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

ons Services

# Operating Instructions **Proline Promass X 500**

Coriolis flowmeter HART







- 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.

Proline Promass X 500 Table of contents

# Table of contents

1	About this document	. 6	6	Installation	22
1.1	Document function	. 6 6 6 . 7	6.1	Mounting requirements  6.1.1 Installation position  6.1.2 Environmental and process requirements  6.1.3 Special mounting instructions  Installing the measuring instrument  6.2.1 Required tools  6.2.2 Preparing the measuring instrument.	22 25 27 30 30 30
1.3 1.4	1.2.6 Symbols in graphics	8		<ul><li>6.2.3 Mounting the measuring device</li><li>6.2.4 Mounting the transmitter housing: Proline 500 – digital</li></ul>	
2 2.1 2.2 2.3 2.4	Safety instructions  Requirements for the personnel Intended use Workplace safety Operational safety	9 9 10 10	6.3	<ul> <li>6.2.5 Mounting the transmitter housing:     Proline 500</li></ul>	34 34
2.5 2.6 2.7	Product safety		7	Electrical connection	36
2.1	<ul> <li>2.7.1 Protecting access via hardware write protection</li></ul>		7.1 7.2 7.3	Electrical safety	36 36 36 41 41
3	Product description	14		7.3.1 Connecting the connecting cable	
3.1	Product design	14 14	7.4	7.3.2 Connecting the signal cable and the supply voltage cable	
4	Incoming acceptance and product			7.4.2 Connecting the signal cable and the supply voltage cable	51
4.1 4.2	Incoming acceptance	16 17 19	7.5 7.6 7.7 7.8	Potential equalization	53 53 54 54 58
5	Storage and transport	21	8	Operation options	60
<ul><li>5.1</li><li>5.2</li><li>5.3</li></ul>	Storage conditions	<ul><li>21</li><li>21</li><li>22</li><li>22</li></ul>	8.1 8.2 8.3	Overview of operation options	60 61 62 63 63 66 68

Table of contents Proline Promass X 500

	8.3.4	Operating elements		10.5	Advanced settings	132
	8.3.5	Opening the context menu			10.5.1 Using the parameter to enter the	400
	8.3.6	Navigating and selecting from list	72		access code	
	8.3.7	Calling the parameter directly	72		10.5.2 Calculated process variables	
	8.3.8	Calling up help text	73		10.5.3 Carrying out a sensor adjustment	
	8.3.9 8.3.10	Changing the parameters User roles and related access	73		<ul><li>10.5.4 Configuring the totalizer</li></ul>	140
		authorization	74		configurations	143
	8.3.11	Disabling write protection via access			10.5.6 WLAN configuration	
		code	74		10.5.7 Configuration management	151
	8.3.12	3 31			10.5.8 Using parameters for device	
		lock	75		administration	152
8.4		to operating menu via web browser	75	10.6	Simulation	
	8.4.1	Function range	75	10.7	Protecting settings from unauthorized access	157
	8.4.2	Requirements	76		10.7.1 Write protection via access code	157
	8.4.3	Connecting the device	77		10.7.2 Write protection via write protection	150
	8.4.4	Logging on	79		switch	158
	8.4.5	User interface				
	8.4.6	Disabling the Web server		11	Operation	161
8.5	8.4.7	Logging out	81	11.1	Reading off the device locking status	161
0.5		to the operating menu via the ng tool	82	11.2	Adjusting the operating language	
	8.5.1	Connecting the operating tool	82	11.3	Configuring the display	161
	8.5.2	Field Xpert SFX350, SFX370	86	11.4	Reading off measured values	161
	8.5.3	FieldCare	86		11.4.1 "Measured variables" submenu	162
	8.5.4	DeviceCare	87		11.4.2 "Totalizer" submenu	172
	8.5.5	AMS Device Manager	87		11.4.3 "Input values" submenu	173
	8.5.6	Field Communicator 475	I		11.4.4 Output values	174
	8.5.7	SIMATIC PDM		11.5	Adapting the measuring device to the process	
					conditions	
9	Syste	m integration	89	11.6	Performing a totalizer reset	176
9.1	Overvie	ew of device description files	89		parameter	178
	9.1.1	Current version data for the device	89		11.6.2 Function range of "Reset all	
	9.1.2	Operating tools	89		totalizers" parameter	178
9.2		red variables via HART protocol			Displaying the measured value history	
	9.2.1	Device variables		11.8	Gas Fraction Handler	
9.3	Other s	ettings	94		11.8.1 "Measurement mode" submenu	
10	C	-!!!	0.7		11.8.2 "Medium index" submenu	183
<b>10</b> 10.1		nissioning		12	Diagnostics and troubleshooting	184
10.2		ng on the measuring device		12.1	General troubleshooting	184
10.3		the operating language		12.2	Diagnostic information via light emitting	
10.4		iring the measuring instrument			diodes	187
		Defining the tag name			12.2.1 Transmitter	
		Setting the system units	99		12.2.2 Sensor connection housing	189
	10.4.3	Selecting and setting the medium	102	12.3	Diagnostic information on local display	190
	10.4.4	Displaying the I/O configuration	104		12.3.1 Diagnostic message	190
	10.4.5	Configuring the current input	105		12.3.2 Calling up remedial measures	192
	10.4.6	Configuring the status input	106	12.4	Diagnostic information in the web browser	193
	10.4.7	Configuring the current output	107		12.4.1 Diagnostic options	193
	10.4.8	Configuring the pulse/frequency/			12.4.2 Calling up remedy information	194
		<u>*</u>	112	12.5	Diagnostic information in FieldCare or	
		3 3 1	121		DeviceCare	195
		5 5 1 1	124		12.5.1 Diagnostic options	
		3 3	125		12.5.2 Calling up remedy information	196
		3 3	130	12.6	Adapting the diagnostic information	197
	10.4.13	3 Configuring partially filled pipe	101		12.6.1 Adapting the diagnostic behavior	
		detection	131		12.6.2 Adapting the status signal	197

Proline Promass X 500 Table of contents

12.7	Overview of diagnostic information 199
12.8	Pending diagnostic events 204
12.9	Diagnostics list
12.10	Event logbook
	12.10.1 Reading out the event logbook 206
	12.10.2 Filtering the event logbook 206
10 11	12.10.3 Overview of information events 207
12.11	Resetting the measuring device
10 10	parameter
	Device information
	Firmware history
13	Maintenance
13.1	Maintenance work 214
	13.1.1 Exterior cleaning 214
13.2	Measuring and test equipment 214
13.3	Endress+Hauser services 214
14	Repair 215
14.1	General notes
	14.1.1 Repair and conversion concept 215
	14.1.2 Notes for repair and conversion 215
14.2	Spare parts
14.3	Endress+Hauser services 215
14.4	Return
14.5	Disposal
	14.5.1 Removing the measuring device 216
	14.5.2 Disposing of the measuring device 216
15	Accessories
 15.1	Device-specific accessories
15.1	15.1.1 For the transmitter
15.2	Communication-specific accessories 218
15.3	Service-specific accessories 219
15.4	System components
16	Technical data
16.1	Application
16.2	Function and system design
16.3	Input
16.4	Output
16.5	Power supply
16.6	Performance characteristics
16.7	Mounting
16.8	Environment
16.9	Process
	Custody transfer
	Mechanical construction 241
	User interface
	Certificates and approvals 248
16.14	Application packages 250
	Accessories
16.16	Supplemental documentation

Index .	• • • • • •	 • • • • • •	 

255

About this document Proline Promass X 500

# 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.

#### **↑** CALITION

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
$\overline{}$	Direct current and alternating current
≐	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Potential equalization connection (PE: protective earth) Ground terminals that must be connected to ground prior to establishing any other connections.
	The ground terminals are located on the interior and exterior of the device:  Interior ground terminal: potential equalization is connected to the supply network.  Exterior ground terminal: device is connected to the plant grounding system.

# 1.2.3 Communication-specific symbols

Symbol	Meaning
<b></b>	Wireless Local Area Network (WLAN) Communication via a wireless, local network.

Proline Promass X 500 About this document

# 1.2.4 Tool symbols

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

# 1.2.5 Symbols for certain types of information

Symbol	Meaning
<b>✓</b>	Permitted Procedures, processes or actions that are permitted.
<b>✓</b> ✓	Preferred Procedures, processes or actions that are preferred.
X	Forbidden Procedures, processes or actions that are forbidden.
i	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
<b>•</b>	Notice or individual step to be observed
1., 2., 3	Series of steps
L	Result of a step
?	Help in the event of a problem
	Visual inspection

# 1.2.6 Symbols in graphics

Symbol	Meaning
1, 2, 3,	Item numbers
1., 2., 3.,	Series of steps
A, B, C,	Views
A-A, B-B, C-C,	Sections
EX	Hazardous area
×	Safe area (non-hazardous area)
≋➡	Flow direction

About this document Proline Promass X 500

#### 1.3 **Documentation**

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

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

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

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

#### 1.4 Registered trademarks

#### **HART®**

Registered trademark of the FieldComm Group, Austin, Texas USA

Proline Promass X 500 Safety instructions

# 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 be used to measure potentially explosive <sup>1)</sup>, flammable, toxid and oxidizing media.

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

To ensure that the measuring instrument is in perfect condition during operation:

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

#### Incorrect use

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

#### **▲** WARNING

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

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

<sup>1)</sup> Not applicable for IO-Link measuring instruments

Safety instructions Proline Promass X 500

#### 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** CAUTION

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

▶ Mount suitable touch protection.

#### **A** WARNING

#### Danger of housing breaking due to measuring tube breakage!

If a measuring tube ruptures, the pressure inside the sensor housing will rise according to the operating process pressure.

▶ Use a rupture disk.

#### **▲** WARNING

#### Danger from medium escaping!

For device versions with a rupture disk: medium escaping under pressure can cause injury or material damage.

▶ Take precautions to prevent injury and material damage if the rupture disk is actuated.

# 2.3 Workplace safety

When working on and with the device:

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

# 2.4 Operational safety

Damage to the device!

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

#### Modifications to the device

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

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

#### Repair

To ensure continued operational safety and reliability:

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

# 2.5 Product safety

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

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

Proline Promass X 500 Safety instructions

# 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) → 🖺 12	Not enabled (0000)	Assign a customized access code during commissioning
WLAN (order option in display module)	Enabled	On an individual basis following risk assessment
WLAN security mode	Enabled (WPA2- PSK)	Do not change
WLAN passphrase (Password) → 🖺 12	Serial number	Assign 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 → 🖺 13	_	On an individual basis following risk assessment

# 2.7.1 Protecting access via hardware write protection

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

#### 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.

Safety instructions Proline Promass X 500

#### User-specific access code

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

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

When the device is delivered, the network key is pre-defined depending on the device. It can be changed via the **WLAN settings** submenu in the **WLAN passphrase** parameter  $(\rightarrow \implies 150)$ .

#### Infrastructure mode

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

#### General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning for safety reasons.
- Follow the general rules for generating a secure password when defining and managing the access code and network key.
- The user is responsible for the management and careful handling of the access code and network key.
- For information on configuring the access code or on what to do if you lose the password, for example, see "Write protection via access code" → 🖺 157.

#### 2.7.3 Access via web server

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

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

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

#### 2.7.4 Access via OPC-UA

The device can communicate with OPC UA clients using the "OPC UA Server" application package.

The OPC UA server integrated in the device can be accessed via the WLAN access point using the WLAN interface - which can be ordered as an optional extra - or the service interface (CDI- RJ45) via Ethernet network. Access rights and authorization as per separate configuration.

Proline Promass X 500 Safety instructions

The following Security Modes are supported as per the OPC UA Specification (IEC 62541):

- None
- Basic128Rsa15 signed
- Basic128Rsa15 signed and encrypted

#### 2.7.5 Access via service interface (CDI-RJ45)

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

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



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

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

Product description Proline Promass X 500

# **3** Product description

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

# 3.1 Product design

Two versions of the transmitter are available.

# **3.1.1 Proline 500 – digital**

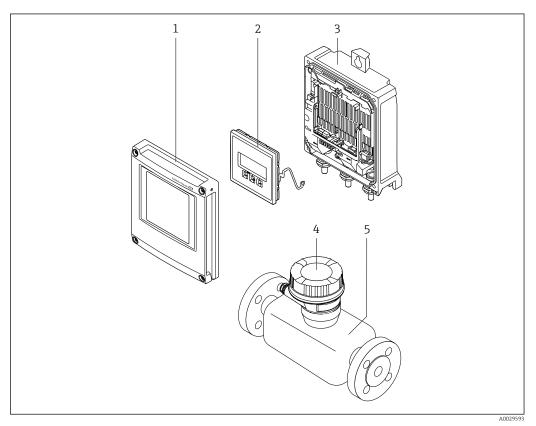
Signal transmission: digital

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

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

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

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



 $\blacksquare$  1 Important components of a measuring device

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

5 Sensoi

Proline Promass X 500 Product description

#### 3.1.2 Proline 500

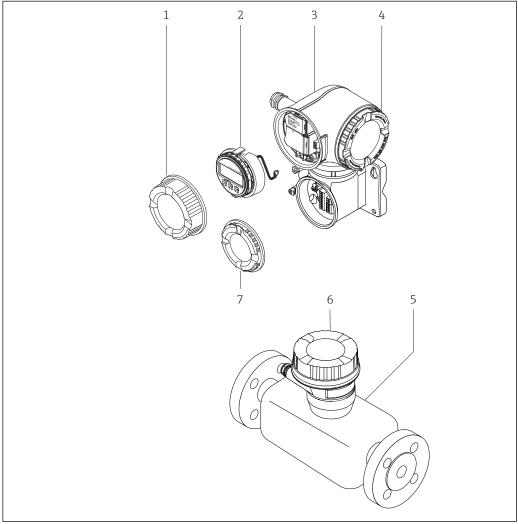
Signal transmission: analog

Order code for "Integrated ISEM electronics", option **B** "Transmitter"

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

As the electronics are located in the transmitter, the device is ideal in the event of:

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



**₽** 2 Important components of a measuring device

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

# 4 Incoming acceptance and product identification

# 4.1 Incoming acceptance

On receipt of the delivery:

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

#### 4.2 Product identification

The device can be identified in the following ways:

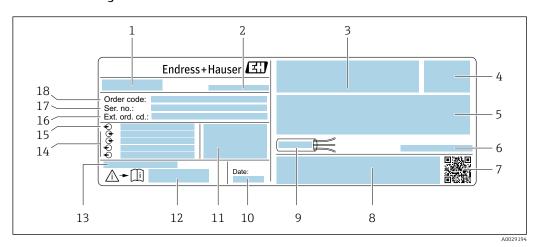
- Nameplate
- Order code with details of the device features on the delivery note
- Enter the serial numbers from the nameplates in the *Device Viewer* (www.endress.com/deviceviewer): all the information about the device is displayed.
- Enter the serial numbers from the nameplates into the *Endress+Hauser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

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

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

# 4.2.1 Transmitter nameplate

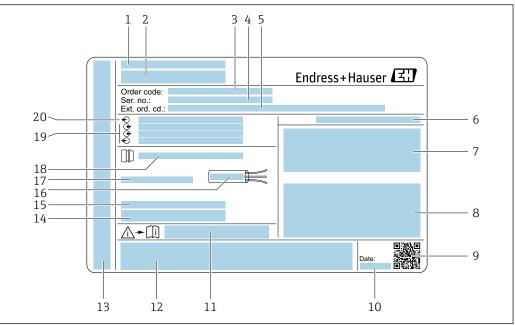
#### Proline 500 - digital



■ 3 Example of a transmitter nameplate

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

#### Proline 500

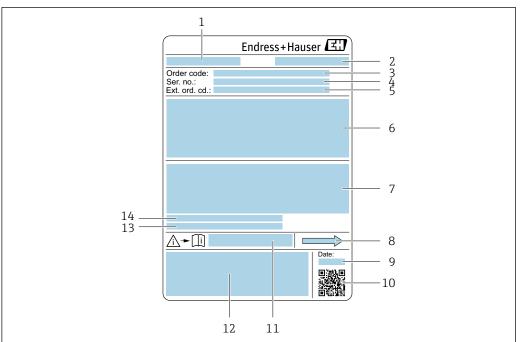


A0029192

#### ■ 4 Example of a transmitter nameplate

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

# 4.2.2 Sensor nameplate



A0029199

#### ■ 5 Example of a sensor nameplate

- 1 Name of the sensor
- 2 Manufacturer address/certificate holder
- 3 Order code
- 4 Serial number (Ser. no.)
- 5 Extended order code (Ext. ord. cd.)
- 6 Nominal diameter of the sensor; flange nominal diameter/nominal pressure; sensor test pressure; medium temperature range; material of measuring tube and manifold; sensor-specific information: e.g. pressure range of sensor housing, wide-range density specification (special density calibration)
- 7 Approval information for explosion protection, Pressure Equipment Directive and degree of protection
- 8 Flow direction
- 9 Date of manufacture: year-month
- 10 2-D matrix code
- 11 Document number of safety-related supplementary documentation
- 12 CE mark, RCM-Tick mark
- 13 Surface roughness
- 14 Allowable 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.
[ji	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.

Proline Promass X 500 Storage and transport

# 5 Storage and transport

# 5.1 Storage conditions

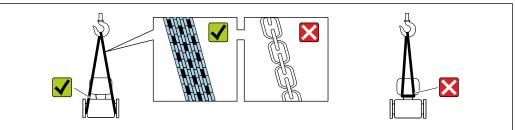
Observe the following notes for storage:

- ► 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  $\rightarrow \triangleq 237$ 

# 5.2 Transporting the product

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



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

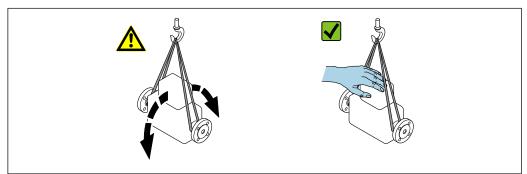
# 5.2.1 Measuring devices without lifting lugs

#### **A** WARNING

Center of gravity of the measuring device is higher than the suspension points of the webbing slings.

Risk of injury if the measuring device slips.

- ► Secure the measuring device against slipping or turning.
- ▶ Observe the weight specified on the packaging (stick-on label).



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Installation Proline Promass X 500

#### 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:

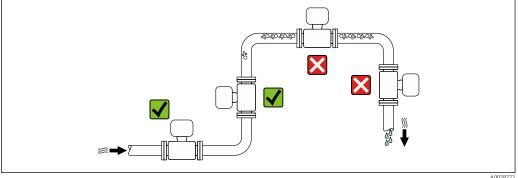
- Outer packaging of device Stretch wrap made of polymer in accordance with EU Directive 2002/95/EC (RoHS)
- Packaging
  - Wood crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
  - Cardboard box in accordance with European packaging guideline 94/62/EC, recyclability confirmed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

#### Installation 6

#### 6.1 Mounting requirements

#### 6.1.1 **Installation position**

#### Installation point



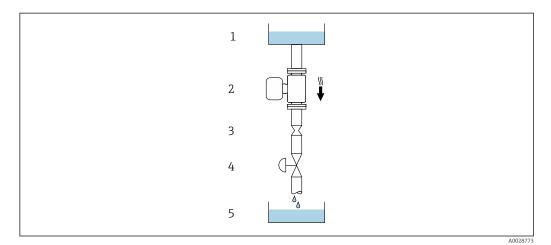
To prevent measuring errors arising from accumulation of gas bubbles in the measuring pipe, avoid the following mounting locations in the piping:

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

Proline Promass X 500 Installation

#### Installation in down pipes

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



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

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

DN		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
300	12	210	8.27
350	14	210	8.27
400	16	210	8.27

#### Orientation

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

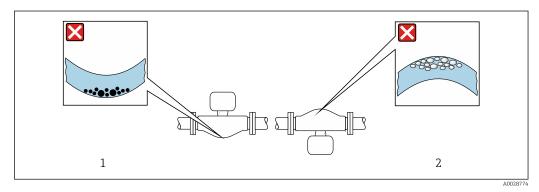
Orientation			Recommendation
A	Vertical orientation	A0015591	<b>✓ ✓</b> 1)
В	Horizontal orientation, transmitter at top	A0015589	✓ ✓ <sup>2)</sup> → • 7, • 24

Installation Proline Promass X 500

	Recommendation		
С	Horizontal orientation, transmitter at bottom	A0015590	✓ ✓ <sup>3)</sup> → <b>2</b> 7, <b>2</b> 24
D	Horizontal orientation, transmitter at side	A0015592	<b>⊘</b> → <b>②</b> 7, <b>③</b> 24

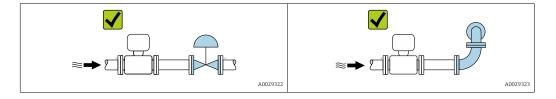
- 1) This orientation is recommended to ensure self-draining.
- 2) Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
- 3) Applications with high process temperatures may increase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

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



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

#### Inlet and outlet runs



Installation dimensions

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

Proline Promass X 500 Installation

#### 6.1.2 Environmental and process requirements

#### Ambient temperature range

Measuring device	<ul> <li>-40 to +60 °C (-40 to +140 °F)</li> <li>Order code for "Test, certificate", option JP:         -50 to +60 °C (-58 to +140 °F)</li> <li>Order code for "Test, certificate", option JQ:         <ul> <li>Sensor: -60 to +60 °C (-76 to +140 °F)</li> </ul> </li> <li>Transmitter: -50 to +60 °C (-58 to +140 °F)</li> </ul>
Readability of the local display	-20 to $+60$ °C ( $-4$ to $+140$ °F) The readability of the display may be impaired at temperatures outside the temperature range.

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

#### Static pressure

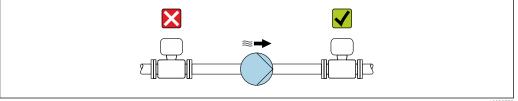
It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas.

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 versions with thermal insulation: Version with extended neck:

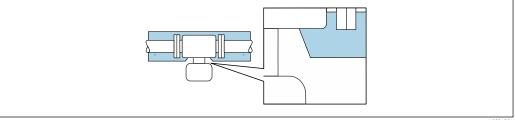
Order code for "Measuring tube material", option SA with an extended neck length of 105 mm (4.13 in).

Installation Proline Promass X 500

#### **NOTICE**

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

- Recommended orientation: horizontal orientation, sensor connection housing pointing downwards.
- ▶ Do not insulate the sensor connection housing.
- ▶ Maximum permissible temperature at the lower end of the sensor connection housing:  $80 \,^{\circ}\text{C} (176 \,^{\circ}\text{F})$
- ► Regarding thermal insulation with an exposed extended neck: We advise against insulating the extended neck to ensure optimal heat dissipation.



■ 8 Thermal insulation with exposed extended neck

#### Heating

#### **NOTICE**

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

- ▶ Observe maximum permitted ambient temperature for the transmitter.
- ▶ Depending on the medium temperature, take the device orientation requirements into account.
- Under critical climatic conditions, in particular, it is important to ensure that the temperature difference between the ambient temperature and the fluid temperature is not >100 K. Suitable measures must be taken, such as heating or insulation.

#### NOTICE

#### Danger of overheating when heating

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

#### Heating options

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

- Electrical heating, e.g. with electric band heaters <sup>2)</sup>
- Via pipes carrying hot water or steam
- Via heating jackets

26 Endress+Hauser

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<sup>2)</sup> The use of parallel electric band heaters is generally recommended (bidirectional electricity flow). Particular considerations must be made if a single-wire heating cable is to be used. For additional information, refer to EA01339D "Installation Instructions for Electrical Trace Heating Systems".

Proline Promass X 500 Installation

#### **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 mounting instructions

#### Drainability

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

#### Hygienic compatibility



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

#### Rupture disk

#### **WARNING**

#### Danger from medium escaping!

Medium escaping under pressure can cause injury or material damage.

- ► Take precautions to prevent danger to persons and damage if the rupture disk is actuated.
- ▶ Observe the information on the rupture disk sticker.
- ► Make sure that the function and operation of the rupture disk is not impeded through the installation of the device.
- ▶ Do not use a heating jacket.
- ▶ Do not remove or damage the rupture disk.

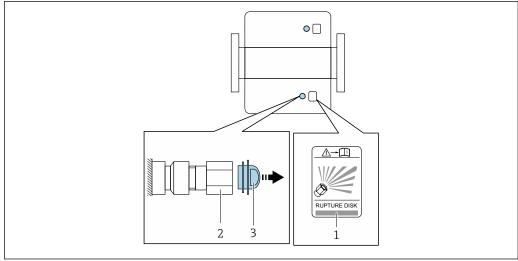
The position of the rupture disk is indicated by a sticker affixed beside it.

The transportation quard must be removed.

The existing connecting nozzles are not intended for the purpose of rinsing or pressure monitoring, but instead serve as the mounting location for the rupture disk.

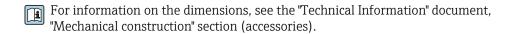
In the event of a failure of the rupture disk, a drain device can be screwed onto the internal thread of the rupture disk in order to drain off any escaping medium.

Installation Proline Promass X 500



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- Rupture disk label
- 2 Rupture disk with 1/2" NPT internal thread and 1" width across flats
- 3 Transportation quard



#### Zero verification and zero adjustment

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 fluids).
- 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 stresses 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

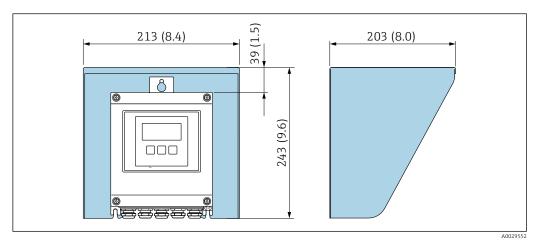
Verification and adjustment cannot be carried out if the following process conditions are present:

- 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

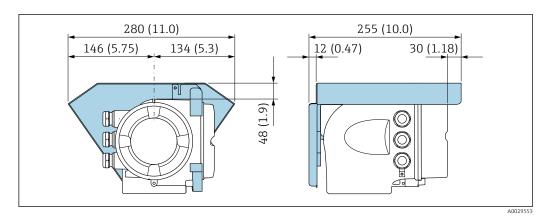
If these conditions cannot be avoided, it is advisable to keep the factory setting for the zero point.

Proline Promass X 500 Installation

# Weather protection cover



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



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label{eq:local_state} 
label{eq:local_state} We at her protection cover for Proline 500; engineering unit mm (in)$ 

#### Cover locking: Proline 500

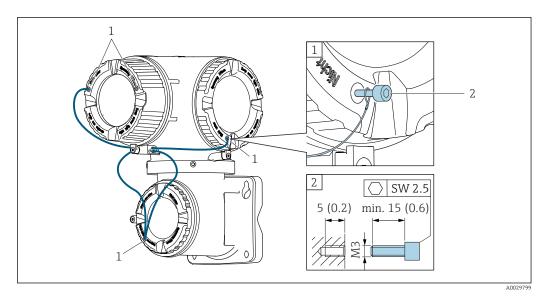
#### NOTICE

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.

Installation Proline Promass X 500



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

# 6.2 Installing the measuring instrument

#### 6.2.1 Required tools

#### For transmitter

For mounting on a post:

- Proline 500 digital transmitter
  - Open-ended wrench AF 10
  - Torx screwdriver TX 25
- Proline 500 transmitter
   Open-ended wrench AF 13

For wall mounting:

Drill with drill bit Ø 6.0 mm

#### For sensor

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

# 6.2.2 Preparing the measuring 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 Mounting the measuring device

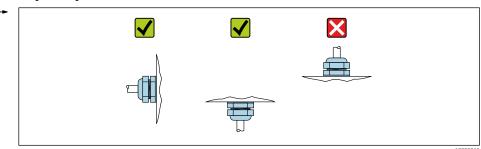
#### **▲** WARNING

#### Danger due to improper process sealing!

- ► Ensure that the inside diameters of the gaskets are greater than or equal to that of the process connections and piping.
- ► Ensure that the seals are clean and undamaged.
- ► Secure the seals correctly.
- 1. Ensure that the direction of the arrow on the nameplate of the sensor matches the flow direction of the medium.

Proline Promass X 500 Installation

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



# 6.2.4 Mounting the transmitter housing: Proline 500 – digital

#### **A** CAUTION

#### Ambient temperature too high!

Danger of electronics overheating and housing deformation.

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

#### **A** CAUTION

#### Excessive force can damage the housing!

► Avoid excessive mechanical stress.

The transmitter can be mounted in the following ways:

- Post mounting
- Wall mounting

#### Pipe mounting

*Required tools:* 

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

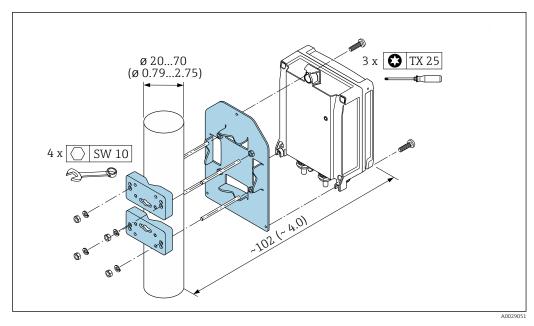
#### NOTICE

#### 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)

Installation Proline Promass X 500

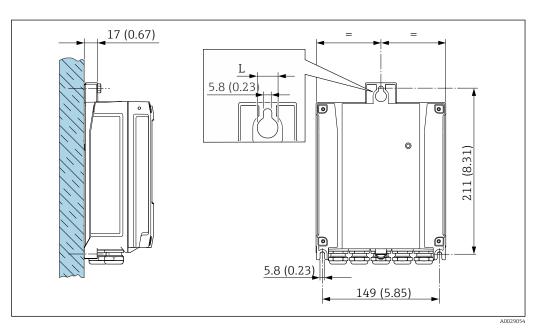


■ 11 Unit mm (in)

#### Wall mounting

Required tools:

Drill with drill bit Ø 6.0 mm



■ 12 Engineering unit mm (in)

L Depends on order code for "Transmitter housing"

Order code for "Transmitter housing"

- Option **A**, aluminum, coated: L = 14 mm (0.55 in)
- Option **D**, polycarbonate: L = 13 mm (0.51 in)
- 1. Drill the holes.
- 2. Insert wall plugs into the drilled holes.
- 3. Screw in the fixing screws slightly.
- 4. Fit the transmitter housing over the fixing screws and mount in place.

Proline Promass X 500 Installation

5. Tighten the fixing screws.

# 6.2.5 Mounting the transmitter housing: Proline 500

#### **A** CAUTION

#### Ambient temperature too high!

Danger of electronics overheating and housing deformation.

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

#### **A** CAUTION

#### Excessive force can damage the housing!

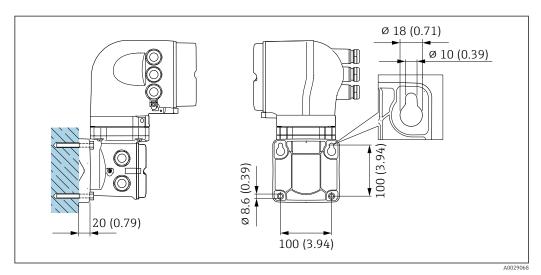
► Avoid excessive mechanical stress.

The transmitter can be mounted in the following ways:

- Post mounting
- Wall mounting

#### Wall mounting

Required tools Drill with drill bit  $\emptyset$  6.0 mm



■ 13 Engineering unit mm (in)

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

#### Pipe mounting

Required tools Open-ended wrench AF 13

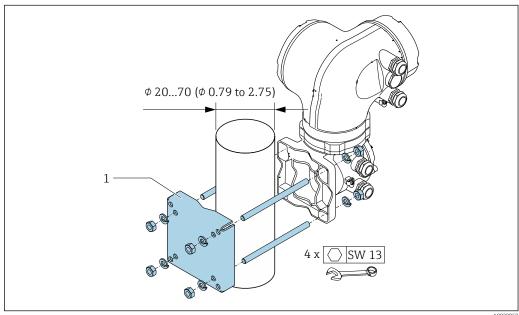
Installation Proline Promass X 500

#### **MARNING**

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.

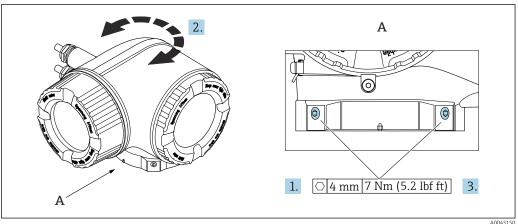
▶ Only mount the transmitter on a secure, fixed post on a stable surface.



■ 14 Engineering unit mm (in)

# 6.2.6 Turning the transmitter housing: Proline 500

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



■ 15 Ex housing

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

#### 6.2.7 Turning the display module: Proline 500

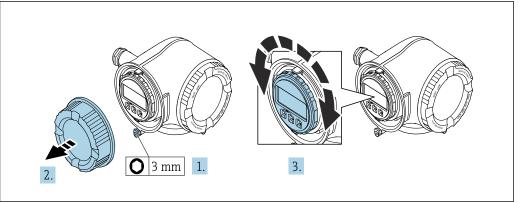
The display module can be turned to optimize display readability and operability.

34 Endress+Hauser

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Proline Promass X 500 Installation



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- 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 → 🖺 238  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 → 🗎 23?  • 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? → 🖺 23?	
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?	

Electrical connection Proline Promass X 500

# 7 Electrical connection

#### **▲** WARNING

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

- ► Set up a disconnecting device (switch or power-circuit breaker) to easily disconnect the device from the supply voltage.
- ► In addition to the device fuse, include an overcurrent protection unit with max. 10 A in the plant installation.

# 7.1 Electrical safety

In accordance with applicable national regulations.

# 7.2 Connecting requirements

#### 7.2.1 Required tools

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

#### 7.2.2 Requirements for connection cable

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

#### Protective grounding cable for the outer ground terminal

Conductor cross-section < 2.1 mm<sup>2</sup> (14 AWG)

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

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

#### Permitted temperature range

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

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

Standard installation cable is sufficient.

#### Signal cable

For custody transfer, all signal lines must be shielded cables (tinned copper braiding, optical coverage  $\geq$  85 %). The cable shield must be connected on both sides.

Current output 4 to 20 mA HART

Shielded twisted-pair cable.

See https://www.fieldcommgroup.org "HART PROTOCOL SPECIFICATIONS".

#### Ethernet-APL

Shielded twisted-pair cable. Cable type A is recommended.



See https://www.profibus.com Ethernet-APL White Paper "

Current output 0 /4 to 20 mA (excluding HART)

Standard installation cable is sufficient.

*Pulse / frequency / switch output* 

Standard installation cable is sufficient.

Relay output

Standard installation cable is sufficient.

Current input 4 to 20 mA

Standard installation cable is sufficient.

Status input

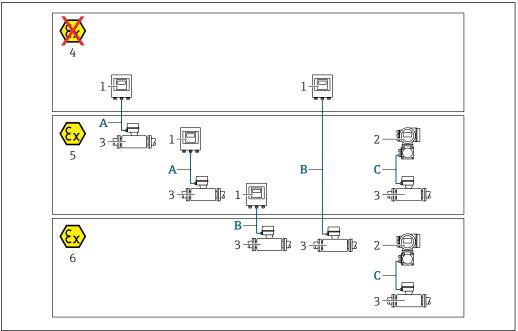
Standard installation cable is sufficient.

#### Cable diameter

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

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

Depends on the type of transmitter and the installation zones



VUU334

- 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
- A Standard cable to 500 digital transmitter → 🖺 38

  Transmitter installed in the non-hazardous area or hazardous area: Zone 2; Class I, Division 2/sensor installed in the hazardous area: Zone 2; Class I, Division 2
- Signal cable to 500 transmitter  $\rightarrow \ \cong \ 41$ 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.

<b>Design</b> 4 cores (2 pairs); uninsulated stranded CU wires; pair-stranded with commshield		
Shield Tin-plated copper braid, optical cover ≥ 85 %		
Loop resistance	stance Power supply line (+, -): maximum $10 \Omega$	
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 <sup>2</sup> (AWG 22)	80 m (240 ft)
0.50 mm <sup>2</sup> (AWG 20)	120 m (360 ft)
0.75 mm <sup>2</sup> (AWG 18)	180 m (540 ft)

Cross-section	Cable length [max.]	
1.00 mm <sup>2</sup> (AWG 17)	240 m (720 ft)	
1.50 mm <sup>2</sup> (AWG 15)	300 m (900 ft)	

#### Optionally available connecting cable

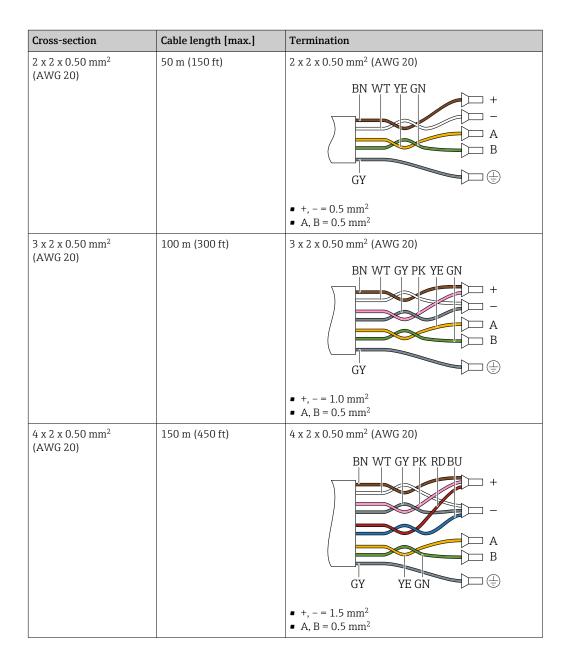
Design $2 \times 2 \times 0.34 \text{ mm}^2 \text{ (AWG 22) PVC cable }^{1)}$ with common shield (2 pairs, uninsulated stranded CU wires; pair-stranded)	
Flame resistance	According to DIN EN 60332-1-2
Oil resistance	According to DIN EN 60811-2-1
Shield	Tin-plated copper braid, optical cover ≥ 85 %
Continuous 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)

1) UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where possible.

# ${\it B: Connecting\ cable\ between\ sensor\ and\ transmitter: Proline\ 500\ -\ digital\ Standard\ cable}$

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)
<b>Loop resistance</b> 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 $\geq$ 85 %	
Operating temperature	When mounted in a fixed position: $-50$ to $+105$ °C ( $-58$ to $+221$ °F); when cable can move freely: $-25$ to $+105$ °C ( $-13$ to $+221$ °F)	
Available cable length	Fixed: 20 m (60 ft); variable: up to maximum 50 m (150 ft)	

1) UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where possible.

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

Design	$6\times0.38~\text{mm}^2$ PVC cable $^{1)}$ with individual shielded cores and common copper shield	
	With order code for "Test, certificate", option $JQ$ $7\times0.38~mm^2$ PUR cable $^{1)}$ with individual shielded cores and common copper shield	
Conductor resistance	$\leq$ 50 $\Omega$ /km (0.015 $\Omega$ /ft)	
Capacitance: core/shield	≤ 420 pF/m (128 pF/ft)	
Cable length (max.)	20 m (60 ft)	
Cable lengths (available for order)	5 m (15 ft), 10 m (30 ft), 20 m (60 ft)	
Cable diameter	11 mm (0.43 in) ± 0.5 mm (0.02 in)	
Operating temperature	Depends on the device version and how the cable is installed:  Standard version:  Cable - fixed installation: -40 to +105 °C (-40 to +221 °F)  Cable - movable: -25 to +105 °C (-13 to +221 °F)  Order code for "Test, certificate", option JP:  Cable - fixed installation: -50 to +105 °C (-58 to +221 °F)  Cable - movable: -25 to +105 °C (-13 to +221 °F)  Order code for "Test, certificate", option JQ:  Cable - fixed installation: -60 to +105 °C (-76 to +221 °F)  Cable - movable: -25 to +105 °C (-13 to +221 °F)	

<sup>1)</sup> UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where possible.

#### 7.2.3 Terminal assignment

#### Transmitter: supply voltage, input/outputs

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

Supply	voltage	Input/output 1		Input/output 2		Input/output 3		Input/output 4	
1 (+)	2 (-)	26 (+)	27 (-)	24 (+)	25 (-)	22 (+)	23 (-)	20 (+)	21 (-)
		Device-specific terminal assignment: adhesive label in terminal cover.							

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

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

Terminal assignment and connection of the connecting cable:

- Proline 500 digital  $\rightarrow$  🖺 43
- Proline 500 → 🖺 48

#### 7.2.4 Preparing the measuring device

Carry out the steps in the following order:

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

#### **NOTICE**

## Insufficient sealing of the housing!

Operational reliability of the measuring device could be compromised.

- ▶ Use suitable cable glands corresponding to the degree of protection.
- 1. Remove dummy plug if present.
- 2. If the measuring device is supplied without cable glands: Provide suitable cable gland for corresponding connecting cable.
- 3. If the measuring device is supplied with cable glands:

  Observe requirements for connecting cables → 

  36.

#### 7.3 Connecting the measuring instrument: Proline 500 digital

#### NOTICE

#### An incorrect connection compromises electrical safety!

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

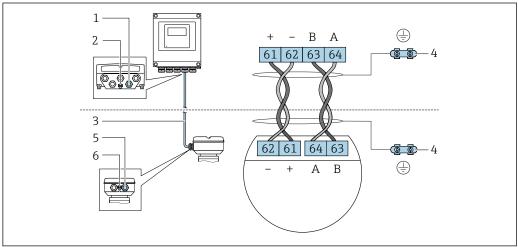
#### 7.3.1 Connecting the connecting cable

#### **A** WARNING

#### Risk of damaging electronic components!

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

#### Connecting cable terminal assignment



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

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

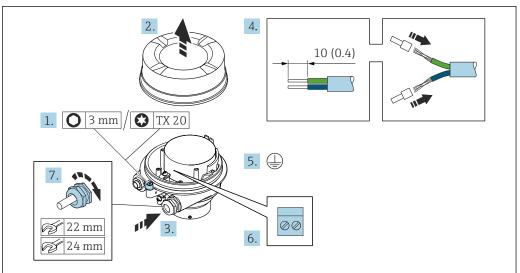
Connection via terminals with order code for "Sensor connection housing": Option L "Cast, stainless" → 🖺 44

#### 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  ${\bf L}$  "Cast, stainless"



A0029616

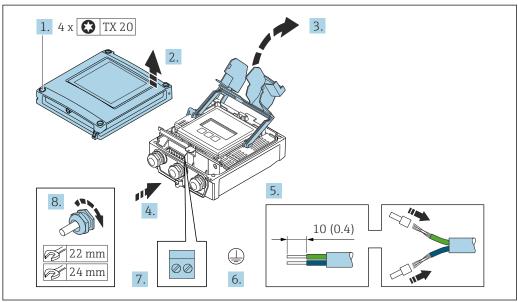
- 1. Loosen the securing clamp of the housing cover.
- 2. Unscrew the housing cover.
- 3. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 4. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
- 5. Connect 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.

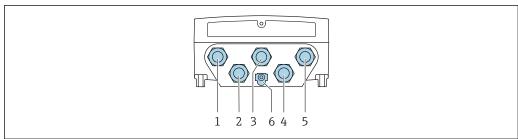
#### Connecting the connecting cable to the transmitter



- 1. Loosen the 4 fixing screws on the housing cover.
- 2. Open the housing cover.
- 3. Fold open the terminal cover.
- 4. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 5. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
- 6. Connect the protective ground.
- 7. Connect the cable according to the terminal assignment for the connecting cable → 

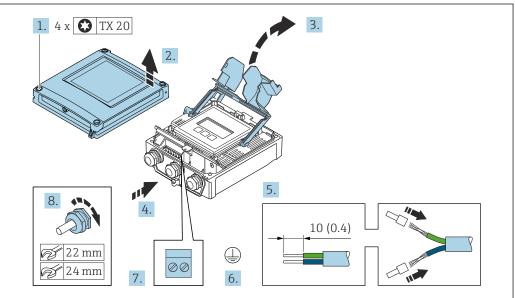
   43.
- 8. Firmly tighten the cable glands.
  - ► The process for connecting the connecting cable is now complete.
- 9. Close the housing cover.
- 10. Tighten the securing screw of the housing cover.
- 11. After connecting the connecting cable: Connect the signal cable and the supply voltage cable  $\rightarrow \triangleq 46$ .

# 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)



A0029597

- 1. Loosen the 4 fixing screws on the housing cover.
- 2. Open the housing cover.
- 3. Fold open the terminal cover.
- 4. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 5. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
- 6. Connect the protective ground.
- 7. Connect the cable according to the terminal assignment.
  - ► **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  $\rightarrow \implies 41$ .

- 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

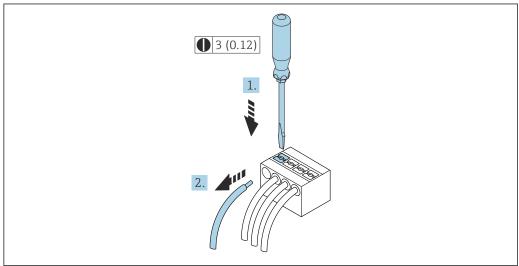
#### Excessive tightening torque applied to the fixing screws!

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

■ 16 Engineering unit mm (in)

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

#### 7.4 Connecting the measuring instrument: Proline 500

#### **NOTICE**

#### An incorrect connection compromises electrical safety!

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

#### 7.4.1 Fitting the connecting cable

#### **A** WARNING

#### Risk of damaging electronic components!

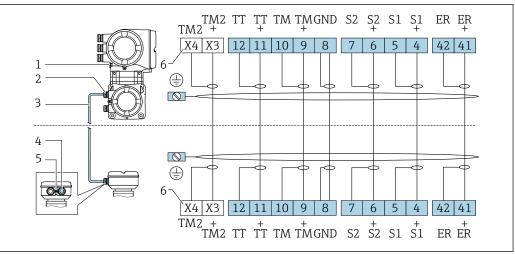
- ► Connect the sensor and transmitter to the same potential equalization.
- ▶ Only connect the sensor to a transmitter with the same serial number.

#### **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



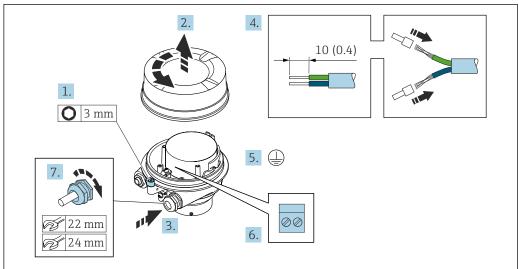
- 1 Protective earth (PE)
- 2 Cable entry for connecting cable on transmitter connection housing
- 3 Connecting cable
- Cable entry for connecting cable on sensor connection housing
- Protective earth (PE)
- Terminals X3, X4: temperature sensor

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

Connection via terminals with order code for "Housing": Option L "Cast, stainless"  $\rightarrow \triangle$  49

#### Connecting the sensor connection housing via terminals

For the device version with the order code for "Housing": Option  ${\bf L}$  "Cast, stainless"



A0029612

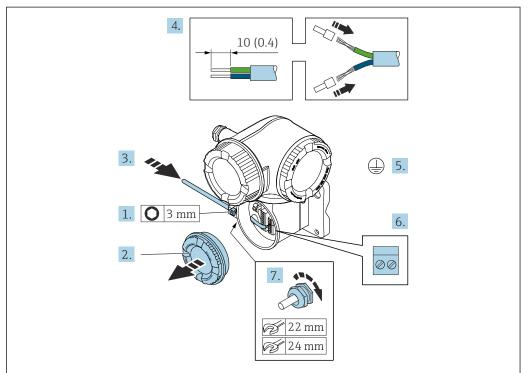
- 1. Loosen the securing clamp of the housing cover.
- 2. Unscrew the housing cover.
- 3. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 4. Strip the cable and cable ends. In the case of stranded cables, fit ferrules.
- 5. Connect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

#### Attaching the connecting cable to the transmitter

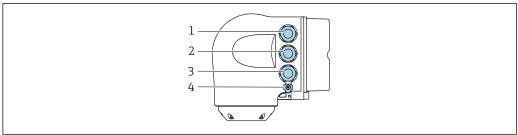


A002959

- 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 → 

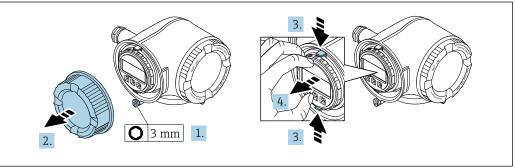
  51.

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



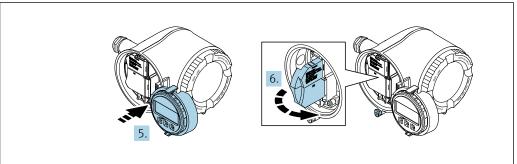
A0026781

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



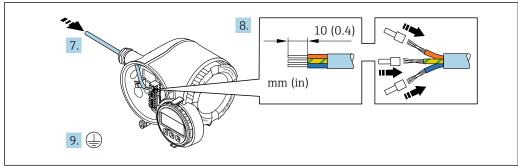
A002981

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



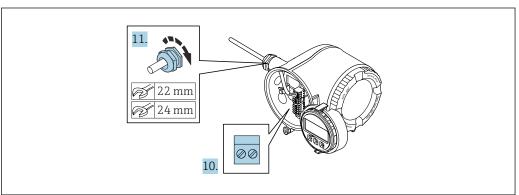
A002981

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



A00298

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



A0029816

- 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.

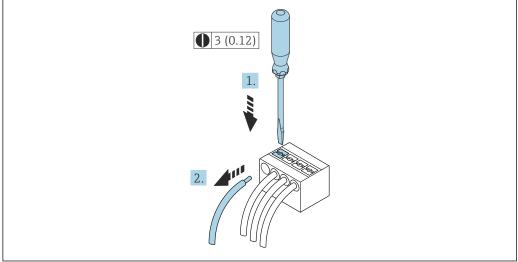
    Supply voltage connection terminal assignment: Adhesive label in the
- 11. Firmly tighten the cable glands.

terminal cover or  $\rightarrow$   $\implies$  41.

- ► 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:



A0029598

■ 17 Engineering unit mm (in)

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

# 7.5 Potential equalization

## 7.5.1 Requirements

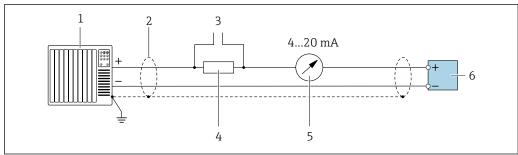
For potential equalization:

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

# 7.6 Special connection instructions

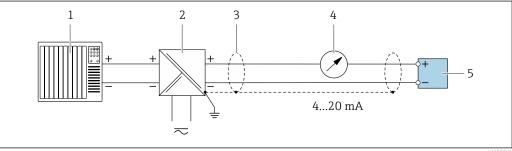
# 7.6.1 Connection examples

#### Current output 4 to 20 mA HART



A002905

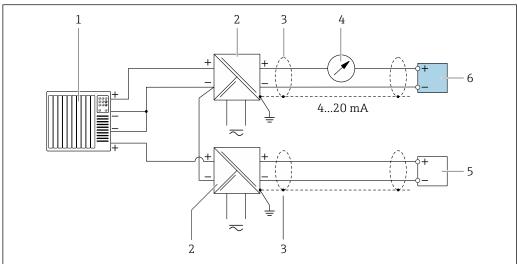
- 18 Connection example for 4 to 20 mA HART current output (active)
- 1 Automation system with current input (e.g. PLC)
- 3 Connection for HART operating devices → 🗎 82
- 4 Resistor for HART communication (≥ 250  $\Omega$ ): observe maximum load  $\rightarrow$   $\cong$  225
- 6 Transmitter



A002876

- 19 Connection example for 4 to 20 mA HART current output (passive)
- 1 Automation system with current input (e.g. PLC)
- Power supply
- 3 Ground cable shield at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 Analog display unit: observe maximum load → В 225
- 5 Transmitter

#### **HART** input

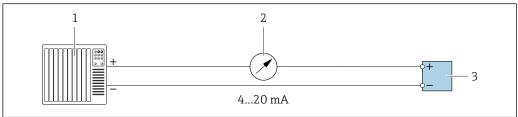


Δ0028763

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

- 1 Automation system with HART output (e.g. PLC)
- 2 Active barrier for power supply (e.g. RN221N)
- 3 Ground cable shield at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 Analog display unit: observe maximum load → 🖺 225
- 5 Pressure measuring device (e.g. Cerabar M, Cerabar S): observe requirements
- 6 Transmitter

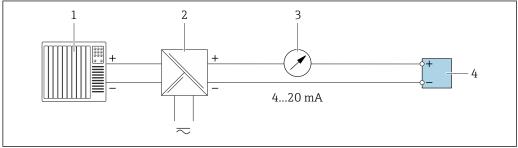
#### Current output 4-20 mA



A0028758

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

- 1 Automation system with current input (e.g. PLC)
- 2 Analog display unit: observe maximum load  $\rightarrow \stackrel{ riangle}{=} 225$
- 3 Transmitter

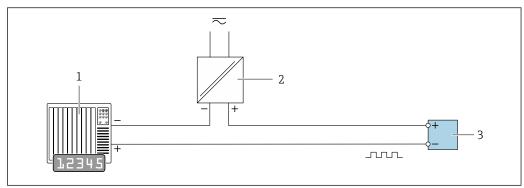


A002875

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

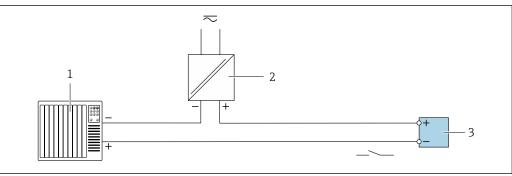
- 1 Automation system with current input (e.g. PLC)
- 2 Active barrier for power supply (e.g. RN221N)
- 3 Analog display unit: observe maximum load  $\rightarrow \triangleq 225$
- 4 Transmitter

#### Pulse/frequency output



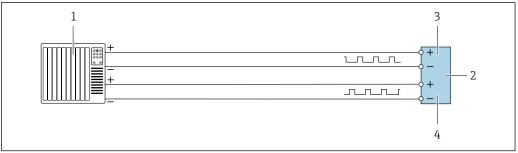
- Connection example for pulse/frequency output (passive)
- 1 Automation system with pulse/frequency input (e.g. PLC with 10 k $\Omega$  pull-up or pull-down resistor)
- 2 Power supply
- 3 *Transmitter: observe input values → В 227*

#### Switch output

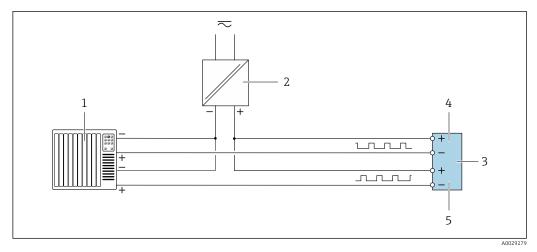


- Connection example for switch output (passive)
- Automation system with switch input (e.g. PLC with a 10 k $\Omega$  pull-up or pull-down resistor)
- 2 Power supply
- *Transmitter: observe input values → 🖺 227*

#### Double pulse output



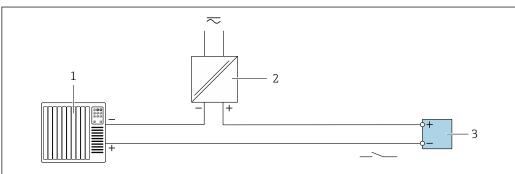
- **₽** 25 Connection example for double pulse output (active)
- 1 Automation system with double pulse input (e.g. PLC)
- 2 *Transmitter: observe input values → В 228*
- 3 Double pulse output
- Double pulse output (slave), phase-shifted



Connection example for double pulse output (passive)

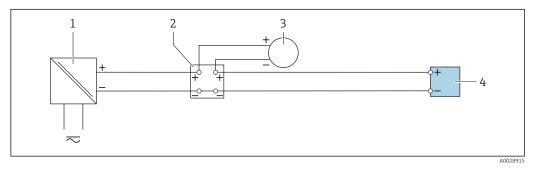
- Automation system with double pulse input (e.g. PLC with a 10 k $\Omega$  pull-up or pull-down resistor) 1
- 2 Power supply
- 3
- 4 5 Double pulse output
- Double pulse output (slave), phase-shifted

#### Relay output



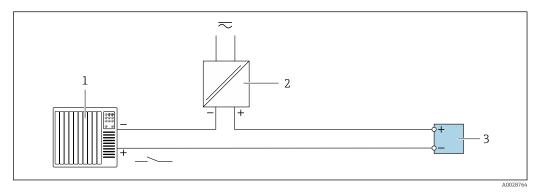
- Connection example for relay output (passive)
- Automation system with relay input (e.g. PLC)
- Power supply
- 3 *Transmitter: observe input values → 🖺 229*

#### **Current input**



- ₽ 28 Connection example for 4 to 20 mA current input
- 1 Power supply
- 3 External measuring device (to read in pressure or temperature, for instance)
- Transmitter

#### Status input



■ 29 Connection example for status input

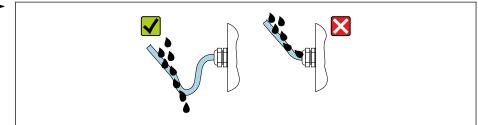
- 1 Automation system with status output (e.g. PLC)
- 2 Power supply
- 3 Transmitter

# 7.7 Ensuring the degree of protection

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

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

- 1. Check that the housing seals are clean and fitted correctly.
- 2. Dry, clean or replace the seals if necessary.
- 3. Tighten all housing screws and screw covers.
- 4. Firmly tighten the cable glands.
- 5. To ensure that moisture does not enter the cable entry:
  Route the cable so that it loops down before the cable entry ("water trap").



A002927

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

#### 7.8 Post-connection check

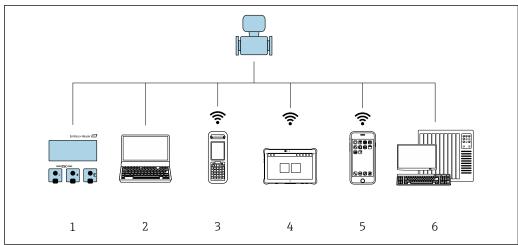
Are the device and cable undamaged (visual inspection)?		
Is the protective earthing established correctly?		
Do the cables used comply with the requirements ?		
Are the installed cables strain-relieved and securely routed?		
Are all cable glands installed, securely tightened and leak-tight? Cable run with "water trap" → 🖺 58?		

Is the terminal assignment correct ?	
Are dummy plugs inserted in unused cable entries and have transportation plugs been replaced with dummy plugs?	

Operation options Proline Promass X 500

# **8** Operation options

# 8.1 Overview of operation options



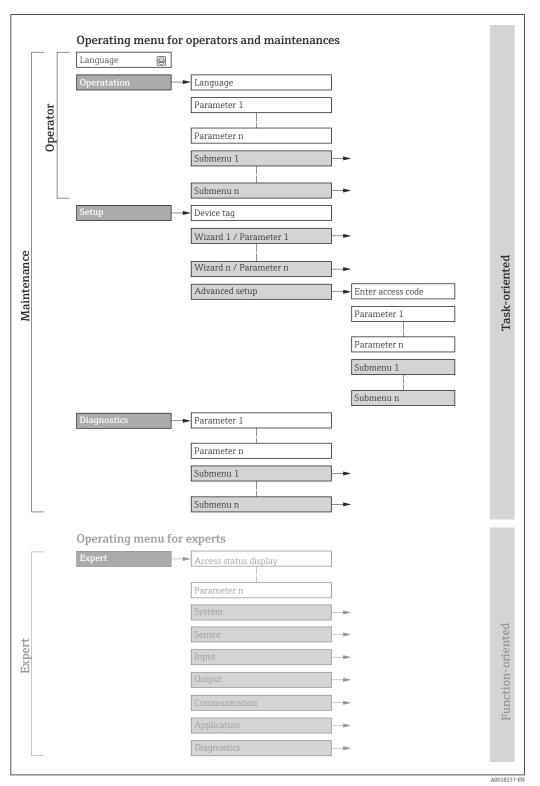
A003451

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

Proline Promass X 500 Operation options

# 8.2 Structure and function of the operating menu

# 8.2.1 Structure of the operating menu



**■** 30 Schematic structure of the operating menu

Operation options Proline Promass X 500

#### Operating philosophy 8.2.2

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.

For custody transfer, once the device has been put into circulation or sealed, its operation is restricted.

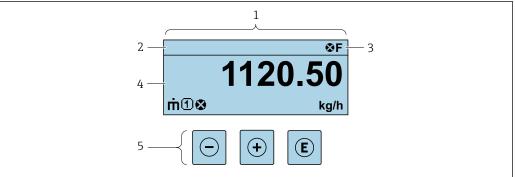
Menu/pa	arameter	User role and tasks	Content/meaning		
Language	Task- oriented	Role "Operator", "Maintenance" Tasks during operation: Configuration of the operational	<ul> <li>Defining the operating language</li> <li>Defining the Web server operating language</li> <li>Resetting and controlling totalizers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

Proline Promass X 500 Operation options

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 of the device parameters and allows direct access to these by means of an access code. The structure of this menu is based on the function blocks of the device:  System Contains all higher-level device parameters that do not affect measurement or measured value communication  Sensor Configuration of the measurement.  Input Configuration of the status input  Output Configuration of the analog current outputs as well as the pulse/frequency and switch output  Communication Configuration of the digital communication interface and the Web server  Application Configuration of the functions that go beyond the actual measurement (e.g. totalizer)  Diagnostics Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology.	

#### 8.3 Access to operating menu via local display

#### 8.3.1 Operational display



- Operational display
- 2 Device tag
- 3 Status area
- Display range for measured values (up to 4 lines)
- *Operating elements*  $\rightarrow$   $\blacksquare$  70

#### Status area

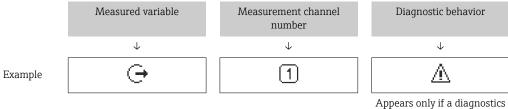
The following symbols appear in the status area of the operational display at the top right:

- Status signals → 🗎 190
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
  - M: Maintenance required
- Diagnostic behavior → 🗎 191
  - Alarm
  - <u></u> : Warning
- 🛱: Locking (the device is locked via the hardware )
- ←: Communication (communication via remote operation is active)

Operation options Proline Promass X 500

#### Display area

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



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

#### Measured variables

Symbol	Meaning
ṁ	Mass flow
Ü	<ul><li>Volume flow</li><li>Corrected volume flow</li></ul>
P	<ul><li>Density</li><li>Reference density</li></ul>
1	Temperature

The number and display format of the measured variables can be configured via the **Format display** parameter ( $\Rightarrow \triangleq 127$ ).

#### Totalizer

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

#### Output

Symbol	Meaning
<b>(-)</b>	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).

Proline Promass X 500 Operation options

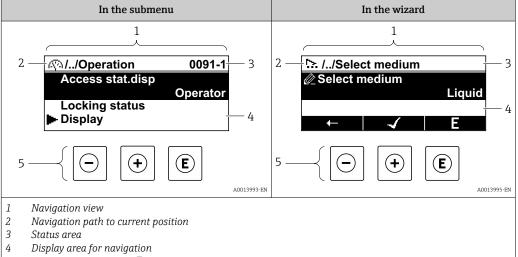
#### Diagnostic behavior

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

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

Operation options Proline Promass X 500

## 8.3.2 Navigation view

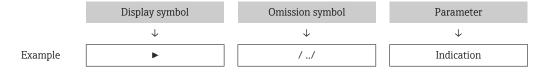


5 Operating elements  $\rightarrow \Box$  70

#### 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



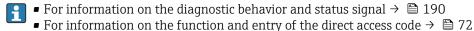
For more information about the icons in the menu, refer to the "Display area" section  $\Rightarrow \triangleq 66$ 

#### Status area

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

- In the submenu
  - The direct access code 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

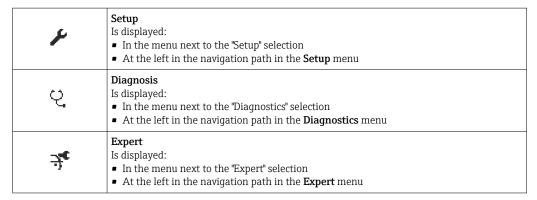


#### Display area

#### 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

Proline Promass X 500 Operation options



#### Submenus, wizards, parameters

Symbol	Meaning
•	Submenu
55.	Wizards
Ø.	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

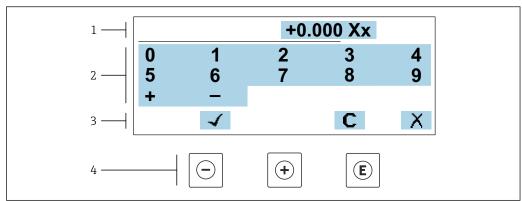
#### Wizards

Symbol	Meaning
<b>←</b>	Switches to the previous parameter.
<b>√</b>	Confirms the parameter value and switches to the next parameter.
E	Opens the editing view of the parameter.

Operation options Proline Promass X 500

#### 8.3.3 **Editing view**

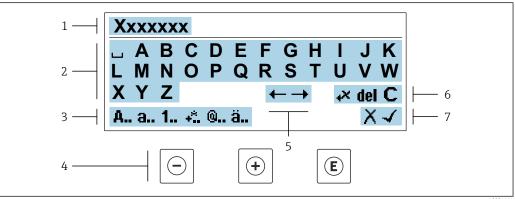
#### Numeric editor



■ 31 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



 $\blacksquare$  32 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.

Proline Promass X 500 Operation options

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

## *Input screens*

Symbol	Meaning
А	Upper case
a	Lower case
1	Numbers
+*	Punctuation marks and special characters: = + - * / 2 3 $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ ( ) [ ] < > { }
<b>@</b>	Punctuation marks and special characters:
ä	Umlauts and accents

## Controlling data entries

Symbol	Meaning
←→	Move entry position
X	Reject entry
4	Confirm entry
.v₄×	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

Operation options Proline Promass X 500

# 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.
<b>(+)</b>	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.
(a)+(+)	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	<ul> <li>Minus/Enter key combination (press and hold down the keys simultaneously)</li> <li>If keypad lock is active:         Pressing the key for 3 s deactivates the keypad lock.</li> <li>If keypad lock is not active:         Pressing the key for 3 s opens the context menu including the option for activating the keypad lock.</li> </ul>

# 8.3.5 Opening the context menu

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

- Setup
- Data backup
- Simulation

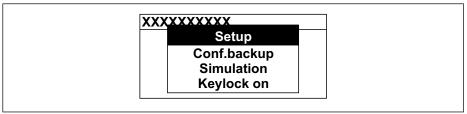
Proline Promass X 500 Operation options

#### 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.



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- 2. Press = + ± simultaneously.
  - ightharpoonup 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.

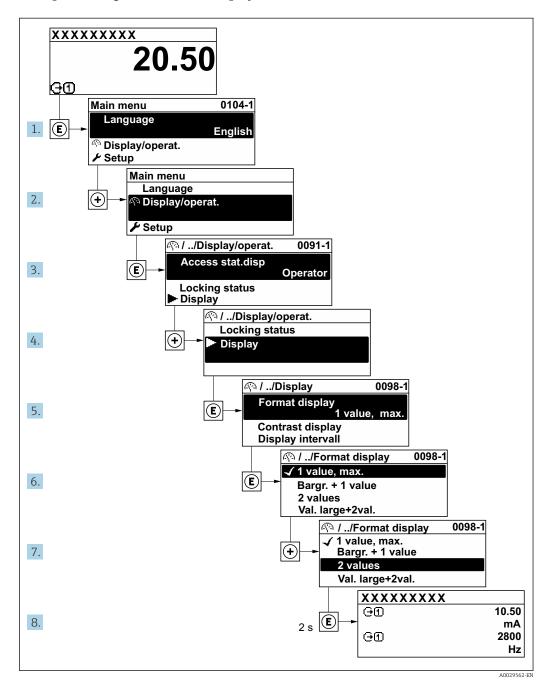
Operation options Proline Promass X 500

# 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  $\Rightarrow \triangleq 66$ 

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



#### 8.3.7 Calling the parameter directly

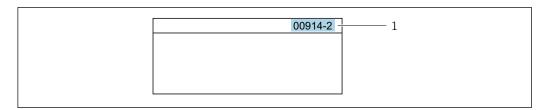
A parameter number is assigned to every parameter to be able to access a parameter directly via the onsite display. Entering this access code in the **Direct access** parameter calls up the desired parameter directly.

#### Navigation path

Expert → Direct access

Proline Promass X 500 Operation options

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

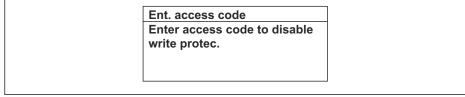
### 8.3.8 Calling up help text

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.



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- 33 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.

Operation options Proline Promass X 500

Ent. access code
Invalid or out of range input
value
Min:0
Max:9999

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

#### 8.3.10 User roles and related access authorization

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  $\rightarrow \blacksquare 157$ .

#### Defining access authorization for user roles

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

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

Access authorization to parameters: "Maintenance" user role

Access code status	Read access	Write access
An access code has not yet been defined (factory setting).	V	V
After an access code has been defined.	V	<b>✓</b> 1)

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

Access authorization to parameters: "Operator" user role

Access code status	Read access	Write access
After an access code has been defined.	V	_ 1)

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

   □ 157
- 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  $\rightarrow oxtimes 157$ .

Parameter write protection via local operation can be disabled by entering the user-specific access code in the **Enter access code** parameter ( $\rightarrow \implies 133$ ) via the respective access option.

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

Proline Promass X 500 Operation options

- 2. Enter the access code.
  - The \( \bar{\mathbb{O}}\) -symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

# 8.3.12 Enabling and disabling the keypad lock

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

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

#### Switching on the keypad lock

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

#### To activate the keylock manually:

- 1. The device is in the measured value display.

  Press the □ and □ keys for 3 seconds.
  - ► A context menu appears.
- 2. In the context menu select the **Keylock on** option.
  - ► The keypad lock is switched on.
- If the user attempts to access the operating menu while the keypad lock is active, the **Keylock on** message appears.

# Switching off the keypad lock

- ► The keypad lock is switched on. Press the □ and □ keys for 3 seconds.
  - ► The keypad lock is switched off.

# 8.4 Access to operating menu via web browser

#### 8.4.1 Function range

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

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

For additional information on the web server, see the Special Documentation for the device. → 🗎 254

Operation options Proline Promass X 500

# 8.4.2 Requirements

# Computer hardware

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

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

# Computer software

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

# Computer settings

Settings	Interface		
	CDI-RJ45	WLAN	
User rights	Appropriate user rights (e.g. administrator rights) for TCP/IP and proxy server settings are necessary (e.g. for adjusting the IP address, subnet mask etc.).		
Proxy server settings of the web browser	The web browser setting <i>Use a proxy server for</i> y	The web browser setting <i>Use a proxy server for your LAN</i> must be <b>disabled</b> .	
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	Only use the active network connections to the measuring device.		
	Switch off all other network connections such as WLAN for example.	Switch off all other network connections.	

Proline Promass X 500 Operation options

#### 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 → 🖺 81	

#### 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  $\rightarrow \triangleq 83$ .
- 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:

Operation options Proline Promass X 500

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

#### Via WLAN interface

Configuring the Internet protocol of the mobile terminal

#### **NOTICE**

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

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

#### NOTICE

#### Note the following to avoid a network conflict:

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

Preparing the mobile terminal

► Enable WLAN on the mobile terminal.

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

- 1. In the WLAN settings of the mobile terminal: Select the measuring device using the SSID (e.g. EH\_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.

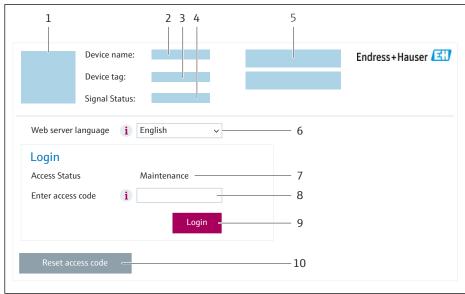
#### Starting the web browser

1. Start the web browser on the computer.

Proline Promass X 500 Operation options

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

► The login page appears.



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- l Picture of device
- 2 Device name
- *3 Device tag (→ 🖺 99)*
- 4 Status signal
- 5 Current measured values
- 6 Operating language
- 7 User role
- 8 Access code
- 9 Login
- 10 Reset access code (→ 🖺 153)
- If a login page does not appear, or if the page is incomplete  $\rightarrow \stackrel{\triangle}{=} 185$

# 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.

Operation options Proline Promass X 500

# 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 → 🖺 193
- Current measured values

#### **Function row**

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

#### Navigation area

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

Proline Promass X 500 Operation options

#### Working area

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

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

# 8.4.6 Disabling the Web server

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

#### **Navigation**

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

#### Parameter overview with brief description

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

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

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

#### Enabling the Web server

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

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

# 8.4.7 Logging out

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

Reset the modified properties of the Internet protocol (TCP/IP)  $\rightarrow$   $\bigcirc$  77.

Operation options Proline Promass X 500

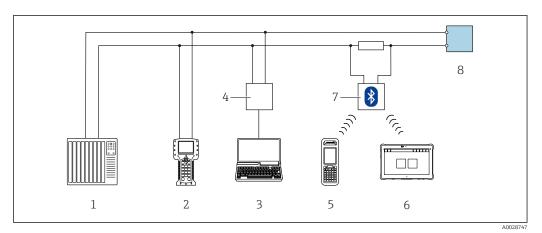
#### 8.5 Access to the operating menu via the operating tool

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

#### 8.5.1 Connecting the operating tool

#### Via HART protocol

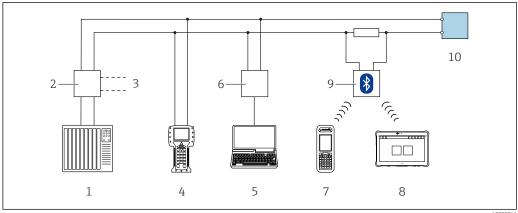
This communication interface is available in device versions with a HART output.



₹ 34 Options for remote operation via HART protocol (active)

- 1 Control system (e.g. PLC)
- 2 Field Communicator 475
- Computer with web browser (e.g. Microsoft Edge) to access the integrated device web server or computer with 3 operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
- Commubox FXA195 (USB)
- Field Xpert SFX350 or SFX370 5
- 6 Field Xpert SMT70
- VIATOR Bluetooth modem with connecting cable
- Transmitter

Operation options Proline Promass X 500



₹ 35 Options for remote operation via HART protocol (passive)

- 1 Control system (e.g. PLC)
- 2 *Transmitter power supply unit, e.g. RN221N (with communication resistor)*
- 3 Connection for Commubox FXA195 and Field Communicator 475
- Field Communicator 475
- Computer with web browser (e.g. Microsoft Edge) to access the integrated device web server or computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
- 6 Commubox FXA195 (USB)
- Field Xpert SFX350 or SFX370
- 8 Field Xpert SMT70
- VIATOR Bluetooth modem with connecting cable
- Transmitter

#### Service interface

Via service interface (CDI-RJ45)

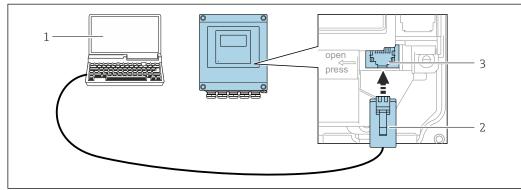
A point-to-point connection can be established to configure the device onsite. With the housing open, the connection is established directly via the service interface (CDI-RJ45) of the device.

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

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

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

Proline 500 - digital transmitter

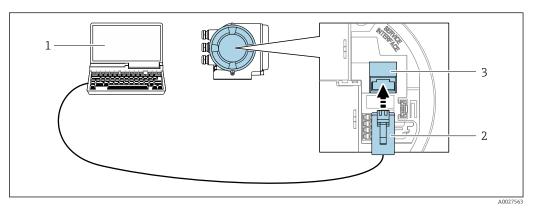


Connection via service interface (CDI-RJ45)

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

Operation options Proline Promass X 500

#### Proline 500 transmitter



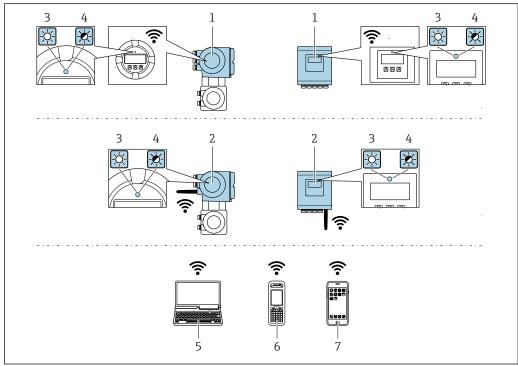
**■** 37 Connection via service interface (CDI-RJ45)

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

#### Via WLAN interface

The optional WLAN interface is available on the following device version:

Order code for "Display; operation", option G "4-line, illuminated; touch control + WLAN"



A003456

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

7 Smart phone or tablet (e.g. Field Xpert SMT70)

Proline Promass X 500 Operation options

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

Configuring the Internet protocol of the mobile terminal

#### NOTICE

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

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

# NOTICE

#### Note the following to avoid a network conflict:

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

#### Preparing the mobile terminal

► Enable WLAN on the mobile terminal.

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

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

  Select the measuring device using the SSID (e.g. EH 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.

Proline Promass X 500 Operation options

#### 8.5.2 Field Xpert SFX350, SFX370

#### **Function** scope

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



For details, see Operating Instructions BA01202S

#### Source for device description files

See information  $\rightarrow \blacksquare 89$ 

#### 8.5.3 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:

- HART protocol → 🖺 82
- CDI-RJ45 service interface → 🖺 83
- WLAN interface → 🖺 84

#### 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



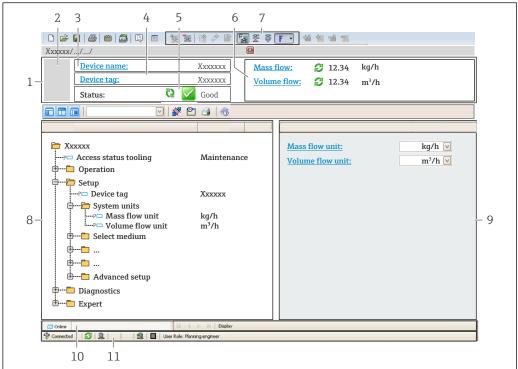
- Operating Instructions BA00027S
- Operating Instructions BA00059S
- Source for device description files  $\rightarrow \triangleq 89$

#### Establishing a connection

- 1. Start FieldCare and launch the project.
- 2. In the network: Add a device.
  - └ The **Add device** window opens.
- 3. Select the **CDI Communication TCP/IP** option from the list and press **OK** to confirm.
- 4. Right-click CDI Communication TCP/IP and select the Add device option in the context menu that opens.
- 5. Select the desired device from the list and press **OK** to confirm.
  - The **CDI Communication TCP/IP (Configuration)** window opens.
- 6. Enter the device address in the **IP address** field: 192.168.1.212 and press **Enter** to confirm.
- 7. Establish the online connection to the device.
- Operating Instructions BA00027S
  - Operating Instructions BA00059S

Proline Promass X 500 Operation options

#### User interface



A00210E1 EN

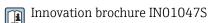
- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Device tag
- 5 Status area with status signal → 🖺 193
- 6 Display area for current measured values
- 7 Editing toolbar with additional functions such as save/load, event list and create documentation
- 8 Navigation area with operating menu structure
- 9 Work area
- 10 Action area
- 11 Status area

#### 8.5.4 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  $\rightarrow \triangleq 89$ 

# 8.5.5 AMS Device Manager

### **Function** range

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

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

Operation options Proline Promass X 500

#### 8.5.6 Field Communicator 475

#### **Function scope**

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

# Source for device description files

See information  $\rightarrow$   $\stackrel{\triangle}{=}$  89

#### SIMATIC PDM 8.5.7

#### Function range

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



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

Proline Promass X 500 System integration

# 9 System integration

# 9.1 Overview of device description files

# 9.1.1 Current version data for the device

Firmware version	01.06.zz	<ul> <li>On the title page of the manual</li> <li>On the transmitter nameplate</li> <li>Firmware version         Diagnostics → Device information → Firmware version     </li> </ul>
Release date of firmware version	08.2022	
Manufacturer ID	0x11	Manufacturer ID Diagnostics → Device information → Manufacturer ID
Device type ID	0x3B	Device type Diagnostics → Device information → Device type
HART protocol revision	7	
Device revision	7	<ul> <li>On the transmitter nameplate</li> <li>Device revision         Diagnostics → Device information → Device revision     </li> </ul>

For an overview of the various firmware versions for the device  $\rightarrow$   $\stackrel{\triangle}{=}$  212

# 9.1.2 Operating tools

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

Operating tool via HART protocol	Sources for obtaining device descriptions	
FieldCare	<ul> <li>www.endress.com → Downloads area</li> <li>USB stick (contact Endress+Hauser)</li> <li>DVD (contact Endress+Hauser)</li> </ul>	
DeviceCare	<ul> <li>www.endress.com → Downloads area</li> <li>CD-ROM (contact Endress+Hauser)</li> <li>DVD (contact Endress+Hauser)</li> </ul>	
<ul><li>Field Xpert SMT70</li><li>Field Xpert SMT77</li></ul>	Use update function of handheld terminal	
AMS Device Manager (Emerson Process Management)	www.endress.com → Downloads area	
SIMATIC PDM (Siemens)	www.endress.com → Downloads area	
Field Communicator 475 (Emerson Process Management)	Use update function of handheld terminal	

System integration Proline Promass X 500

# 9.2 Measured variables via HART protocol

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

Dynamic variables	Measured variables (HART device variables)
Primary dynamic variable (PV)	Mass flow
Secondary dynamic variable (SV)	Totalizer 1
Tertiary dynamic variable (TV)	Density
Quaternary dynamic variable (QV)	Temperature

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

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

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

Proline Promass X 500 System integration

### Measured variables for PV (primary dynamic variable)

- Measured variables which are generally available:
  - Mass flow
  - Volume flow
  - Corrected volume flow
  - Density
  - Reference density
  - Temperature
  - Electronics temperature
  - Pressure
  - Raw value mass flow
  - Oscillation frequency 0
  - Oscillation damping 0
  - Signal asymmetry
  - Exciter current 0
  - Inhomogeneous medium index
  - Sensor index coil asymmetry
  - Test point 0
  - Test point 1
  - Torsion signal asymmetry
- Additional measured variables with the Heartbeat Verification + Monitoring application package:
  - Carrier pipe temperature
  - Oscillation amplitude
  - Frequency fluctuation 0
  - Oscillation damping fluctuation 0
  - HBSI
- Additional measured variables with the Concentration application package:
  - Concentration
  - Target mass flow
  - Carrier mass flow
  - Target volume flow
  - Carrier volume flow
  - Target corrected volume flow
  - Carrier corrected volume flow
- With application-specific output
  - Application specific output 0
  - Application specific output 1
- Additional measured variables with the Petroleum application package:
  - GSV flow
  - GSV flow alternative
  - NSV flow
  - NSV flow alternative
  - S&W volume flow
  - Reference density alternative
  - Water cut
  - Oil density
  - Water density
  - Oil mass flow
  - Water mass flow
  - Oil volume flow
  - Water volume flow
  - Oil corrected volume flow
  - Water corrected volume flow

System integration Proline Promass X 500

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

- Measured variables which are always available:
  - Mass flow
  - Volume flow
  - Corrected volume flow
  - Density
  - Reference density
  - Temperature
  - Electronics temperature
  - Oscillation frequency 0
  - Oscillation damping 0
  - Inhomogeneous medium index
  - Suspended bubbles index
  - Sensor index coil asymmetry
  - Test point 0
  - Test point 1
  - Pressure
  - Totalizer 1
  - Totalizer 2
  - Totalizer 3
- Additional measured variables with the Heartbeat Verification + Monitoring application package:
  - Carrier pipe temperature
  - HBSI
- Additional measured variables with the Concentration application package:
  - Concentration
  - Target mass flow
  - Carrier mass flow
  - Target volume flow
  - Carrier volume flow
  - Target corrected volume flow
  - Carrier corrected volume flow
- Additional measured variables with the Petroleum application package:
  - Reference density alternative
  - GSV flow
  - GSV flow alternative
  - NSV flow
  - NSV flow alternative
  - S&W volume flow
  - Water cut
  - Oil density
  - Water density
  - Oil mass flow
  - Water mass flow
  - Oil volume flow
  - Water volume flow
  - Oil corrected volume flow
  - Water corrected volume flow
  - Weighted density average
  - Weighted temperature average

Proline Promass X 500 System integration

# 9.2.1 Device variables

Device variables are permanently assigned. A maximum of eight device variables can be transmitted.

Assignment	Device variables
0	Mass flow
1	Volume flow
2	Corrected volume flow
3	Density
4	Reference density
5	Temperature
6	Totalizer 1
7	Totalizer 2
8	Totalizer 3
13	Target mass flow <sup>1)</sup>
14	Carrier mass flow 1)
15	Concentration 1)

<sup>1)</sup> Visible depending on the order options or device settings

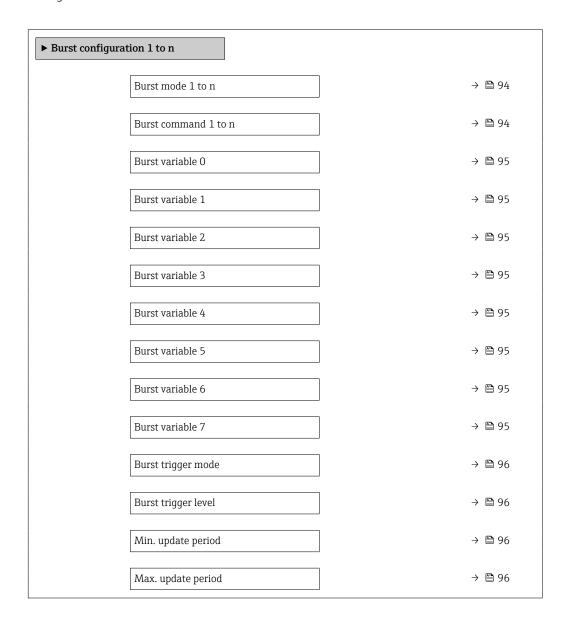
System integration Proline Promass X 500

# 9.3 Other settings

Burst mode functionality in accordance with HART 7 Specification:

### Navigation

"Expert" menu  $\to$  Communication  $\to$  HART output  $\to$  Burst configuration  $\to$  Burst configuration 1 to n



#### Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Burst mode 1 to n	Activate the HART burst mode for burst message X.	<ul><li>Off</li><li>On</li></ul>	Off
Burst command 1 to n	Select the HART command that is sent to the HART master.	<ul> <li>Command 1</li> <li>Command 2</li> <li>Command 3</li> <li>Command 9</li> <li>Command 33</li> <li>Command 48</li> </ul>	Command 2

Proline Promass X 500 System integration

Parameter	Description	Selection / User entry	Factory setting
Burst variable 0	For HART command 9 and 33: select the HART device variable or the process variable.	Mass flow Volume flow Corrected volume flow* Density Reference density* Temperature Totalizer 1 Totalizer 2 Totalizer 3 Target mass flow* Concentration* Totalizer 1 Totalizer 1 Totalizer 2 Totalizer 3 HBSI* Target volume flow* Carrier wolume flow* Carrier corrected volume flow* Carrier corrected volume flow* Ses Volume flow* NSV flow alternative* S&W volume flow* NSV flow alternative* S&W volume flow* Water cut* Oil density* Water density Oil mass flow* Water wolume flow* Water cut density Oil corrected volume flow* Water cut Totalizer 1 Totalizer 2 Totalizer 3 HBSI Target volume flow Target corrected volume flow* Carrier corrected volume flow* NSV flow alternative SSV flow SSV flow alternative SW volume flow Water cut Oil density Water density Oil mass flow Water mass flow Vater mass flow Total point flow Water volume flow Water volume flow Test point 0 Test point 1 HART input Percent of range Measured current Primary variable (PV) Secondary variable (SV) Tertiary variable (TV) Quaternary variable (QV) Not used	Volume flow
Burst variable 1	For HART command 9 and 33: select the HART device variable or the process variable.	See the <b>Burst variable 0</b> parameter.	Not used
Burst variable 2	For HART command 9 and 33: select the HART device variable or the process variable.	See the <b>Burst variable 0</b> parameter.	Not used
Burst variable 3	For HART command 9 and 33: select the HART device variable or the process variable.	See the <b>Burst variable 0</b> parameter.	Not used
Burst variable 4	For HART command 9: select the HART device variable or the process variable.	See the <b>Burst variable 0</b> parameter.	Not used
Burst variable 5	For HART command 9: select the HART device variable or the process variable.	See the <b>Burst variable 0</b> parameter.	Not used
Burst variable 6	For HART command 9: select the HART device variable or the process variable.	See the <b>Burst variable 0</b> parameter.	Not used
Burst variable 7	For HART command 9: select the HART device variable or the process variable.	See the <b>Burst variable 0</b> parameter.	Not used

System integration Proline Promass X 500

Parameter	Description	Selection / User entry	Factory setting
Burst trigger mode	Select the event that triggers burst message X.	<ul> <li>Continuous</li> <li>Window*</li> <li>Rising*</li> <li>Falling*</li> <li>On change</li> </ul>	Continuous
Burst trigger level	Enter the burst trigger value.  Together with the option selected in the Burst trigger mode parameter the burst trigger value determines the time of burst message X.	Signed floating-point number	-
Min. update period	Enter the minimum time span between two burst commands of burst message X.	Positive integer	1 000 ms
Max. update period	Enter the maximum time span between two burst commands of burst message X.	Positive integer	2 000 ms

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

Proline Promass X 500 Commissioning

# 10 Commissioning

# 10.1 Post-mounting and post-connection check

Before commissioning the device:

- ► Make sure that the post-installation and post-connection checks have been performed successfully.
- Checklist for "Post-connection" check → 

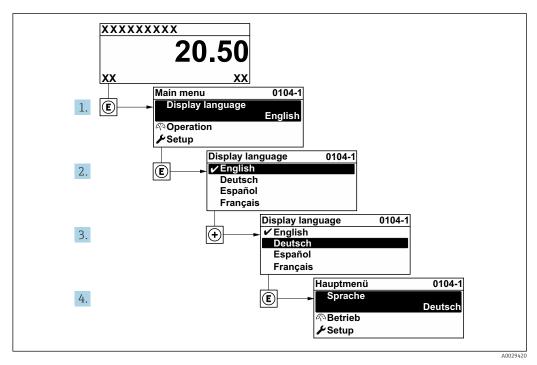
  □ 58

# 10.2 Switching on the measuring device

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

# 10.3 Setting the operating language

Factory setting: English or ordered local language

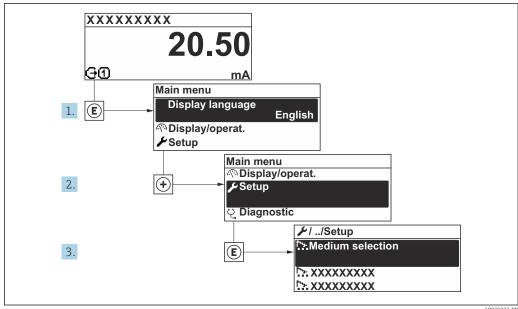


■ 38 Taking the example of the local display

# 10.4 Configuring the measuring instrument

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

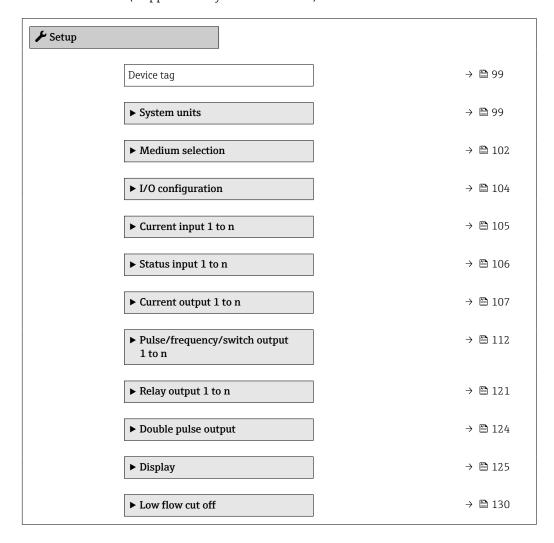
Commissioning Proline Promass X 500



 $label{eq:section}$  39 Navigation to "Setup" menu using the example of the local display

A0032222-E

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").

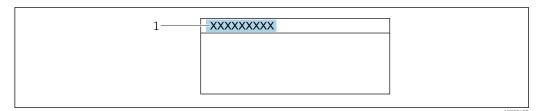


Proline Promass X 500 Commissioning

▶ Partially filled pipe detectio	on → 🖺 131
► Advanced setup	→ 🖺 132

# 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.



 $\blacksquare$  40 Header of the operational display with tag name

1 Tag name

#### **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. @, %, /).	Promass

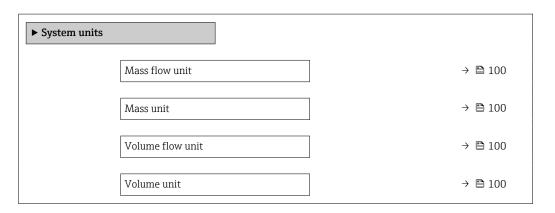
# 10.4.2 Setting the system units

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



Commissioning Proline Promass X 500

Corrected volume flow unit	→ 🖺 100
Corrected volume unit	→ 🖺 100
Density unit	→ 🖺 100
Reference density unit	→ 🗎 100
Density 2 unit	→ 🖺 101
Temperature unit	→ 🖺 101
Pressure unit	→ 🖺 101

# Parameter overview with brief description

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  (→   164)	Unit choose list	Country-specific:  NI/h Sft³/min
Corrected volume unit	Select corrected volume unit.	Unit choose list	Country-specific:  NI Sft³
Density unit	Select density unit.  Effect  The selected unit applies to:  Output Simulation process variable Density adjustment (Expert menu)	Unit choose list	Country-specific:  kg/l lb/ft <sup>3</sup>
Reference density unit	Select reference density unit.	Unit choose list	Country-specific  kg/Nl lb/Sft³

Proline Promass X 500 Commissioning

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 (→ 🖺 104)  ■ External pressure parameter (→ 🖺 104)  ■ Pressure value	Unit choose list	Country-specific:  • bar a  • psi a

Commissioning Proline Promass X 500

# 10.4.3 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

► Medium selection	
Select medium type	→ 🖺 103
Select gas type	→ 🖺 103
Reference sound velocity	→ 🗎 103
Reference sound velocity	→ 🖺 103
Temperature coefficient sound velocity	→ 🖺 103
Temperature coefficient sound velocity	→ 🖺 103
Pressure compensation	→ 🖺 103
Pressure value	→ 🖺 104
External pressure	→ 🗎 104

Proline Promass X 500 Commissioning

# Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Select medium type	-	Use this function to select the type of medium: "Gas" or "Liquid". Select the "Other" option in exceptional cases in order to enter the properties of the medium manually (e.g. for highly compressive liquids such as sulfuric acid).	<ul><li>Liquid</li><li>Gas</li><li>Other</li></ul>	Liquid
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 ■ Nitrogen N2 ■ Nitrous oxide N2O ■ Methane CH4 ■ Methane CH4 + 10% Hydrogen H2 ■ Methane CH4 + 20% Hydrogen H2 ■ Methane CH4 + 30% Hydrogen H2 ■ Hydrogen H2 ■ Hydrogen H2 ■ Hydrogen Sulfide HCI ■ Hydrogen sulfide HCI ■ Hydrogen Sulfide HCS ■ Ethylene C2H4 ■ Carbon dioxide CO2 ■ Carbon monoxide CO ■ Chlorine Cl2 ■ Butane C4H10 ■ Propane C3H8 ■ Propylene C3H6 ■ Ethane C2H6	Methane CH4
Reference sound velocity	In the <b>Select gas type</b> parameter, the <b>Other</b> 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 <b>Select medium type</b> parameter, the <b>Other</b> 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 <b>Select gas type</b> parameter, the <b>Other</b> 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 <b>Select medium type</b> parameter, the <b>Other</b> 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.	<ul> <li>Off</li> <li>Fixed value</li> <li>External value *</li> <li>Current input 1 *</li> <li>Current input 2 *</li> <li>Current input 3 *</li> </ul>	Off

Commissioning Proline Promass X 500

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

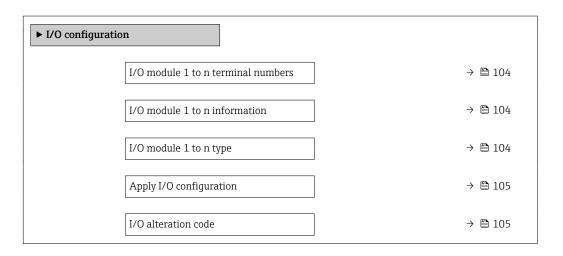
<sup>\*</sup> Visibility depends on order options or device settings

# 10.4.4 Displaying the I/O configuration

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

### Navigation

"Setup" menu  $\rightarrow$  I/O configuration



# Parameter overview with brief description

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

Proline Promass X 500 Commissioning

Parameter	Description	User interface / Selection / User entry	Factory setting
Apply I/O configuration	Apply parameterization of the freely configurable I/O module.	■ No ■ Yes	No
I/O alteration code	Enter the code in order to change the I/O configuration.	Positive integer	0

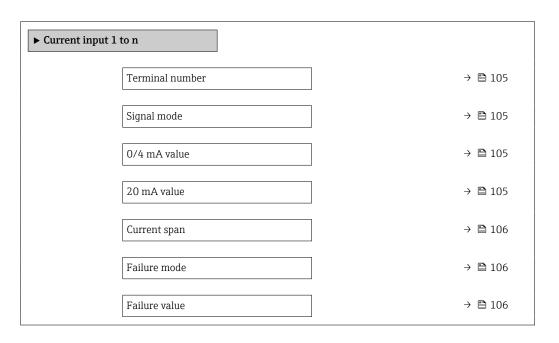
<sup>\*</sup> Visibility depends on order options or device settings

# 10.4.5 Configuring the current input

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

# Navigation

"Setup" menu  $\rightarrow$  Current input



### Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	-	Shows the terminal numbers used by the current input module.	<ul> <li>Not used</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> <li>20-21 (I/O 4)*</li> </ul>	-
Signal mode	The measuring device is <b>not</b> approved for use in the hazardous area with type of protection Ex-i.	Select the signal mode for the current input.	• Passive • Active*	Active
0/4 mA value	_	Enter 4 mA value.	Signed floating-point number	0
20 mA value	-	Enter 20 mA value.	Signed floating-point number	Depends on country and nominal diameter

Commissioning Proline Promass X 500

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

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

# 10.4.6 Configuring the status input

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

# **Navigation**

"Setup" menu  $\rightarrow$  Status input 1 to n

► Status input 1 to n	
Assign status input	→ 🖺 107
Terminal number	→ 🖺 107
Active level	→ 🖺 107
Terminal number	→ 🖺 107
Response time status input	→ 🖺 107
Terminal number	→ 🖺 107

Proline Promass X 500 Commissioning

### Parameter overview with brief description

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

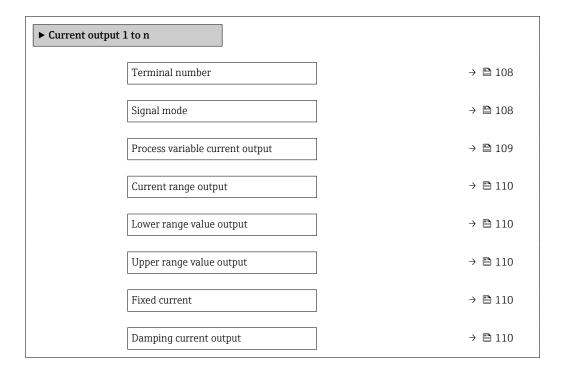
<sup>\*</sup> Visibility depends on order options or device settings

# 10.4.7 Configuring the current output

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

#### **Navigation**

"Setup" menu  $\rightarrow$  Current output



Commissioning Proline Promass X 500

Failure behavior current output	→ 🖺 111
Failure current	→ 🖺 111

# Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	-	Shows the terminal numbers used by the current output module.	<ul> <li>Not used</li> <li>26-27 (I/O 1)</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> <li>20-21 (I/O 4)*</li> </ul>	-
Signal mode	_	Select the signal mode for the current output.	<ul><li>Active *</li><li>Passive *</li></ul>	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 Target volume flow* Carrier mass flow* Target corrected volume flow* Carrier corrected volume flow* Reference density alternative* GSV flow GSV flow alternative* NSV flow NSV flow alternative* S&W volume flow* Water cut Oil density* Water density Oil mass flow* Vater volume flow* Vater cut Oil corrected volume flow Water mass flow Vater volume flow Vater volume flow Water oriected volume flow Vater corrected volume flow Vater flow Vate	Mass flow
			fluctuation 0 *	

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
			<ul> <li>Oscillation amplitude 0*</li> <li>Oscillation damping fluctuation 0*</li> <li>HBSI*</li> <li>Pressure*</li> <li>Electronics temperature</li> <li>Sensor index coil asymmetry</li> <li>Test point 0</li> <li>Test point 1</li> </ul>	
Current range output	-	Select current range for process value output and upper/lower level for alarm signal.	<ul> <li>420 mA NE (3.820.5 mA)</li> <li>420 mA US (3.920.8 mA)</li> <li>420 mA (4 20.5 mA)</li> <li>020 mA (0 20.5 mA)</li> <li>Fixed value</li> </ul>	Depends on country:  420 mA NE (3.820.5 mA)  420 mA US (3.920.8 mA)
Lower range value output	In <b>Current span</b> parameter (→ ≧ 110), one of the following options is selected:  • 420 mA NE (3.820.5 mA)  • 420 mA US (3.920.8 mA)  • 420 mA (4 20.5 mA)  • 020 mA (0 20.5 mA)	Enter lower range value for the measured value range.	Signed floating-point number	Depends on country:  • 0 kg/h  • 0 lb/min
Upper range value output	In <b>Current span</b> parameter (→ ≧ 110), one of the following options is selected:  • 420 mA NE (3.820.5 mA)  • 420 mA US (3.920.8 mA)  • 420 mA (4 20.5 mA)  • 020 mA (0 20.5 mA)	Enter upper range value for the measured value range.	Signed floating-point number	Depends on country and nominal diameter
Fixed current	The <b>Fixed current</b> option is selected in the <b>Current span</b> parameter ( $\rightarrow \square 110$ ).	Defines the fixed output current.	0 to 22.5 mA	22.5 mA
Damping current output	A process variable is selected in the <b>Assign current output</b> parameter (→ 🖺 109) and one of the following options is selected in the <b>Current span</b> parameter (→ 🖺 110):  ■ 420 mA NE (3.820.5 mA)  ■ 420 mA US (3.920.8 mA)  ■ 420 mA (4 20.5 mA)  ■ 020 mA (0 20.5 mA)	Set reaction time for output signal to fluctuations in the measured value.	0.0 to 999.9 s	1.0 s

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Failure behavior current output	A process variable is selected in the <b>Assign current output</b> parameter (→ 🖺 109) and one of the following options is selected in the <b>Current span</b> parameter (→ 🖺 110):  • 420 mA NE (3.820.5 mA)  • 420 mA US (3.920.8 mA)  • 420 mA (4 20.5 mA)  • 020 mA (0 20.5 mA)	Define output behavior in alarm condition.	<ul> <li>Min.</li> <li>Max.</li> <li>Last valid value</li> <li>Actual value</li> <li>Fixed value</li> </ul>	Max.
Failure current	The <b>Defined value</b> option is selected in the <b>Failure mode</b> parameter.	Enter current output value in alarm condition.	0 to 22.5 mA	22.5 mA

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

# 10.4.8 Configuring the pulse/frequency/switch output

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

#### Navigation

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



### Parameter overview with brief description

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

### Configuring the pulse output

### Navigation

"Setup" menu → Pulse/frequency/switch output

► Pulse/frequency/switch output 1 to n	
Operating mode	→ 🖺 113
Terminal number	→ 🖺 113
Signal mode	→ 🖺 113
Assign pulse output	→ 🖺 113
Pulse scaling	→ 🖺 113
Pulse width	→ 🖺 113
Failure mode	→ 🖺 114
Invert output signal	→ 🗎 114

# Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	-	Define the output as a pulse, frequency or switch output.	<ul><li>Pulse</li><li>Frequency</li><li>Switch</li></ul>	Pulse
Terminal number	-	Shows the terminal numbers used by the PFS output module.	<ul> <li>Not used</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> <li>20-21 (I/O 4)*</li> </ul>	-
Signal mode	-	Select the signal mode for the PFS output.	<ul> <li>Passive</li> <li>Active *</li> <li>Passive NE</li> </ul>	Passive
Assign pulse output	The <b>Pulse</b> option is selected in <b>Operating mode</b> parameter.	Select process variable for pulse output.	Off     Mass flow     Volume flow     Corrected volume flow*     Target mass flow*     Carrier mass flow *     Carrier volume flow*     Carrier volume flow*     Carrier corrected volume flow*     Carrier corrected volume flow*     Carrier corrected volume flow*     Carrier corrected volume flow*     GSV flow alternative *     NSV flow alternative *     NSV flow alternative *     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
Pulse scaling	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 112) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🖺 113).	Enter quantity for measured value at which a pulse is output.	Positive floating point number	Depends on country and nominal diameter
Pulse width	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 112) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🖺 113).	Define time width of the output pulse.	0.05 to 2 000 ms	100 ms

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Failure mode	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ 🗎 112) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🖺 113).	Define output behavior in alarm condition.	<ul><li>Actual value</li><li>No pulses</li></ul>	No pulses
Invert output signal	-	Invert the output signal.	<ul><li>No</li><li>Yes</li></ul>	No

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

# Configuring the frequency output

# Navigation

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

► Pulse/frequency/switch outp 1 to n	ut	
Operating m	ode	→ 🖺 115
Terminal nu	mber	→ 🖺 115
Signal mode		→ 🖺 115
Assign frequ	ency output	→ 🖺 116
Minimum fr	equency value	→ 🖺 117
Maximum fr	equency value	→ 🖺 117
Measuring v frequency	alue at minimum	→ 🖺 117
Measuring v frequency	alue at maximum	→ 🖺 117
Failure mode	2	→ 🖺 117
Failure frequ	iency	→ 🖺 117
Invert outpu	t signal	→ 🖺 117

# Parameter overview with brief description

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

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Assign frequency output	The <b>Frequency</b> option is selected in <b>Operating mode</b> parameter (→ 🖺 112).	Select process variable for frequency output.	Off     Mass flow     Volume flow     Corrected volume flow*     Density     Reference density*     Time period signal frequency (TPS)*     Temperature     Pressure     GSV flow*     GSV flow alternative*     NSV flow alternative*     NSV flow alternative*     NSV flow alternative*     Water cut*     Oil density*     Water density*     Oil mass flow*     Oil volume flow*     Water wolume flow*     Water wolume flow*     Water corrected volume flow*     Water corrected volume flow*     Carrier mass flow*     Carrier mass flow*     Carrier wolume flow*     Carrier volume flow*     Carrier volume flow*     Carrier volume flow*     Carrier wolume flow*     Carrier wolume flow*     Carrier wolume flow*     Carrier volume flow flow*     Carrier volume flow*     Carrier volume flow*     Carrier volume flow flow flow flow flow flow flow flow	Off

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
			<ul> <li>Torsion signal asymmetry*</li> <li>Carrier pipe temperature*</li> <li>Electronics temperature</li> <li>Sensor index coil asymmetry</li> <li>Test point 0</li> <li>Test point 1</li> </ul>	
Minimum frequency value	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter ( $\rightarrow \implies 112$ ) and a process variable is selected in the <b>Assign frequency output</b> parameter ( $\rightarrow \implies 116$ ).	Enter minimum frequency.	0.0 to 10 000.0 Hz	0.0 Hz
Maximum frequency value	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🗎 112) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 116).	Enter maximum frequency.	0.0 to 10 000.0 Hz	10 000.0 Hz
Measuring value at minimum frequency	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🗎 112) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 116).	Enter measured value for minimum frequency.	Signed floating-point number	Depends on country and nominal diameter
Measuring value at maximum frequency	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 112) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 116).	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 112) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 116).	Define output behavior in alarm condition.	<ul><li>Actual value</li><li>Defined value</li><li>0 Hz</li></ul>	0 Hz
Failure frequency	In the Operating mode parameter (→ 🗎 112), the Frequency option is selected, in the Assign frequency output parameter (→ 🖺 116) 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

 $<sup>^{\</sup>star}$  Visibility depends on order options or device settings

# Configuring the switch output

# Navigation

"Setup" menu → Pulse/frequency/switch output

► Pulse/frequency/switch output 1 to n	
Operating mode	→ 🗎 118
Terminal number	→ 🖺 118
Signal mode	→ 🖺 118
Switch output function	→ 🖺 119
Assign diagnostic behavior	→ 🖺 119
Assign limit	→ 🖺 120
Assign flow direction check	→ 🖺 120
Assign status	→ 🖺 121
Switch-on value	→ 🖺 121
Switch-off value	→ 🖺 121
Switch-on delay	→ 🖺 121
Switch-off delay	→ 🖺 121
Failure mode	→ 🖺 121
Invert output signal	→ 🖺 121

## Parameter overview with brief description

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

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch output function	The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.	Select function for switch output.	<ul> <li>Off</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit</li> <li>Flow direction check</li> <li>Status</li> </ul>	Off
Assign diagnostic behavior	<ul> <li>In the Operating mode parameter, the Switch option is selected.</li> <li>In the Switch output function parameter, the Diagnostic behavior option is selected.</li> </ul>	Select diagnostic behavior for switch output.	<ul><li>Alarm</li><li>Alarm or warning</li><li>Warning</li></ul>	Alarm

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Assign limit	The Switch option is selected in Operating mode parameter.  The Limit option is selected in Switch output function parameter.	Select process variable for limit function.	Mass flow Volume flow Corrected volume flow* Target mass flow* Target volume flow* Carrier volume flow* Carrier corrected volume flow* Carrier corrected volume flow* Density Reference density alternative* GSV flow alternative* NSV flow alternative* NSV flow alternative* S&W volume flow* Water cut* Oil density Vater density* Vater density* Vater water volume flow* Vater corrected volume flow volume f	Volume flow
Assign flow direction check	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Flow direction check option is selected in the Switch output function parameter.</li> </ul>	Select process variable for flow direction monitoring.		Mass flow

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

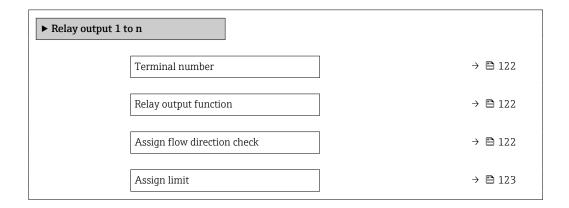
<sup>\*</sup> Visibility depends on order options or device settings

# 10.4.9 Configuring the relay output

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

### Navigation

"Setup" menu  $\rightarrow$  Relay output 1 to n



Assign diag	nostic behavior	-	→ 🖺 123
Assign stati	18	<del>-</del>	→ 🖺 123
Switch-off v	ralue	<u> </u>	→ 🖺 123
Switch-off o	lelay	-	→ 🖺 124
Switch-on v	alue	=	→ 🖺 124
Switch-on d	elay	- -	→ 🖺 124
Failure mod	le	- -	→ 🗎 124
Switch state	2	- -	→ 🗎 124
Powerless r	elay status		→ 🖺 124

# Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	-	Shows the terminal numbers used by the relay output module.	<ul> <li>Not used</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> <li>20-21 (I/O 4)</li> </ul>	-
Relay output function	-	Select the function for the relay output.	<ul> <li>Closed</li> <li>Open</li> <li>Diagnostic behavior</li> <li>Limit</li> <li>Flow direction check</li> <li>Digital Output</li> </ul>	Closed
Assign flow direction check	The Flow direction check option is selected in the Relay output function parameter.	Select process variable for flow direction monitoring.		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 process variable for limit function.	Mass flow Volume flow Corrected volume flow* Target mass flow Target volume flow Carrier mass flow Target volume flow Carrier corrected volume flow Carrier corrected volume flow Carrier corrected volume flow Density Reference density Reference density Alternative Solv flow Alternative NSV flow Alternative Solv flow Alternative Totalizer 1 Totalizer 2 Totalizer 1 Totalizer 2 Totalizer 3 Oscillation Amping Pressure Application Specific output 0 Application Specific output 1 Inhomogeneous medium index Suspended bubbles index*	Mass flow
Assign diagnostic behavior	In the <b>Relay output function</b> parameter, the <b>Diagnostic behavior</b> option is selected.	Select diagnostic behavior for switch output.	<ul><li>Alarm</li><li>Alarm or warning</li><li>Warning</li></ul>	Alarm
Assign status	In the <b>Relay output function</b> parameter, the <b>Digital Output</b> option is selected.	Select device status for switch output.	<ul><li>Partially filled pipe detection</li><li>Low flow cut off</li></ul>	Partially filled pipe detection
Switch-off value	The <b>Limit</b> option is selected in the <b>Relay output function</b> parameter.	Enter measured value for the switch-off point.	Signed floating-point number	Depends on country:  • 0 kg/h  • 0 lb/min

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Switch-off delay	In the <b>Relay output function</b> parameter, the <b>Limit</b> option is selected.	Define delay for the switch-off of status output.	0.0 to 100.0 s	0.0 s
Switch-on value	The <b>Limit</b> option is selected in the <b>Relay output function</b> parameter.	Enter measured value for the switch-on point.	Signed floating-point number	Depends on country:  Okg/h Olb/min
Switch-on delay	In the <b>Relay output function</b> parameter, the <b>Limit</b> option is selected.	Define delay for the switch-on of status output.	0.0 to 100.0 s	0.0 s
Failure mode	-	Define output behavior in alarm condition.	<ul><li>Actual status</li><li>Open</li><li>Closed</li></ul>	Open
Switch state	-	Shows the current relay switch status.	<ul><li>Open</li><li>Closed</li></ul>	-
Powerless relay status	-	Select quietscent state for relay.	<ul><li>Open</li><li>Closed</li></ul>	Open

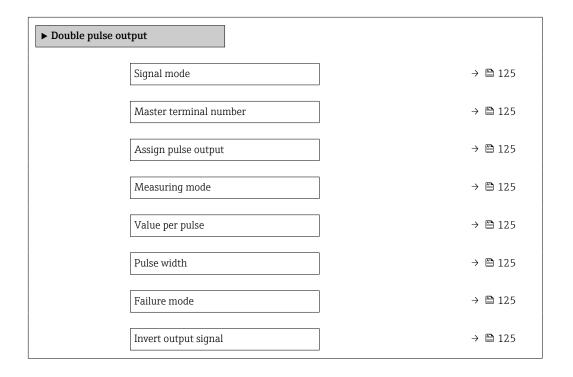
<sup>\*</sup> Visibility depends on order options or device settings

# 10.4.10 Configuring the double pulse output

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

### Navigation

"Setup" menu → Double pulse output



### Parameter overview with brief description

Parameter	Description	Selection / User interface / User entry	Factory setting
Signal mode	Select the signal mode for the double pulse output.	<ul> <li>Passive</li> <li>Active*</li> <li>Passive NE</li> </ul>	Passive
Master terminal number	Shows the terminal numbers used by the master of the double pulse output module.	<ul><li>Not used</li><li>24-25 (I/O 2)</li><li>22-23 (I/O 3)</li></ul>	-
Assign pulse output	Select process variable for pulse output.	Off     Mass flow     Volume flow     Corrected volume flow*     Carrier mass flow*     Carrier mass flow*     Carrier volume flow*     Carrier volume flow*     Carrier corrected volume flow*     Carrier corrected volume flow*     Carrier description flow*     Carrier corrected volume flow*     SSV flow*     GSV flow alternative*     NSV flow alternative*     S&W volume flow*     Oil mass flow*     Water mass flow*     Water volume flow*     Oil corrected volume flow*     Water corrected volume flow*     Water corrected volume flow*     Water corrected volume flow*	Off
Measuring mode	Select measuring mode for pulse output.	<ul> <li>Forward flow</li> <li>Forward/Reverse flow</li> <li>Reverse flow</li> <li>Reverse flow compensation</li> </ul>	Forward flow
Value per pulse	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	Define time width of the output pulse.	0.5 to 2 000 ms	0.5 ms
Failure mode	Define output behavior in alarm condition.	<ul><li>Actual value</li><li>No pulses</li></ul>	No pulses
Invert output signal	Invert the output signal.	• No • Yes	No

Visibility depends on order options or device settings

# 10.4.11 Configuring the local display

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

### Navigation

"Setup" menu → Display



Value 1 display	→ 🗎 128
0% bargraph value 1	→ 🖺 129
100% bargraph value 1	→ 🗎 129
Value 2 display	→ 🖺 129
Value 3 display	→ 🖺 129
0% bargraph value 3	→ 🖺 129
100% bargraph value 3	→ 🗎 129
Value 4 display	→ 🖺 129
Value 5 display	→ 🖺 129
Value 6 display	→ 🖺 129
Value 7 display	→ 🖺 129
Value 8 display	→ 🖺 129

# Parameter overview with brief description

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

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	Mass flow Volume flow Corrected volume flow* Density Reference density* Temperature Pressure Totalizer 1 Totalizer 2 Totalizer 3 GSV flow GSV flow alternative* NSV flow alternative* NSV flow alternative* S&W volume flow* Reference density alternative* Weighted density average* Weighted temperature average* Water cut Oil density* Water density* Oil wolume flow* Water mass flow Vater mass flow Oil volume flow* Vater volume flow* Oil corrected volume flow* Concentration* Target mass flow Carrier mass flow Carrier mass flow Target volume flow Carrier wolume flow Carrier wolume flow Carrier wolume flow Carrier volume flow Carrier corrected volume flow Carrier orected volume flow Carrier orected volume flow Carrier orected volume flow Carrier corrected volume flow Carrier orlected volume flow	Mass flow

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
			<ul> <li>Frequency fluctuation 0*</li> <li>Oscillation amplitude 0*</li> <li>Signal asymmetry</li> <li>Torsion signal asymmetry*</li> <li>Carrier pipe temperature*</li> <li>Electronics temperature</li> <li>Sensor index coil asymmetry</li> <li>Test point 0</li> <li>Test point 1</li> <li>Current output 1 current output 2 current output 3 current output 3</li> <li>Current output 4</li> </ul>	
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 (→ 🖺 128)	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  (→   128)	None
0% bargraph value 3	A selection was made in the <b>Value 3 display</b> parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  Okg/h Olb/min
100% bargraph value 3	A selection was made in the <b>Value 3 display</b> parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see  Value 1 display parameter (→   128)	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  (→   128)	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 (→   128)	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 (→   128)	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 (→   128)	None

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

# 10.4.12 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	→ 🖺 130
On value low flow cutoff	→ 🖺 130
Off value low flow cutoff	→ 🖺 130
Pressure shock suppression	→ 🖺 130

## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	-	Select process variable for low flow cut off.	<ul> <li>Off</li> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow *</li> </ul>	Mass flow
On value low flow cutoff	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow  ext{ }  ext{ } $	Enter on value for low flow cut off.	Positive floating- point number	Depends on country and nominal diameter
Off value low flow cutoff	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \implies 130$ ).	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow  ext{ }  ext{ } $	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

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

130

# 10.4.13 Configuring partially filled pipe detection

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

### Navigation

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

▶ Partially filled pipe detection	
Assign process variable	→ 🖺 131
Low value partial filled pipe detection	→ 🗎 131
High value partial filled pipe detection	→ 🖺 131
Response time part. filled pipe detect.	→ 🗎 131

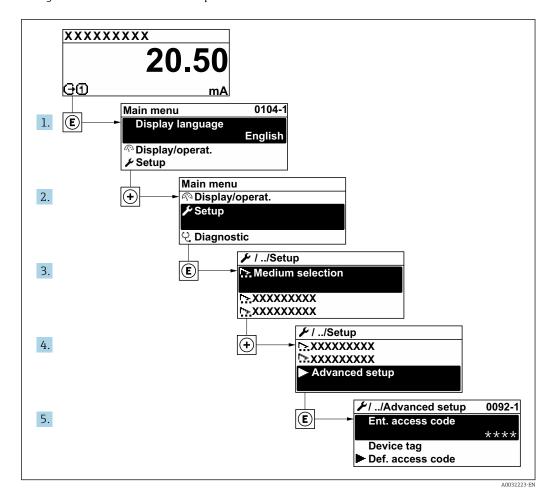
## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	-	Select process variable for partially filled pipe detection.	<ul><li> Off</li><li> Density</li><li> Calculated reference density</li></ul>	Density
Low value partial filled pipe detection	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \implies 131$ ).	Enter lower limit value for deactivating partialy filled pipe detection.	Signed floating-point number	Depends on country:  200 kg/m³  12.5 lb/ft³
High value partial filled pipe detection	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \implies 131$ ).	Enter upper limit value for deactivating partialy filled pipe detection.	Signed floating-point number	Depends on country:  • 6000 kg/m <sup>3</sup> • 374.6 lb/ft <sup>3</sup>
Response time part. filled pipe detect.	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🗎 131).	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

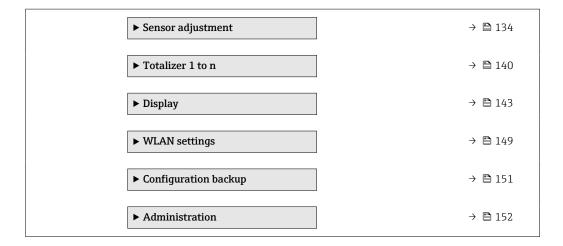


- The number of submenus and parameters can vary depending on the device version and the available application packages. These submenus and their parameters are explained in the Special Documentation for the device and not in Operating Instructions.
  - For detailed information on the parameter descriptions for application packages or for operation in custody transfer mode: Special Documentation for the device → 🖺 254
  - For detailed information on the SIL parameter descriptions, see the Functional Safety Manual → 🖺 253

#### **Navigation**

"Setup" menu → Advanced setup

► Advanced setup	
Enter access code	→ 🗎 133
► Calculated values	→ 🖺 133



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

#### 10.5.2 Calculated process variables

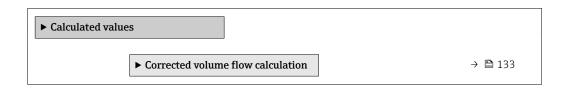
The Calculated values submenu contains parameters for calculating the corrected volume flow.



The Calculated values submenu is **not** available if one of the following options was selected in the **Petroleum mode** parameter in the "Application package", option **EJ** "Petroleum": API referenced correction option, Net oil & water cut option or ASTM D4311 option

#### **Navigation**

"Setup" menu → Advanced setup → Calculated values



### "Corrected volume flow calculation" submenu

#### **Navigation**

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



External reference density (6198)	→ 🖺 134
Fixed reference density (1814)	→ 🖺 134
Reference temperature (1816)	→ 🖺 134
Linear expansion coefficient (1817)	→ 🖺 134
Square expansion coefficient (1818)	→ 🖺 134

# 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.	<ul> <li>Fixed reference density</li> <li>Calculated reference density</li> <li>Current input 1*</li> <li>Current input 2*</li> <li>Current input 3*</li> </ul>	Calculated reference density
External reference density	One of the following options is selected in the Corrected volume flow calculation parameter:  • Current input 1*  • Current input 2*  • Current input 3*	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 <sup>2</sup>

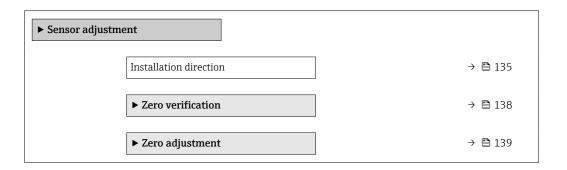
<sup>\*</sup> Visibility depends on order options or device settings

# 10.5.3 Carrying out a sensor adjustment

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

#### **Navigation**

"Setup" menu → Advanced setup → Sensor adjustment



### Parameter overview with brief description

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

#### Density adjustment

With density adjustment, a high level of accuracy is achieved only at the point of adjustment and at the relevant density and temperature. However, the accuracy of a density adjustment is only ever as good as the quality of the reference measuring data provided. Therefore it is not a substitute for special density calibration.

### Performing density adjustment

- Note the following before performing the adjustment:
  - A density adjustment only makes sense if there is little variation in the operating conditions and the density adjustment is performed under the operating conditions.
  - The density adjustment scales the internally computed density value with a user-specific slope and offset.
  - A 1-point or 2-point density adjustment can be performed.
  - For a 2-point density adjustment, there must be a difference of at least 0.2 kg/l between the two target density values.
  - The reference media must be gas-free or pressurized so that any gas they contain is compressed.
  - The reference density measurements must be performed at the same medium temperature that prevails in the process, as otherwise the density adjustment will not be accurate.
  - The correction resulting from the density adjustment can be deleted with the **Restore original** option.

### "1 point adjustment" option

- 1. In the **Density adjustment mode** parameter, select the **1 point adjustment** option and confirm.
- 2. In the **Density setpoint 1** parameter, enter the density value and confirm.
  - In the **Execute density adjustment** parameter the following options are now available:

Ok

**Measure density 1** option Restore original

3. Select the **Measure density 1** option and confirm.

4. If 100% was reached in the **Progress** parameter on the display and the **Ok** option is displayed in the **Execute density adjustment** parameter, then confirm.

In the Execute density adjustment parameter the following options are now available:

Ok

Calculate

Cancel

5. Select the **Calculate** option and confirm.

If the adjustment was completed successfully, the **Density adjustment factor** parameter and the **Density adjustment offset** parameter and the values calculated for them are shown on the display.

#### "2 point adjustment" option

- 1. In the **Density adjustment mode** parameter, select the **2 point adjustment** option and confirm.
- 2. In the **Density setpoint 1** parameter, enter the density value and confirm.
- 3. In the **Density setpoint 2** parameter, enter the density value and confirm.
  - In the **Execute density adjustment** parameter the following options are now available:

Ok

Measure density 1

Restore original

- 4. Select the **Measure density 1** option and confirm.
  - In the **Execute density adjustment** parameter the following options are now available:

Ok

Measure density 2

Restore original

- 5. Select the **Measure density 2** option and confirm.
  - In the **Execute density adjustment** parameter the following options are now available:

Ok

Calculate

Cancel

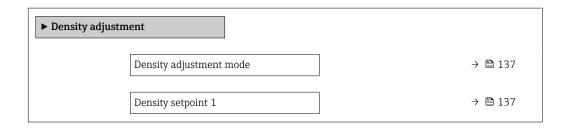
6. Select the **Calculate** option and confirm.

If the **Density adjust failure** option is displayed in the **Execute density adjustment** parameter, call up the options and select the **Cancel** option. The density adjustment is canceled and can be repeated.

If the adjustment was completed successfully, the **Density adjustment factor** parameter and the **Density adjustment offset** parameter and the values calculated for them are shown on the display.

#### **Navigation**

"Expert" menu  $\rightarrow$  Sensor  $\rightarrow$  Sensor adjustment  $\rightarrow$  Density adjustment



Density setpoint 2	→ 🖺 137
Execute density adjustment	→ 🖺 137
Progress	→ 🖺 137
Density adjustment factor	→ 🖺 137
Density adjustment offset	→ 🖺 137

### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Density adjustment mode	-	Select the method for field density adjustment to correct the factory setting.	<ul><li>1 point adjustment</li><li>2 point adjustment</li></ul>	1 point adjustment
Density setpoint 1	-	Enter density for the first reference media.	The entry depends on the unit selected in the <b>Density unit</b> parameter (0555).	1 kg/l
Density setpoint 2	In the <b>Density adjustment mode</b> parameter, the <b>2 point adjustment</b> option is selected.	Enter density for the second reference media.	The entry depends on the unit selected in the <b>Density unit</b> parameter (0555).	1 kg/l
Execute density adjustment	-	Select the next step to be performed for the density adjustment.	<ul> <li>Cancel*</li> <li>Busy*</li> <li>Ok*</li> <li>Density adjust failure*</li> <li>Measure density 1*</li> <li>Measure density 2*</li> <li>Calculate*</li> <li>Restore original*</li> </ul>	Ok
Progress	-	Shows the progress of the process.	0 to 100 %	-
Density adjustment factor	-	Shows the calculated correction factor for the density.	Signed floating-point number	1
Density adjustment offset	-	Shows the calculated correction offset for the density.	Signed floating-point number	0

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

### Zero verification and zero adjustment

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 fluids).
- 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 stresses 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

► Zero verification	
Process conditions	→ 🖺 139
Progress	→ 🖺 139
Status	→ 🖺 139
Additional information	→ 🗎 139
Recommendation:	→ 🗎 139
Root cause	→ 🗎 139
Abort cause	→ 🖺 139
Zero point measured	→ 🖺 139
Zero point standard deviation	→ 🖺 139

### Parameter overview with brief description

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

# Zero adjust

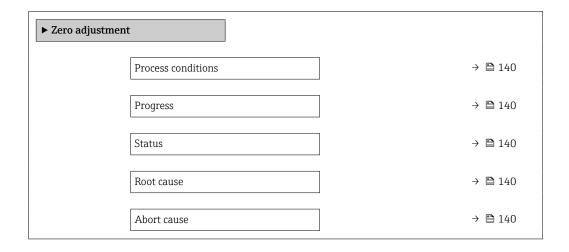
The zero point can be adjusted with the **Zero adjustment** wizard.



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

#### **Navigation**

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



Root cause	→ 🖺 140
Reliability of measured zero point	→ 🗎 140
Additional information	→ 🖺 140
Reliability of measured zero point	→ 🖺 140
Zero point measured	→ 🖺 140
Zero point standard deviation	→ 🖺 140
Select action	→ 🖺 140

## Parameter overview with brief description

Parameter	Description	Selection / User interface	Factory setting
Process conditions	Ensure process conditions as follows.	<ul> <li>Tubes are completely filled</li> <li>Process operational pressure applied</li> <li>No-flow conditions (closed valves)</li> <li>Process and ambient temperatures stable</li> </ul>	-
Progress	Shows the progress of the process.	0 to 100 %	-
Status	Shows the status of the process.	<ul><li>Busy</li><li>Failed</li><li>Done</li></ul>	-
Abort cause	Indicates why the wizard was aborted.	Check process conditions!     A technical issue has occurred	-
Root cause	Shows the diagnostic and remedy.	<ul> <li>Zero point too high. Ensure no-flow.</li> <li>Zero point is unstable. Ensure no-flow.</li> <li>Fluctuation high. Avoid 2-phase medium.</li> </ul>	-
Reliability of measured zero point	Indicates the reliability of the zero point measured.	<ul><li>Not done</li><li>Good</li><li>Uncertain</li></ul>	-
Additional information	Indicate whether to display additional information.	■ 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.	<ul> <li>Keep current zero point</li> <li>Apply zero point measured</li> <li>Apply factory zero point*</li> </ul>	Keep current zero point

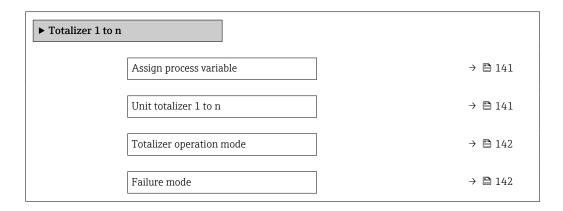
<sup>\*</sup> Visibility depends on order options or device settings

# 10.5.4 Configuring the totalizer

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

### Navigation

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



## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable		Select process variable for totalizer.	Off     Mass flow     Volume flow     Corrected volume flow*     Target mass flow*     Carrier mass flow*     Carrier volume flow*     Carrier corrected volume flow*     Carrier corrected volume flow*     Carrier corrected volume flow*     Carrier corrected volume flow*     SSV flow     SSV flow     alternative*     NSV flow     alternative*     S&W volume flow*     Oil mass flow*     Oil volume flow*     Water mass flow*     Oil corrected volume flow*     Water corrected volume flow*     Water corrected volume flow*     Water corrected volume flow*     Raw value mass flow     Raw value mass flow	Mass flow
Unit totalizer 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 141) of the <b>Totalizer 1 to n</b> submenu.	Select the unit for the process variable of the totalizer.	Unit choose list	Depends on country:  • kg • lb

Parameter	Prerequisite	Description	Selection	Factory setting
Totalizer operation mode	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	Select totalizer calculation mode.	<ul><li>Net</li><li>Forward</li><li>Reverse</li></ul>	Net
Failure mode	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 141) of the <b>Totalizer 1 to n</b> submenu.	Select totalizer behavior in the event of a device alarm.	<ul><li>Hold</li><li>Continue</li><li>Last valid value + continue</li></ul>	Hold

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

# 10.5.5 Carrying out additional display configurations

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

### Navigation

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

Format display  Format display  ⇒ □ 145  Value 1 display  ⇒ □ 146  0% bargraph value 1  ⇒ □ 147  100% bargraph value 1  ⇒ □ 147  Value 2 display  ⇒ □ 147  Value 3 display  ⇒ □ 147  0% bargraph value 3  ⇒ □ 147	
Value 1 display       ⇒	
Decimal places 1       → 🖺 147         Value 2 display       → 🖺 147         Decimal places 2       → 🖺 147         Value 3 display       → 🖺 147         0% bargraph value 3       → 🖺 147	
Decimal places 2 $\rightarrow \  \   \Rightarrow \  \   147$ Value 3 display $\rightarrow \  \   \Rightarrow \  \   147$ 0% bargraph value 3 $\rightarrow \  \   \Rightarrow \  \   \   \Rightarrow \  \  \Rightarrow \  \   $	
Value 3 display $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	
0% bargraph value 3 → 🖺 147	
100% bargraph value 3 → 🖺 147	
Decimal places 3 → 🖺 147	
Value 4 display → 🖺 148	
Decimal places 4 → 🖺 148	
Value 5 display → 🗎 148	
0% bargraph value 5 → 🖺 148	
100% bargraph value 5 → 🖺 148	
Decimal places 5 → 🖺 148	
Value 6 display → 🗎 148	
Decimal places 6 → 🗎 148	
Value 7 display → 🖺 148	

0% bargraph value 7	→ 🖺 148
100% bargraph value 7	→ 🖺 148
Decimal places 7	→ 🖺 148
Value 8 display	→ 🖺 148
Decimal places 8	→ 🖺 149
Display language	→ 🖺 149
Display interval	→ 🖺 149
Display damping	→ 🖺 149
Header	→ 🖺 149
Header text	→ 🖺 149
Separator	→ 🖺 149
Backlight	→ 🖺 149

## Parameter overview with brief description

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

Commissioning Proline Promass X 500

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	Mass flow Volume flow Corrected volume flow* Density Reference density* Temperature Pressure Totalizer 1 Totalizer 2 Totalizer 3 GSV flow GSV flow alternative* NSV flow alternative* NSV flow alternative* S&W volume flow* Reference density alternative* Weighted density average* Weighted temperature average* Water cut Oil density* Water density* Oil wolume flow* Water mass flow Vater mass flow Oil volume flow* Vater volume flow* Oil corrected volume flow* Concentration* Target mass flow Carrier mass flow Carrier mass flow Target volume flow Carrier wolume flow Carrier wolume flow Carrier wolume flow Carrier volume flow Carrier corrected volume flow Carrier orected volume flow Carrier orected volume flow Carrier orected volume flow Carrier corrected volume flow Carrier orlected volume flow	Mass flow

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
			■ Frequency fluctuation 0 * ■ Oscillation amplitude 0 * ■ 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 <b>Value 1 display</b> parameter.	Select the number of decimal places for the display value.	<ul> <li>X</li> <li>X.X</li> <li>X.XX</li> <li>X.XXX</li> <li>X.XXXX</li> <li>X.XXXXX</li> <li>X.XXXXXX</li> </ul>	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  (→   128)	None
Decimal places 2	A measured value is specified in the <b>Value 2 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXXX	x.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 (→ 🖺 128)	None
0% bargraph value 3	A selection was made in the <b>Value 3 display</b> parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  Okg/h Olb/min
100% bargraph value 3	A selection was made in the <b>Value 3 display</b> parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 3	A measured value is specified in the <b>Value 3 display</b> parameter.	Select the number of decimal places for the display value.	<ul> <li>X</li> <li>X.X</li> <li>X.XX</li> <li>X.XXX</li> <li>X.XXXX</li> <li>X.XXXXX</li> <li>X.XXXXXX</li> </ul>	x.xx

Commissioning Proline Promass X 500

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see  Value 1 display  parameter  (→   128)	None
Decimal places 4	A measured value is specified in the <b>Value 4 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXXX     X.XXXXX	x.xx
Value 5 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see  Value 1 display  parameter  (→   128)	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 <b>Value 5 display</b> parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 5	A measured value is specified in the <b>Value 5 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXX     X.XXXX     X.XXXXX	x.xx
Value 6 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see  Value 1 display parameter (→   128)	None
Decimal places 6	A measured value is specified in the <b>Value 6 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXXX     X.XXXXX	x.xx
Value 7 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see  Value 1 display  parameter  (→   128)	None
0% bargraph value 7	An option was selected in the <b>Value 7 display</b> parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Depends on country:  Okg/h Olb/min
100% bargraph value 7	An option was selected in the <b>Value 7 display</b> parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 7	A measured value is specified in the <b>Value 7 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.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 (> \exists 128)	None

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Decimal places 8	A measured value is specified in the <b>Value 8 display</b> parameter.	Select the number of decimal places for the display value.	X     X.X     X.XX     X.XXX     X.XXXX     X.XXXXX     X.XXXXX	x.xx
Display language	A local display is provided.	Set display language.	<ul> <li>English</li> <li>Deutsch</li> <li>Français</li> <li>Español</li> <li>Italiano</li> <li>Nederlands</li> <li>Portuguesa</li> <li>Polski</li> <li>русский язык (Russian)</li> <li>Svenska</li> <li>Türkçe</li> <li>中文 (Chinese)</li> <li>日本語 (Japanese)</li> <li>한국어 (Korean)</li> <li>tiếng Việt (Vietnamese)</li> <li>čeština (Czech)</li> </ul>	English (alternatively, the ordered language is preset in the device)
Display interval	A local display is provided.	Set time measured values are shown on display if display alternates between values.	1 to 10 s	5 s
Display damping	A local display is provided.	Set display reaction time to fluctuations in the measured value.	0.0 to 999.9 s	0.0 s
Header	A local display is provided.	Select header contents on local display.	<ul><li>Device tag</li><li>Free text</li></ul>	Device tag
Header text	The <b>Free text</b> option is selected in the <b>Header</b> parameter.	Enter display header text.	Max. 12 characters, such as letters, numbers or special characters (e.g. @, %, /)	
Separator	A local display is provided.	Select decimal separator for displaying numerical values.	• . (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.	<ul><li>Disable</li><li>Enable</li></ul>	Enable

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

### 10.5.6 WLAN configuration

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

Commissioning Proline Promass X 500

 $\begin{tabular}{ll} \textbf{Navigation} \\ \begin{tabular}{ll} \textbf{"Setup" menu} \rightarrow \textbf{Advanced setup} \rightarrow \textbf{WLAN settings} \\ \end{tabular}$ 

► WLAN settings	
WLAN IP address	→ 🖺 150
Security type	→ 🖺 150
WLAN passphrase	→ 🗎 150
Assign SSID name	→ 🗎 150
SSID name	→ 🗎 150
Apply changes	→ 🖺 150

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

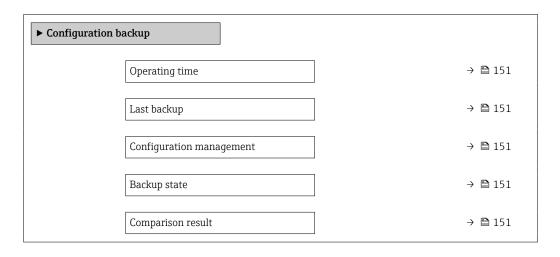
Visibility depends on order options or device settings

## 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  $\rightarrow$  Advanced setup  $\rightarrow$  Configuration backup



### Parameter overview with brief description

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

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

Commissioning Proline Promass X 500

### Function scope of the "Configuration management" parameter

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

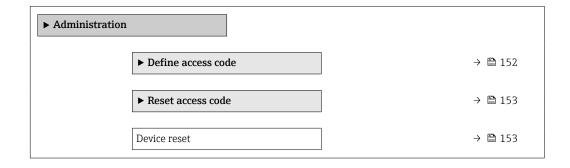
- HistoROM backup
  A HistoROM is a "non-volatile" device memory in the form of an EEPROM.
- While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

### 10.5.8 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

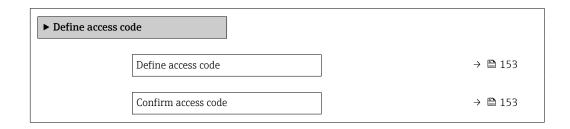


### Using the parameter to define the access code

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

### **Navigation**

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



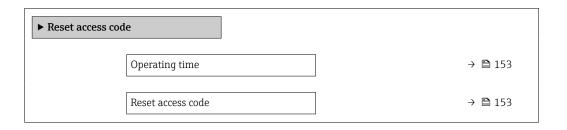
### Parameter overview with brief description

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

### Using the parameter to reset the access code

### Navigation

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



### Parameter overview with brief description

Parameter	Description	User interface / User entry	Factory setting
Operating time	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)	-
Reset access code	Reset access code to factory settings.  For a reset code, contact your Endress+Hauser service organization.	Character string comprising numbers, letters and special characters	0x00
	The reset code can only be entered via:  Web browser  DeviceCare, FieldCare (via CDI-RJ45 service interface)  Fieldbus		

### Using the parameter to reset the device

#### Navigation

"Setup" menu → Advanced setup → Administration

### Parameter overview with brief description

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

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

### 10.6 Simulation

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

Commissioning Proline Promass X 500

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

► Simulation		
	Assign simulation process variable	→ 🖺 155
	Process variable value	→ 🖺 155
	Current output 1 to n simulation	→ 🖺 155
	Current output value	→ 🖺 155
	Frequency output 1 to n simulation	→ 🖺 155
	Frequency output 1 to n value	→ 🖺 155
	Pulse output simulation 1 to n	→ 🖺 156
	Pulse value 1 to n	→ 🖺 156
	Switch output simulation 1 to n	→ 🖺 156
	Switch state 1 to n	→ 🖺 156
	Relay output 1 to n simulation	→ 🖺 156
	Switch state 1 to n	→ 🖺 156
	Pulse output simulation	→ 🖺 156
	Pulse value	→ 🖺 156
	Device alarm simulation	→ 🖺 156
	Diagnostic event category	→ 🖺 156
	Diagnostic event simulation	→ 🖺 156
	Current input 1 to n simulation	→ 🖺 156
	Value current input 1 to n	→ 🖺 156
	Status input 1 to n simulation	→ 🖺 156
	Input signal level 1 to n	→ 🖺 156

### 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 * ■ Target volume flow * ■ Carrier volume flow * ■ Carrier corrected volume flow * ■ Carrier corrected volume flow * ■ Density ■ Reference density * ■ Reference density alternative * ■ GSV flow * ■ GSV flow alternative * ■ NSV flow alternative * ■ NSV flow alternative * ■ NSV flow alternative * ■ S&W volume flow * ■ Water cut * ■ Oil density * ■ Water density * ■ Oil volume flow * ■ Water volume flow * ■ Water volume flow * ■ Water corrected volume flow * ■ Water corrected volume flow * ■ Temperature ■ Concentration * ■ Time period signal frequency (TPS) *	Off
Process variable value	A process variable is selected in the <b>Assign simulation process variable</b> parameter (→ 🖺 155).	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Current output 1 to n simulation	-	Switch the simulation of the current output on and off.	Off On	Off
Current output value	In the <b>Current output 1 to n simulation</b> parameter, the <b>On</b> option is selected.	Enter the current value for simulation.	3.59 to 22.5 mA	3.59 mA
Frequency output 1 to n simulation	In the <b>Operating mode</b> parameter, the <b>Frequency</b> option is selected.	Switch the simulation of the frequency output on and off.	Off On	Off
Frequency output 1 to n value	In the <b>Frequency simulation 1 to n</b> parameter, the <b>On</b> option is selected.	Enter the frequency value for the simulation.	0.0 to 12 500.0 Hz	0.0 Hz

Commissioning Proline Promass X 500

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Pulse output simulation 1 to n	In the <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected.	Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter (→  113) defines the pulse width of the pulses output.	<ul><li>Off</li><li>Fixed value</li><li>Down-counting value</li></ul>	Off
Pulse value 1 to n	In the <b>Pulse output simulation 1 to n</b> parameter, the <b>Down-counting value</b> option is selected.	Enter the number of pulses for simulation.	0 to 65 535	0
Switch output simulation 1 to n	In the <b>Operating mode</b> parameter, the <b>Switch</b> option is selected.	Switch the simulation of the switch output on and off.	• Off • On	Off
Switch state 1 to n	-	Select the status of the status output for the simulation.	<ul><li>Open</li><li>Closed</li></ul>	Open
Relay output 1 to n simulation	-	Switch simulation of the relay output on and off.	Off On	Off
Switch state 1 to n	The <b>On</b> option is selected in the <b>Switch output simulation 1 to n</b> parameter parameter.	Select status of the relay output for the simulation.	<ul><li>Open</li><li>Closed</li></ul>	Open
Pulse output simulation	-	Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter defines the pulse width of the pulses output.	<ul><li>Off</li><li>Fixed value</li><li>Down-counting value</li></ul>	Off
Pulse value	In the <b>Pulse output simulation</b> parameter, the <b>Down-counting value</b> option is selected.	Set and switch off the pulse output simulation.	0 to 65 535	0
Device alarm simulation	-	Switch the device alarm on and off.	Off On	Off
Diagnostic event category	-	Select a diagnostic event category.	<ul><li>Sensor</li><li>Electronics</li><li>Configuration</li><li>Process</li></ul>	Process
Diagnostic event simulation	-	Select a diagnostic event to simulate this event.	<ul> <li>Off</li> <li>Diagnostic event picklist (depends on the category selected)</li> </ul>	Off
Current input 1 to n simulation	-	Switch simulation of the current input on and off.	Off On	Off
Value current input 1 to n	In the <b>Current input 1 to n simulation</b> parameter, the <b>On</b> option is selected.	Enter the current value for simulation.	0 to 22.5 mA	0 mA
Status input 1 to n simulation	-	Switch simulation of the status input on and off.	Off On	Off
Input signal level 1 to n	In the <b>Status input simulation</b> parameter, the <b>On</b> option is selected.	Select the signal level for the simulation of the status input.	■ High ■ Low	High

<sup>\*</sup> 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:

### 10.7.1 Write protection via access code

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

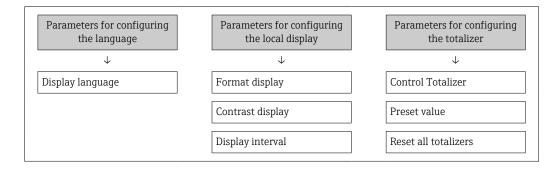
- Via local operation, the parameters for the measuring device configuration are writeprotected and their values can no longer be changed.
- Device access is protected via the Web browser, as are the parameters for the measuring device configuration.
- Device access is protected via FieldCare or DeviceCare (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 ( $\rightarrow \triangleq 153$ ).
- 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 ( $\Rightarrow \triangleq 153$ ) to confirm.
  - ► The 🗈 symbol appears in front of all write-protected parameters.
- Disabling parameter write protection via access code  $\rightarrow$   $\stackrel{\triangle}{=}$  74.
  - If the access code is lost: Resetting the access code  $\rightarrow \triangleq 158$ .
  - The user role with which the user is currently logged in is displayed in **Access** status parameter.
    - Navigation path: Operation → Access status
- 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 ( $\rightarrow \triangleq 153$ ).

Commissioning Proline Promass X 500

- 2. Define a 16-digit (max.) numeric code as the access code.
- 3. Enter the access code again in the **Confirm access code** parameter ( $\rightarrow \implies 153$ ) to confirm.
  - └ The web browser switches to the login page.
- - If the access code is lost: Resetting the access code  $\rightarrow \triangleq 158$ .
  - The Access status parameter shows which user role the user is currently logged in with.
    - Navigation path: Operation → Access status
    - User roles and their access rights  $\rightarrow \triangleq 74$

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 ( $\rightarrow \triangleq 153$ ).
  - The access code has been reset to the factory setting **0000**. It can be redefined  $\rightarrow \boxminus 157$ .
- 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

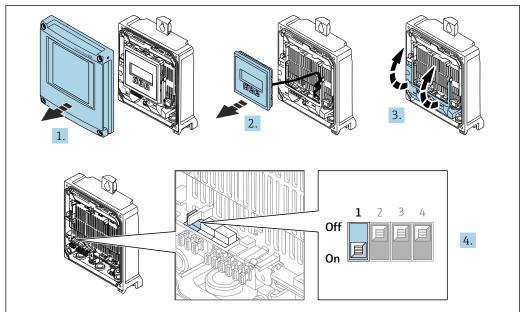
Unlike parameter write protection via a user-specific access code, this allows the user to lock write access to the entire operating menu - apart from the **"Contrast display"** parameter.

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

- Via local display
- Via HART protocol

### Proline 500 - digital

### Enable/disable write protection



A002967

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

### 4. Enable or disable write protection:

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

└ In the **Locking status** parameter, the **Hardware locked** option is displayed  $\rightarrow \boxminus 161$ . When hardware write protection is enabled, the 🖻 symbol appears in the header of the measured value display and in the navigation view in front of the parameters.



A002942

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

### 7. NOTICE

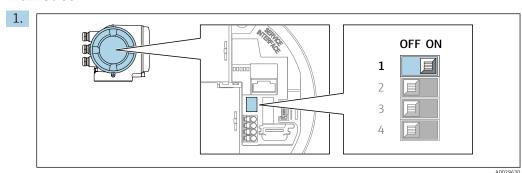
# **Excessive tightening torque applied to the fixing screws!** Risk of damaging the plastic transmitter.

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

Tighten the fixing screws.

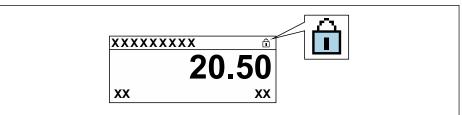
Commissioning Proline Promass X 500

### 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  $\rightarrow \stackrel{\triangle}{=} 161$ . 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.



A0029425

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

#### Operation 11

#### 11.1 Reading off the device locking status

Device active write protection: Locking status parameter

Operation → Locking status

Function scope of the "Locking status" parameter

Options	Description
None	The access authorization displayed in the <b>Access status</b> parameter applies → 🖺 74. Only appears on local display.
Hardware locked	The DIP switch for hardware locking is activated on the PCB board. This locks write access to the parameters (e.g. via local display or operating tool) $\rightarrow$ $\stackrel{\triangle}{=}$ 158.
SIL locked	The SIL mode is enabled. This locks write access to the parameters (e.g. via local display or operating tool).
CT active - all parameters	The DIP switch for custody transfer mode is activated on the PCB board.  Locks the parameters that are relevant for custody transfer and also parameters that are predefined by Endress+Hauser and are not relevant for custody transfer (e.g. on local display or operating tool).
	For detailed information on custody transfer mode, see the Special Documentation for the device
CT active - defined parameters	The DIP switch for the custody transfer mode is activated on the PCB board. Only locks the parameters that are relevant for custody transfer (e.g. on the local display or operating tool).
	For detailed information on custody transfer mode, see the Special Documentation for the device
Temporarily locked	Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset, etc.). Once the internal processing has been completed, the parameters can be changed once again.

#### 11.2 Adjusting the operating language



Detailed information:

- To configure the operating language  $\rightarrow$   $\stackrel{\triangle}{=}$  97
- For information on the operating languages supported by the measuring device → 🗎 244

#### 11.3 Configuring the display

Detailed information:

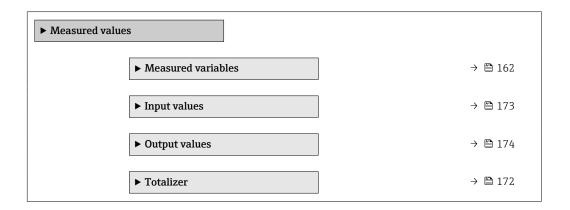
- On the basic settings for the local display  $\rightarrow \implies 125$
- On the advanced settings for the local display  $\rightarrow \implies 143$

#### 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	bles	
	Mass flow	→ 🖺 164
	Volume flow	→ 🗎 164
	Corrected volume flow	→ 🗎 164
	Density	→ 🗎 164
	Reference density	→ 🖺 164
	Temperature	→ 🖺 164
	Pressure	→ 🖺 165
	Concentration	→ 🖺 165
	Target mass flow	→ 🖺 165
	Carrier mass flow	→ 🖺 165
	Target corrected volume flow	→ 🖺 165
	Carrier corrected volume flow	→ 🖺 165
	Target volume flow	→ 🖺 166

Carrier volume flow	]	→ 🖺 166
CTL	-	→ 🖺 166
CPL	<u> </u>	→ 🖺 166
CTPL	=	→ 🖺 167
S&W volume flow	-	→ 🖺 167
S&W correction value	-	→ 🖺 167
Reference density alternative	· 	→ 🖺 167
GSV flow		→ 🖺 167
GSV flow alternative	· 	→ 🖺 168
NSV flow	· -	→ 🖺 168
NSV flow alternative		→ 🖺 168
Oil CTL	] -	→ 🖺 168
Oil CPL		→ 🖺 168
Oil CTPL		→ 🖺 169
Water CTL		→ 🖺 169
water CTL	-	7 🗏 109
CTL alternative	<u>-</u>	→ 🖺 169
CPL alternative	]	→ 🖺 169
CTPL alternative	-	→ 🖺 169
Oil reference density	·	→ 🖺 170
Water reference density	-	→ 🖺 170
Oil density	=	→ 🖺 170
Water density	=	→ 🖺 170
Water cut	-	→ 🖺 170
Oil volume flow	- 	→ 🖺 171
Oil corrected volume flow	· 	→ 🖺 171
	1	

Oil mass flow	→ 🖺 171
Water volume flow	→ 🖺 171
Water corrected volume flow	→ 🗎 171
Water mass flow	→ 🖺 172
Weighted density average	→ 🖺 172
Weighted temperature average	→ 🖺 172

### Parameter overview with brief description

Parameter	Prerequisite	Description	User interface	Factory setting
Mass flow	-	Displays the mass flow that is currently measured.	Signed floating-point number	-
		Dependency The unit is taken from: Mass flow unit parameter (→ 🖺 100)		
Volume flow	-	Displays the volume flow that is currently calculated.	Signed floating-point number	-
		Dependency The unit is taken from the Volume flow unit parameter (→   100).		
Corrected volume flow	-	Displays the corrected volume flow that is currently calculated.	Signed floating-point number	_
		Dependency The unit is taken from: Corrected volume flow unit parameter (→   100)		
Density	-	Shows the density currently measured.	Signed floating-point number	-
		Dependency The unit is taken from the Density unit parameter (→   100).		
Reference density	-	Displays the reference density that is currently calculated.	Signed floating-point number	-
		Dependency The unit is taken from: Reference density unit parameter (→   100)		
Temperature	-	Shows the medium temperature currently measured.	Signed floating-point number	-
		Dependency The unit is taken from: Temperature unit parameter (→ 🖺 101)		

Parameter	Prerequisite	Description	User interface	Factory setting
Pressure	_	Displays either a fixed or external pressure value.  Dependency The unit is taken from the Pressure unit parameter (→  101).	Signed floating-point number	-
Concentration	For the following order code: Order code for "Application package", option ED "Concentration"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the concentration that is currently calculated.  Dependency The unit is taken from the Concentration unit parameter.	Signed floating-point number	_
Target mass flow	With the following conditions: Order code for "Application package", option ED "Concentration"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the mass flow that is currently measured for the target medium.  Dependency The unit is taken from: Mass flow unit parameter (→ ■ 100)	Signed floating-point number	-
Carrier mass flow	With the following conditions: Order code for "Application package", option ED "Concentration"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the mass flow of the carrier medium that is currently measured.  Dependency The unit is taken from: Mass flow unit parameter (→ ■ 100)	Signed floating-point number	-
Target corrected volume flow	With the following conditions:  Order code for "Application package", option ED "Concentration"  The Ethanol in water option or %mass / %volume option is selected in the Liquid type parameter.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the corrected volume flow that is currently measured for the target fluid.  Dependency The unit is taken from the Volume flow unit parameter (→  100).	Signed floating-point number	
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.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the corrected volume flow currently measured for the carrier fluid.  Dependency The unit is taken from the Volume flow unit parameter (→  100).	Signed floating-point number	-

Parameter	Prerequisite	Description	User interface	Factory setting
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 (→  100).	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 (→ 🖺 100).	Signed floating-point number	
CTL	For the following order code:  "Application package", option EJ "Petroleum"  The API referenced correction option is selected in Petroleum mode parameter.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the calibration factor which represents the effect of temperature on the fluid. This is used to convert the measured volume flow and the measured density to values at reference temperature.	Positive floating- point number	
CPL	For the following order code:  "Application package", option EJ "Petroleum"  The API referenced correction option is selected in Petroleum mode parameter.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the calibration factor which represents the effect of pressure on the fluid. This is used to convert the measured volume flow and the measured density to values at reference pressure.	Positive floating- point number	

Parameter	Prerequisite	Description	User interface	Factory setting
CTPL	For the following order code:  "Application package", option EJ "Petroleum"  The API referenced correction option is selected in Petroleum mode parameter.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the combined calibration factor which represents the effect of temperature and pressure on the fluid This is used to convert the measured volume flow and the measured density to values at reference temperature and reference pressure.	Positive floating- point number	-
S&W volume flow	For the following order code:  "Application package", option EJ "Petroleum"  The API referenced correction option is selected in Petroleum mode parameter.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the S&W volume flow which is calculated from the measured total volume flow minus the net volume flow.  Dependency The unit is taken from:  Volume flow unit parameter	Signed floating-point number	-
S&W correction value	For the following order code:  "Application package", option EJ "Petroleum"  The External value option or Current input 1n option is selected in the S&W input mode parameter.  The software options currently enabled are displayed in the Software option overview parameter.	Shows the correction value for sediment and water.	Positive floating- point number	
Reference density alternative	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the API referenced correction option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the fluid density at the alternative reference temperature.  Dependency The unit is taken from:  Reference density unit parameter	Signed floating-point number	_
GSV flow	For the following order code:  "Application package", option EJ "Petroleum"  The API referenced correction option is selected in Petroleum mode parameter.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the measured total volume flow, corrected to the reference temperature and the reference pressure.  Dependency The unit is taken from:  Corrected volume flow unit parameter	Signed floating-point number	

Parameter	Prerequisite	Description	User interface	Factory setting
GSV flow alternative	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the API referenced correction option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the measured total volume flow, corrected to the alternative reference temperature and the alternative reference pressure.  Dependency The unit is taken from:  Corrected volume flow unit parameter	Signed floating-point number	_
NSV flow	For the following order code:  • "Application package", option EJ "Petroleum"  • The API referenced correction option is selected in Petroleum mode parameter.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the net volume flow which is calculated from the measured total volume flow minus the value for sediment & water and minus the shrinkage.  Dependency The unit is taken from: Corrected volume flow unit parameter	Signed floating-point number	-
NSV flow alternative	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the API referenced correction option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the net volume flow which is calculated from the measured alternative total volume minus the value for sediment & water and minus the shrinkage.  Dependency The unit is taken from: Corrected volume flow unit parameter	Signed floating-point number	_
Oil CTL	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the correction factor which represents the effect of temperature on the oil. This is used to convert the measured oil volume flow and the measured oil density to values at reference temperature.	Positive floating- point number	_
Oil CPL	For the following order code:  • "Application package", option  EJ "Petroleum"  • In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the correction factor which represents the effect of pressure on the oil. This is used to convert the measured oil volume flow and the measured oil density to values at reference pressure.	Positive floating- point number	_

Parameter	Prerequisite	Description	User interface	Factory setting
Oil CTPL	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the combined correction factor which represents the effect of temperature and pressure on the oil. This is used to convert the measured oil volume flow and the measured oil density to values at reference temperature and reference pressure.	Positive floating- point number	-
Water CTL	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the correction factor which represents the effect of temperature on the water. This is used to convert the measured water volume flow and the measured water density to values at reference temperature.	Positive floating- point number	-
CTL alternative	For the following order code:  "Application package", option  EJ "Petroleum"  In the Petroleum mode parameter, the API referenced correction option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the correction factor which represents the effect of temperature on the fluid. This is used to convert the measured volume flow and the measured density to values at the alternative reference temperature.	Positive floating- point number	-
CPL alternative	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the API referenced correction option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the correction factor which represents the effect of pressure on the fluid. This is used to convert the measured volume flow and the measured density to values at the alternative reference pressure.	Positive floating- point number	_
CTPL alternative	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the API referenced correction option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the combined correction factor which represents the effect of temperature and pressure on the fluid. This is used to convert the measured volume flow and the measured density to values at the alternative reference temperature and the alternative reference pressure.	Positive floating- point number	1

Parameter	Prerequisite	Description	User interface	Factory setting
Oil reference density	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options currently enabled are displayed in the	Shows the oil density at the reference temperature.	Signed floating-point number	-
	Software option overview parameter.			
Water reference density	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options	Shows the water density at the reference temperature.	Signed floating-point number	-
	currently enabled are displayed in the Software option overview parameter.			
Oil density	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.	Displays the density of the oil currently measured.	Signed floating-point number	-
	The software options currently enabled are displayed in the Software option overview parameter.			
Water density	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.	Displays the density of the water currently measured.	Signed floating-point number	-
	The software options currently enabled are displayed in the Software option overview parameter.			
Water cut	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the API referenced correction option is selected.	Displays the percentage water volume flow in relation to the total volume flow of the fluid.	0 to 100 %	-
	The software options currently enabled are displayed in the Software option overview parameter.			

Parameter	Prerequisite	Description	User interface	Factory setting
Oil volume flow	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the currently calculated volume flow of the oil.  Dependency:  Based on the value displayed in the Water cut parameter  The unit is taken from: Volume flow unit parameter	Signed floating-point number	-
Oil corrected volume flow	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the currently calculated volume flow of the oil, calculated to values at reference temperature and reference pressure.  Dependency:  Based on the value displayed in the Water cut parameter  The unit is taken from:  Corrected volume flow unit parameter	Signed floating-point number	-
Oil mass flow	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the currently calculated mass flow of the oil.  Dependency:  Based on the value displayed in the Water cut parameter  The unit is taken from:  Mass flow unit parameter	Signed floating-point number	_
Water volume flow	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the currently calculated volume flow of the water.  Dependency:  Based on the value displayed in the Water cut parameter  The unit is taken from:  Volume flow unit parameter	Signed floating-point number	_
Water corrected volume flow	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the currently calculated volume flow of the water, calculated to values at reference temperature and reference pressure.  Dependency:  Based on the value displayed in the Water cut parameter  The unit is taken from: Corrected volume flow unit parameter	Signed floating-point number	_

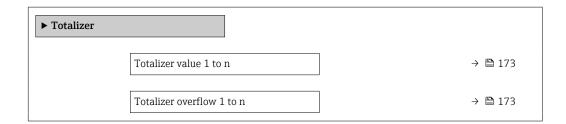
Parameter	Prerequisite	Description	User interface	Factory setting
Water mass flow	For the following order code:  "Application package", option EJ "Petroleum"  In the Petroleum mode parameter, the Net oil & water cut option is selected.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the currently calculated mass flow of the water.  Dependency:  Based on the value displayed in the Water cut parameter  The unit is taken from:  Mass flow unit parameter	Signed floating-point number	-
Weighted density average	For the following order code:  "Application package", option EJ "Petroleum"  "Application package", option EM "Petroleum + Locking function"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the weighted average for the density since the last time the density averages were reset.  Dependency:  The unit is taken from:  Density unit parameter  The value is reset to NaN (Not a Number) via the Reset weighted averages parameter	Signed floating-point number	-
Weighted temperature average	For the following order code:  "Application package", option  EJ "Petroleum"  "Application package", option  EM "Petroleum + Locking function"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the weighted average for the temperature since the last time the temperature averages were reset.  Dependency: The unit is taken from: Temperature unit parameter The value is reset to NaN (Not a Number) via the Reset weighted averages parameter	Signed floating-point number	

### 11.4.2 "Totalizer" submenu

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

### Navigation

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



### Parameter overview with brief description

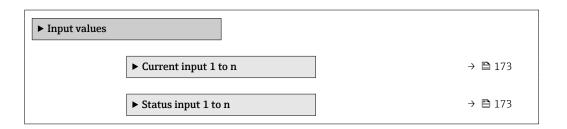
Parameter	Prerequisite	Description	User interface
Totalizer value 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 141) of the <b>Totalizer 1 to n</b> submenu.	Displays the current totalizer counter value.	Signed floating-point number
Totalizer overflow 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 141) of the <b>Totalizer 1 to n</b> submenu.	Displays the current totalizer overflow.	Integer with sign

### 11.4.3 "Input values" submenu

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

### Navigation

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

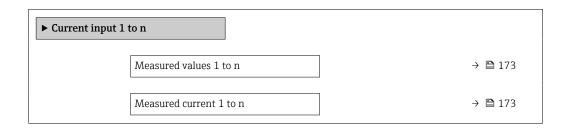


### Input values of current input

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

### **Navigation**

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Input values  $\rightarrow$  Current input 1 to n



### Parameter overview with brief description

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

### Input values of status input

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

### **Navigation**

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Input values  $\rightarrow$  Status input 1 to n



### Parameter overview with brief description

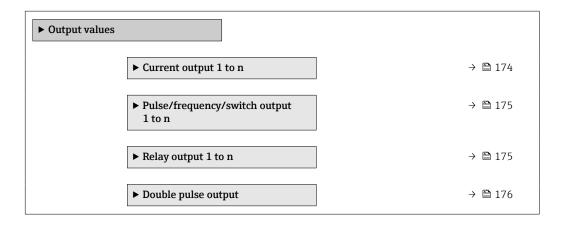
Parameter	Description	User interface
Value status input	Shows the current input signal level.	■ High ■ Low

### 11.4.4 Output values

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

### Navigation

"Diagnostics" menu → Measured values → Output values

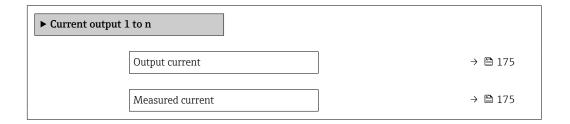


### Output values of current output

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

### Navigation

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



174

### Parameter overview with brief description

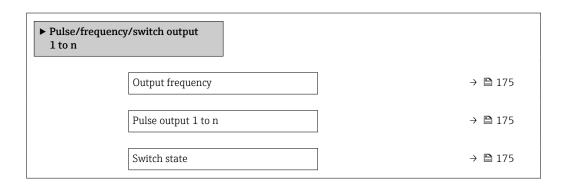
Parameter	Description	User interface
Output current	Displays the current value currently calculated for the current output.	3.59 to 22.5 mA
Measured current	Displays the current value currently measured for the current output.	0 to 30 mA

### 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.

#### Navigation

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



### Parameter overview with brief description

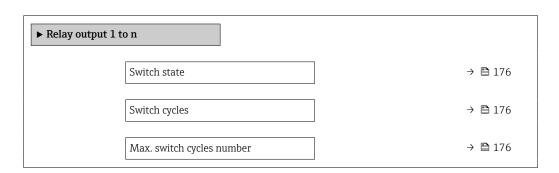
Parameter	Prerequisite	Description	User interface
Output frequency	In the <b>Operating mode</b> parameter, the <b>Frequency</b> option is selected.	Displays the value currently measured for the frequency output.	0.0 to 12 500.0 Hz
Pulse output 1 to n	The <b>Pulse</b> option is selected in the <b>Operating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

### Output values for relay output

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

### Navigation

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



### Parameter overview with brief description

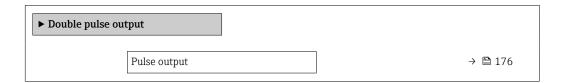
Parameter	Description	User interface
Switch state	Shows the current relay switch status.	<ul><li>Open</li><li>Closed</li></ul>
Switch cycles	Shows number of all performed switch cycles.	Positive integer
Max. switch cycles number	Shows the maximal number of guaranteed switch cycles.	Positive integer

### Output values for double pulse output

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

#### **Navigation**

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



### Parameter overview with brief description

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

# 11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu ( $\rightarrow$  **2** 97)
- Advanced settings using the **Advanced setup** submenu (→ 🖺 132)

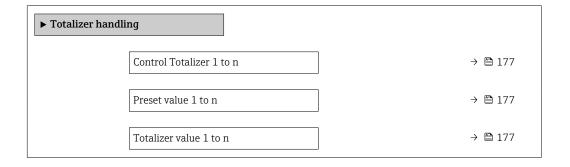
### 11.6 Performing a totalizer reset

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

- Control Totalizer
- Reset all totalizers

### Navigation

"Operation" menu → Totalizer handling



Weighted density average	→ 🖺 177
Weighted temperature average	→ 🖺 177
Reset weighted averages	→ 🖺 178
Reset all totalizers	→ 🖺 178

### 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 <b>Assign process variable</b> parameter (→ 🖺 141) of the <b>Totalizer 1 to n</b> submenu.	Control totalizer value.	<ul> <li>Totalize</li> <li>Reset + hold *</li> <li>Preset + hold *</li> <li>Reset + totalize</li> <li>Preset + totalize *</li> <li>Hold *</li> </ul>	Totalize
Preset value 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter ( $\Rightarrow                                    $	Specify start value for totalizer.  Dependency  The unit of the selected process variable is defined in the Unit totalizer parameter (→   141) for the totalizer.	Signed floating-point number	Depends on country:  Okg Olb
Totalizer value 1 to n	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	Displays the current totalizer counter value.	Signed floating-point number	-
Weighted density average	For the following order code:  "Application package", option EJ "Petroleum"  "Application package", option EM "Petroleum + Locking function"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the weighted average for the density since the last time the density averages were reset.  Dependency:  The unit is taken from:  Density unit parameter  The value is reset to NaN (Not a Number) via the Reset weighted averages parameter	Signed floating-point number	-
Weighted temperature average	For the following order code:  "Application package", option EJ "Petroleum"  "Application package", option EM "Petroleum + Locking function"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the weighted average for the temperature since the last time the temperature averages were reset.  Dependency:  The unit is taken from:  Temperature unit parameter  The value is reset to NaN (Not a Number) via the Reset weighted averages parameter	Signed floating-point number	

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Reset weighted averages	The values can only be reset at zero flow.  For the following order code: "Application package", option  EJ "Petroleum"  The software options currently enabled are displayed in the Software option overview parameter.	Resets the weighted averages for density and temperature to NaN (Not a Number) and then starts determining the weighted averages.	<ul> <li>Totalize</li> <li>Reset weighted averages</li> <li>Reset weighted averages + totalizer 3</li> </ul>	Totalize
Reset all totalizers	-	Reset all totalizers to 0 and start.	<ul><li>Cancel</li><li>Reset + totalize</li></ul>	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 <b>Preset value</b> parameter.
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.
Preset + totalize 1)	The totalizer is set to the defined start value in the <b>Preset value</b> parameter and the totaling process is restarted.
Hold	Totalizing is stopped.

<sup>1)</sup> Visible depending on the order options or device settings

### 11.6.2 Function range of "Reset all totalizers" parameter

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

### 11.7 Displaying the measured value history

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

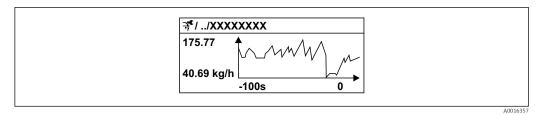


Data logging is also available via:

- Web browser

### Function range

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



41 Chart of a measured value trend

• x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.

y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

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  $\rightarrow$  Data logging

▶ Data logging	
Assign channel 1	→ 🖺 180
Assign channel 2	→ 🖺 181
Assign channel 3	→ 🖺 181
Assign channel 4	→ 🖺 181
Logging interval	→ 🖺 181
Clear logging data	→ 🖺 181
Data logging	→ 🖺 181
Logging delay	→ 🖺 181
Data logging control	→ 🖺 181
Data logging status	→ 🖺 182
Entire logging duration	→ 🖺 182

### 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.	<ul> <li>Off</li> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow*</li> <li>Reference density*</li> <li>Temperature</li> <li>Pressure</li> <li>GSV flow</li> <li>GSV flow</li> <li>alternative*</li> <li>NSV flow</li> <li>alternative flow</li> <li>S&amp;W volume flow*</li> <li>Reference density alternative*</li> <li>Water cut*</li> <li>Oil density</li> <li>Water density</li> <li>Oil mass flow*</li> <li>Water mass flow</li> <li>Oil corrected volume flow*</li> <li>Water volume flow</li> <li>Water volume flow</li> <li>Target mass flow</li> <li>Carrier corrected volume flow</li> <li>Carrier corrected volume flow</li> <li>Carrier corrected volume flow</li> <li>Target volume flow</li> <li>Carrier corrected volume flow</li> <li>Earrier corrected volume flow</li> <li>Target corrected volume flow</li> <li>Exerciter corrected volume flow</li> <li>Exerciter current O</li> <li>Oscillation specific output 1*</li> <li>Inhomogeneous medium index</li> <li>Suspended bubbles index*</li> <li>HBSI</li> <li>Raw value mass flow</li> <li>Exciter current O</li> <li>Oscillation damping 0</li> <li>Oscillation frequency 0</li> <li>Frequency 0</li> <li>Foundation amplitude</li> </ul>	Off

Proline Promass X 500 Operation

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
			<ul> <li>Oscillation amplitude 1*</li> <li>Signal asymmetry</li> <li>Torsion signal asymmetry*</li> <li>Carrier pipe temperature*</li> <li>Electronics temperature</li> <li>Sensor index coil asymmetry</li> <li>Test point 0</li> <li>Test point 1</li> <li>Current output 1</li> <li>Current output 2*</li> <li>Current output 3*</li> <li>Current output 4*</li> </ul>	
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  (→   180)	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 (→ 🖺 180)	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 (→ 🖺 180)	Off
Logging interval	The <b>Extended HistoROM</b> application package is available.	Define the logging interval for data logging. This value defines the time interval between the individual data points in the memory.	0.1 to 3600.0 s	1.0 s
Clear logging data	The <b>Extended HistoROM</b> application package is available.	Clear the entire logging data.	Cancel Clear data	Cancel
Data logging	-	Select the type of data logging.	<ul><li>Overwriting</li><li>Not overwriting</li></ul>	Overwriting
Logging delay	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> option is selected.	Enter the time delay for measured value logging.	0 to 999 h	0 h
Data logging control	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> option is selected.	Start and stop measured value logging.	<ul><li>None</li><li>Delete + start</li><li>Stop</li></ul>	None

Operation Proline Promass X 500

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Data logging status	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> option is selected.	Displays the measured value logging status.	<ul><li>Done</li><li>Delay active</li><li>Active</li><li>Stopped</li></ul>	Done
Entire logging duration	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> option is selected.	Displays the total logging duration.	Positive floating- point number	0 s

Visibility depends on order options or device settings

### 11.8 Gas Fraction Handler

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

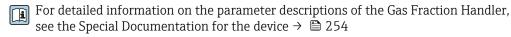
The function continuously checks for the presence of gas bubbles in liquids or droplets in gases, as this second phase influences the output values for flow and density.

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

Possible options in the Gas Fraction Handler parameter:

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

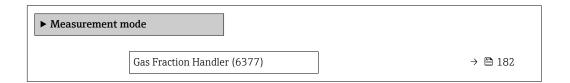
The Gas Fraction Handler is cumulative to any fixed damping constants applied to flow and density that are set elsewhere in the instrument parameterization.



#### 11.8.1 "Measurement mode" submenu

#### **Navigation**

"Expert" menu → Sensor → Measurement mode



#### Parameter overview with brief description

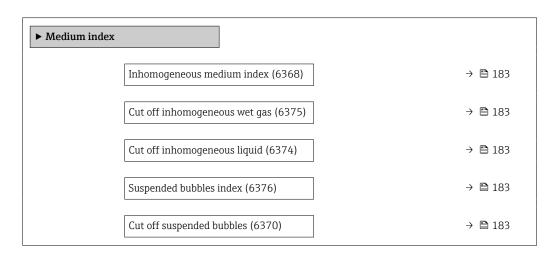
Parameter	Description	Selection	Factory setting
Gas Fraction Handler	Activates the Gas Fraction Handler function for two phase media.	<ul><li>Off</li><li>Moderate</li><li>Powerful</li></ul>	Moderate

Proline Promass X 500 Operation

### 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

# 12 Diagnostics and troubleshooting

# 12.1 General troubleshooting

### For local display

Error Possible causes		Remedial action
Local display is dark, but signal output is within the valid range	The cable of the display module is not plugged in correctly.	Insert the plug correctly into the main electronics module and display module.
Local display dark and no output signals	Supply voltage does not match the voltage specified on the nameplate.	Apply the correct supply voltage $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
Local display dark and no output signals	Supply voltage has incorrect polarity.	Reverse polarity of supply voltage.
Local display dark and no output signals	No contact between connecting cables and terminals.	Ensure electrical contact between the cable and the terminal.
Local display dark and no output signals	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.	
Local display dark and no output signals	<ul><li>I/O electronics module is defective.</li><li>Main electronics module is defective.</li></ul>	Order spare part → 🖺 215.
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 → 🖺 215.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures → 🖺 199
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 (→ □ 149).
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	<ul> <li>Check the cable and the connector between the main electronics module and display module.</li> <li>Order spare part →   215.</li> </ul>

### For output signals

Error	Possible causes	Remedial action
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 🖺 215.
Signal output outside the valid current range (< 3.6 mA or > 22 mA)	Main electronics module is defective.  I/O electronics module is defective.	Order spare part → 🗎 215.
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Parameter configuration error	Check and adjust parameter configuration.
Device measures incorrectly.	Configuration error or device is operated outside the application.	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 <b>OFF</b> position → 🖺 158.
Write access to parameters is not possible.	Current user role has limited access authorization.	1. Check user role → 🗎 74. 2. Enter correct customer-specific access code → 🖺 74.
Connection via HART protocol is not possible.	Missing or incorrectly installed communication resistor	Install the communication resistor (250 $\Omega$ ) correctly. Observe the maximum load $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
Connection via HART protocol is not possible.	Commubox  Incorrectly connected.  Incorrectly configured.  Driver is not installed correctly.  The USB port on the PC is incorrectly configured.	Refer to the documentation on Commubox FXA195 HART:  Technical Information TI00404F
Unable to connect to the web server.	Web server is disabled.	Using the "FieldCare" or "DeviceCare" operating tool, check whether the web server of the device is enabled, and enable it if necessary → 🖺 81.
	The Ethernet interface on the PC is incorrectly configured.	<ul> <li>Check the properties of the Internet protocol (TCP/IP)→ ≅ 77.</li> <li>Check the network settings with the IT manager.</li> </ul>
Unable to connect to the web server.	The IP address on the PC is incorrectly configured.	Check the IP address: 192.168.1.212 → 🖺 77
Unable to connect to the web server.	WLAN access data are incorrect.	<ul> <li>Check WLAN network status.</li> <li>Log on to the device again using WLAN access data.</li> <li>Check that WLAN is enabled on the measuring instrument and operating unit → ≅ 77.</li> </ul>
	WLAN communication is disabled.	-
Unable to connect to web server, FieldCare or DeviceCare.	WLAN network is not available.	<ul> <li>Check if WLAN reception is present: LED on display module is lit blue.</li> <li>Check if WLAN connection is enabled: LED on display module flashes blue.</li> <li>Switch on instrument function.</li> </ul>
Network connection not present or unstable	WLAN network is weak.	<ul> <li>Operating unit outside reception range: Check network status on operating unit.</li> <li>To improve network performance, use an external WLAN antenna.</li> </ul>
	Parallel WLAN and Ethernet communication	<ul><li>Check network settings.</li><li>Temporarily enable only the WLAN as an interface.</li></ul>
Web browser frozen and operation no longer possible	Data transfer is active.	Wait until data transfer or current action is finished.
	Connection lost	<ul> <li>Check cable connection and power supply.</li> <li>Refresh the web browser and restart if necessary.</li> </ul>
Display of web browser content is difficult to read or incomplete.	Web browser version used is not optimal.	<ul> <li>▶ Use correct web browser version → ≅ 76.</li> <li>▶ Empty the web browser cache.</li> <li>▶ Restart the web browser.</li> </ul>
	Unsuitable view settings.	Change the font size/display ratio of the Web browser.
Incomplete or no display of content in the web browser	<ul><li>JavaScript is not enabled.</li><li>JavaScript cannot be enabled.</li></ul>	<ul> <li>Enable JavaScript.</li> <li>Enter http://XXX.XXX.X.XX/servlet/basic.html as the IP address.</li> </ul>

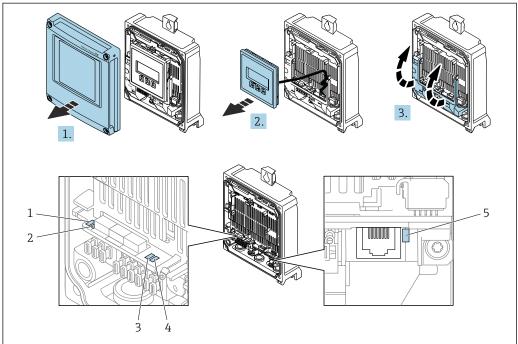
Fault	Possible causes	Remedial action
Operation with FieldCare or DeviceCare via service interface CDI-RJ45 (port 8000) is not possible.	Firewall of the PC or network is blocking communication.	Depending on the settings of the firewall used on the PC or in the network, the firewall must be adapted or 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 light emitting diodes

### 12.2.1 Transmitter

### Proline 500 - digital

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



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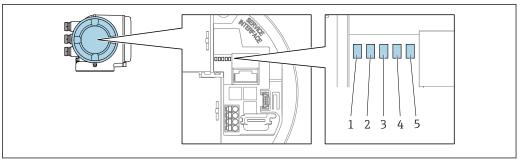
- Supply voltage
- 2 Device status
- 3 Not used
- 4 Communication
- 5 Service interface (CDI) active
- 1. Open the housing cover.
- 2. Remove the display module.
- 3. Fold open the terminal cover.

LED		Color	Meaning
1	Supply voltage	Off	Supply voltage is off or too low.
		Green	Supply voltage is OK.
2	Device status (normal	Off	Firmware error
	operation)	Green	Device status is OK.
		Flashing green	Device is not configured.
		Flashing red	A diagnostic event with "Warning" diagnostic behavior has occurred.
		Red	A diagnostic event with "Alarm" diagnostic behavior has occurred.
		Flashing red or green	The device restarts.
2	Device status (during	Flashes red slowly	If > 30 seconds: problem with the boot loader.
	start-up)	Flashes red quickly	If > 30 seconds: compatibility problem when reading the firmware.
3	Not used	_	_

LED		Color	Meaning
4	Communication	Off	Communication not active.
		White	Communication active.
5	Service interface (CDI)	Off	Not connected or no connection established.
		Yellow	Connected and connection established.
		Flashing yellow	Service interface active.

### Proline 500

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



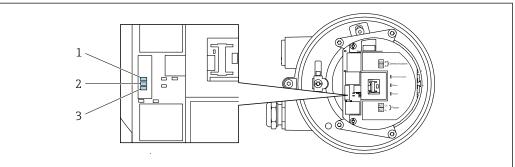
- Supply voltage Device status 1
- 2
- 3 Not used
- Communication
- Service interface (CDI) active

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 or green	The device restarts.
2	Device status (during	Flashes red slowly	If > 30 seconds: problem with the boot loader.
	start-up)	Flashes red quickly	If > 30 seconds: compatibility problem when reading the firmware.
3	Not used	-	-
4	Communication	Off	Communication not active.
		White	Communication active.
5	Service interface (CDI)	Off	Not connected or no connection established.
		Yellow	Connected and connection established.
		Flashing yellow	Service interface active.

#### 12.2.2 Sensor connection housing

### Proline 500 - digital

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



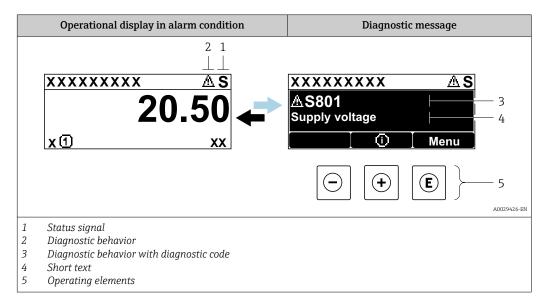
- Communication
- Device status
- 2 3 Supply voltage

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

### 12.3 Diagnostic information on local display

### 12.3.1 Diagnostic message

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



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

- Other diagnostic events that have occurred can be displayed in the **Diagnostics** menu:
  - Via parameter → 🖺 204
  - Via submenus  $\rightarrow$  🖺 204

#### Status signals

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

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

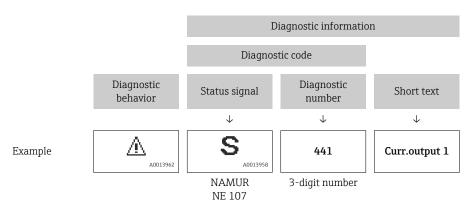
Symbol	Meaning
F	Failure A device error has occurred. The measured value is no longer valid.
С	Function check The device is in service mode (e.g. during a simulation).
s	Out of specification  The device is being operated:  Outside its technical specification limits (e.g. outside the process temperature range)  Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)
М	Maintenance required Maintenance is required. The measured value remains valid.

### Diagnostic behavior

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

### Diagnostic information

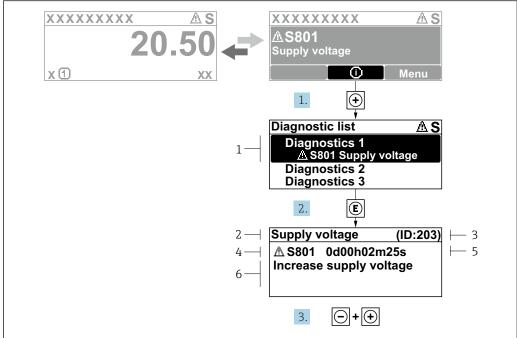
The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.



### Operating elements

Operating key	Meaning
<b>(+)</b>	Plus key In menu, submenu Opens the message about the remedial measures.
E	Enter key In menu, submenu Opens the operating menu.

### 12.3.2 Calling up remedial measures



A0029431-EN

- 42 Message for remedial measures
- 1 Diagnostic information
- 2 Short text
- 3 Service ID
- 4 Diagnostic behavior with diagnostic code
- 5 Operation time when error occurred
- 6 Remedial measures
- 1. The user is in the diagnostic message.

Press ± (① symbol).

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

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

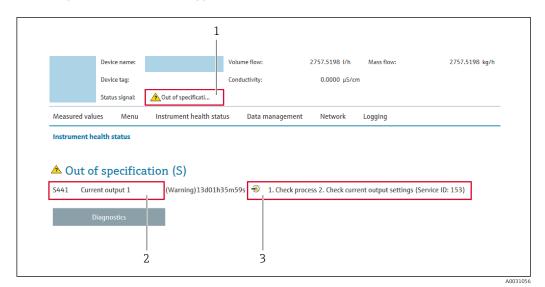
- 1. Press E.
  - ► The message for the remedial measures for the selected diagnostic event opens.
- 2. Press  $\Box$  +  $\pm$  simultaneously.
  - └ The message for the remedial measures closes.

192

### 12.4 Diagnostic information in the web browser

### 12.4.1 Diagnostic options

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



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

  - Via submenu → 🗎 204

### 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.
	Function check The device is in service mode (e.g. during a simulation).
A	Out of specification The device is being operated:  Outside its technical specification limits (e.g. outside the process temperature range)  Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)
<b>&amp;</b>	Maintenance required Maintenance is required. The measured value remains valid.

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

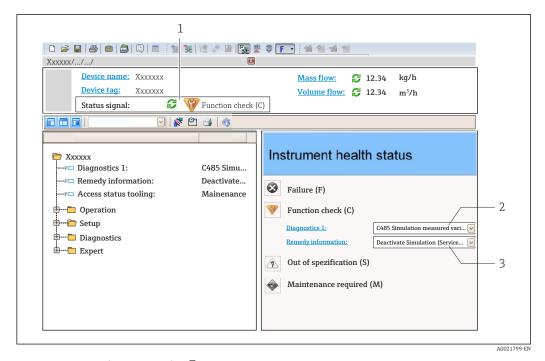
# 12.4.2 Calling up remedy information

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

### 12.5 Diagnostic information in FieldCare or DeviceCare

### 12.5.1 Diagnostic options

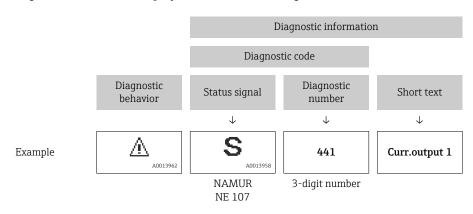
Any faults detected by the measuring device are displayed on the home page of the operating tool once the connection has been established.



- 1 Status area with status signal → \( \bigsim 190 \)
- Remedial measures with service ID
- In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
  - Via parameter  $\rightarrow$  🗎 204
  - Via submenu → 🖺 204

### Diagnostic information

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



## 12.5.2 Calling up remedy information

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

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

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

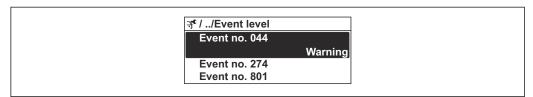
- 1. Call up the desired parameter.
- 2. On the right in the working area, mouse over the parameter.
  - ► A tool tip with remedy information for the diagnostic event appears.

### 12.6 Adapting the diagnostic information

### 12.6.1 Adapting the diagnostic behavior

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

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



Using the example of the local display

€ 43

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

Options	Description
Alarm	The device stops measurement. The signal outputs and totalizers assume the defined alarm condition. A diagnostic message is generated.  The background lighting changes to red.
Warning	The device continues to measure. The signal outputs and totalizers are not affected. A diagnostic message is generated.
Logbook entry only	The device continues to measure. The diagnostic message is only displayed in the <b>Event logbook</b> submenu ( <b>Event list</b> 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.

### 12.6.2 Adapting the status signal

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

Expert  $\rightarrow$  Communication  $\rightarrow$  Diagnostic event category

### Available status signals

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

Symbol	Meaning
A0013956	Failure A device error has occurred. The measured value is no longer valid.
<b>C</b>	Function check The device is in service mode (e.g. during a simulation).
<b>S</b>	Out of specification The device is being operated:  Outside its technical specification limits (e.g. outside the process temperature range)  Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)

Symbol	Meaning
A0013957	Maintenance required Maintenance is required. The measured value remains valid.
A0023076	Has no effect on the condensed status.

## 12.7 Overview of diagnostic information

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

In the case of some items of diagnostic information, the status signal and the diagnostic behavior can be changed. Change the diagnostic information → 🖺 197

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)
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

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
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	М	Warning
331	Firmware update failed	Update firmware of device     Restart device	F	Warning
332	Writing in HistoROM backup failed	Replace user interface board     Ex d/XP: replace transmitter	F	Alarm
361	I/O module 1 to n faulty	Restart device     Check electronic modules     Change I/O module or main electronics	F	Alarm
369	Matrix code scanner defective	Replace matrix code scanner	F	Alarm
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

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
374	Sensor electronics (ISEM) faulty	Restart device     Check if failure recurs     Replace sensor electronic module     (ISEM)	S	Warning <sup>1)</sup>
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	Insert T-DAT     Replace T-DAT	F	Alarm
383	Memory content	Reset device	F	Alarm
387	HistoROM data faulty	Contact service organization	F	Alarm
Diagnostic of	configuration		<b>'</b>	
410	Data transfer failed	Retry data transfer     Check connection	F	Alarm
412	Processing download	Download active, please wait	С	Warning
431	Trim 1 to n required	Carry out trim	С	Warning
437	Configuration incompatible	Update firmware     Execute factory reset	F	Alarm
438	Dataset different	Check data set file     Check device parameterization     Download new device     parameterization	M	Warning
441	Current output 1 to n faulty	Check process     Check current output settings	S	Warning 1)
442	Frequency output faulty	Check process     Check frequency output settings	S	Warning 1)
443	Pulse output 1 to n faulty	Check process     Check pulse output settings	S	Warning 1)
444	Current input 1 to n faulty	Check process     Check current input settings	S	Warning 1)
453	Flow override active	Deactivate flow override	С	Warning
484	Failure mode simulation active	Deactivate simulation	С	Alarm
485	Process variable simulation active	Deactivate simulation	С	Warning
486	Current input simulation active	Deactivate simulation	С	Warning
491	Current output 1 to n simulation active	Deactivate simulation	С	Warning
492	Frequency output simulation active	Deactivate simulation frequency output	С	Warning
493	Pulse output simulation active	Deactivate simulation pulse output	С	Warning
494	Switch output simulation active	Deactivate simulation switch output	С	Warning

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

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

<sup>1)</sup> Diagnostic behavior can be changed.

### 12.8 Pending diagnostic events

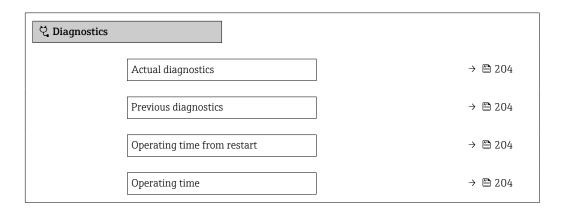
The **Diagnostics** menu allows the user to view the current diagnostic event and the previous diagnostic event separately.

- To call up the measures to rectify a diagnostic event:
  - Via local display → 
    192

    - Via "FieldCare" operating tool → 🗎 196
    - Via "DeviceCare" operating tool → 🖺 196
- Other pending diagnostic events can be displayed in the **Diagnostic list** submenu  $\rightarrow \cong 204$ .

#### 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)

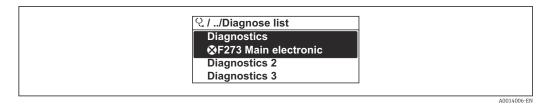
### 12.9 Diagnostics list

Up to 5 currently pending diagnostic events can be displayed in the **Diagnostic list** submenu along with the associated diagnostic information. If more than 5 diagnostic events are pending, the events with the highest priority are shown on the display.

#### Navigation path

Diagnostics → Diagnostic list

204



€ 44 Using the example of the local display

To call up the measures to rectify a diagnostic event:

- Via local display → 
  ☐ 192
  Via web browser → 
  ☐ 194
- Via "FieldCare" operating tool → 🗎 196
- Via "DeviceCare" operating tool → 🖺 196

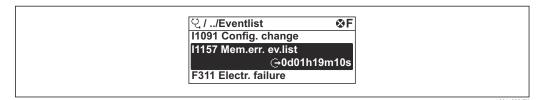
### 12.10 Event logbook

### 12.10.1 Reading out the event logbook

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

#### Navigation path

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



Using the example of the local display

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

The event history includes entries for:

- Diagnostic events → 🗎 199
- Information events  $\rightarrow$   $\stackrel{\triangle}{=}$  207

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

- Diagnostics event
  - ᢒ: Occurrence of the event
  - ⊖: End of the event
- Information event
  - €: Occurrence of the event
- To call up the measures to rectify a diagnostic event:
  - Via local display → 

    192

  - Via "FieldCare" operating tool → 🖺 196
- For filtering the displayed event messages → 🗎 206

### 12.10.2 Filtering the event logbook

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

#### Navigation path

Diagnostics  $\rightarrow$  Event logbook  $\rightarrow$  Filter options

#### Filter categories

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

### 12.10.3 Overview of information events

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

Info number	Info name		
I1000	(Device ok)		
I1079	Sensor changed		
I1089	Power on		
I1090	Configuration reset		
I1091	Configuration changed		
I1092	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		
I1264	Safety sequence aborted		
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		
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		

Info number	Info name	
I1515	Upload finished	
I1517	Custody transfer active	
I1518	Custody transfer inactive	
I1554	Safety sequence started	
I1555	Safety sequence confirmed	
I1556	Safety mode off	
I1618	I/O module 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	

# 12.11 Resetting the measuring device

The entire device configuration or some of the configuration can be reset to a defined state with the **Device reset** parameter ( $\Rightarrow \triangleq 153$ ).

### 12.11.1 Function range of "Device reset" parameter

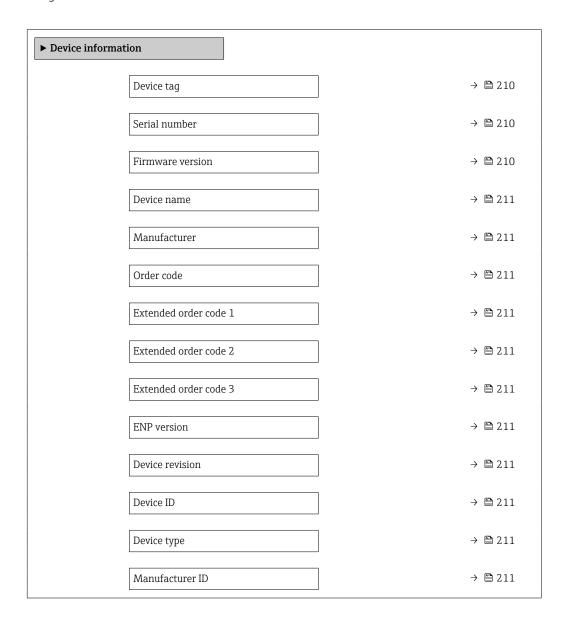
Options	Description	
Cancel	No action is executed and the user exits the parameter.	
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to the customer-specific value. All other parameters are reset to the factory setting.	
Restart device	The restart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

### 12.12 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	_

Parameter	ameter Description		nce Factory setting	
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	
Device revision	Shows the device revision with which the device is registered with the HART Communication Foundation.	2-digit hexadecimal number	7	
Device ID	Shows the device ID for identifying the device in a HART network.	6-digit hexadecimal number	-	
Device type	Shows the device type with which the measuring device is registered with the HART Communication Foundation.	Hexadecimal number	0x3B (for Promass 300/500)	
Manufacturer ID	Shows the device's manufacturer ID registered with the HART Communication Foundation.	2-digit hexadecimal number	0x11 (for Endress+Hauser)	

### 12.13 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware Changes	Documentation type	Documentation
08.2022	01.06.zz	Option <b>60</b>	<ul> <li>New gas type: methane with hydrogen</li> <li>Eight display values on local display</li> <li>Zero point verification and zero adjustment wizard</li> <li>New density unit: API</li> <li>New diagnostic parameters</li> <li>Additional languages for Heartbeat Technology Reports</li> </ul>	Operating instructions	BA01536D/06/EN/04.22
09.2019	01.05.zz	Option 66	<ul> <li>Gas fraction handler         Adaptive filter, gas entrainment index</li> <li>Application-specific input module</li> <li>Upgrading of the Petroleum application package</li> </ul>	Operating instructions	BA01536D/06/EN/03.19
10.2017	01.01.zz	Option 71	<ul> <li>Petroleum new</li> <li>Concentration update</li> <li>OPC-UA with Security new</li> <li>Local display - enhanced performance and data entry via text editor</li> <li>Optimized keypad lock for local display</li> <li>Improvements and enhancements with regard to custody transfer measurement</li> <li>Web server feature update</li> <li>Support for trend data function</li> <li>Heartbeat function enhanced to include detailed results (page 3/4 of the report)</li> <li>Device configuration as PDF (parameter log, similar to FDT print)</li> <li>Network capability of Ethernet (service) interface</li> <li>Comprehensive Heartbeat feature update</li> <li>Local display - support for WLAN infrastructure mode</li> <li>Implementation of reset code</li> </ul>	Operating instructions	BA01536D/06/EN/02.17
08.2016	01.00.zz	Option 78	Original firmware	Operating instructions	BA01536D/06/EN/01.16

- For the compatibility of the firmware version with the previous version, the installed device description files and operating tools, observe the information about the device in the "Manufacturer's information" document.
- The manufacturer's information is available:
  - $\blacksquare$  In the Download Area of the Endress+Hauser web site: www.endress.com  $\to$  Downloads
  - Specify the following details:
    - Product root: e.g. 8X5B
       The product root is the first part of the order code: see the nameplate on the device.
    - Text search: Manufacturer's information
    - Media type: Documentation Technical Documentation

212

## 12.14 Device history and compatibility

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

Device model	Release	Change compared with earlier model	Compatibility with earlier model
A2	09.2019	I/O module with enhanced performance and functionality: see device firmware 01.05.zz → 🖺 212	No
A1	08.2016	_	-

Maintenance Proline Promass X 500

### 13 Maintenance

### 13.1 Maintenance work

No special maintenance work is required.

### 13.1.1 Exterior cleaning

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

## 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:  $\rightarrow \stackrel{\triangle}{=} 219$ 

### 13.3 Endress+Hauser services

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

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

Proline Promass X 500 Repair

### 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 Endress+Hauser services

Endress+Hauser offers a wide range of services.

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

### 14.4 Return

The requirements for safe device return can vary depending on the device type and national legislation.

- 1. Refer to the web page for information: https://www.endress.com/support/return-material
  - Select the region.
- 2. If returning the device, pack the device in such a way that it is reliably protected against impact and external influences. The original packaging offers the best protection.

Proline Promass X 500 Repair

#### 14.5 **Disposal**



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

#### 14.5.1 Removing the measuring device

1. Switch off the device.

#### **WARNING**

#### Danger to persons from process conditions!

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

#### 14.5.2 Disposing of the measuring device

#### **WARNING**

### Danger to personnel and environment from fluids that are hazardous to health.

► Ensure that the measuring device and all cavities are free of fluid residues that are hazardous to health or the environment, e.g. substances that have permeated into crevices or diffused through plastic.

Observe the following notes during disposal:

- ▶ Observe valid federal/national regulations.
- ► Ensure proper separation and reuse of the device components.

Proline Promass X 500 Accessories

# 15 Accessories

Various accessories, which can be ordered with the device or subsequently from Endress +Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

# 15.1 Device-specific accessories

## 15.1.1 For the transmitter

Accessories	Description
Transmitter Proline 500 – digital Proline 500	Transmitter for replacement or storage. Use the order code to define the following specifications:  Approvals Output Input Display/operation Housing Software  Proline 500 – digital transmitter: Order number: 8X5BXX-******* Order number: 8X5BXX-******** Proline 500 transmitter: Order number: 8X5BXX-******* Order number: 8X5BXX-*********  Proline 500 transmitter for replacement: It is essential to specify the serial number of the current transmitter when ordering. On the basis of the serial number, the device-specific data (e.g. calibration factors) of the replaced device can be used for the new
	transmitter.  Proline 500 – digital transmitter: Installation Instructions EA01151D  Proline 500 transmitter: Installation Instructions EA01152D
External WLAN antenna	External WLAN antenna with 1.5 m (59.1 in) connecting cable and two angle brackets. Order code for "Accessory enclosed", option P8 "Wireless antenna wide area".  ■ The external WLAN antenna is not suitable for use in hygienic applications.  ■ Additional information regarding the WLAN interface → 🖺 84.  ■ Order number: 71351317  ■ Installation Instructions EA01238D
Pipe mounting set	Pipe mounting set for transmitter.  Proline 500 – digital transmitter Order number: 71346427  Installation Instructions EA01195D  Proline 500 transmitter Order number: 71346428
Weather protection cover Transmitter Proline 500 – digital Proline 500	Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight.  Proline 500 – digital transmitter Order number: 71343504 Proline 500 transmitter Order number: 71343505  Installation Instructions EA01191D

Accessories Proline Promass X 500

Display guard Proline 500 – digital	Is used to protect the display against impact or scoring, for example from sand in desert areas.
	• Order number: 71228792
	Installation Instructions EA01093D
Connecting cable Proline 500 – digital Sensor – Transmitter	The connecting cable can be ordered directly with the measuring device (order code for "Cable, sensor connection) or as an accessory (order number DK8012).
	The following cable lengths are available: order code for "Cable, sensor connection"  Option B: 20 m (65 ft)  Option E: User-configurable up to max. 50 m  Option F: User-configurable up to max. 165 ft
	Maximum possible cable length for a Proline 500 – digital connecting cable: 300 m (1000 ft)
Connecting cables Proline 500	The connecting cable can be ordered directly with the measuring device (order code for "Cable, sensor connection") or as an accessory (order number DK8012).
Sensor – Transmitter	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)

# 15.2 Communication-specific accessories

Accessories	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB port.  Technical Information TI00404F
HART loop converter HMX50	Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.  Technical Information TI00429F Operating Instructions BA00371F
Fieldgate FXA42	Transmission of the measured values of connected 4 to 20 mA analog measuring instruments, as well as digital measuring instruments  Technical Information TI01297S Operating Instructions BA01778S Product page: www.endress.com/fxa42
Field Xpert SMT50	The Field Xpert SMT50 tablet PC for device configuration enables mobile plant asset management in the non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.  This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.  Technical Information TI01555S Operating Instructions BA02053S Product page: www.endress.com/smt50

Proline Promass X 500 Accessories

Field Xpert SMT70	The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.  This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage the field instruments throughout their entire life cycle.
	<ul> <li>Technical Information TI01342S</li> <li>Operating Instructions BA01709S</li> <li>Product page: www.endress.com/smt70</li> </ul>
Field Xpert SMT77	The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.
	<ul> <li>Technical Information TI01418S</li> <li>Operating Instructions BA01923S</li> <li>Product page: www.endress.com/smt77</li> </ul>

# 15.3 Service-specific accessories

Accessories	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  Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.  Applicator is available:
	Via the Internet: https://portal.endress.com/webapp/applicator
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. Drawing upon decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem designed to effortlessly extract insights from data. These insights allow process optimization, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant. www.netilion.endress.com
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.  Innovation brochure IN01047S

Accessories Proline Promass X 500

# 15.4 System components

Accessories	Description
Memograph M graphic data manager	The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.
	<ul> <li>Technical Information TI00133R</li> <li>Operating Instructions BA00247R</li> </ul>
Cerabar M	The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.
	<ul> <li>Technical Information TI00426P and TI00436P</li> <li>Operating Instructions BA00200P and BA00382P</li> </ul>
Cerabar S	The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.
	<ul><li>Technical Information TI00383P</li><li>Operating Instructions BA00271P</li></ul>
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 $\rightarrow \implies 14$

# 16.3 Input

#### Measured variable

#### Direct measured variables

- Mass flow
- Density
- Temperature

## Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

## Measuring range

## Measuring range for liquids

DN		Measuring range full scal	e values $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$
[mm]	[in]	[t/h]	[tn. sh./h]
300	12	0 to 4 100	0 to 4520
350	14	0 to 4 100	0 to 4520
400	16	0 to 4 100	0 to 4520

## Measuring range for gases

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

$$\dot{m}_{max(G)} = Minimum \ of \qquad \qquad (\dot{m}_{max(F)} \cdot \rho_G : x \ ) \ and$$

$$(\rho_G\cdot(c_G/2)\cdot d_i{}^2\cdot(\pi/4)\cdot 3600\cdot n)$$

m <sub>max(G)</sub>	Maximum full scale value for gas [kg/h]
m <sub>max(F)</sub>	Maximum full scale value for liquid [kg/h]
$\dot{m}_{\max(G)} < \dot{m}_{\max(F)}$	$\dot{m}_{ max(G)}$ can never be greater than $\dot{m}_{ max(F)}$
$\rho_{G}$	Gas density in [kg/m³] at operating conditions
х	Limitation constant for max. gas flow [kg/m³]
$c_{G}$	Sound velocity (gas) [m/s]
d <sub>i</sub>	Measuring tube internal diameter [m]
π	Pi
n = 4	Number of measuring tubes

DN		x
[mm]	[in]	[kg/m³]
300	12	200
350	14	200
400	16	200

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 device 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
- Various pressure and temperature measuring devices can be ordered from Endress +Hauser: see "Accessories" section → 🗎 220

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

#### HART protocol

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

- HART protocol
- Burst mode

#### Current input

#### Current input 0/4 to 20 mA

Current input	0/4 to 20 mA (active/passive)
Current span	<ul> <li>4 to 20 mA (active)</li> <li>0/4 to 20 mA (passive)</li> </ul>
Resolution	1 μΑ
Voltage drop	Typically: 0.6 to 2 V for 3.6 to 22 mA (passive)
Maximum input voltage	≤ 30 V (passive)
Open-circuit voltage	≤ 28.8 V (active)
Possible input variables	<ul><li>Pressure</li><li>Temperature</li><li>Density</li></ul>

## Status input

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

# 16.4 Output

## Output signal

## Current output 4 to 20 mA HART

Order code	"Output; input 1" (20): Option BA: current output 4 to 20 mA HART
Signal mode	Can be set to:  Active Passive
Current range	Can be set to:  4 to 20 mA NAMUR  4 to 20 mA US  4 to 20 mA  0 to 20 mA (only if the signal mode is active)  Fixed current
Open-circuit voltage	DC 28.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	250 to 700 Ω
Resolution	0.38 μΑ
Damping	Configurable: 0 to 999.9 s
Assignable measured variables	<ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Electronics temperature</li> <li>Oscillation frequency 0</li> <li>Oscillation damping 0</li> <li>Signal asymmetry</li> <li>Exciter current 0</li> <li>The range of options increases if the measuring device has one or more application packages.</li> </ul>

## Current output 4 to 20 mA HART Ex i

Order code	"Output; input 1" (20) choose from:  ■ Option CA: current output 4 to 20 mA HART Ex i passive  ■ Option CC: current output 4 to 20 mA HART Ex i active
Signal mode	Depends on the selected order version.
Current range	Can be set to:  4 to 20 mA NAMUR  4 to 20 mA US  4 to 20 mA  0 to 20 mA  for index is active)  Fixed current
Open-circuit voltage	DC 21.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	<ul> <li>250 to 400 Ω (active)</li> <li>250 to 700 Ω (passive)</li> </ul>
Resolution	0.38 μΑ

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

## Current output 4 to 20 mA

Order code	"Output; input 2" (21), "Output; input 3" (022) or "Output; input 4" (023): Option B: current output 4 to 20 mA
Signal mode	Can be set to: Active Passive
Current range	Can be set to:  4 to 20 mA NAMUR  4 to 20 mA US  4 to 20 mA  0 to 20 mA  (only if the signal mode is active)  Fixed current
Maximum output values	22.5 mA
Open-circuit voltage	DC 28.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	$0$ to $700\Omega$
Resolution	0.38 μΑ
Damping	Configurable: 0 to 999.9 s
Assignable measured variables	<ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Electronics temperature</li> <li>Oscillation frequency 0</li> <li>Oscillation damping 0</li> <li>Signal asymmetry</li> <li>Exciter current 0</li> <li>The range of options increases if the measuring device has one or more application packages.</li> </ul>

# Current output 4 to 20 mA Ex i passive

Order code	"Output; input 2" (21), "Output; input 3" (022): Option C: current output 4 to 20 mA Ex i passive
Signal mode	Passive
Current range	Can be set to:  4 to 20 mA NAMUR  4 to 20 mA US  4 to 20 mA  Fixed current

Maximum output values	22.5 mA
Maximum input voltage	DC 30 V
Load	0 to 700 $\Omega$
Resolution	0.38 μΑ
Damping	Configurable: 0 to 999 s
Assignable measured variables	<ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Electronics temperature</li> <li>Oscillation frequency 0</li> <li>Oscillation damping 0</li> <li>Signal asymmetry</li> <li>Exciter current 0</li> <li>The range of options increases if the measuring device has one or more application packages.</li> </ul>

## Pulse/frequency/switch output

Function	Can be configured as pulse, frequency or switch output
Version	Open collector
	Can be set to:
	• Active
	■ Passive
	■ Passive NAMUR
	Ex-i, passive
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Voltage drop	For 22.5 mA: ≤ DC 2 V
Pulse output	
Maximum input values	DC 30 V, 250 mA (passive)
Maximum output current	22.5 mA (active)
Open-circuit voltage	DC 28.8 V (active)
Pulse width	Configurable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Configurable
Assignable measured variables	<ul><li>Mass flow</li><li>Volume flow</li></ul>
	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	<ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Electronics temperature</li> <li>Oscillation frequency 0</li> <li>Oscillation damping 0</li> <li>Signal asymmetry</li> <li>Exciter current 0</li> <li>The range of options increases if the measuring device has one or more application packages.</li> </ul>
Switch output	
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Switching behavior	Binary, conductive or non-conductive
Switching delay	Configurable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	<ul> <li>Disable</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit</li> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Totalizer 1-3</li> <li>Flow direction monitoring</li> <li>Status</li> <li>Partially filled pipe detection</li> <li>Low flow cut off</li> <li>The range of options increases if the measuring device has one or more application packages.</li> </ul>

## Double pulse output

Function	Double pulse
Version	Open collector
	Can be set to: Active Passive Passive NAMUR
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Voltage drop	For 22.5 mA: ≤ DC 2 V
Output frequency	Configurable: 0 to 1000 Hz
Damping	Configurable: 0 to 999 s

Pulse/pause ratio	1:1
Assignable measured variables	<ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> </ul>
	The range of options increases if the measuring device has one or more application packages.

## Relay output

Function	Switch output
Version	Relay output, galvanically isolated
Switching behavior	Can be set to: NO (normally open), factory setting NC (normally closed)
Maximum switching capacity (passive)	■ DC 30 V, 0.1 A ■ AC 30 V, 0.5 A
Assignable functions	<ul> <li>Disable</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit</li> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Totalizer 1-3</li> <li>Flow direction monitoring</li> <li>Status</li> <li>Partially filled pipe detection</li> <li>Low flow cut off</li> <li>The range of options increases if the measuring device has one or more application packages.</li> </ul>

## User-configurable input/output

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

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:

## Current output 0/4 to 20 mA

## 4 to 20 mA

Failure mode	Choose from:  4 to 20 mA in accordance with NAMUR recommendation NE 43  4 to 20 mA in accordance with US  Min. value: 3.59 mA  Max. value: 22.5 mA  Definable value between: 3.59 to 22.5 mA  Actual value
	<ul> <li>Last valid value</li> </ul>

## 0 to 20 mA

Fail	lure mode	Choose from:	
■ Maximum alarm: 22 mA		<ul> <li>Maximum alarm: 22 mA</li> <li>Definable value between: 0 to 20.5 mA</li> </ul>	
		- Definable value between 0 to 20.5 mm	

## Pulse/frequency/switch output

Pulse output	
Fault mode	Choose from:  Actual value  No pulses
Frequency output	
Fault mode	Choose from:  Actual value  O Hz  Definable value between: 2 to 12 500 Hz
Switch output	
Fault mode	Choose from:  Current status  Open Closed

## Relay output

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

## 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

230

## Interface/protocol

- Via digital communication: HART protocol
- Via service interface
  - CDI-RJ45 service interface
  - WLAN interface

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

#### Web browser

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

## Light emitting diodes (LED)

Status information	Status indicated by various light emitting diodes	
	The following information is displayed depending on the device version:  Supply voltage active  Data transmission active  Device alarm/error has occurred	
Diagnostic information via light emitting diodes → 🗎 187		

Low flow cut off

The switch points for low flow cut off are user-selectable.

Galvanic isolation

The outputs are galvanically isolated:

- from the power supply
- from one another
- from the potential equalization (PE) terminal

## Protocol-specific data

Manufacturer ID	0x11	
Device type ID	0x3B	
HART protocol revision	7	
Device description files (DTM, DD) Information and files under: www.endress.com		
HART load Min. 250 $Ω$		
System integration  Information on system integration → ■ 90.  • Measured variables via HART protocol  • Burst Mode functionality		

# 16.5 Power supply

Terminal assignment

→ 🖺 41

Supply voltage

Order code "Power supply"	Terminal voltage		Frequency range
Option <b>D</b>	DC 24 V	±20%	_
Option <b>E</b>	AC 100 to 240 V	-15+10%	50/60 Hz

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

# Overcurrent protection element

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

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

#### Electrical connection

- **■** → **□** 43
- **■** → **■** 48

## Potential equalization

→ 🖺 53

## Terminals

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

## Cable entries

- Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
  - NPT ½"
  - G ½"
  - M20

#### Cable specification

→ 🖺 36

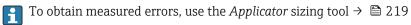
#### Overvoltage protection

Mains voltage fluctuations	→ <b>1</b> 231
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

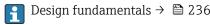
- Error limits based on ISO 11631
- Water
  - +15 to +45 °C (+59 to +113 °F)
  - 2 to 6 bar (29 to 87 psi)
- Data as indicated in the calibration protocol
- Accuracy based on accredited calibration rigs according to ISO 17025



# 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)

- $\pm 0.05$  % o.r. (optional for mass flow: PremiumCal; order code for "Calibration flow", option D)
- ±0.10 % o.r. (standard)

Mass flow (gases)

±0.35 % o.r.

Density (liquids)

Under referen	ce conditions Sta	andard density calibration	Extended density calibration 1) 2)	
[g/cɪ	n³]	[g/cm³]	[g/cm³]	
±0.0005		±0.0005	±0.0005	

- 1) Valid range for extended density calibration: 0 to 2  $g/cm^3$ , +20 to +60 °C (+68 to +140 °F)
- order code for "Application package", option E1 "Extended 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]	
300	12	137	5.03	
350	14	137	5.03	
400	16	137	5.03	

## 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]
300	4 100 000	410 000	205 000	82 000	41000	8200
350	4 100 000	410 000	205 000	82 000	41000	8200
400	4 100 000	410 000	205 000	82 000	41000	8200

#### 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]
12	150700	15 070	7 5 3 5	3 0 1 4	1507	301.4
14	150700	15 070	7 5 3 5	3 0 1 4	1507	301.4
16	150700	15 070	7 5 3 5	3 0 1 4	1507	301.4

### 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 ightharpoonup 236

Mass flow and volume flow (liquids)

±0.025 % o.r. (PremiumCal)

±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 μΑ/°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).

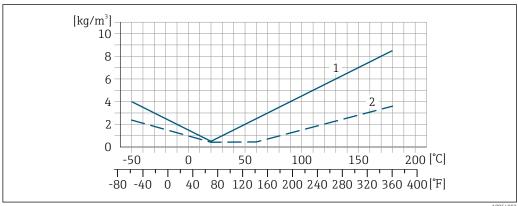
The influence is reduced when the zero adjustment is performed at process temperature.

#### Density

If there is a difference between the density calibration temperature and the process temperature, the measurement error of the sensors is typically  $\pm 0.00005$  g/cm<sup>3</sup>/°C ( $\pm 0.000025$  g/cm<sup>3</sup>/°F). Field density adjustment is possible.

#### Extended density specification

If the process temperature is outside the valid range ( $\rightarrow \stackrel{\triangle}{=} 233$ ) the measurement error is  $\pm 0.000025 \text{ g/cm}^3 \text{ /°C } (\pm 0.0000125 \text{ g/cm}^3 \text{ /°F})$ 



- Field density adjustment, for example at +20 °C (+68 °F)
- 2 Extended 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]		
300	12	-0.009	-0.0006
350	14	-0.009	-0.0006
400	16	-0.009	-0.0006

## 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

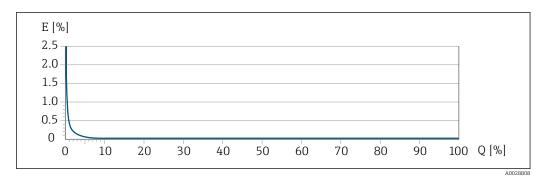
Calculation of the maximum measured error as a function of the flow rate

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

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

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

## Example of maximum measurement error



- E Maximum measurement error in % o.r. (example with PremiumCal)
- $Q \qquad \textit{Flow rate in \% of maximum full scale value} \\$

# 16.7 Mounting

Mounting requirements

→ 🗎 22

## 16.8 Environment

# Ambient temperature range

→ 🖺 25

#### Temperature tables



Observe the interdependencies between the permitted ambient and fluid temperatures when operating the device in hazardous areas.



For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.

## Storage temperature

Climate class

DIN EN 60068-2-38 (test Z/AD)

Relative humidity

The device is suitable for use outdoors and indoors with a relative humidity of 4 to 95 %.

#### Operating height

According to EN 61010-1

- $\le 2000 \text{ m} (6562 \text{ ft})$
- > 2 000 m (6 562 ft) with additional overvoltage protection (e.g. Endress+Hauser HAW Series)

### Degree of protection

#### **Transmitter**

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

#### Sensor

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

#### Optional

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

### External WLAN antenna

IP67

# Shock and vibration resistance

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

Sensor: order code for "Meas. tube mat., wetted parts surface", option LA, SD, SE, SF, TH, TT, TU

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

Sensor: order code for "Meas. tube mat., wetted parts surface", option HA, SA, SB, SC

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

#### Transmitter

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

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

Sensor: order code for "Meas. tube mat., wetted parts surface", option LA, SD, SE, SF, TH, TT, TU

- 10 to 200 Hz, 0.003 q<sup>2</sup>/Hz
- 200 to 2000 Hz, 0.001 g<sup>2</sup>/Hz
- Total: 1.54 g rms

Sensor: order code for "Meas. tube mat., wetted parts surface", option HA, SA, SB, SC

- 10 to 200 Hz, 0.01 q<sup>2</sup>/Hz
- 200 to 2000 Hz, 0.003 q<sup>2</sup>/Hz
- Total: 2.70 g rms

#### Transmitter

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

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

- Sensor: order code for "Meas. tube mat., wetted parts surface", option LA, SD, SE, SF, TH, TT, TU 6 ms 30 q
- Sensor: order code for "Meas. tube mat., wetted parts surface", option HA, SA, SB, SC 6 ms 50 g
- Transmitter6 ms 50 g

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

#### Mechanical load

Transmitter housing and sensor connection housing:

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

# Electromagnetic compatibility (EMC)

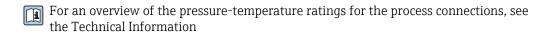
- As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)
- As per IEC/EN 61000-6-2 and IEC/EN 61000-6-4
- $oxed{\mathbb{H}}$  Details are provided in the Declaration of Conformity.
- This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.

#### 16.9 Process

Medium temperature range

-50 to +180 °C (−58 to +356 °F)

# Pressure-temperature ratings



#### 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.

In the event of a tube failure, the pressure level inside the sensor housing will rise according to the operating process pressure. If the user judges that the sensor housing burst pressure does not provide an adequate safety margin, the device can be fitted with a

238

rupture disk. This prevents excessively high pressure from forming inside the sensor housing. Therefore, the use of a rupture disk is strongly recommended in applications involving high gas pressures, and particularly in applications in which the process pressure is greater than 2/3 of the sensor housing burst pressure.

If there is a need to drain the leaking medium into a discharge device, the sensor should be fitted with a rupture disk. Connect the discharge to the additional threaded connection .

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: 2 bar (29.0 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.

If the device is fitted with a rupture disk (order code for "Sensor option", option CA "Rupture disk"), the rupture disk trigger pressure is decisive.

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]
300	12	28	406
350	14	28	406
400	16	28	406



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

### Rupture disk

To increase the level of safety, a device version with a rupture disk with a trigger pressure of 5.5 to 6.5 bar (80 to 94 psi) can be used (order code for "Sensor option", option CA "rupture disk").



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

#### Flow limit

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



For an overview of the full scale values for the measuring range, see the "Measuring range" section  $\rightarrow \ \cong \ 222$ 

■ The minimum recommended full scale value is approx. 1/20 of the maximum full scale value

- In most applications, 20 to 50 % of the maximum full scale value can be considered ideal
- A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity < 1 m/s (< 3 ft/s).
- For gas measurement the following rules apply:
  - The flow velocity in the measuring tubes should not exceed half the sound velocity (0.5 Mach).
  - The maximum mass flow depends on the density of the gas: formula
- To calculate the flow limit, use the *Applicator* sizing tool  $\rightarrow \triangleq 219$

## 16.10 Custody transfer

The measuring device is optionally tested in accordance with OIML R117 and has an EU type evaluation certificate which authorizes the use in EU type-examination certificates according to Measuring Instruments Directive 2014/32/EU for service subject to legal metrological control ("custody transfer") for liquids other than water (Annex VII).

The measuring device is optionally tested according to OIML R137 and has an EU type-examination certificate according to Measuring Instruments Directive 2014/32/EU for service subject to legal metrological control ("custody transfer") as a gas meter (Annex IV).

The device is used with a legally controlled totalizer display on the local display and optionally with outputs subject to legal metrological control.

Measuring devices subject to legal metrological control totalize in both directions, i.e. all the outputs consider flow components in the positive (forward) and negative (reverse) flow direction.

Generally a measuring device subject to legal metrological control is secured against tampering by seals on the transmitter or sensor. These seals may normally only be opened by a representative of the competent authority for legal metrology controls.

After putting the device into circulation or after sealing the device, operation is only possible to a limited extent.

Detailed ordering information is available from your local Endress+Hauser sales center for national approvals, which are based on the OIML certificates, for applications with liquids other than water or gases.



More information is provided in the supplementary documentation.

## 16.11 Mechanical construction

Design, dimensions



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

Weight

All values (weight exclusive of packaging material) refer to devices with ASME B16.5 Class 150 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:

#### Weight in SI units

DN [mm]	Weight [kg]
300	557
350	581
400	605

## Weight in US units

DN [in]	Weight [lbs]
12	1227
14	1280
16	1333

#### Materials

## Transmitter housing

Housing of Proline 500 – digital transmitter

Order code for "Transmitter housing":

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

Housing of Proline 500 transmitter

Order code for "Transmitter housing":

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

Window material

Order code for "Transmitter housing":

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

Fastening components for mounting on a post

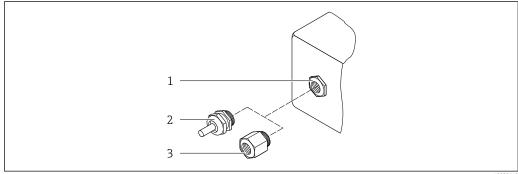
- Screws, threaded bolts, washers, nuts: stainless A2 (chrome-nickel steel)
- Metal plates: stainless steel, 1.4301 (304)

## Sensor connection housing

Order code for "Sensor connection housing":

Option L "Cast, stainless": 1.4409 (CF3M) similar to 316L

## Cable entries/cable glands



■ 46 Possible cable entries/cable glands

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

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



UV rays can impair the cable outer sheath. Protect the cable from exposure to sun as much as possible.

Connecting cable for sensor - Proline 500 - digital transmitter

PVC cable with copper shield

Connecting cable for sensor - Proline 500 transmitter

- PVC cable with copper shield
- Devices with order code for "Test, certificate", option **JQ**: PUR with copper shield

### Sensor housing

- Acid and alkali-resistant outer surface
- Stainless steel, 1.4404 (316L)

#### Measuring tubes

Stainless steel, 1.4404 (316/316L);

Manifold: stainless steel, 1.4404 (316/316L)

#### **Process connections**

Flanges in accordance with EN 1092-1 (DIN2501) / ASME B 16.5: Stainless steel, 1.4404 (F316/F316L)



Available process connections→ 🗎 244

#### **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



Process connection materials → 🖺 243

#### Surface roughness

All data refer to parts in contact with the medium.

The following surface roughness categories can be ordered: Not polished

## 16.12 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

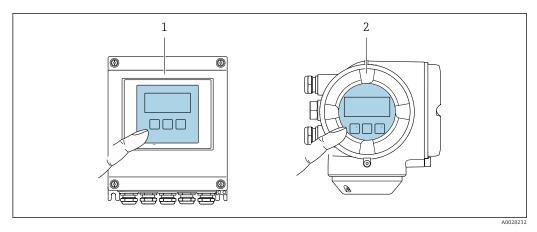
### Via display module

#### Features:

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



Information about WLAN interface → 🖺 84



47 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:  $\boxdot$ ,
- Operating elements also accessible in the various zones of the hazardous area

Remote operation	→ 🖺 82
Service interface	→ 🗎 83

#### Supported operating tools

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

Supported operating tools	Operating unit	Interface	Additional information
Web browser	Notebook, PC or tablet with Web browser	<ul><li>CDI-RJ45 service interface</li><li>WLAN interface</li></ul>	Special Documentation for device → 🖺 254
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	<ul><li>CDI-RJ45 service interface</li><li>WLAN interface</li><li>Fieldbus protocol</li></ul>	→ 🖺 219
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	<ul><li>CDI-RJ45 service interface</li><li>WLAN interface</li><li>Fieldbus protocol</li></ul>	→ 🖺 219

Supported operating tools	Operating unit	Interface	Additional information
Field Xpert	SMT70/77/50	<ul> <li>All fieldbus protocols</li> <li>WLAN interface</li> <li>Bluetooth</li> <li>CDI-RJ45 service interface</li> </ul>	Operating Instructions BA01202S Device description files: Use update function of handheld terminal
SmartBlue app	Smartphone or tablet with iOs or Android	WLAN	→ 🖺 219

- 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:
  - FactoryTalk AssetCentre (FTAC) from Rockwell Automation → www.rockwellautomation.com
  - Process Device Manager (PDM) from Siemens → www.siemens.com
  - Asset Management Solutions (AMS) from Emerson → www.emersonprocess.com
  - FieldCommunicator 375/475 from Emerson → www.emersonprocess.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 → Download Area

#### Web server

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

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

#### Supported functions

Data exchange between the operating unit (such as a notebook, for example,) and measuring 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** → 🖺 250 application package)
- Flash firmware version for device firmware upgrade, for example
- Download driver for system integration

HistoROM data management

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



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

#### Additional information on the data storage concept

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

	HistoROM backup	T-DAT	S-DAT
Available data	<ul> <li>Event logbook, e.g. diagnostic events</li> <li>Parameter data record backup</li> <li>Device firmware package</li> </ul>	<ul> <li>Measured value logging ("Extended HistoROM" order option)</li> <li>Current parameter data record (used by firmware at run time)</li> <li>Indicator (minimum/maximum values)</li> <li>Totalizer value</li> </ul>	<ul> <li>Sensor data: e.g. nominal diameter</li> <li>Serial number</li> <li>Calibration data</li> <li>Device configuration (e.g. SW options, fixed I/O or multi I/O)</li> </ul>
Storage location	Fixed on the user interface 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

#### Manua

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

#### **Event list**

#### Automatic

- Chronological display of up to 20 event messages in the events list
- If the Extended HistoROM application package (order option) is enabled: up to 100 event messages are displayed in the events list along with a time stamp, plain text description and remedial measures
- The events list can be exported and displayed via a variety of interfaces and operating tools e.g. DeviceCare, FieldCare or Web server

#### Data logging

#### Manual

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

- 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

## 16.13 Certificates and approvals

Current certificates and approvals for the product are available at <a href="https://www.endress.com">www.endress.com</a> 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)".

#### HART certification

#### HART interface

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

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

248

### Pressure Equipment Directive

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

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

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

The scope of application is indicated

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

#### Radio approval

The measuring device has radio approval.



For detailed information on the radio approval, see the Special Documentation  $\rightarrow \stackrel{\triangle}{=} 254$ 

# Measuring instrument approval

The measuring device is (optionally) approved as a gas meter (MI-002) or component in measuring systems (MI-005) in service subject to legal metrological control in accordance with the European Measuring Instruments Directive 2014/32/EU (MID).

The measuring device is qualified to OIML R117 or OIML R137 OIML R117 and has an OIML Certificate of Conformity (optional).

#### 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

- ISO 23277 ZG2x (PT)+ISO 10675-1 ZG1 (RT) measuring pipe (PT) + process connection (RT) weld seam, Heartbeat Technology verification report
- Penetrant + radiographic testing ASME B31.3 NFS(RT) measuring pipe (PT) + process connection (RT) weld seam, Heartbeat Technology verification report
- Penetrant + radiographic testing ASME VIII Div.1(RT) measuring pipe (PT) + process connection (RT) weld seam, Heartbeat Technology verification report
- Visual+penetrant+radiographic testing NORSOK M-601 (RT) measuring pipe (VT+PT)
   +process connection (VT+RT) weld seam, Heartbeat Technology verification report

#### *Testing of welded connections*

Option	Test standard			Com	ponent	
	ISO 23277 AL2x (PT) ISO 10675-1 AL1 (RT, DR)	ASME B31.3 NFS	ASME VIII Div.1 Appx. 4+8	NORSOK M-601	Measuring pipe	Process connection
KF	Х				PT	RT
KK		Х			PT	RT
KP			х		PT	RT
KR				х	VT, PT	VT, RT

PT = penetrant testing, RT = radiographic testing, VT = visual testing All options with test report

External standards and quidelines

■ EN 60529

Degrees of protection provided by enclosures (IP code)

■ IEC/EN 60068-2-6

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

■ IEC/EN 60068-2-31

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

■ EN 61010-1

Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements

■ 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 diagnosis of field devices

■ NAMUR NE 131

Requirements for field devices for standard applications

■ NAMUR NE 132

Coriolis mass meter

■ NACE MR0103

Materials resistant to sulfide stress cracking in corrosive petroleum refining environments.

■ NACE MR0175/ISO 15156-1

Materials for use in H2S-containing Environments in Oil and Gas Production.

■ ETSI EN 300 328

Guidelines for 2.4 GHz radio components.

■ EN 301489

Electromagnetic compatibility and radio spectrum matters (ERM).

# 16.14 Application packages

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

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



Diagnostic functionality

Order code for "Application package", option EA "Extended HistoROM"

Comprises extended functions concerning the event log and the activation of the measured value memory.

Event log:

Memory volume is extended from 20 message entries (standard version) to up to 100 entries.

Data logging (line recorder):

- Memory capacity for up to 1000 measured values is activated.
- 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user.
- Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server.



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

#### Heartbeat Technology

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

#### **Heartbeat Verification**

Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".

- Functional testing in the installed state without interrupting the process.
- Traceable verification results on request, including a report.
- Simple testing process via local operation or other operating interfaces.
- Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk assessment.

#### **Heartbeat Monitoring**

Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:

- Draw conclusions using these data and other information about the impact process influences (e.g. corrosion, abrasion, buildup etc.) have on the measuring performance over time.
- Schedule servicing in time.
- Monitor the process or product quality, e.q. gas pockets .



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

# Concentration measurement

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

Calculation and outputting of fluid concentrations.

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

- Choice of predefined fluids (e.g. various sugar solutions, acids, alkalis, salts, ethanol etc.).
- 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.

#### Extended density

Order code for "Application package", option E1 "Extended density"

For volume-based applications, the device can calculate and output a volume flow rate by dividing the mass flow rate by the measured density.

> This application package is the standard calibration for custody transfer applications according to national and international standards (e.g. OIML, MID). It is recommended for volume-based fiscal dosing applications over a wide temperature range.

The calibration certificate supplied describes the density performance in air and water at various temperatures in detail.



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

#### Petroleum

Order code for "Application package", option EJ "Petroleum"

The most important parameters for the Oil & Gas Industry can be calculated and displayed with this application package.

- Corrected volume flow and calculated reference density in accordance with the "API Manual of Petroleum Measurement Standards, Chapter 11.1"
- Water content, based on density measurement
- Weighted mean of the density and temperature



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

#### Petroleum & locking function

Order code for "Application package", option EM "Petroleum & locking function"

The most important parameters for the Oil & Gas Industry can be calculated and displayed with this application package. It is also possible to lock the settings.

- Corrected volume flow and calculated reference density in accordance with the "API Manual of Petroleum Measurement Standards, Chapter 11.1"
- Water content, based on density measurement
- Weighted mean of the density and temperature



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

#### **OPC-UA Server**

Order code for "Application package", option EL "OPC-UA Server"

The application package provides an integrated OPC-UA server for comprehensive device services for IoT and SCADA applications.



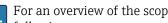
For detailed information, see the Special Documentation for the device.

#### 16.15 Accessories



Overview of accessories available to order → 🖺 217

# Supplemental 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
- 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 X	KA01288D

## *Brief Operating Instructions for the transmitter*

Measuring device	Documentation code
Proline 500 – digital	KA01315D
Proline 500	KA01314D

## **Technical information**

Measuring device	Documentation code
Promass X 500	TI01289D

## Description of device parameters

Measuring instrument	Documentation code
Promass 500	GP01060D

Supplementary devicedependent documentation Safety instructions

Safety instructions for electrical equipment for hazardous areas.

Contents	Documentation code
	Measuring device
ATEX/IECEx Ex i	XA01473D
ATEX/IECEx Ex ec	XA01474D
cCSAus IS	XA01475D
cCSAus Ex i	XA01509D
cCSAus Ex nA	XA01510D
INMETRO Ex i	XA01476D
INMETRO Ex ec	XA01477D
NEPSI Ex i	XA01478D
NEPSI Ex nA	XA01479D
NEPSI Ex i	XA01658D
NEPSI Ex nA	XA01659D
JPN	XA01780D

## **Functional Safety Manual**

Contents	Documentation code		
Proline Promass 500	SD01729D		

## 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	SD01666D
OPC-UA server	SD02040D
Heartbeat Technology	SD01643D
Concentration measurement	SD01645D
Petroleum	SD02013D
Custody transfer (counter for liquids other than water)	SD01690D
Custody transfer (counter for gas)	SD02464D
Custody transfer (counter for gas, in accordance with the German Measurement and Calibration Ordinance (Mess- und Eichverordnung))	SD02582D

## **Installation instructions**

Contents	Note
Installation instructions for spare part sets and accessories	<ul> <li>Access the overview of all the available spare part sets via <i>Device Viewer</i> →          <sup>10</sup>/<sub>2</sub> 215</li> <li>Accessories available for order with Installation Instructions →          <sup>10</sup>/<sub>2</sub> 217</li> </ul>

Proline Promass X 500 Index

# Index

A	Connecting the signal cable/supply voltage cable
Access authorization to parameters	Proline 500 – digital transmitter 46
Read access	Proline 500 transmitter 51
Write access	Connection
Access code	see Electrical connection
Incorrect input	Connection cable
Adapting the diagnostic behavior 197	Connection preparations 41
Adapting the status signal	Connection tool
Additional certification	Context menu
Ambient conditions	Calling up
Mechanical load	Closing
Operating height	Explanation
Relative humidity	Current consumption
Shock and vibration resistance	Custody transfer
Storage temperature	•
Ambient temperature	D
Influence	Date of manufacture
Ambient temperature range	Declaration of Conformity
AMS Device Manager	Defining the access code
Function	Degree of protection
Application	Density adjustment
Application packages	Design
Applicator	Measuring device
Approvals	Operating menu 61
Attaching the connecting cable	Design fundamentals
Proline 500 transmitter 50	Measurement error
Tronne 900 transmitter 90	Repeatability
В	Device components
Burst mode	Device description files
	Device history
C	Device locking, status
Cable entries	Device name
03:010	
Technical data	Sensor
Technical data	Sensor       19         Transmitter       17
Technical data	Sensor
Technical data       232         Cable entry       58         Degree of protection       58         CE mark       10, 248	Sensor       19         Transmitter       17         Device repair       215         Device revision       89
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89
Technical data       232         Cable entry       58         CE mark       10, 248	Sensor19Transmitter17Device repair215Device revision89Device type ID89Device Viewer215
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       89         Symbols       190
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       89         Symbols       190         Diagnostic behavior
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       89         Symbols       190         Diagnostic behavior       191         Explanation       191
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       \$9         Symbols       190         Diagnostic behavior       \$191         Explanation       191         Symbols       191
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       \$9         Symbols       190         Diagnostic behavior       \$191         Symbols       191         Diagnostic information       191
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       \$9         Symbols       190         Diagnostic behavior       \$191         Explanation       191         Symbols       191         Diagnostic information       191, 195         Design, description       191, 195
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       \$9         Symbols       190         Diagnostic behavior       \$191         Explanation       191         Symbols       191         Diagnostic information       191         Design, description       191, 195         DeviceCare       195
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       \$9         Symbols       190         Diagnostic behavior       \$191         Explanation       191         Symbols       191         Diagnostic information       191, 195         DeviceCare       195         FieldCare       195
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       \$9         Symbols       190         Diagnostic behavior       \$191         Explanation       191         Symbols       191         Diagnostic information       191, 195         DeviceCare       195         FieldCare       195         Light emitting diodes       187
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       \$9         Symbols       190         Diagnostic behavior       \$191         Explanation       191         Symbols       191         Diagnostic information       191         DeviceCare       195         FieldCare       195         Light emitting diodes       187         Local display       190
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       \$9         Symbols       190         Diagnostic behavior       Explanation       191         Symbols       191         Diagnostic information       191         Design, description       191, 195         DeviceCare       195         FieldCare       195         Light emitting diodes       187         Local display       190         Overview       199
Technical data	Sensor19Transmitter17Device repair215Device revision89Device type ID89Device Viewer215DeviceCare87Device description file89Diagnosis190Symbols190Diagnostic behaviorExplanation191Symbols191Diagnostic information191, 195DeviceCare195FieldCare195Light emitting diodes187Local display190Overview199Remedial measures199
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       190         Symbols       190         Diagnostic behavior       Explanation       191         Symbols       191         Diagnostic information       191         Design, description       191, 195         DeviceCare       195         FieldCare       195         Light emitting diodes       187         Local display       190         Overview       199         Remedial measures       199         Web browser       193
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       \$9         Symbols       190         Diagnostic behavior       \$191         Explanation       191         Symbols       191         Diagnostic information       191         Design, description       191, 195         DeviceCare       195         FieldCare       195         Light emitting diodes       187         Local display       190         Overview       199         Remedial measures       199         Web browser       193         Diagnostic message       190
Technical data	Sensor       19         Transmitter       17         Device repair       215         Device revision       89         Device type ID       89         Device Viewer       215         DeviceCare       87         Device description file       89         Diagnosis       190         Symbols       190         Diagnostic behavior       Explanation       191         Symbols       191         Diagnostic information       191       195         DeviceCare       195       195         FieldCare       195       195         Light emitting diodes       187       160         Local display       190       190         Overview       199       199         Remedial measures       199         Web browser       193

Index Proline Promass X 500

DIP switch see Write protection switch	Field Communicator 475
Direct access	Residual risks
Disabling write protection	Field Xpert
Display	Function
see Local display	Field Xpert SFX350
Display area	FieldCare
For operational display	Device description file
In the navigation view	Establishing a connection
Display values	Function
For locking status	User interface
Displaying the measured value history	Filtering the event logbook 206
Disposal	Firmware
Document	Release date
Function 6	Version
Symbols 6	Firmware history
Document function 6	Fitting the connecting cable
Down pipe	Proline 500 terminal assignment 48
Down pipe	Sensor connection housing, Proline 500 48
E	Flow direction
Editing view	Flow limit
Input screen	
Using operating elements 68, 69	Function range AMS Device Manager
Electrical connection	SIMATIC PDM
Commubox FXA195 (USB) 82	Function scope
Computer with web browser (e.g. Microsoft Edge) 82	Field Communicator
Degree of protection	Field Communicator 475
Field Communicator 475 82	
Field Xpert SFX350/SFX370	Field Xpert
Field Xpert SMT70	
Measuring instrument	see Parameters
Operating tool (e.g. FieldCare, AMS Device	G
Manager, SIMATIC PDM)	Galvanic isolation
Operating tools	Gas Fraction Handler
Via HART protocol	das Praction flanulei
Via service interface (CDI-RJ45)	Н
Via WLAN interface	Hardware write protection
VIATOR Bluetooth modem	HART certification
Web server	HART protocol
WLAN interface	Device variables
Electromagnetic compatibility	Measured variables
Electronics module	Help text
Enabling write protection	Calling up
Enabling write protection	Closing
Endress+Hauser services	Explanation
Maintenance	HistoROM
Repair	Installation and the second se
Error messages	I
see Diagnostic messages	Identifying the measuring instrument
Event logbook	Incoming acceptance
Events list	Indication
Extended order code	Current diagnostic event 204
Sensor	Previous diagnostic event 204
Transmitter	Influence
Exterior cleaning	Ambient temperature
Laterior dearing	Medium pressure
F	Medium temperature
Field Communicator	Information about this document 6
Function	Inlet runs
2 444044	

Proline Promass X 500 Index

Input variables	Menus For measuring instrument configuration 97 For specific settings
Installation	Mounting dimensions see Installation dimensions
Installation	Mounting preparations
Installation point	Down pipe
L	Installation dimensions24Installation point22
Languages, operation options 244	Orientation
Line recorder	Rupture disk
Local display	Sensor heating
Navigation view	Static pressure
see In alarm condition	Vibrations
see Operational display	Mounting tool
Text editor	Widuming tool
Low flow cut off	N
D.C.	Nameplate
M Main electronics medule	Sensor
Main electronics module	Transmitter
Managing the device configuration	Navigation path (navigation view) 66  Navigation view
Manufacturer ID	In the submenu 66
Materials	In the wizard
Maximum measurement error	Netilion
Measured variables see Process variables	Numeric editor
Measurement accuracy	Ongita diaplay
Measuring and test equipment	Onsite display  Numeric editor
Conversion	Operable flow range
Design	Operating elements 70, 191
Disposal	Operating height
Mounting the sensor	Operating keys
Preparing for electrical connection 41	see Operating elements
Removing	Operating menu
Repairs	Design
Measuring instrument	Submenus and user roles 62
Configuring	Operating philosophy 62
Preparing for mounting	Operation
Measuring instrument approval 249	Operation options 60
Measuring principle	Operational display
Measuring range	Operational safety
For gases	Order code
For liquids	Outlet runs
Measuring system	Output signal
Mechanical load	Output variables
Medium pressure	•
Influence	P
Medium temperature	Packaging disposal
Influence	Parameter Changing 73
Menu 204	Changing
Diagnostics	Entering values of text
Octup	

Index Proline Promass X 500

Parameter settings	Power consumption
Administration (Submenu)	Power supply failure
Advanced setup (Submenu)	Pressure Equipment Directive 249
Burst configuration 1 to n (Submenu) 94	Pressure loss
Configuration backup (Submenu) 151	Pressure-temperature ratings 238
Corrected volume flow calculation (Submenu) 133	Process connections
Current input	Process variables
Current input (Wizard)	Calculated
Current input 1 to n (Submenu) 173	Measured
Current output	Product safety
Current output (Wizard)	Proline 500 – digital transmitter
Data logging (Submenu)	Connecting the signal cable/supply voltage cable 46
Define access code (Wizard) 152	Proline 500 connecting cable terminal assignment
Density adjustment (Wizard) 135	Sensor connection housing 48
Device information (Submenu) 210	Proline 500 transmitter
Diagnostics (Menu)	Connecting the signal cable/supply voltage cable 51
Display (Submenu)	Protecting parameter settings 157
Display (Wizard)	<b>D</b>
Double pulse output	R
Double pulse output (Submenu) 176	Radio approval
Double pulse output (Wizard)	RCM marking
I/O configuration	Read access
I/O configuration (Submenu) 104	Reading off measured values
Low flow cut off (Wizard) 130	Recalibration
Measured variables (Submenu) 162	Reference operating conditions
Measurement mode (Submenu) 182	Registered trademarks
Medium index (Submenu)	Remedial measures
Medium selection (Wizard) 102	Calling up
Partially filled pipe detection (Wizard) 131	Closing
Pulse/frequency/switch output 112	Remote operation
Pulse/frequency/switch output (Wizard)	Repair
	Notes
Pulse/frequency/switch output 1 to n (Submenu) 175	Repair of a device
Relay output	Repeatability
Relay output 1 to n (Submenu)	Replacement
Relay output 1 to n (Wizard)	Device components
Reset access code (Submenu)	Requirements for personnel
Sensor adjustment (Submenu)	Response time
Setup (Menu)	Return
Simulation (Submenu)	Rupture disk
Status input	Safety instructions
Status input 1 to n (Submenu)	Triggering pressure 239
Status input 1 to n (Wizard)	S
System units (Submenu)	Safety
Totalizer (Submenu)	Sensor
Totalizer 1 to n (Submenu)	Installing
Totalizer handling (Submenu)	Sensor heating
Value current output 1 to n (Submenu) 174	Sensor housing
Web server (Submenu)	Serial number
WLAN settings (Wizard)	Setting the operating language
Zero verification (Wizard)	Settings
Performance characteristics	Adapting the measuring device to the process
Performing density adjustment	conditions
Post-connection check	Administration
Post-connection check (checklist)	Advanced display configurations
Post-installation check	Current input
Post-installation check (checklist)	Current output
Potential equalization	Double pulse output
1 Occident equalization	1

Proline Promass X 500 Index

***	
I/O configuration	Medium index
Local display	Output values
Low flow cut off	Overview
Managing the device configuration	Process variables
Medium	Pulse/frequency/switch output 1 to n
Operating language	Relay output 1 to n
Partially filled pipe detection	Reset access code
Pulse output	Sensor adjustment
Pulse/frequency/switch output 112, 114	Simulation
Relay output	Status input 1 to n
Resetting the device	System units
Resetting the totalizer	Totalizer
Sensor adjustment	Totalizer 1 to n
Simulation	Totalizer handling
Status input	Value current output 1 to n
Switch output	Web server
System units	Supply voltage
Tag name	Surface roughness
Totalizer	Switch output
Totalizer reset	Symbols
WLAN	Controlling data entries
Shock and vibration resistance	For communication
Signal on alarm	For diagnostic behavior
SIMATIC PDM	For locking
Function	For measured variable
Software release	For measurement channel number
Spare part	For menus
Spare parts	For parameters
Special connection instructions	For status signal
Special mounting instructions	For submenu
Hygienic compatibility	For wizards
Standards and guidelines	In the status area of the local display 63
Static pressure	Input screen
Status area	Operating elements
For operational display	System design
In the navigation view	Measuring system
Status signals	see Measuring device design
Storage concept	System integration
Storage conditions	T
Storage temperature	
Storage temperature range	Technical data, overview
Submenu	Temperature range
Administration	Ambient temperature range for display 244
Advanced setup	Medium temperature
Burst configuration 1 to n	Storage temperature
Calculated values	Terminal assignment
Configuration backup	Terminal assignment of connecting cable for Proline
Corrected volume flow calculation	500- digital
Current input 1 to n	Sensor connection housing
Data logging	Terminals
Device information	Tests and certificates
Display	Text editor
Double pulse output	Thermal insulation
Events list	Tool
I/O configuration	For electrical connection
Input values	For mounting
Measured values	Transport
Measured variables	Tool tip
Measurement mode	see Help text

Index Proline Promass X 500

Totalizer	
Configuring	140
Transmitter	
Turning the display module	34
Turning the housing	. 34
Transporting the measuring device	21
Troubleshooting	
General	184
Turning the display module	
Turning the electronics housing	
see Turning the transmitter housing	
Turning the transmitter housing	34
Tailing the transmitter mousing	
U	
UKCA marking	248
Use of measuring device	
Borderline cases	c
Incorrect use	
Use of measuring instrument	. ,
see Intended use	
User roles	67
OSCI TOICS	. 02
V	
Version data for the device	89
Vibrations	
W	
W@M Device Viewer	16
Weight	
SI units	241
Transport (notes)	
US units	
Wizard	
Current input	105
	107
1	152
	135
Display	17/
Low flow cut off	
Medium selection	
Partially filled pipe detection	
Pulse/frequency/switch output 112, 114,	
Relay output 1 to n	106
±	
WLAN settings	
Zero adjustment	
Zero verification	
WLAN settings	
Workplace safety	10
Write access	74
Write protection	4
Via access code	
Via write protection switch	
Write protection switch	158

260



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