213	40
< ½· ZeroPoint BaseRepeat · 100		± ½ · ZeroPoint MeasValue · 100	
	A0021336	A00213	37

Example of maximum measurement error



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

16.7 Installation

Installation requirements

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16.8 Environment

Ambient temperature range

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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)
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 $4 \text{ to } 95\%$.
Operating height	According to EN 61010-1 ≤ 2 000 m (6 562 ft)

Degree of protection

Transmitter

- IP66/67, Type 4X enclosure, suitable for pollution degree 4
- When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2
- Display module: IP20, Type 1 enclosure, suitable for pollution degree 2

Sensor

- IP66/67, Type 4X enclosure, suitable for pollution degree 4
- When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2

Optional

Order code for "Sensor options", option CM "IP69"

External WLAN antenna

IP66/67, type 4X enclosure

Vibration resistance and shock resistance

Sinusoidal vibration similar to IEC 60068-2-6

Sensor

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

Transmitter

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

Broadband random vibration similar to IEC 60068-2-64

Sensor

- 10 to 200 Hz, $0.003 \text{ g}^2/\text{Hz}$
- 200 to 2000 Hz, 0.001 g²/Hz
- Total: 1.54 g rms

Transmitter

- 10 to 200 Hz, 0.01 q²/Hz
- 200 to 2000 Hz, 0.003 q²/Hz
- Total: 2.70 g rms

Half-sine shocks similar to IEC 60068-2-27

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

Rough handling shocks similar to IEC 60068-2-31

Mechanical load

Transmitter housing and sensor connection housing:

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

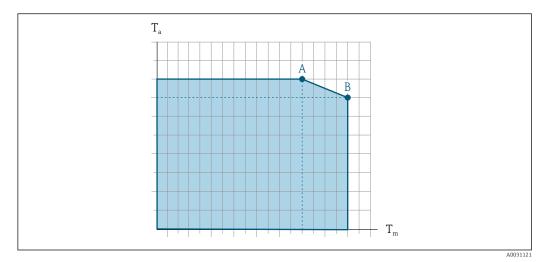
Electromagnetic compatibility (EMC)

- As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21), NAMUR Recommendation 21 (NE 21) is fulfilled when the device is installed in accordance with NAMUR Recommendation 98 (NE 98).
- As per IEC/EN 61000-6-2 and IEC/EN 61000-6-4
- Details are provided in the Declaration of Conformity.
- This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.

16.9 Process

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

Dependency of ambient temperature on medium temperature



40 Exemplary representation, values in the table below.

- *T_a* 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 $\Rightarrow \triangleq 236$.

	Not insulated			Insulated				
	A		В		A		В	
Version	Ta	T_{m}	Ta	T _m	Ta	T_{m}	Ta	T _m
Promass I 500 – digital	60°C	140 °C	55 ℃	150 ℃	60 ℃	90 ℃	45 °C	150 °C
Promass I 500	(140°F)	(284°F)	(131°F)	(302°F)	(140°F)	(194°F)	(113°F)	(302 °F)

Medium density

0 to 5000 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 a measuring tube fails (e.g. due to process characteristics like corrosive or abrasive fluids), the fluid will initially be contained by the sensor housing.

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").

DN		Sensor housing burst pressure		
[mm]	[in]	[bar]	[psi]	
8	3/8	220	3 190	
15	1/2	220	3 190	
15 FB	½ FB	235	3 408	
25	1	235	3 408	
25 FB	1 FB	220	3 190	
40	11/2	220	3 190	
40 FB	1 ½ FB	235	3 408	
50	2	235	3 408	
50 FB	2 FB	460	6670	
80	3	460	6670	
FB = Full bore				



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

Internal cleaning

- CIP cleaning
- SIP cleaning
- Cleaning with pigs

Options

Oil- and grease-free version for wetted parts, without declaration Order code for "Service", option HA $^{\,2)}$

Flow limit

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

²⁾ Cleaning only refers to the measuring instrument. Any accessories that have been supplied are not cleaned.

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale
- For the most common 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).
- For gas measurement the following rules apply:
 - The flow velocity in the measuring tubes should not exceed half the speed of sound (0.5 Mach)
 - The maximum mass flow depends on the density of the gas: formula $\rightarrow \triangleq 205$
- To calculate the flow limit, use the *Applicator* sizing tool $\rightarrow \triangleq 202$

Pressure loss

To calculate the pressure loss, use the *Applicator* sizing tool $\rightarrow \triangle 202$

System pressure

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Mechanical construction 16.10

Design, dimensions



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

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)
- Proline 500 cast, stainless: 15.6 kg (34.4 lbs)

Sensor

- Sensor with cast connection housing version, stainless: +3.7 kg (+8.2 lbs)
- Sensor with aluminum connection housing version:

Weight in SI units

DN [mm]	Weight [kg]
8	11
15	13
15 FB	19
25	20
25 FB	39
40	40
40 FB	65
50	67
50 FB	118
80	122
FB = Full bore	

Weight in US units

DN [in]	Weight [lbs]
3/8	24
1/2	29
½ FB	42
1	44
1 FB	86
1½	88
1½ FB	143
2	148
2 FB	260
3	269
FB = Full bore	

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

Window material

Order code for "Transmitter housing":

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

Fixing components for pipe mounting

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

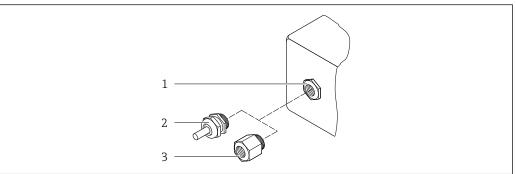
Sensor connection housing

Order code for "Sensor connection housing":

- Option A "Aluminum coated": aluminum, AlSi10Mq, 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)
- Option L "Cast, stainless": 1.4409 (CF3M) similar to 316L

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Cable entries/cable glands



A002064

- \blacksquare 41 Possible cable entries/cable glands
- 1 Internal thread M20 \times 1.5
- 2 Cable gland $M20 \times 1.5$
- 3 Adapter for cable entry with internal thread G ½" or NPT ½"

Cable entries and adapters	Material
Cable gland M20 × 1.5	Plastic
■ Adapter for cable entry with female thread G ½" ■ Adapter for cable entry with female thread NPT ½"	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" Option L "Cast, stainless" Proline 500: Option B "Stainless" Option L "Cast, stainless"	
 Adapter for cable entry with female thread G ½" Adapter for cable entry with female thread NPT ½" 	Stainless steel, 1.4404 (316L)
Only available for certain device versions: Order code for "Transmitter housing": Option L "Cast, stainless" Order code for "Sensor connection housing": Option L "Cast, stainless"	

Connecting cable



UV radiation 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

Grade 9 titanium

Process connections

- Flanges similar to EN 1092-1 (DIN 2501)/similar to ASME B16.5/similar to JIS:
 - Stainless steel 1.4301 (304)
 - Wetted parts: Grade 2 titanium
- All other process connections:

Grade 2 titanium

Seals

Welded process connections without internal seals

Accessories

Protective cover

Stainless steel, 1.4404 (316L)

External WLAN antenna

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

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

• Eccentric clamp connections:

Eccen. Tri-Clamp, DIN 11866 series C

- 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

ho Process connection materials ightarrow
ho 226

Surface roughness

All data relate to parts in contact with medium.

The following surface roughness categories can be ordered:

Category	Method	Option(s)/Order code "Measuring tube mat., wetted surface"
Not polished	_	CA
Ra ≤ 0.76 μm (30 μin) 1)	Mechanically polished ²⁾	СВ
Ra ≤ 0.38 μm (15 μin) 1)	Mechanically polished ²⁾	CD

- 1) Ra according to ISO 21920
- 2) Inaccessible weld seams between pipe and manifold are excluded

16.11 User interface

Languages

Can be operated in the following languages:

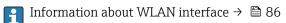
- Via local operation
 English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish,
 Chinese, Japanese, Korean, Vietnamese, Czech, Swedish
- Via web browser
 English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish,
 Chinese, Japanese, Vietnamese, Czech, Swedish
- Via "FieldCare", "DeviceCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese

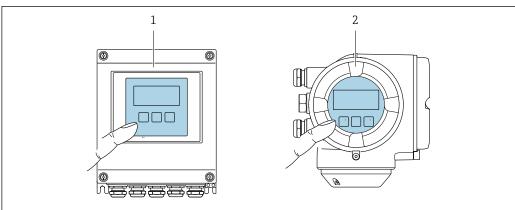
Onsite operation

Via display module

Equipment level:

- 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"





Δ00282

■ 42 Operation with touch control

- 1 Proline 500 digital
- 2 Proline 500

Display elements

- 4-line, illuminated, graphic display
- White background lighting; switches to red in event of device errors
- Format for displaying measured variables and status variables can be individually configured

Operating elements

- External operation via touch control (3 optical keys) without opening the housing: \pm , \Box . \blacksquare
- Operating elements also accessible in the various zones of the hazardous area

Remote operation	→ 🖺 85
Service interface	→ 🖺 85

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	Service interface CDI- RJ45WLAN interface	Special Documentation for device → 🖺 236
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	 Service interface CDI- RJ45 WLAN interface Fieldbus protocol 	→ 🖺 202
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	 Service interface CDI- RJ45 WLAN interface Fieldbus protocol 	→ 🖺 202
Field Xpert	SMT70/77/50	 All fieldbus protocols WLAN interface Bluetooth Service interface CDI-RJ45 	Operating Instructions BA01202S Device description files: Use update function of handheld terminal

- Other operating tools based on FDT technology with a device driver such as DTM/iDTM or DD/EDD can be used for device operation. These operating tools are available from the individual manufacturers. Integration into the following operating tools, among others, is supported:
 - Emersons TREX → www.emerson.com
 - 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 \rightarrow Download Area

Web server

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

Furthermore the device data can be managed and the network parameters can be configured.

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

Supported functions

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

- Upload the configuration from the measuring instrument (XML format, configuration backup)
- Save the configuration to the measuring instrument (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 Technology verification report (PDF file, only available with the **Heartbeat Verification** → 🖺 233 application package)
- Flash firmware version for device firmware upgrade, for example
- Download driver for system integration

HistoROM data management

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



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

Additional information on the data storage concept

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

	HistoROM backup	T-DAT	S-DAT
Available data	 Event logbook, e.g. diagnostic events Parameter data record backup Device firmware package 	 Measured value logging ("Extended HistoROM" order option) Current parameter data record (used by firmware at run time) Indicator (minimum/maximum values) Totalizer value 	 Sensor data: e.g. nominal diameter Serial number Calibration data Device configuration (e.g. SW options, fixed I/O or multi I/O)
Storage location	Fixed on the user interface PC board in the connection compartment	Can be plugged into the user interface PC board in the connection compartment	In the sensor plug in the transmitter neck part

Data backup

Automatic

- The most important device data (sensor and transmitter) are automatically saved in the DAT modules
- If the transmitter or measuring device is replaced: once the T-DAT containing the previous device data has been exchanged, the new measuring device is ready for operation again immediately without any errors
- If the sensor is replaced: once the sensor has been replaced, new sensor data are transferred from the S-DAT in the measuring device and the measuring device is ready for operation again immediately without any errors
- If exchanging the electronics module (e.g. I/O electronics module): Once the electronics module has been replaced, the software of the module is compared against the current device firmware. The module software is upgraded or downgraded where necessary. The electronics module is available for use immediately afterwards and no compatibility problems occur.

Manual

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

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

Data transmission

Manual

Transfer of a device configuration to another device using the export function of the specific operating tool, e.g. with FieldCare, DeviceCare or web server: to duplicate the configuration or to store in an archive (e.g. for backup purposes)

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.q. DeviceCare, FieldCare or Web server

Data logging

Manual

If the **Extended HistoROM** application package (order option) is enabled:

- Recording of 1 to 4 channels of up to 1000 measured values (up to 250 measured values per channel)
- User configurable recording interval
- Export the measured value log via a variety of interfaces and operating tools e.g.
 FieldCare, DeviceCare or web server

16.12 Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.

- 2. Open the product page.
- 3. Select **Downloads**.

CE mark

The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

UKCA marking

The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.

Contact address Endress+Hauser UK: Endress+Hauser Ltd.

Floats Road Manchester M23 9NF United Kingdom www.uk.endress.com

RCM marking

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

Hygienic compatibility

- 3-A approval
 - Only measuring instruments with the order code for "Additional approval", option LP "3A" have 3-A approval.
 - The 3-A approval refers to the measuring instrument.
 - When installing the measuring instrument, ensure that no liquid can accumulate on the outside of the measuring instrument.
 - 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 (Type EL Class I)

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.ehedg.org).

To meet the requirements for EHEDG certification, the orientation of the device must ensure drainability.

Test criteria for cleanability according to EHEDG is a flow velocity of 1.5 m/s in the process line. This speed must be ensured for EHEDG-compliant cleaning.

- FDA CFR 21
- Food Contact Materials Regulation (EC) 1935/2004
- Food Contact Materials Regulation GB 4806
- The requirements of the Food Contact Material regulations must be observed when selecting the material versions.
- Observe special installation instructions

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 cGMPderived 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) PESR/G1/x (x = category)

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

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

Radio approval

The measuring instrument has radio approval.



For detailed information on the radio approval, see the Special Documentation → 🖺 236

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 (order code for "Test, certificate", option JA)
- Pressure test, internal process, test report (order code for "Test, certificate", option [B)
- Surface roughness test ISO4287/Ra, (wetted parts), test report (option JE)
- Compliance with requirements derived from cGMP, Declaration (option JG)

External standards and guidelines

■ EN 60529

Degrees of protection provided by enclosure (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

■ GB 30439.5

Safety requirements for industrial automation products - Part 5: Flowmeter safety requirements

■ EN 61326-1/-2-3

EMC requirements for electrical equipment for measurement, control and laboratory use

NAMUR NE 21

Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment

NAMUR NE 32

Data retention in the event of a power failure in field and control instruments with microprocessors

NAMUR NE 43

Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.

■ NAMUR NE 53

Software of field devices and signal-processing devices with digital electronics

■ NAMUR NE 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 diagnostics of field devices

■ NAMUR NE 131

Requirements for field devices for standard applications

■ NAMUR NE 132

Coriolis mass meter

ETSI EN 300 328

Guidelines for 2.4 GHz radio components.

■ EN 301489

Electromagnetic compatibility and radio spectrum matters (ERM).

16.13 Application packages

Many different application packages are available to enhance the functionality of the device. Such packages might be needed to address safety aspects or specific application requirements.

The application packages can be ordered with the device or subsequently from Endress+Hauser. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.



Detailed information on the application packages:

Special Documentation $\rightarrow \stackrel{\square}{=} 236$

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.

 $\hfill \hfill \hfill$

Heartbeat Technology

Order code for "Application package", option EB "Heartbeat Verification + Monitoring"

Heartbeat Verification

Meets the requirement for traceable verification in accordance with DIN ISO 9001:2015 Clause 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 total test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk evaluation.

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



Detailed information on Heartbeat Technology: Special Documentation \rightarrow \cong 236

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.

Viscosity

Order code for "Application package", option EG "Viscosity"

In-line and real-time viscosity measurement

Promass I with the "Viscosity" application package also measures the real-time viscosity of the fluid directly in the process, in addition to measuring the mass flow/volume flow/ temperature and density.

The following viscosity measurements are performed on liquids:

- Dynamic viscosity
- Kinematic viscosity
- Temperature-compensated viscosity (kinematic and dynamic) in relation to the reference temperature

Viscosity measurement can be used for Newtonian and non-Newtonian applications and supplies accurate measured data irrespective of the flow, even under difficult conditions.



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

Special density

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

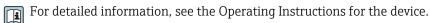
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Many applications use density as a key measured value for monitoring quality or controlling processes. The device measures the density of the fluid as standard and makes this value available to the control system.

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.

The following information can be found in the calibration certificate supplied:

- Density performance in air
- Density performance in liquids with different density
- Density performance in water with different temperatures

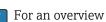


16.14 Accessories



Overview of accessories available to order $\rightarrow \triangleq 201$

16.15 Documentation



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

- Device Viewer (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- Endress+Hauser Operations app: Enter serial number from nameplate or scan matrix code on nameplate.

Standard documentation

Brief Operating Instructions

Brief Operating Instructions for the sensor

Measuring instrument	Documentation code
Proline Promass I	KA01284D

Brief operating instructions for transmitter

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

Technical information

Measuring instrument	Documentation code
Promass I 500	TI01284D

Description of Device Parameters

Measuring instrument	Documentation code
Promass 500	GP01062D

Device-dependent additional documentation

Safety instructions

Safety instructions for electrical equipment for hazardous areas.

Contents	Documentation code
	Measuring instrument
ATEX/IECEx Ex ia	XA01473D
ATEX/IECEx Ex ec	XA01474D
cCSAus IS	XA01475D
cCSAus Ex ia	XA01509D
cCSAus Ex ec	XA01510D
EAC Ex ia	XA01658D
EAC Ex ec	XA01659D
JPN Ex ia	XA01780D
KCs Ex ia	XA03287D
INMETRO Ex ia	XA01476D
INMETRO Ex ec	XA01477D
NEPSI Ex ia	XA01478D
NEPSI Ex nA	XA01479D
UKEX Ex ia	XA02570D
UKEX Ex ec	XA02572D

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
Gas fraction handler	SD02584D
Viscosity measurement	SD01724D
Modbus TCP system integration	SD03383D

Installation Instructions

Contents	Note
Installation instructions for spare part sets and accessories	 Access the overview of all the available spare part sets via <i>Device Viewer</i> →

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