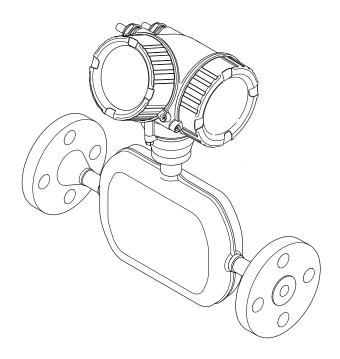
Valid as of version 01.01.zz (Device firmware)

# Operating Instructions **Proline Promass A 200 PROFIBUS PA**

Coriolis flowmeter





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

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# 1 About this document

#### 1.1 Document function

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

# 1.2 Symbols

#### 1.2.1 Safety symbols

#### **⚠** DANGER

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

#### **▲** WARNING

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

#### **A** CAUTION

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

#### NOTICE

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

#### 1.2.2 Electrical symbols

Symbol	Meaning	
===	Direct current	
~	Alternating current	
$\overline{}$	Direct current and alternating current	
Ground connection A grounded terminal which, as far as the operator is concerned, is ground grounding system.		
	Protective Earth (PE) A terminal which must be connected to ground prior to establishing any other connections.	
	The ground terminals are situated inside and outside the device:  Inner ground terminal: Connects the protectiv earth to the mains supply.  Outer ground terminal: Connects the device to the plant grounding system.	

#### 1.2.3 Communication symbols

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

# 1.2.4 Tool symbols

Symbol	Meaning
0	Flat blade screwdriver
06	Allen key
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.
	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.
A	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

#### 1.3 Documentation

- For an overview of the scope of the associated Technical Documentation, refer to the following:
  - *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from nameplate
  - *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2D matrix code (QR code) on the nameplate
- Detailed list of the individual documents along with the documentation code  $\rightarrow \stackrel{\cong}{=} 156$

#### 1.3.1 Standard documentation

Document type	Purpose and content of the document
Technical Information	Planning aid for your device The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Sensor Brief Operating Instructions	Guides you quickly to the 1st measured value - Part 1 The Sensor Brief Operating Instructions are aimed at specialists with responsibility for installing the measuring device.
	<ul><li>Incoming acceptance and product identification</li><li>Storage and transport</li><li>Installation</li></ul>
Transmitter Brief Operating Instructions	Guides you quickly to the 1st measured value - Part 2 The Transmitter Brief Operating Instructions are aimed at specialists with responsibility for commissioning, configuring and parameterizing the measuring device (until the first measured value).
	<ul> <li>Product description</li> <li>Installation</li> <li>Electrical connection</li> <li>Operation options</li> <li>System integration</li> <li>Commissioning</li> <li>Diagnostic information</li> </ul>
Description of Device Parameters	Reference for your parameters The document provides a detailed explanation of each individual parameter in the Expert operating menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

#### 1.3.2 Supplementary device-dependent documentation

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

# 1.4 Registered trademarks

#### **PROFIBUS®**

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

#### TRI-CLAMP®

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

# 2 Safety instructions

# 2.1 Requirements for the personnel

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

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

The operating personnel must fulfill the following requirements:

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

# 2.2 Designated use

#### Application and media

- The measuring device described in this manual is intended only for the flow measurement of liquids and gases.
- ullet The measuring device described in this manual is intended only for flow measurement of liquids with a minimum conductivity of 20  $\mu$ S/cm.

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

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

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

- ► Keep within the specified pressure and temperature range.
- ▶ Only use the measuring device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- ▶ Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area (e.g. explosion protection, pressure vessel safety).
- ▶ Use the measuring device only for media to which the process-wetted materials are sufficiently resistant.
- ▶ If the ambient temperature of the measuring device is outside the atmospheric temperature, it is absolutely essential to comply with the relevant basic conditions as specified in the device documentation → 🖺 8.
- ► Protect the measuring device permanently against corrosion from environmental influences.

#### Incorrect use

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

#### **WARNING**

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

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

#### **NOTICE**

#### Verification for borderline cases:

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

#### Residual risks

#### **▲** WARNING

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

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

#### **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.

#### **A** 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

For work on and with the device:

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

For welding work on the piping:

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

If working on and with the device with wet hands:

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

# 2.4 Operational safety

Risk of injury.

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

#### Conversions to the device

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

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

#### Repair

To ensure continued operational safety and reliability,

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

# 2.5 Product safety

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

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

# 2.6 IT security

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

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

# 2.7 Device-specific IT security

The device offers a range of specific functions to support protective measures on the operator's side. These functions can be configured by the user and guarantee greater inoperation safety if used correctly. An overview of the most important functions is provided in the following section.

#### 2.7.1 Protecting access via hardware write protection

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

#### 2.7.2 Protecting access via a password

A password can be used to protect against write access to the device parameters.

This password locks write access to the device parameters via the local display or another operating tool (e.g. FieldCare, DeviceCare) and, in terms of functionality, is equivalent to hardware write protection. If the service interface CDI RJ-45 is used, read access is only possible if the password is entered.

#### User-specific access code

Write access to the device parameters via the local display or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code ( $\rightarrow \square$  91).

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

#### General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning.
- Follow the general rules for generating a secure password when defining and managing the access code or network key.
- The user is responsible for the management and careful handling of the access code and network key.
- For information on configuring the access code or on what to do if you lose the password, see the "Write protection via access code" section → 🖺 91

#### 2.7.3 Access via fieldbus

Cyclic fieldbus communication (read and write, e.g. measured value transmission) with a higher-order system is not affected by the restrictions mentioned above.

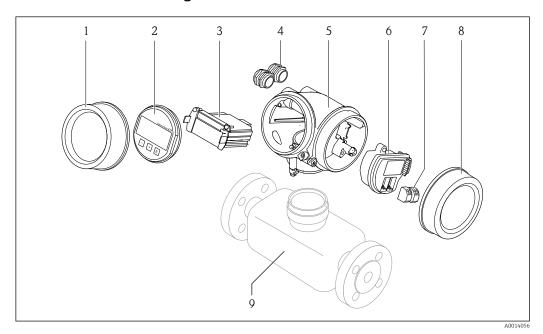
# **3** Product description

The device consists of a transmitter and a sensor.

The device is available as a compact version:

The transmitter and sensor form a mechanical unit.

# 3.1 Product design

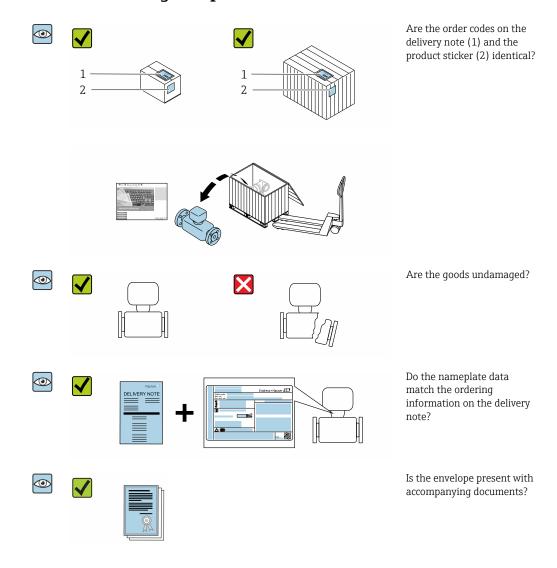


■ 1 Important components of a measuring device

- 1 Electronics compartment cover
- 2 Display module
- 3 Main electronics module
- 4 Cable glands
- 5 Transmitter housing (incl. integrated HistoROM)
- 6 I/O electronics module
- 7 Terminals (pluggable spring terminals)
- 8 Connection compartment cover
- 9 Sensor

# 4 Incoming acceptance and product identification

# 4.1 Incoming acceptance



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

    15.

# 4.2 Product identification

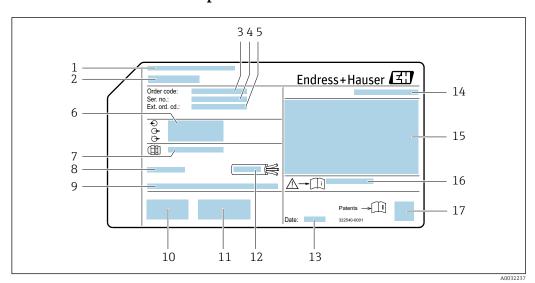
The following options are available for identification of the device:

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

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

- The "Additional standard documentation on the device" → 🗎 8 and "Supplementary device-dependent documentation" → 🗎 8 sections
- The *W@M Device Viewer*: enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

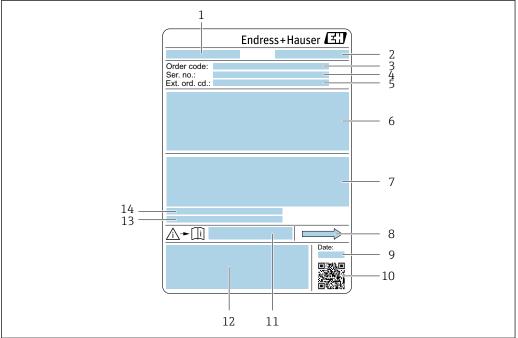
#### 4.2.1 Transmitter nameplate



■ 2 Example of a transmitter nameplate

- 1 Manufacturing location
- 2 Name of the transmitter
- 3 Order code
- 4 Serial number (ser. no.)
- 5 Extended order code (Ext. ord. cd.)
- 6 Electrical connection data, e.g. available inputs and outputs, supply voltage
- 7 Type of cable glands
- 8 Permitted ambient temperature  $(T_a)$
- 9 Firmware version (FW) from the factory
- 10 CE mark, C-Tick
- 11 Additional information on version: certificates, approvals
- 12 Permitted temperature range for cable
- 13 Manufacturing date: year-month
- 14 Degree of protection
- 15 Approval information for explosion protection
- 16 Document number of safety-related supplementary documentation  $\rightarrow \implies 157$
- 17 2-D matrix code

# 4.2.2 Sensor nameplate



A00291

#### ■ 3 Example of a sensor nameplate

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

#### Order code

The measuring device is reordered using the order code.

#### Extended order code

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

# 4.2.3 Symbols on measuring device

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

# 5 Storage and transport

# 5.1 Storage conditions

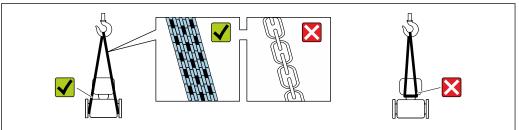
Observe the following notes for storage:

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

Storage temperature → 🗎 146

# 5.2 Transporting the product

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



A002925

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

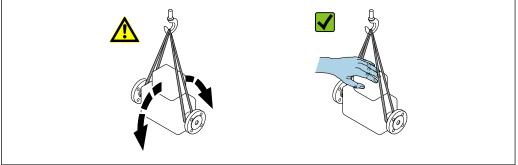
#### 5.2.1 Measuring devices without lifting lugs

#### **MARNING**

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

Risk of injury if the measuring device slips.

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



A0029214

# 5.2.2 Measuring devices with lifting lugs

#### **A** CAUTION

#### Special transportation instructions for devices with lifting lugs

- ▶ Only use the lifting lugs fitted on the device or flanges to transport the device.
- ▶ The device must always be secured at two lifting lugs at least.

#### 5.2.3 Transporting with a fork lift

If transporting in wood crates, the floor structure enables the crates to be lifted lengthwise or at both sides using a forklift.

# 5.3 Packaging disposal

All packaging materials are environmentally friendly and 100 % recyclable:

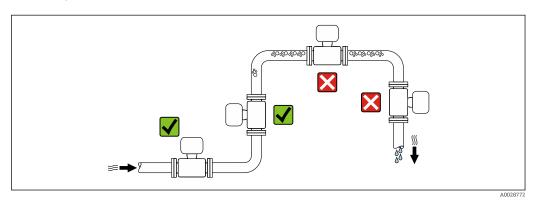
- Outer packaging of device
   Polymer stretch wrap that complies with EU Directive 2002/95/EC (RoHS)
- Packaging
  - Wooden crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
  - Cardboard box in accordance with European packaging guideline 94/62EC, recyclability confirmed by Resy symbol
- Carrying and securing materials
  - Disposable plastic pallet
  - Plastic straps
  - Plastic adhesive strips
- Filler material Paper pads

# 6 Installation

#### 6.1 Installation conditions

#### 6.1.1 Mounting position

#### Mounting location

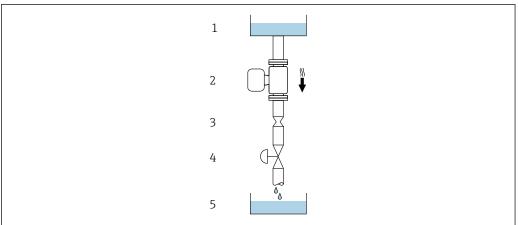


To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:

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

#### Installation in down pipes

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.



A002877

- 4 Installation in a down pipe (e.g. for batching applications)
- 1 Supply tank
- 2 Sensor
- 3 Orifice plate, pipe restriction
- 4 Valve
- 5 Batching tank

20

DN		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
1	1/24	0.8	0.03
2	1/12	1.5	0.06
4	1/8	3.0	0.12

#### Orientation

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

	Recommendation		
A	Vertical orientation	A0015591	<b>√ √</b> 1)
В	Horizontal orientation, transmitter at top	A0015589	<b>✓</b> <sup>2)</sup>
С	Horizontal orientation, transmitter at bottom	A0015590	<b>✓</b> 3)
D	Horizontal orientation, transmitter at side	A0015592	$\checkmark$

- 1) This orientation is recommended to ensure self-draining.
- 2) Applications with low process temperatures may decrease 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.

#### Inlet and outlet runs



#### Installation dimensions

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

#### 6.1.2 Environmental and process requirements

#### Ambient temperature range

Measuring device	-40 to +60 °C (-40 to +140 °F)
Readability of the local display	-20 to $+60$ °C ( $-4$ to $+140$ °F) The readability of the display may be impaired at temperatures outside the temperature range.

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

You can order a weather protection cover from Endress+Hauser.  $\rightarrow \triangleq 132$ .

#### System pressure

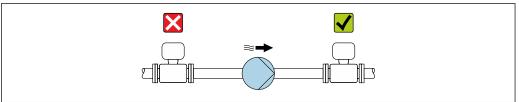
It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas.

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

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

For this reason, the following mounting locations are recommended:

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



A0028777

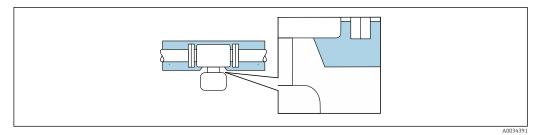
#### Thermal insulation

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.

#### **NOTICE**

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

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



 $\blacksquare$  5 Thermal insulation with extended neck free

#### Heating

#### NOTICE

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

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

#### NOTICE

#### Danger of overheating when heating

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

#### Heating options

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

- Electrical heating, e.g. with electric band heaters
- Via pipes carrying hot water or steam
- Via heating jackets

#### **Vibrations**

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

#### **6.1.3** Special mounting instructions

#### Drainability

When the device is installed in a vertical position, the measuring tube can be drained completely and protected against deposit buildup if the properties of the measured liquid allow this. Furthermore, as only one measuring tube is used the flow is not impeded and the risk of product being retained in the measuring device is reduced to a minimum. The larger internal diameter of the measuring tube  $^{1)}$  also reduces the risk of particles getting trapped in the measuring system. Due to the larger cross-section of the individual measuring tube, the tube is also generally less susceptible to clogging.

<sup>1)</sup> Compared with the double-tube design with a similar flow capacity and measuring tubes with a smaller internal diameter

#### Sanitary compatibility

When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section  $\Rightarrow \triangleq 154$ 

#### Rupture disk

#### **A** WARNING

#### Danger from medium escaping!

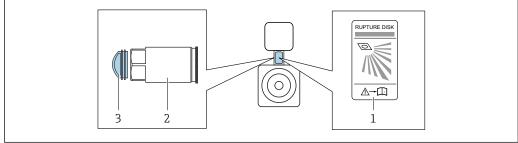
Medium escaping under pressure can cause injury or material damage.

- ► Take precautions to prevent danger to persons and damage if the rupture disk is actuated.
- ▶ Observe 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 remove or damage the rupture disk, drain connection and warning signs.

The position of the rupture disk is indicated by an affixed sticker. In versions without a drain connection (order option CU), the sticker is destroyed if the rupture disk is triggered. The disk can therefore be visually monitored.

To allow any escaping medium to drain in a controlled manner, a drain connection is available for the rupture disk integrated in the sensor: order code for "Sensor option", option CU "Drain connection for rupture disk". This connection is intended for a pipe connection with a  $^{1}$ /<sub>4</sub> " NPT thread and sealed with a grip plug for protection. To guarantee the function of the rupture disk with a drain connection, the drain connection must be connected to the drain system in a hermetically tight manner.

- The drain connection is firmly mounted in place by the manufacturer and may not be removed.
- It is not possible to use the holder with a measuring device with a drain connection for a rupture disk: order code for "Sensor option", option CU "Drain connection for rupture disk"
- It is not possible to use a heating jacket if the drain connection is used: order code for "Sensor option", option CU "Drain connection for rupture disk"



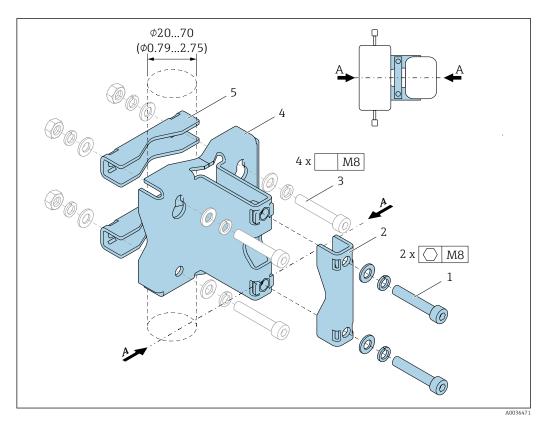
A0042344

- 1 Rupture disk label
- 2 Drain connection for rupture disk with 1/4" NPT female thread and 17mm width across flats (AF): order code for "Sensor option", option CU, drain connection for rupture disk
- 3 Transportation guard

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

#### Sensor holder

The sensor holder is used to secure the device to a wall, tabletop or pipe (order code for "Accessory enclosed", option PR).



- 2 x Allen screw M8 x 50, washer and spring washer A4
- 2 1 x clamp (measuring device neck)
- 3 4 *x securing screw for wall, tabletop or pipe mounting (not supplied)*
- 1 x base profile
- 2 x clamp (pipe mounting)
- Measuring device central line

If the holder is used with a measuring device fitted with a rupture disk, it is important to ensure that the rupture disk in the neck is not covered over and that the cover of the rupture disk is not damaged.



Lubricate all threaded joints prior to mounting. The screws for wall, tabletop or pipe mounting are not supplied with the device and must be chosen to suit the individual installation position.

#### **A** WARNING

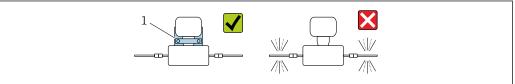
#### Strain on pipes!

Excessive strain on an unsupported pipe can cause the pipe to break.

► Install the sensor in a pipe that is adequately supported.

The following mounting versions are recommended for the installation:

Use of the sensor holder.



Sensor holder (order code for "Accessory enclosed", option PR)

#### Mounting on a wall

Screw the sensor holder to the wall with four screws. Two of the four holes to secure the holder are designed to hook into the screws.

#### Mounting on a table

Screw the sensor holder onto the tabletop with four screws.

#### Mounting on a pipe

Secure the sensor holder to the pipe with two clamps.

#### Zero point adjustment

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

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

# 6.2 Mounting the measuring device

#### 6.2.1 Required tools

#### For transmitter

- For turning the transmitter housing: Open-ended wrench8 mm
- For opening the securing clamps: Allen key3 mm

#### For sensor

For flanges and other process connections: Corresponding mounting tools

#### 6.2.2 Preparing the measuring device

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

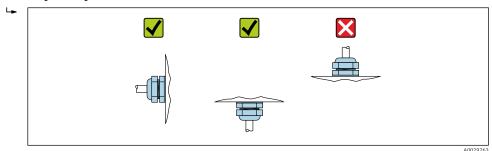
#### 6.2.3 Mounting the measuring device

#### **WARNING**

#### Danger due to improper process sealing!

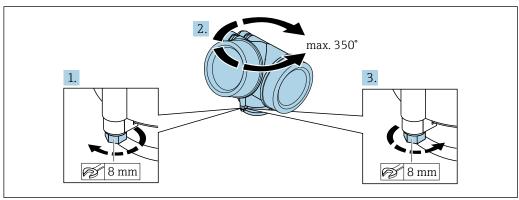
- ► Ensure that the inside diameters of the gaskets are greater than or equal to that of the process connections and piping.
- ► Ensure that the seals are clean and undamaged.
- ► Secure the seals correctly.
- 1. Ensure that the direction of the arrow on the nameplate of the sensor matches the flow direction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

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



# 6.2.4 Turning the transmitter housing

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

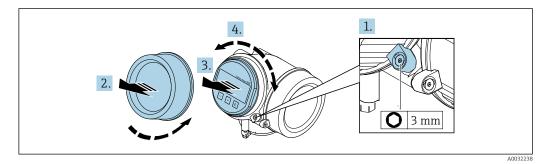


A003224

- 1. Release the fixing screw.
- 2. Turn the housing to the desired position.
- 3. Firmly tighten the securing screw.

#### 6.2.5 Turning the display module

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



- 1. Loosen the securing clamp of the electronics compartment cover using an Allen key.
- 2. Unscrew cover of the electronics compartment from the transmitter housing.
- 3. Optional: pull out the display module with a gentle rotational movement.
- 4. Turn the display module to the desired position: max.  $8 \times 45^{\circ}$  in every direction.
- 5. Without display module pulled out:
  Allow display module to engage at desired position.

- 6. With display module pulled out:

  Feed the cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment until it engages.
- 7. Reverse the removal procedure to reassemble the transmitter.

# 6.3 Post-installation check

Is the device undamaged (visual inspection)?		
Does the measuring device conform to the measuring point specifications?  For example:  Process temperature → 🖺 147  Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document)  Ambient temperature  Measuring range		
Has the correct orientation for the sensor been selected?  According to sensor type  According to medium temperature  According to medium properties (outgassing, with entrained solids)		
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping $\rightarrow$ $\  \   \  \   \   \   \   \   \$		
Are the measuring point identification and labeling correct (visual inspection)?		
Is the device adequately protected from precipitation and direct sunlight?		
Are the securing screw and securing clamp tightened securely?		

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# 7 Electrical connection



The measuring device does not have an internal circuit breaker. For this reason, assign the measuring device a switch or power-circuit breaker so that the power supply line can be easily disconnected from the mains.

#### 7.1 Connection conditions

#### 7.1.1 Required tools

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

#### 7.1.2 Connecting cable requirements

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

#### **Electrical safety**

In accordance with applicable federal/national regulations.

#### Permitted temperature range

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

#### Signal cable

Pulse/frequency/switch output

Standard installation cable is sufficient.

#### PROFIBUS PA

Twisted, shielded two-wire cable. Cable type A is recommended.



For further information on planning and installing PROFIBUS networks see:

- Operating Instructions "PROFIBUS DP/PA: Guidelines for planning and commissioning" (BA00034S)
- PNO Directive 2.092 "PROFIBUS PA User and Installation Guideline"
- IEC 61158-2 (MBP)

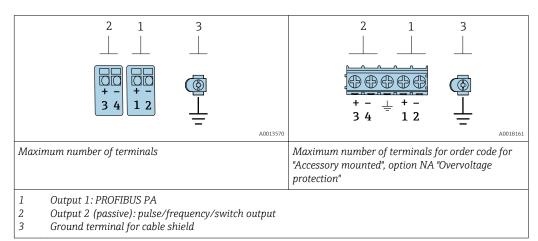
#### Cable diameter

- Cable glands supplied:
- $M20 \times 1.5$  with cable  $\phi$  6 to 12 mm (0.24 to 0.47 in)
- Plug-in spring terminals for device version without integrated overvoltage protection: wire cross-sections 0.5 to 2.5 mm<sup>2</sup> (20 to 14 AWG)
- ullet Screw terminals for device version with integrated overvoltage protection: wire cross-sections 0.2 to 2.5 mm<sup>2</sup> (24 to 14 AWG)

# 7.1.3 Terminal assignment

#### **Transmitter**

Connection version for PROFIBUS PA, pulse/frequency/switch output



Order code for "Output"	Terminal numbers			
	Output 1		Output 2	
	1 (+)	2 (-)	3 (+)	4 (-)
Option G <sup>1) 2)</sup>	PROFIBUS PA		Pulse/frequenc	y/switch output sive)

- 1) Output 1 must always be used; output 2 is optional.
- 2) PROFIBUS PA with integrated reverse polarity protection.

#### 7.1.4 Pin assignment of device plug

	2	Pin	Assignment		Coding	Plug/socket
2 /	3	1	+	PROFIBUS PA +	A	Plug
1	<del>-</del> 4	2		Grounding		
	7/	3	-	PROFIBUS PA -		
		4		Not assigned		

#### 7.1.5 Shielding and grounding

Optimal electromagnetic compatibility (EMC) of the fieldbus system can be guaranteed only if the system components and, in particular, the lines are shielded and the shield forms as complete a cover as possible. A shield coverage of 90 %is ideal.

- 1. To ensure optimal EMC protection, connect the shield to the reference ground as often as possible.
- 2. For reasons concerning explosion protection, it is recommended that grounding be dispensed with.

To comply with both requirements, there are basically three different types of shielding in the fieldbus system:

- Shielding at both ends
- Shielding at one end on the feed side with capacitance termination at the field device
- Shielding at one end on the feed side

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

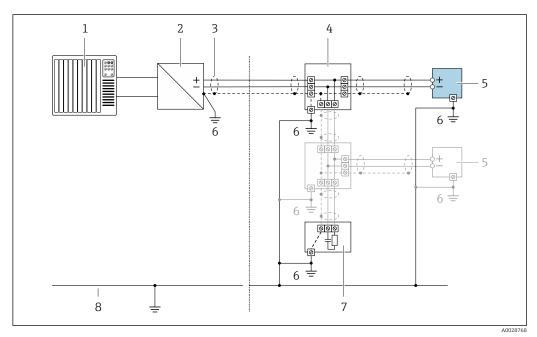
- 1. Observe national installation requirements and quidelines during installation.
- 2. Where there are large differences in potential between the individual grounding points, connect only one point of the shielding directly to the reference ground.
- 3. In systems without potential equalization, the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

#### NOTICE

In systems without potential matching, the multiple grounding of the cable shield causes mains frequency equalizing currents!

Damage to the bus cable shield.

- ▶ Only ground the bus cable shield to either the local ground or the protective ground at one end.
- Insulate the shield that is not connected.



- 6 Connection example for PROFIBUS PA
- 1 Control system (e.g. PLC)
- 2 PROFIBUS PA segment coupler
- 3 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 T-box
- 5 Measuring device
- 6 Local grounding
- 7 Bus terminator
- 8 Potential equalization conductor

# 7.1.6 Requirements for the supply unit

#### Supply voltage

**Transmitter** 

An external power supply is required for each output.

The following supply voltage values apply for the outputs available:

Order code for "Output"	Minimum terminal voltage	Maximum terminal voltage
Option <b>G</b> : PROFIBUS PA, pulse/frequency/switch output	≥ DC 9 V	DC 32 V

#### 7.1.7 Preparing the measuring device

#### **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 → 

  29.

# 7.2 Connecting the measuring device

#### NOTICE

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

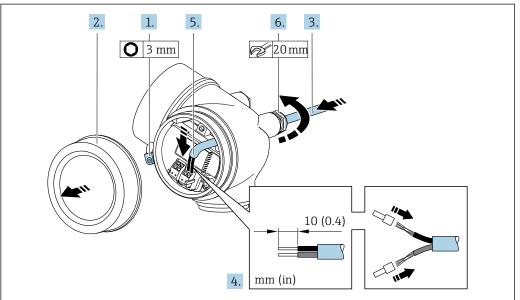
- ► Have electrical connection work carried out by appropriately trained specialists only.
- ▶ Observe applicable federal/national installation codes and regulations.
- ► Comply with local workplace safety regulations.
- ► Always connect the protective ground cable ⊕ before connecting additional cables.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

#### 7.2.1 Connecting the transmitter

The connection of the transmitter depends on the following order code: "Electrical connection":

- Option A, B, C, D: terminals
- Option I, M: device plug

#### Connection via terminals



A0032239

- 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 cable in accordance with terminal assignment  $\rightarrow \triangleq 30$ .
- 6. **WARNING**

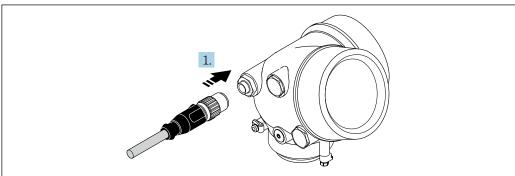
# Housing degree of protection may be voided due to insufficient sealing of the housing.

► Screw in the screw without using any lubricant. The threads on the cover are coated with a dry lubricant.

Firmly tighten the cable glands.

7. Reverse the removal procedure to reassemble the transmitter.

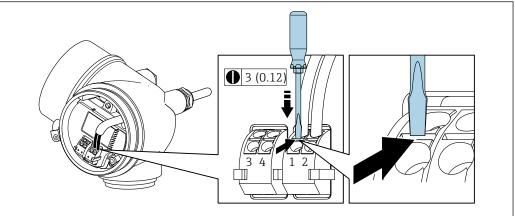
#### Connection via device plug



A0032229

► Plug in the device plug and tighten firmly.

#### Removing a cable



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

#### 7.2.2 **Ensuring potential equalization**

#### Requirements

No special measures for potential equalization are required.

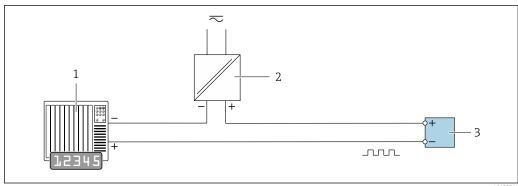


For devices intended for use in hazardous locations, please observe the guidelines in the Ex documentation (XA).

#### 7.3 Special connection instructions

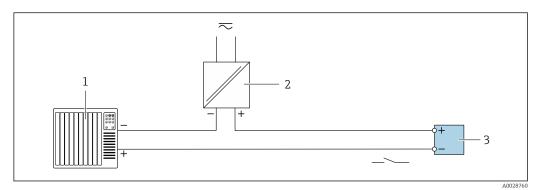
#### 7.3.1 **Connection examples**

#### Pulse/frequency output



- Connection example for pulse/frequency output (passive)
- Automation system with pulse/frequency input (e.g. PLC)
- Power supply
- Transmitter: Observe input values

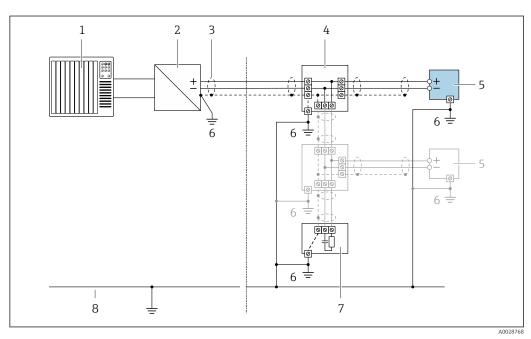
#### Switch output



■ 8 Connection example for switch output (passive)

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

#### **PROFIBUS PA**



■ 9 Connection example for PROFIBUS PA

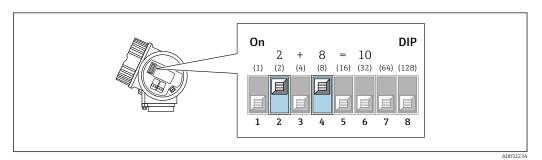
- 1 Control system (e.g. PLC)
- 2 PROFIBUS PA segment coupler
- 3 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 T-box
- 5 Measuring device
- 6 Local grounding
- 7 Bus terminator
- 8 Potential matching line

# 7.4 Hardware settings

# 7.4.1 Setting the device address

#### **PROFIBUS PA**

The address must always be configured for a PROFIBUS DP/PA device. The valid address range is between 1 and 126. In a PROFIBUS DP/PA network, each address can only be assigned once. If an address is not configured correctly, the device is not recognized by the master. All measuring devices are delivered from the factory with the device address 126 and with the software addressing method.



10 Address switch in the connection compartment; example of how to configure the device address 10.

Hardware addressing

- 1. Set switch 8 to the "OFF" position.
- 2. Set the address using switches 1 to 7.

The change of address takes effect after 10 seconds. The device is restarted.

Software addressing  $\rightarrow \triangleq 64$ 

- 1. Set switches 1 to 7 to the "OFF" position.
- 2. Set switch 8 to "ON".
  - The device restarts automatically and reports the current address (factory setting: 126).
- 3. Configure the address via the operating menu: **Setup** menu→**Communication** submenu→**Device address** parameter

# 7.5 Ensuring the degree of protection

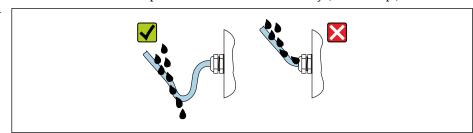
The measuring device fulfills all the requirements for the IP66/67 degree of protection, Type 4X enclosure.

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

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

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



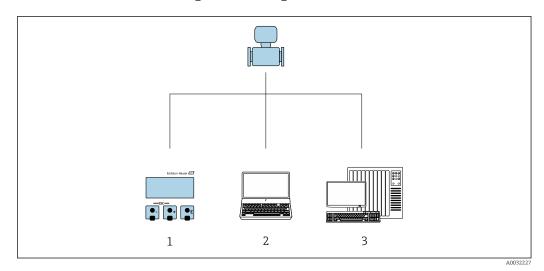
6. Insert dummy plugs into unused cable entries.

# 7.6 Post-connection check

Are cables or the device undamaged (visual inspection)?	
Do the cables used meet the requirements → 🖺 29?	
Do the cables have adequate strain relief?	
Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" → 🖺 36?	
Depending on the device version: are all the device plugs firmly tightened → 🖺 32?	
Does the supply voltage match the specifications on the transmitter nameplate $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	
Is the terminal assignment correct ?	
Is the terminal assignment or pin assignment of the connector correct?	
If supply voltage is present, do values appear on the display module?	
Are all housing covers installed and firmly tightened?	
Is the securing clamp tightened correctly?	

#### **Operation options** 8

#### Overview of operation options 8.1



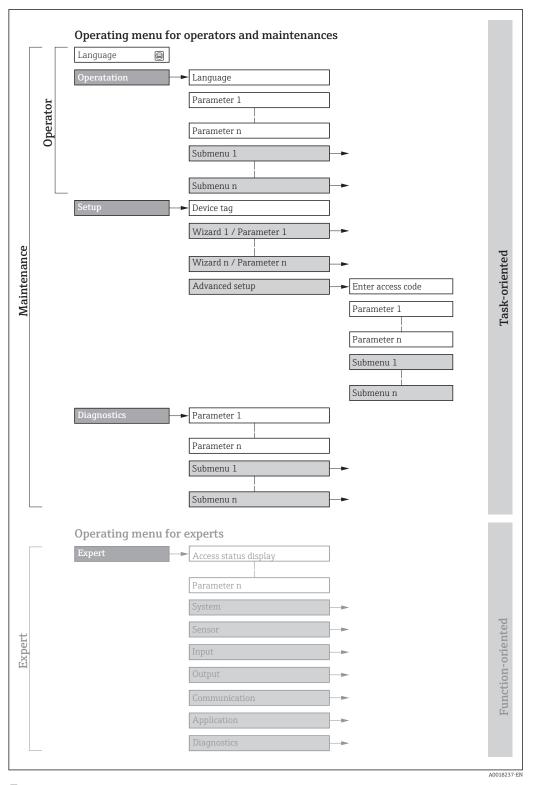
- Local operation via display module Computer with operating tool (e.g. FieldCare, SIMATIC PDM)
- Control system (e.g. PLC)

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# 8.2 Structure and function of the operating menu

# 8.2.1 Structure of the operating menu

For an overview of the operating menu for experts: "Description of Device Parameters" document supplied with the device



 $\blacksquare 11$  Schematic structure of the operating menu

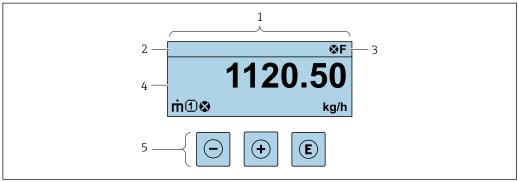
# 8.2.2 Operating philosophy

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

Men	u/parameter	User role and tasks	Content/meaning
Language Operation	task-oriented	Role "Operator", "Maintenance" Tasks during operation: Configuring the operational display Reading measured values	<ul> <li>Defining the operating language</li> <li>Resetting and controlling totalizers</li> <li>Configuring the operational display (e.g. display format, display contrast)</li> <li>Resetting and controlling totalizers</li> </ul>
Setup		"Maintenance" role Commissioning: Configuration of the measurement Configuration of the inputs and outputs	Wizards for fast commissioning:  Set the system units  Define the medium  Configure the outputs  Configuring the operational display  Define the output conditioning  Set the low flow cut off  Configure partial and empty pipe detection  Advanced setup  For more customized configuration of the measurement (adaptation to special measuring conditions)  Configuration of totalizers
Diagnostics		"Maintenance" role Fault elimination:	<ul> <li>Configure the WLAN settings</li> <li>Administration (define access code, reset measuring device)</li> <li>Contains all parameters for error detection and analyzing process and device errors:</li> </ul>
		<ul> <li>Diagnostics and elimination of process and device errors</li> <li>Measured value simulation</li> </ul>	<ul> <li>Diagnostic list         Contains up to 5 currently pending diagnostic messages.</li> <li>Event logbook         Contains event messages that have occurred.</li> <li>Device information         Contains information for identifying the device.</li> <li>Measured values         Contains all current measured values.</li> <li>Analog inputs         Is used to display the analog input.</li> <li>Data logging submenu with "Extended HistoROM" order option         Storage and visualization of measured values</li> <li>Heartbeat         The functionality of the device is checked on demand and the verification         results are documented.</li> <li>Simulation         Is used to simulate measured values or output values.</li> </ul>
Expert	function-oriented	Tasks that require detailed knowledge of the function of the device:  Commissioning measurements under difficult conditions  Optimal adaptation of the measurement to difficult conditions  Detailed configuration of the communication interface  Error diagnostics in difficult cases	Contains all the parameters of the device and makes it possible to access these parameters directly using an access code. The structure of this menu is based on the function blocks of the device:  System Contains all higher-order device parameters which do not concern the measurement or the communication interface.  Sensor Configuration of the measurement.  Output Configure the pulse/frequency/switch output.  Communication Configuration of the digital communication interface.  Submenus for function blocks (e.g. "Analog Inputs") Configuration of function blocks.  Application Configure the functions that go beyond the actual measurement (e.g. totalizer).  Diagnostics Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology.

# 8.3 Access to the operating menu via the local display

## 8.3.1 Operational display



A002934

- 1 Operational display
- 2 Device tag
- 3 Status area
- 4 Display area for measured values (4-line)
- 5 *Operating elements* → 🖺 46

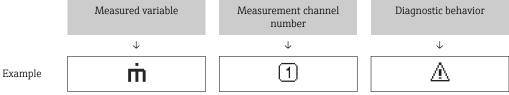
#### Status area

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

- Status signals → 🗎 103
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
- M: Maintenance required
- Diagnostic behavior → 🖺 104
  - 🐼: Alarm
  - <u>M</u>: Warning
- 🖆: Locking (the device is locked via the hardware )
- ←: Communication (communication via remote operation is active)

## Display area

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



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

#### Measured values

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

ρ	<ul><li>Density</li><li>Reference density</li></ul>
ı.	Temperature
Σ	Totalizer  The measurement channel number indicates which of the three totalizers is displayed.

#### Measurement channel numbers

Symbol	Meaning
14	Measurement channel 1 to 4

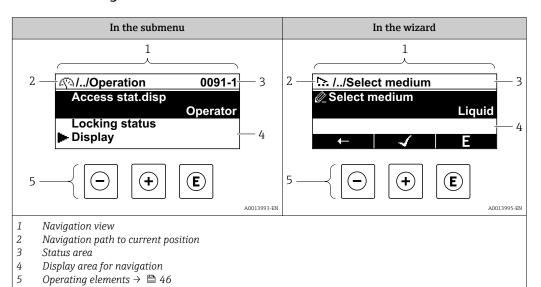
The measurement channel number is displayed only if more than one channel is present for the same measured variable type (e.g. Totalizer 1 to 3).

#### Diagnostic behavior

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable. For information on the symbols  $\rightarrow \stackrel{\text{\tiny the}}{=} 104$ 

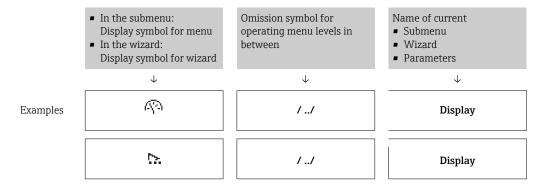
The number and display format of the measured values can be configured via the **Format display** parameter ( $\Rightarrow \triangleq 72$ ).

## 8.3.2 Navigation view



## Navigation path

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



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

#### Status area

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

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

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



- For information on the function and entry of the direct access code  $\rightarrow$   $\stackrel{ riangle}{=}$  48

#### Display area

#### Menus

Symbol	Meaning
P	Operation Appears: In the menu next to the "Operation" selection At the left in the navigation path in the Operation menu
۶	Setup Appears: In the menu next to the "Setup" selection At the left in the navigation path in the Setup menu
્ય	Diagnostics Appears: ■ In the menu next to the "Diagnostics" selection ■ At the left in the navigation path in the Diagnostics menu
-} <b>*</b>	Expert Appears: In the menu next to the "Expert" selection At the left in the navigation path in the Expert menu

### Submenus, wizards, parameters

Symbol	Meaning
•	Submenu
75.	Wizard
Ø.	Parameters within a wizard  No display symbol exists for parameters in submenus.

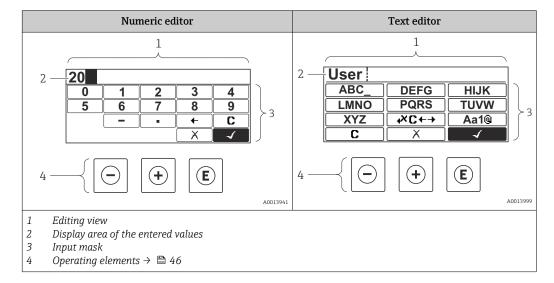
## Locking

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

## Wizard operation

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.

# 8.3.3 Editing view



## Input mask

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

#### Numeric editor

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

## Text editor

Symbol	Meaning
(Aa1@)	Toggle  Between upper-case and lower-case letters  For entering numbers  For entering special characters
ABC_  XYZ	Selection of letters from A to Z.
abc _  xyz	Selection of letters from a to z.
""^ _  ~& _	Selection of special characters.
<b>√</b>	Confirms selection.
•×C←→	Switches to the selection of the correction tools.
X	Exits the input without applying the changes.
C	Clears all entered characters.

# Correction symbols under<del>∞c+</del>

Symbol	Meaning
C	Clears all entered characters.
<b>-</b>	Moves the input position one position to the right.
€	Moves the input position one position to the left.
*	Deletes one character immediately to the left of the input position.

# 8.3.4 Operating elements

Operating key(s)	Meaning
	Minus key
	In a menu, submenu Moves the selection bar upwards in a choose list.
	With a Wizard Confirms the parameter value and goes to the previous parameter.
	With a text and numeric editor In the input screen, moves the selection bar to the left (backwards).
	Plus key
	In a menu, submenu Moves the selection bar downwards in a choose list.
(+)	With a Wizard Confirms the parameter value and goes to the next parameter.
	With a text and numeric editor  Moves the selection bar to the right (forwards) in an input screen.
	Enter key
	<ul> <li>For operational display</li> <li>Pressing the key briefly opens the operating menu.</li> <li>Pressing the key for 2 s opens the context menu.</li> </ul>
E	<ul> <li>In a menu, submenu</li> <li>Pressing the key briefly:</li> <li>Opens the selected menu, submenu or parameter.</li> <li>Starts the wizard.</li> <li>If help text is open, closes the help text of the parameter.</li> <li>Pressing the key for 2 s for parameter:</li> </ul>
	If present, opens the help text for the function of the parameter.  With a Wizard  Opens the editing view of the parameter.
	With a text and numeric editor  Pressing the key briefly: Opens the selected group. Carries out the selected action. Pressing the key for 2 s confirms the edited parameter value.
	Escape key combination (press keys simultaneously)
(a) + (+)	<ul> <li>In a menu, submenu</li> <li>Pressing the key briefly:</li> <li>Exits the current menu level and takes you to the next higher level.</li> <li>If help text is open, closes the help text of the parameter.</li> <li>Pressing the key for 2 s returns you to the operational display ("home position").</li> <li>With a Wizard</li> <li>Exits the wizard and takes you to the next higher level.</li> </ul>
	With a text and numeric editor Closes the text or numeric editor without applying changes.
-+E	Minus/Enter key combination (press the keys simultaneously)
	Reduces the contrast (brighter setting).
+ E	Plus/Enter key combination (press and hold down the keys simultaneously) Increases the contrast (darker setting).
	Minus/Plus/Enter key combination (press the keys simultaneously)
-++E	For operational display Enables or disables the keypad lock (only SD02 display module).

# 8.3.5 Opening the context menu

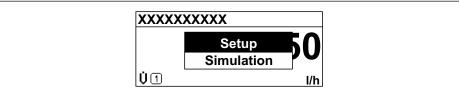
Using the context menu, the user can call up the following menus quickly and directly from the operational display:  $\frac{1}{2} \left( \frac{1}{2} \right) = \frac{1}{2} \left( \frac{1}{2} \right) \left( \frac{$ 

- Setup
- Configuration backup display
- Simulation

## Calling up and closing the context menu

The user is in the operational display.

- 1. Press E for 2 s.
  - └ The context menu opens.



A0017421-E

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

## Calling up the menu via the context menu

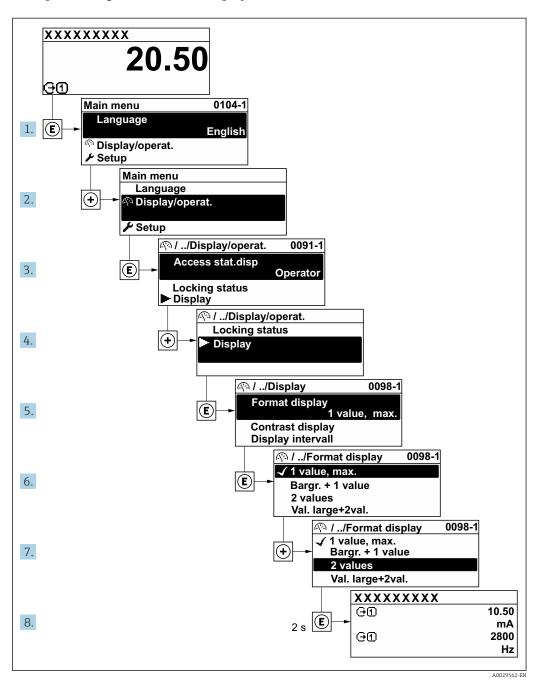
- 1. Open the context menu.
- 2. Press ± to navigate to the desired menu.
- 3. Press 🗉 to confirm the selection.
  - └ The selected menu opens.

## 8.3.6 Navigating and selecting from list

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

For an explanation of the navigation view with symbols and operating elements  $\Rightarrow \stackrel{\triangle}{=} 42$ 

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



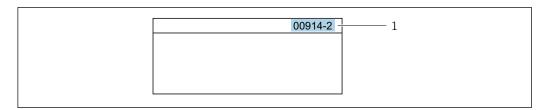
## 8.3.7 Calling the parameter directly

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

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 accessed automatically.
   Example: Enter 00914 → Assign process variable parameter
- If a different channel is accessed: Enter the direct access code with the corresponding channel number.

Example: Enter **00914-2** → **Assign process variable** parameter

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

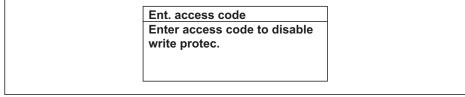
## 8.3.8 Calling up help text

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

#### Calling up and closing the help text

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

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



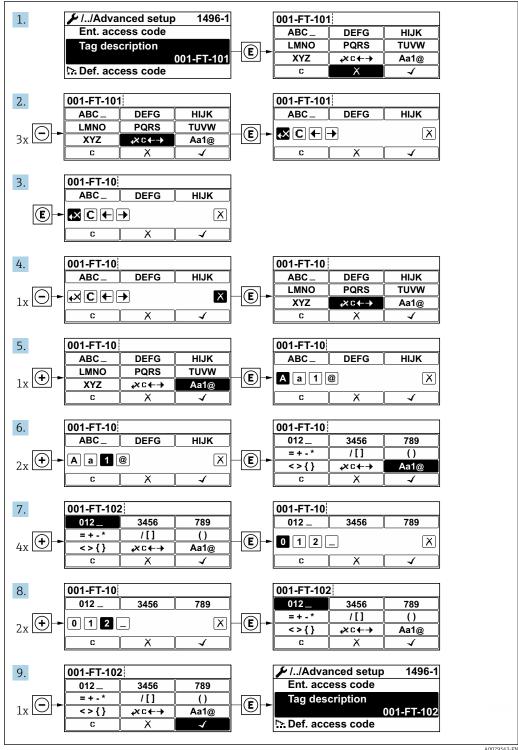
A0014002-EN

- 12 Example: Help text for parameter "Enter access code"
- 2. Press  $\Box$  +  $\pm$  simultaneously.
  - ► The help text is closed.

#### 8.3.9 Changing the parameters

For a description of the editing view - consisting of the text editor and numeric editor 

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



A0029563-EN

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

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

A0014049-EN

### 8.3.10 User roles and related access authorization

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

#### 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 excepted from the write protection, as they do not affect the measurement. Refer to the "Write protection via access code" section
- The user role with which the user is currently logged on is indicated by the **Access** status display parameter. Navigation path: Operation  $\rightarrow$  Access status display

## 8.3.11 Disabling write protection via access code

If the  $\square$ -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  $\rightarrow \square$  91.

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

- 1. After you press E, the input prompt for the access code appears.
- 2. Enter the access code.
  - ► The 🗈-symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

## 8.3.12 Enabling and disabling the keypad lock

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

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

### Switching on the keypad lock

- For the SD03 display only
  - 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 **E** for at least 2 seconds.
  - ► A context menu appears.
- 2. In the context menu select the **Keylock on** option.
  - ► The keypad lock is switched on.
- If the user attempts to access the operating menu while the keypad lock is active, the **Keylock on** message appears.

#### Switching off the keypad lock

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

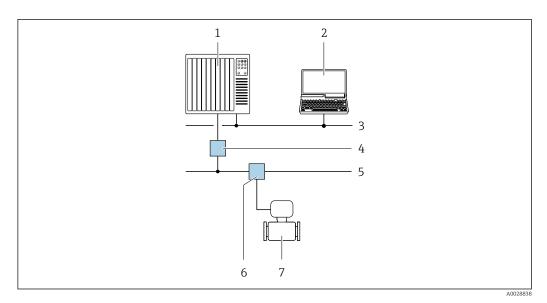
# 8.4 Access to the operating menu via the operating tool

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

## 8.4.1 Connecting the operating tool

### Via PROFIBUS PA network

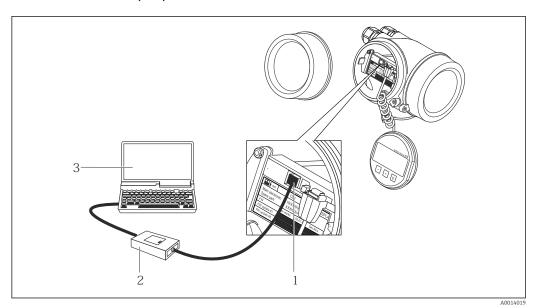
This communication interface is available in device versions with PROFIBUS PA.



■ 13 Options for remote operation via PROFIBUS PA network

- 1 Automation system
- 2 Computer with PROFIBUS network card
- 3 PROFIBUS DP network
- 4 Segment coupler PROFIBUS DP/PA
- 5 PROFIBUS PA network
- 6 T-box
- 7 Measuring device

## Via service interface (CDI)



- Service interface (CDI = Endress+Hauser Common Data Interface) of the measuring device
- 2 Commubox FXA291
- $3\qquad \textit{Computer with FieldCare operating tool with COM DTM CDI Communication FXA291}$

# 8.4.2 FieldCare

#### **Function scope**

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

#### Access is via:

- PROFIBUS PA protocol → 🗎 52
- CDI service interface → 🗎 53

#### Typical functions:

- Configuring parameters of transmitters
- Loading and saving device data (upload/download)
- Documentation of the measuring point
- Visualization of the measured value memory (line recorder) and event logbook
- For additional information about FieldCare, see Operating Instructions BA00027S and BA00059S

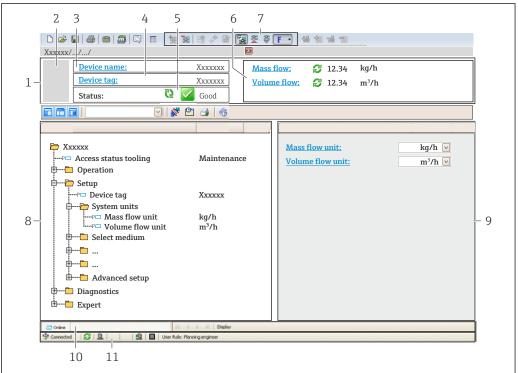
## Source for device description files

See information  $\rightarrow \blacksquare 56$ 

## Establishing a connection

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

#### User interface



A0021051-EN

- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Tag name
- 5 Status area with status signal  $\rightarrow = 106$
- 6 Display area for current measured values
- 7 Edit toolbar with additional functions such as save/restore, event list and create documentation
- 8 Navigation area with operating menu structure
- 9 Working area
- 10 Range of action
- 11 Status area

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## 8.4.3 DeviceCare

### **Function scope**

Tool to connect and configure Endress+Hauser field devices.

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



For details, see Innovation Brochure INO1047S

## Source for device description files

See information  $\rightarrow \blacksquare 56$ 

## 8.4.4 SIMATIC PDM

## **Function scope**

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

## Source for device description files

See data  $\rightarrow \implies 56$ 

# 9 System integration

# 9.1 Overview of device description files

#### 9.1.1 Current version data for the device

Firmware version	01.01.zz	<ul> <li>On the title page of the Operating Instructions</li> <li>On the transmitter nameplate → 15</li> <li>Firmware version         Diagnostics → Device information → Firmware version     </li> </ul>
Release date of firmware version	06.2015	
Manufacturer ID	0x11	Manufacturer ID Diagnostics → Device information → Manufacturer ID
Device type ID	0x155F	Device type Diagnostics → Device information → Device type
Profile version	3.02	

For an overview of the different firmware versions for the device  $\rightarrow \triangleq 127$ 

# 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 PROFIBUS protocol	Sources for obtaining device descriptions
FieldCare	<ul> <li>www.endress.com → Download Area</li> <li>CD-ROM (contact Endress+Hauser)</li> <li>DVD (contact Endress+Hauser)</li> </ul>
DeviceCare	<ul> <li>www.endress.com → Download Area</li> <li>CD-ROM (contact Endress+Hauser)</li> <li>DVD (contact Endress+Hauser)</li> </ul>
SIMATIC PDM (Siemens)	www.endress.com → Download Area

# 9.2 Device master file (GSD)

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

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

With the Profile 3.0 device master file (GSD) it is possible to exchange field devices made by different manufacturers without having to reconfigure.

Generally speaking two different GSD versions are possible with Profile 3.0 and higher.

 Before configuring, the user must decide which GSD should be used to operate the system.

• The setting can be changed via a Class 2 master.

## 9.2.1 Manufacturer-specific GSD

This GSD guarantees the unrestricted functionality of the measuring device. Device-specific process parameters and functions are therefore available.

Manufacturer-specific GSD	ID number	File name
PROFIBUS PA	0x1564	EH3x1564.gsd

The fact that the manufacturer-specific GSD should be used is specified in the **Ident number selector** parameter by selecting the **Manufacturer** option.



Where to acquire the manufacturer-specific GSD:

www.endress.com → Downloads area

#### 9.2.2 Profile GSD

Differs in terms of the number of Analog Input blocks (AI) and the measured values. If a system is configured with a Profile GSD, it is possible to exchange devices made by different manufacturers. However, it is essential to ensure that the order of the cyclic process values is correct.

ID number	Supported blocks	Supported channels
0x9740	<ul><li>1 Analog Input</li><li>1 Totalizer</li></ul>	<ul><li>Channel Analog Input: volume flow</li><li>Channel totalizer: volume flow</li></ul>
0x9741	<ul><li>2 Analog Input</li><li>1 Totalizer</li></ul>	<ul> <li>Channel Analog Input 1: volume flow</li> <li>Channel Analog Input 2: mass flow</li> <li>Channel totalizer: volume flow</li> </ul>
0x9742	<ul><li>3 Analog Input</li><li>1 Totalizer</li></ul>	<ul> <li>Channel Analog Input 1: volume flow</li> <li>Channel Analog Input 2: mass flow</li> <li>Channel Analog Input 3: corrected volume flow</li> <li>Channel totalizer: volume flow</li> </ul>

The Profile GSD that is to be used is specified in the **Ident number selector** parameter by selecting the **Profile 0x9740** option, **Profile 0x9741** option or **Profile 0x9742** option.

# 9.3 Cyclic data transmission

Cyclic data transmission when using the device master file (GSD).

## 9.3.1 Block model

The block model shows which input and output data the measuring device makes available for cyclic data exchange. Cyclic data exchange takes place with a PROFIBUS master (Class 1), e.g. a control system.

	Measuring device				
	Analog Input block 1 to 6	→ 🖺 58	Output value AI	$\rightarrow$	
			Output value TOTAL	$\rightarrow$	
Transducer	Totalizer block 1 to 3	→ 🖺 59	Controller SETTOT	<b>←</b>	
Block			Configuration MODETOT	<b>←</b>	PROFIBUS PA
	Analog Output block 1	→ 🖺 61	Input values AO	<b>←</b>	
	Discrete Input block 1 to 2	→ 🖺 61	Output values DI	$\rightarrow$	

Discrete Output block 1 to 4	→ 🖺 62	Input values DO	+	

#### Defined order of modules

The measuring device works as a modular PROFIBUS slave. In contrast to a compact slave, a modular slave has a variable design and consists of several individual modules. The device master file (GSD) contains a description of the individual modules (input and output data) along with their individual properties.

The modules are permanently assigned to the slots, i.e. when configuring the modules, the order and the arrangement of the modules must be respected.

Slot	Module	Function block
16	AI	Analog Input block 1 to 4
7	TOTAL or	Totalizer block 1
8	SETTOT_TOTAL or SETOT_MODETOT_TOTAL	Totalizer block 2
9		Totalizer block 3
10	AO	Analog Output block 1
1112	DI	Discrete Input block 1 to 2
13 16	DO	Discrete Output block 1 to 3

To optimize the data throughput rate of the PROFIBUS network, it is advisable to only configure modules that are processed in the PROFIBUS master system. If this results in gaps between the configured modules, these gaps must be assigned to the EMPTY\_MODULE.

## 9.3.2 Description of the modules

The data structure is described from the perspective of the PROFIBUS master:

- Input data: Are sent from the measuring device to the PROFIBUS master.
- Output data: Are sent from the PROFIBUS master to the measuring device.

#### AI module (Analog Input)

Transmit an input variable from the measuring device to the PROFIBUS master (Class 1).

The selected input variable, along with the status, is cyclically transmitted to the PROFIBUS Master (Class 1) via the AI module. The input variable is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

Four Analog Input blocks are available (slot 1 to 6).

Selection: input variable

The input variable can be determined using the **Channel** parameter.

Channel	Input variable
32961	Mass flow
33122	Volume flow
33093	Corrected volume flow
32850	Density
33092	Reference density
33101	Temperature

## Factory setting

Function block	Factory setting
AI 1	Volume flow
AI 2	Mass flow
AI 3	Corrected volume flow
AI 4	Density
AI 5	Reference density
AI 6	Temperature

#### Data structure

## Input data of Analog Input

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

#### TOTAL module

Transmit a totalizer value from the measuring device to the PROFIBUS master (Class 1).

A selected totalizer value, along with the status, is cyclically transmitted to a PROFIBUS Master (Class 1) via the TOTAL module. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the totalizer value.

Three Totalizer blocks are available (slot 7 to 9).

Selection: totalizer value

The totalizer value can be specified using the CHANNEL parameter.

Channel	Input variable
32961	Mass flow
33122	Volume flow
33093	Corrected volume flow

## Factory setting

Function block	Factory setting: TOTAL
Totalizer 1, 2 and 3	Volume flow

#### Data structure

## Input data of TOTAL

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

## SETTOT\_TOTAL module

The module combination consists of the SETTOT and TOTAL functions:

- SETTOT: Control the totalizers via the PROFIBUS master.
- TOTAL: Transmit totalizer value, along with the status, to the PROFIBUS master.

Three Totalizer blocks are available (slot 7 to 9).

Selection: control totalizer

Channel	Value SETTOT	Control totalizer
33310	0	Totalize
33046	1	Resetting
33308	2	Adopt totalizer initial setting

#### Factory setting

Function block	Factory setting: Value SETTOT (meaning)	
Totalizer 1, 2 and 3	0 (totalizing)	

#### Data structure

## Output data of SETTOT

Byte 1
Control variable 1

#### Input data of TOTAL

Byte	: 1	Byte 2	Byte 3	Byte 4	Byte 5
N	1easure	d value: floating	point number (IE	EEE 754)	Status

## SETTOT\_MODETOT\_TOTAL module

The module combination consists of the SETTOT, MODETOT and TOTAL functions:

- SETTOT: Control the totalizers via the PROFIBUS master.
- MODETOT: Configure the totalizers via the PROFIBUS master.
- TOTAL: Transmit totalizer value, along with the status, to the PROFIBUS master.

Three Totalizer blocks are available (slot 7 to 9).

Selection: totalizer configuration

Channel	MODETOT value	Totalizer configuration	
33306	0 Balancing		
33028	1 Balance the positive flow		
32976	2	Balance the negative flow	
32928	3	Stop totalizing	

#### Factory setting

Function block	Factory setting: Value MODETOT (meaning)	
Totalizer 1, 2 and 3	0 (balancing)	

#### Data structure

#### Output data of SETTOT and MODETOT

Byte 1	Byte 2	
Control variable 1: SETTOT	Control variable 2: MODETOT	

#### Input data of TOTAL

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

### AO module (Analog Output)

Transmit a compensation value from the PROFIBUS master (Class 1) to the measuring device.

A compensation value, along with the status, is cyclically transmitted from the PROFIBUS Master (Class 1) to the measuring device via the AO module. The compensation value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the compensation value.

One Analog Output block is available (slot 10).

Assigned compensation values

A compensation value is permanently assigned to the individual Analog Output blocks.

CHANNEL	Function block	Compensation value
306	AO 1	External pressure <sup>1)</sup>

- 1) The compensation values must be transmitted to the device in the SI basic unit
- The selection is made via: Expert  $\rightarrow$  Sensor  $\rightarrow$  External compensation

Data structure

#### Output data of Analog Output

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measure	d value: floating	point number (IE	EEE 754)	Status

#### DI module (Discrete Input)

Transmit discrete input values from the measuring device to the PROFIBUS master (Class 1). Discrete input values are used by the measuring device to transmit the state of device functions to the PROFIBUS master (Class 1).

The DI module cyclically transmits the discrete input value, along with the status, to the PROFIBUS Master (Class 1). The discrete input value is depicted in the first byte. The second byte contains standardized status information pertaining to the input value.

Two Discrete Input blocks are available (slot 11 to 12).

## Selection: device function

The device function can be specified using the CHANNEL parameter.

CHANNEL	Device function	Factory setting: Status (meaning)
893	Status switch output	
894	Empty pipe detection	■ 0 (device function not active)
895	Low flow cut off	■ 1 (device function active)
1430	Status verification 1)	

1) Only available with the Heartbeat Verification application package

#### Factory setting

Function block	Factory setting
DI 1	Empty pipe detection
DI 2	Low flow cut off

#### Data structure

## Input data of Discrete Input

Byte 1	Byte 2	
Discrete	Status	

### **DO module (Discrete Output)**

Transmit discrete output values from the PROFIBUS master (Class 1) to the measuring device. Discrete output values are used by the PROFIBUS master (Class 1) to enable and disable device functions.

The DO module cyclically transmits the discrete output value, along with the status, to the measuring device. The discrete output value is depicted in the first byte. The second byte contains standardized status information pertaining to the output value.

Four Discrete Output blocks are available (slot 13 to 16).

### *Assigned device functions*

A device function is permanently assigned to the individual Discrete Output blocks.

CHANNEL	Function block	Device function	Values: control (meaning)
891	DO 1	Flow override	
890	DO 2	Zero point adjustment	<ul><li>0 (disable device function)</li></ul>
253	DO 3	Pulse/freq./switch output	• 1 (enable device function)
1429	DO 4	Start verification 1)	

1) Only available with the Heartbeat Verification application package

Data structure

Output data of Discrete Output

Byte 1	Byte 2	
Discrete	Status	

#### EMPTY\_MODULE module

This module is used to assign empty spaces arising from modules not being used in the slots .

The measuring device works as a modular PROFIBUS slave. In contrast to a compact slave, a modular PROFIBUS slave has a variable design and consists of several individual modules. The GSD file contains a description of the individual modules along with their individual properties.

The modules are permanently assigned to the slots. When configuring the modules, it is absolutely essential to observe the sequence/arrangement of the modules. Any gaps between the configured modules must be filled with the EMPTY MODULE.

# 10 Commissioning

## 10.1 Function check

Before commissioning the measuring device:

- ▶ Make sure that the post-installation and post-connection checks have been performed.
- "Post-installation check" checklist → 🗎 28
- "Post-connection check" checklist  $\rightarrow$   $\triangleq$  37

# 10.2 Switching on the measuring device

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

# 10.3 Configuring the device address via software

In the "Communication" submenu the device address can be set.

#### **Navigation**

"Setup" menu  $\rightarrow$  Communication  $\rightarrow$  Device address

## 10.3.1 PROFIBUS network

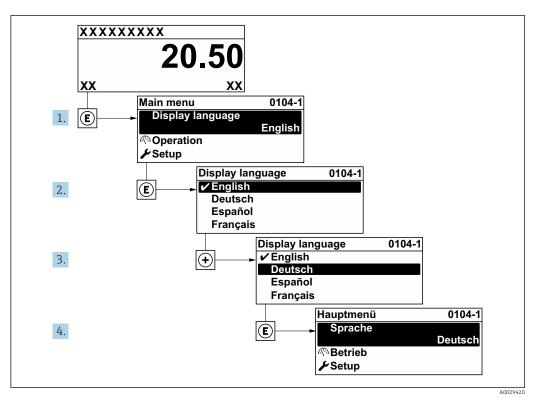
At time of delivery, the measuring device has the following factory setting:

Device address	126	
----------------	-----	--

If hardware addressing is active, software addressing is blocked

# 10.4 Setting the operating language

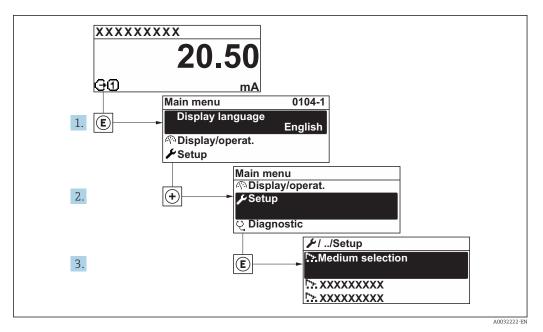
Factory setting: English or ordered local language



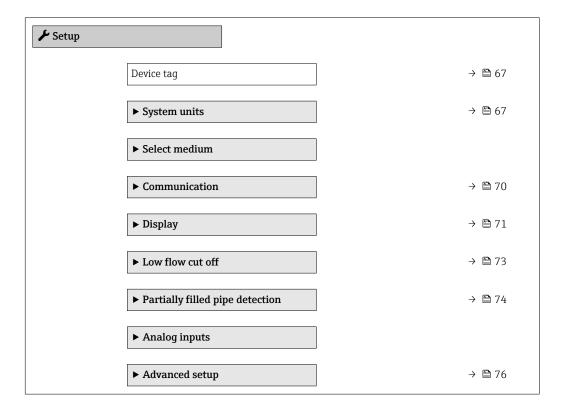
Taking the example of the local display

# 10.5 Configuring the measuring device

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

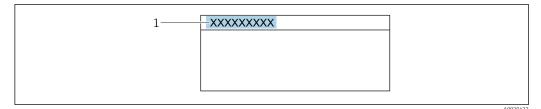


 $\blacksquare$  15 Taking the example of the local display



## 10.5.1 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.



 $\blacksquare$  16 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 200

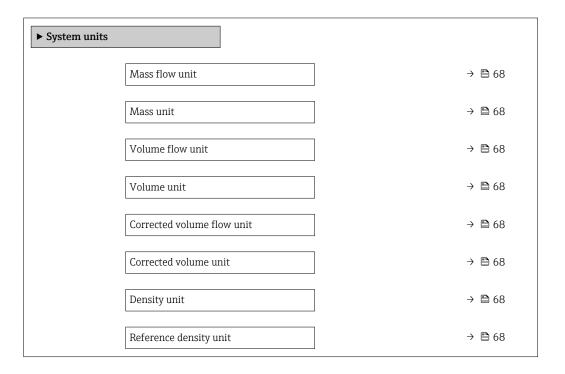
## 10.5.2 Setting the system units

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

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

## Navigation

"Setup" menu  $\rightarrow$  System units



Temperature unit	→ 🖺 68
Pressure unit	→ 🖺 69

# Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Mass flow unit	Select mass flow unit.  Result  The selected unit applies for:  Output  Low flow cut off Simulation process variable	Unit choose list	Country-specific:  kg/h lb/min
Mass unit	Select mass unit.	Unit choose list	Country-specific:     kg     lb
Volume flow unit	Select volume flow unit.  Result  The selected unit applies for:  Output  Low flow cut off Simulation process variable	Unit choose list	Country-specific:  1/h gal/min (us)
Volume unit	Select volume unit.	Unit choose list	Country-specific:  l gal (us)
Corrected volume flow unit	Select corrected volume flow unit.  Result  The selected unit applies for:  Corrected volume flow parameter $(\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	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.  Result  The selected unit applies for:  Output  Simulation process variable  Density adjustment (Expert menu)	Unit choose list	Country-specific:  • kg/l  • lb/ft³
Reference density unit	Select reference density unit.	Unit choose list	Country-dependent  kg/Nl lb/Sft³
Temperature unit	Select temperature unit.  Result  The selected unit applies for:  Minimum value  Maximum value  Minimum value  Average value  Minimum value  Maximum value  Maximum value  Maximum value  Maximum value  Reference temperature	Unit choose list	Country-specific:  °C  °F

68

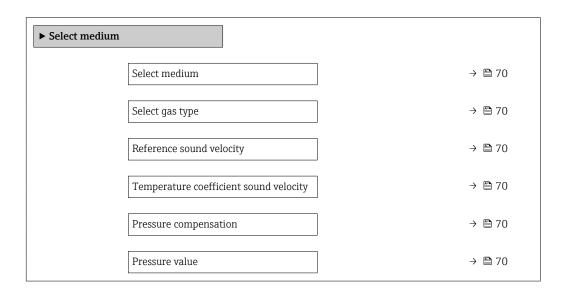
Parameter	Description	Selection	Factory setting
Length unit	Select length unit for nominal diameter.	Unit choose list	Country-specific:  mm  in
Pressure unit	Select process pressure unit.  Result  The unit is taken from:  ■ Pressure value parameter (→ 🖺 70)  ■ External pressure parameter	Unit choose list	Country-specific:  • bar a  • psi a

## 10.5.3 Selecting and setting the medium

The **Medium selection** wizard systematically guides the user through all the parameters that must be configured in order to select and set the medium.

#### **Navigation**

"Setup" menu  $\rightarrow$  Medium selection



## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Select medium	-	Select medium type.	<ul><li>Liquid</li><li>Gas</li></ul>	Liquid
Select gas type	In the <b>Select medium</b> parameter the <b>Gas</b> option is selected.	Select measured gas type.	Gas type choose list	Air
Reference sound velocity	In the <b>Select gas type</b> parameter the <b>Others</b> option is selected.	Enter sound velocity of gas at $0 ^{\circ}\text{C}  (32 ^{\circ}\text{F})$ .	1 to 99 999.9999 m/s	331.5 m/s
Temperature coefficient sound velocity	In the <b>Select gas type</b> parameter the <b>Others</b> option is selected.	Enter temperature coefficient for the gas sound velocity.	Positive floating- point number	0.61 (m/s)/K
Pressure compensation	-	Select pressure compensation type.	<ul><li>Off</li><li>Fixed value</li><li>External value</li></ul>	Off
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	Country-specific:  1.01 bar a  14.7 psi a

# 10.5.4 Configuring communication interface

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

## Navigation

"Setup" menu  $\rightarrow$  Communication



## Parameter overview with brief description

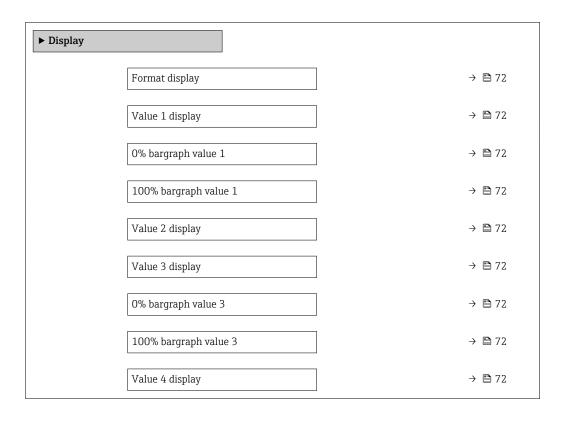
Parameter	Description	User entry	Factory setting
Device address	Enter device address.	0 to 126	126

# 10.5.5 Configuring the local display

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

## Navigation

"Setup" menu  $\rightarrow$  Display



# Parameter overview with brief description

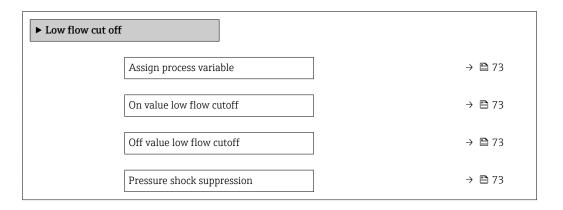
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	<ul> <li>1 value, max. size</li> <li>1 bargraph + 1</li> <li>value</li> <li>2 values</li> <li>1 value large + 2</li> <li>values</li> <li>4 values</li> </ul>	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> </ul>	Volume flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  Okg/h Olb/min
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the <b>Value 1 display</b> parameter	None
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the <b>Value 1 display</b> parameter (→ 🖺 72)	None
0% bargraph value 3	A selection was made in the Value 3 display parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  Okg/h Olb/min
100% bargraph value 3	A selection was made in the Value 3 display parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the <b>Value 1 display</b> parameter (→ 🗎 72)	None

## 10.5.6 Configuring the low flow cut off

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

#### Navigation

"Setup" menu  $\rightarrow$  Low flow cut off



#### Parameter overview with brief description

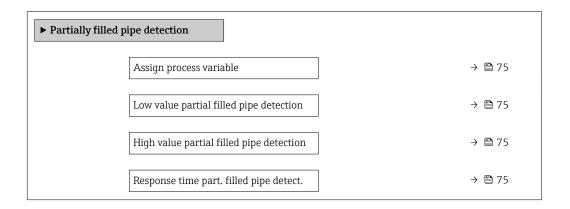
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	-	Select process variable for low flow cut off.	<ul><li>Off</li><li>Mass flow</li><li>Volume flow</li><li>Corrected volume flow</li></ul>	Mass flow
On value low flow cutoff	A process variable is selected in the <b>Assign process variable</b> parameter $( \rightarrow \ \ \ \ \ \ \ \ \ \ \ \ )$ .	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 $(\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ )$ .	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 (→ 🗎 73).	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

## 10.5.7 Configuring the partial 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



#### Parameter overview with brief description

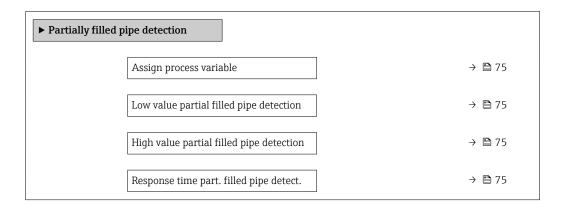
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	-	Select process variable for partially filled pipe detection.	<ul><li>Off</li><li>Density</li><li>Reference density</li></ul>	Off
Low value partial filled pipe detection	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \implies 74$ ).	Enter lower limit value for deactivating partialy filled pipe detection.	Signed floating-point number	200
High value partial filled pipe detection	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \implies 74$ ).	Enter upper limit value for deactivating partialy filled pipe detection.	Signed floating-point number	6000
Response time part. filled pipe detect.	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 74).	Enter time before diagnostic message is displayed for partially filled pipe detection.	0 to 100 s	1 s

## 10.5.8 Configuring the partial 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



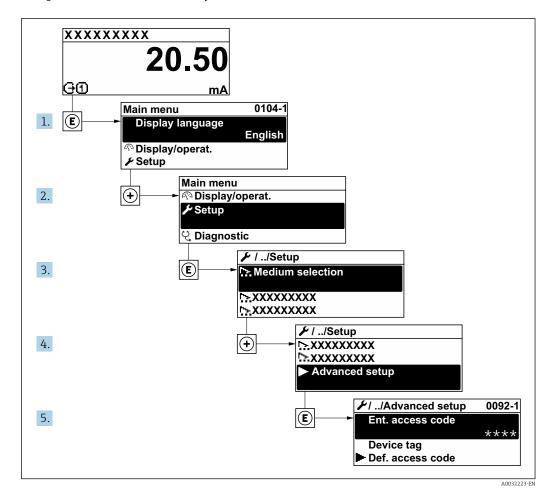
#### Parameter overview with brief description

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> Reference density</li></ul>	Off
Low value partial filled pipe detection	One of the following options is selected in the <b>Assign process</b> variable parameter:  Density Reference density	Enter lower limit value for deactivating partialy filled pipe detection.	Positive floating- point number	200
High value partial filled pipe detection	One of the following options is selected in the Assign process variable parameter:  Density Reference density	Enter upper limit value for deactivating partialy filled pipe detection.	Signed floating-point number	6 000
Response time part. filled pipe detect.	One of the following options is selected in the Assign process variable parameter:  Density Reference density	Enter time before diagnostic message is displayed for partially filled pipe detection.	0 to 100 s	1s

## 10.6 Advanced settings

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

Navigation to the "Advanced setup" submenu



#### Navigation

"Setup" menu  $\rightarrow$  Advanced setup

► Advanced setup	
Enter access code	
► Sensor adjustment	→ 🖺 77
► Pulse/frequency/switch output	→ 🖺 78
► Totalizer 1 to n	→ 🖺 83
► Display	→ 🖺 85

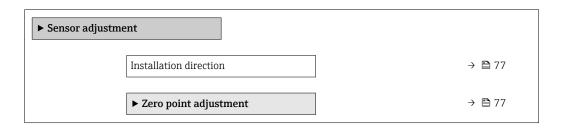
► Configuration backup display	→ 🖺 88
► Administration	→ 🖺 87

#### 10.6.1 Carrying out a sensor adjustment

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

#### Navigation

"Setup" menu → Advanced setup → Sensor adjustment



#### Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Installation direction	Set sign of flow direction to match the direction of the arrow on the sensor.	<ul><li>Flow in arrow direction</li><li>Flow against arrow direction</li></ul>	Flow in arrow direction

#### Zero point adjustment

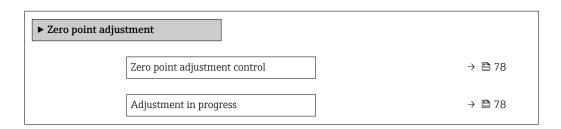
All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions  $\Rightarrow \triangleq 142$ . Therefore, a zero point adjustment in the field is generally not required.

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

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

#### **Navigation**

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



Parameter	Prerequisite	Description	Selection / User interface	Factory setting
Zero point adjustment control	-	Start zero point adjustment.	<ul><li>Cancel</li><li>Busy</li><li>Zero point adjust failure</li><li>Start</li></ul>	Cancel
Adjustment in progress	The <b>Start</b> option is selected in the <b>Zero point adjustment control</b> parameter.		0 to 100 %	_

#### 10.6.2 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 → Pulse/frequency/switch output



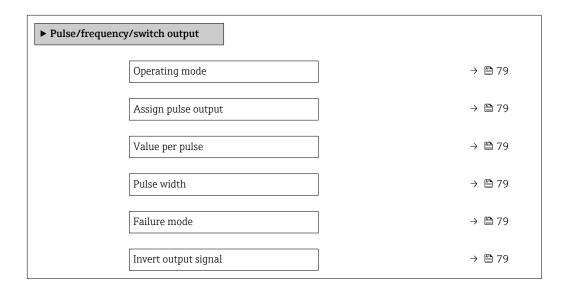
#### Parameter overview with brief description

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



Parameter	Prerequisite	Description	Selection / 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
Assign pulse output	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter parameter.	Select process variable for pulse output.	<ul><li>Off</li><li>Mass flow</li><li>Volume flow</li><li>Corrected volume flow</li></ul>	Off
Value per pulse	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 78) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🖺 79).	Enter measured value at which a pulse is output.	Signed 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 (→ 🖺 78) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🖺 79).	Define time width of the output pulse.	5 to 2 000 ms	100 ms
Failure mode	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 78) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🖺 79).	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

#### Configuring the frequency output

#### Navigation

 $\hbox{``Setup''} \ menu \rightarrow Advanced \ setup \rightarrow Pulse/frequency/switch \ output$ 

▶ Pulse/frequency/switch output	
Operating mode	→ 🖺 80
Assign frequency output	→ 🖺 80
Minimum frequency value	→ 🗎 80
Maximum frequency value	→ 🖺 80
Measuring value at minimum frequency	→ 🖺 80
Measuring value at maximum frequency	→ 🗎 80
Failure mode	→ 🖺 81

Failure frequency	→ 🖺 81
Invert output signal	→ 🖺 81

Parameter	Prerequisite	Description	Selection / 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
Assign frequency output	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🗎 78) parameter.	Select process variable for frequency output.	Off Mass flow Volume flow Corrected volume flow Density Reference density Temperature Electronic temperature Oscillation frequency Oscillation amplitude Oscillation damping Signal asymmetry	Off
Minimum frequency value	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter ( $\rightarrow \boxminus 78$ ) and a process variable is selected in the <b>Assign frequency output</b> parameter ( $\rightarrow \trianglerighteq 80$ ).	Enter minimum frequency.	0 to 1000 Hz	0 Hz
Maximum frequency value	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter ( $\rightarrow \boxminus 78$ ) and a process variable is selected in the <b>Assign frequency output</b> parameter ( $\rightarrow \boxminus 80$ ).	Enter maximum frequency.	0 to 1000 Hz	1000 Hz
Measuring value at minimum frequency	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter $(\rightarrow \boxminus 78)$ and a process variable is selected in the <b>Assign frequency output</b> parameter $(\rightarrow \trianglerighteq 80)$ .	Enter measured value for minmum 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 (→ 🖺 78) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 80).	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter

80

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Failure mode	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🗎 78) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 80).	Define output behavior in alarm condition.	<ul><li>Actual value</li><li>Defined value</li><li>0 Hz</li></ul>	0 Hz
Failure frequency	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 78) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 80).	Enter frequency output value in alarm condition.	0.0 to 1250.0 Hz	0.0 Hz
Invert output signal	-	Invert the output signal.	■ No ■ Yes	No

## Configuring the switch output

#### Navigation

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

▶ Pulse/fre	quency/switch output	
	Operating mode	→ 🖺 82
	Switch output function	→ 🖺 82
	Assign diagnostic behavior	→ 🖺 82
	Assign limit	→ 🖺 82
	Assign flow direction check	→ 🖺 82
	Assign status	→ 🖺 82
	Switch-on value	→ 🖺 82
	Switch-off value	→ 🖺 82
	Switch-on delay	→ 🖺 82
	Switch-off delay	→ 🖺 83
	Failure mode	→ 🖺 83
	Invert output signal	→ 🖺 83

Parameter	Prerequisite	Description	Selection / 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
Switch output function	The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.	Select function for switch output.	<ul> <li>Off</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit</li> <li>Flow direction check</li> <li>Status</li> </ul>	Off
Assign diagnostic behavior	<ul> <li>In the Operating mode parameter, the Switch option is selected.</li> <li>In the Switch output function parameter, the Diagnostic behavior option is selected.</li> </ul>	Select diagnostic behavior for switch output.	<ul><li>Alarm</li><li>Alarm or warning</li><li>Warning</li></ul>	Alarm
Assign limit	<ul> <li>The Switch option is selected in the Operating mode parameter parameter.</li> <li>The Limit option is selected in the Switch output function parameter parameter.</li> </ul>	Select process variable for limit function.	<ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> </ul>	Mass flow
Assign flow direction check	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Flow direction check option is selected in the Switch output function parameter.</li> </ul>	Select process variable for flow direction monitoring.	<ul><li>Mass flow</li><li>Volume flow</li><li>Corrected volume flow</li></ul>	Mass flow
Assign status	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Status option is selected in the Switch output function parameter.</li> </ul>	Select device status for switch output.	<ul> <li>Partially filled pipe detection</li> <li>Low flow cut off</li> <li>Digital output 3</li> </ul>	Partially filled pipe detection
Switch-on value	<ul> <li>In the Operating mode parameter, the Switch option is selected.</li> <li>In the Switch output function parameter, the Limit option is selected.</li> </ul>	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific:  • 0 kg/h  • 0 lb/min
Switch-off value	<ul> <li>In the Operating mode parameter, the Switch option is selected.</li> <li>In the Switch output function parameter, the Limit option is selected.</li> </ul>	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific:  • 0 kg/h  • 0 lb/min
Switch-on delay	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Limit option is selected in the Switch output function parameter.</li> </ul>	Define delay for the switch-on of status output.	0.0 to 100.0 s	0.0 s

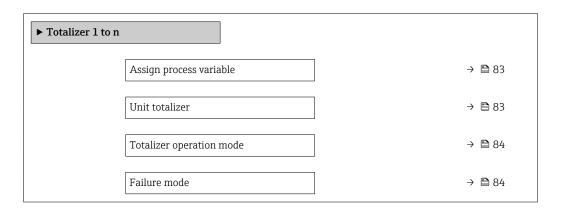
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Switch-off delay	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Limit option is selected in the Switch output function parameter.</li> </ul>	Define delay for the switch-off of status output.	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

## 10.6.3 Configuring the totalizer

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

#### Navigation

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



#### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable	-	Select process variable for totalizer.	<ul><li>Mass flow</li><li>Volume flow</li><li>Corrected volume flow</li></ul>	Mass flow
Unit totalizer	One of the following options is selected in the Assign process variable parameter:  Mass flow Volume flow Corrected volume flow	Select the unit for the process variable of the totalizer.	Unit choose list	Country-specific:  • kg • lb
Control Totalizer	In the Assign process variable parameter, one of the following options is selected:  Mass flow  Volume flow Corrected volume flow	Control totalizer value.	<ul><li>Totalize</li><li>Reset + hold</li><li>Preset + hold</li></ul>	Totalize

Parameter	Prerequisite	Description	Selection	Factory setting
Totalizer operation mode	In the Assign process variable parameter, one of the following options is selected:  Mass flow  Volume flow Corrected volume flow	Select totalizer calculation mode.	<ul> <li>Net flow total</li> <li>Forward flow total</li> <li>Reverse flow total</li> <li>Last valid value</li> </ul>	Net flow total
Failure mode	In the Assign process variable parameter, one of the following options is selected:  Mass flow Volume flow Corrected volume flow	Define the totalizer behavior in the event of a device alarm.	<ul><li>Stop</li><li>Actual value</li><li>Last valid value</li></ul>	Actual value

## 10.6.4 Carrying out additional display configurations

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

#### Navigation

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

► Display			
	Format display		→ 🖺 86
	Value 1 display		→ 🖺 86
	0% bargraph value 1		→ 🖺 86
	100% bargraph value 1		→ 🖺 86
	Decimal places 1		→ 🖺 86
	Value 2 display		→ 🖺 86
	Decimal places 2		→ 🖺 86
	Value 3 display		→ 🖺 86
	0% bargraph value 3		→ 🖺 86
	100% bargraph value 3		→ 🖺 86
	Decimal places 3		→ 🖺 86
	Value 4 display		→ 🖺 86
	Decimal places 4		→ 🖺 86
	Language		→ 🖺 87
	Display interval		→ 🖺 87
	Display damping	]	→ 🖺 87
	Header		→ 🖺 87
	Header text	]	→ 🖺 87
	Separator		→ 🖺 87
	Backlight		→ 🖺 87

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	<ul> <li>1 value, max. size</li> <li>1 bargraph + 1 value</li> <li>2 values</li> <li>1 value large + 2 values</li> <li>4 values</li> </ul>	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> </ul>	Volume flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  Okg/h Olb/min
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Decimal places 1	A measured value is specified in the <b>Value 1 display</b> parameter.	Select the number of decimal places for the display value.	• X • X.X • X.XX • X.XXX	x.xx
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the <b>Value 1 display</b> parameter	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.xx
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the <b>Value 1 display</b> parameter (→ 🖺 72)	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.	• x • x.x • x.xx • x.xxx • x.xxx	x.xx
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the <b>Value 1 display</b> parameter (→ 🖺 72)	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.XXX	x.xx

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
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>pyсский 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>Bahasa Indonesia*</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	In the <b>Header</b> parameter, the <b>Free text</b> option is selected.	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	Order code for "Display; operation", option <b>E</b> "SD03 4- line, illum.; touch control + data backup function"	Switch the local display backlight on and off.	<ul><li>Disable</li><li>Enable</li></ul>	Disable

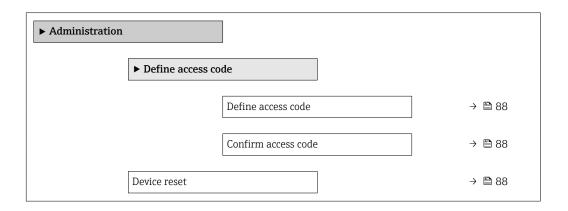
<sup>\*</sup> Visibility depends on order options or device settings

## 10.6.5 Using parameters for device administration

The  ${\bf Administration}$  submenu systematically guides the user through all the parameters that can be used for device administration purposes.

#### **Navigation**

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



#### Parameter overview with brief description

Parameter	Description	User entry / Selection	Factory setting
Define access code	Restrict write-access to parameters to protect the configuration of the device against unintentional changes via the local display.	0 to 9 999	0
Confirm access code	Confirm the entered access code.	0 to 9 999	0
Device reset	Reset the device configuration - either entirely or in part - to a defined state.	<ul><li>Cancel</li><li>To factory defaults</li><li>To delivery settings</li><li>Restart device</li></ul>	Cancel

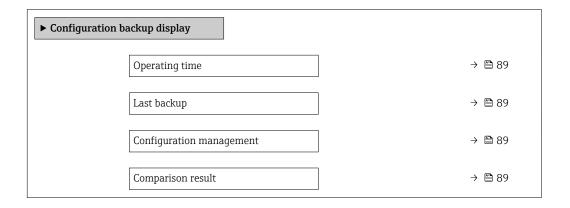
## 10.7 Configuration management

After commissioning, you can save the current device configuration, copy it to another measuring point or restore the previous device configuration.

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

#### Navigation

"Setup" menu → Advanced setup → Configuration backup display



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Parameter	Prerequisite	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	A local display is provided.	Indicates when the last data backup was saved to the display module.	Days (d), hours (h), minutes (m) and seconds (s)	-
Configuration management	A local display is provided.	Select action for managing the device data in the display module.	<ul> <li>Cancel</li> <li>Execute backup</li> <li>Restore</li> <li>Duplicate</li> <li>Compare</li> <li>Clear backup data</li> </ul>	Cancel
Comparison result	A local display is provided.	Comparison between present device data and display 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

#### 10.7.1 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 display module of the device. The backup copy includes the transmitter data of the device.
Restore	The last backup copy of the device configuration is restored from the display module to the device's HistoROM backup. The backup copy includes the transmitter data of the device.
Compare	The device configuration saved in the display module is compared with the current device configuration of the HistoROM backup.
Duplicate	The transmitter configuration from another device is duplicated to the device using the display module.
Clear backup data	The backup copy of the device configuration is deleted from the display module 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.

#### 10.8 Simulation

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

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

<b>▶</b> Simulation		
	Assign simulation process variable	→ 🖺 90
	Value process variable	→ 🖺 90
	Frequency simulation	→ 🖺 90
	Frequency value	→ 🖺 90
	Pulse simulation	→ 🖺 91
	Pulse value	→ 🖺 91
	Switch output simulation	→ 🖺 91
	Switch status	→ 🖺 91
	Simulation device alarm	→ 🖺 91
	Diagnostic event category	→ 🖺 91
	Simulation diagnostic event	→ 🖺 91

## 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.	<ul> <li>Off</li> <li>Mass flow</li> <li>Volume flow</li> <li>Corrected volume flow</li> <li>Density</li> <li>Reference density</li> <li>Temperature</li> </ul>	Off
Value process variable	A process variable is selected in the <b>Assign simulation process variable</b> parameter (→ 🖺 90).	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Frequency 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 value	In the <b>Frequency simulation</b> parameter, the <b>On</b> option is selected.	Enter the frequency value for the simulation.	0.0 to 1250.0 Hz	0.0 Hz

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Pulse simulation	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 (→ 🖺 79) 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 simulation</b> parameter (→ 🖺 91), the <b>Down-counting value</b> option is selected.	Enter the number of pulses for simulation.	0 to 65 535	0
Switch output simulation	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 status	In the Switch output simulation parameter (→ 🗎 91) Switch output simulation 1 to n parameter Switch output simulation 1 to n parameter, the On option is selected.	Select the status of the status output for the simulation.	<ul><li>Open</li><li>Closed</li></ul>	Open
Simulation device alarm	_	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
Simulation diagnostic event	-	Select a diagnostic event to simulate this event.	<ul> <li>Off</li> <li>Diagnostic event picklist (depends on the category selected)</li> </ul>	Off

## 10.9 Protecting settings from unauthorized access

The following options exist for protecting the configuration of the measuring device from unintentional modification after commissioning:

- Write protection via access code
- Write protection via write protection switch
- Write protection via keypad lock

#### 10.9.1 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.

#### Defining the access code via local display

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

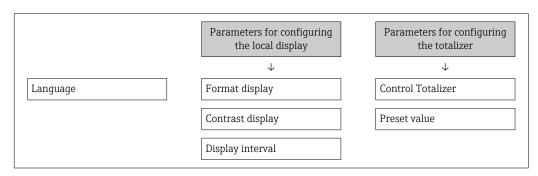
The device automatically locks the write-protected parameters again if a key is not pressed for 10 minutes in the navigation and editing view. The device locks the write-protected parameters automatically after 60 s if the user skips back to the operational display mode from the navigation and editing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



- If parameter write protection is activated via an access code, it can also only be deactivated via this access code  $\rightarrow \implies 51$ .
- The user role with which the user is currently logged on via the local display is Operation → Access status display

#### 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.

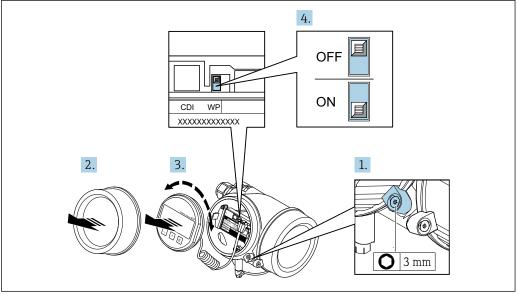


#### 10.9.2 Write protection via write protection switch

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

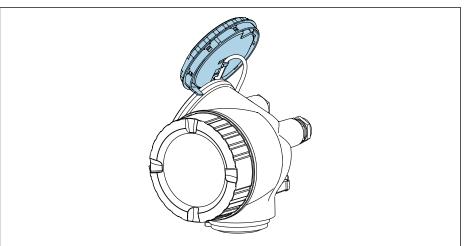
The parameter values are now read only and cannot be edited any more (exception "Contrast display" parameter):

- Via local display
- Via PROFIBUS PA protocol

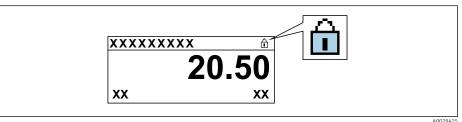


- 1. Loosen the securing clamp.
- 2. Unscrew the electronics compartment cover.

- 3. Pull out the display module with a gentle rotational movement. To make it easier to access the write protection switch, attach the display module to the edge of the electronics compartment.
  - └ Display module is attached to the edge of the electronics compartment.



- 4. Setting the write protection switch (WP) on the main electronics module to the **ON** position enables hardware write protection. Setting the write protection switch (WP) on the main electronics module to the **OFF** position (factory setting) disables hardware write protection.
  - └ If the hardware write protection is enabled: The **Hardware locked** option is displayed in the **Locking status** parameter  $\rightarrow \implies$  94. In addition, on the local display the 🖻-symbol appears in front of the parameters in the header of the operational display and in the navigation view.



If the hardware write protection is disabled: No option is displayed in the Locking in front of the parameters in the header of the operational display and in the navigation view.

- 5. Feed the cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment in the desired direction until it engages.
- 6. Reverse the removal procedure to reassemble the transmitter.

#### Operation 11

#### 11.1 Reading device locking status

The write protection types that are currently active can be determined using the Locking status parameter.

#### **Navigation**

"Operation" menu → Locking status

Function scope of "Locking status" parameter

Options	Description
None	The access status displayed in "Access status display" parameter applies $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
Hardware locked	The DIP switch for hardware locking is activated on the main electronics module. This prevents write access to the parameters .
Temporarily locked	Due to internal processing in the device (e.g. up-/downloading of data, reset), write access to the parameters is blocked for a short time. Once the internal processing has been completed, the parameters can be changed once again.

#### 11.2 Adjusting the operating language



Petailed information:

- To configure the operating language  $\rightarrow$   $\triangleq$  64
- For information on the operating languages supported by the measuring device → ■ 153

#### 11.3 Configuring the display

Detailed information:

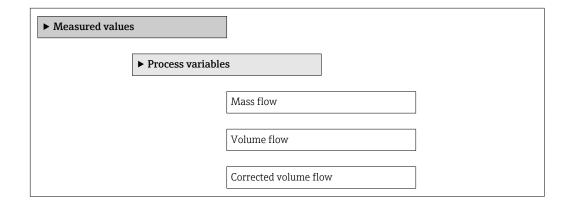
- On the advanced settings for the local display  $\rightarrow \triangleq 85$

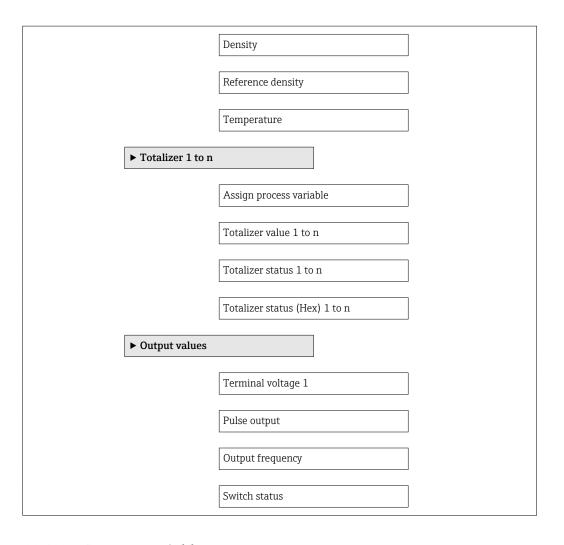
#### 11.4 Reading measured values

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

#### Navigation

"Diagnostics" menu → Measured values



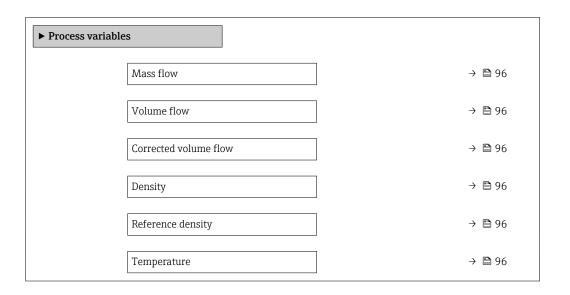


#### 11.4.1 Process variables

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

#### Navigation

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



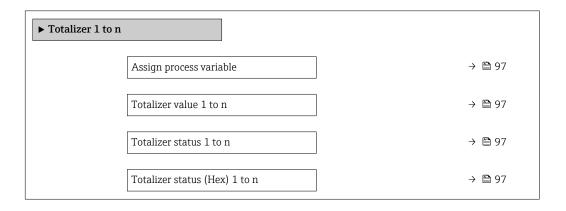
Parameter	Description	User interface
Mass flow	Displays the mass flow currently measured.	Signed floating-point number
	Dependency	
	The unit is taken from the <b>Mass flow unit</b> parameter	
Volume flow	Displays the volume flow currently measured.	Signed floating-point number
	Dependency	
	The unit is taken from the <b>Volume flow unit</b> parameter	
Corrected volume flow	Displays the corrected volume flow currently calculated.	Signed floating-point number
	Dependency	
	The unit is taken from the <b>Corrected volume flow unit</b>	
	parameter	
Density	Displays the density or specific density currently measured.	Positive floating-point number
	Dependency	
	The unit is taken from the <b>Density unit</b> parameter	
Reference density	Displays the density at the reference temperature.	Positive floating-point number
	Dependency	
	The unit is taken from the <b>Reference density unit</b> parameter	
Temperature	Displays the temperature currently measured.	Positive floating-point number
	Dependency	
	The unit is taken from the <b>Temperature unit</b> parameter	

#### 11.4.2 Totalizer

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 1 to n



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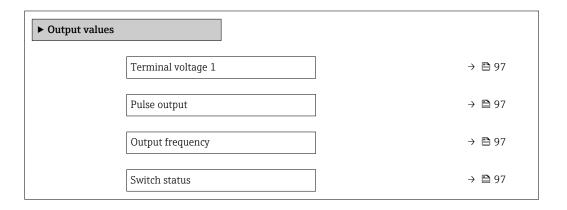
Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign process variable	-	Select process variable for totalizer.	<ul><li>Mass flow</li><li>Volume flow</li><li>Corrected volume flow</li></ul>	Mass flow
Totalizer value 1 to n	In the Assign process variable parameter one of the following options is selected:  Volume flow  Mass flow  Corrected volume flow  Total mass flow  Condensate mass flow  Energy flow  Heat flow difference	Displays the current totalizer counter value.	Signed floating-point number	0 kg
Totalizer status 1 to n	-	Displays the current totalizer status.	<ul><li>Good</li><li>Uncertain</li><li>Bad</li></ul>	_
Totalizer status (Hex) 1 to n	In <b>Target mode</b> parameter, the <b>Auto</b> option is selected.	Displays the current status value (hex) of the totalizer.	0 to 0xFF	_

## 11.4.3 Output values

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

#### Navigation

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



## Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Terminal voltage 1	-	Displays the current terminal voltage that is applied at the output.	0.0 to 50.0 V
Pulse output	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
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 to 1250 Hz
Switch status	The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.	Displays the current switch output status.	<ul><li>Open</li><li>Closed</li></ul>

# 11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu (→ 🖺 65)
- Advanced settings using the Advanced setup submenu (→ 🗎 76)

## 11.6 Performing a totalizer reset

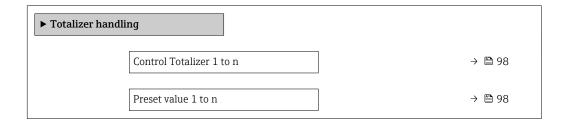
The totalizers are reset in the **Operation** submenu: Control Totalizer

Function scope of the "Control Totalizer" parameter

Options	Description
Totalize	The totalizer is started.
Reset + hold	The totaling process is stopped and the totalizer is reset to 0.
Preset + hold	The totaling process is stopped and the totalizer is set to its defined start value from the <b>Preset value 1 to n</b> parameter.
Stop totalizing option	Totalizing is stopped.

#### Navigation

"Operation" menu → Totalizer handling



#### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Control Totalizer 1 to n	In the Assign process variable parameter, one of the following options is selected:  Mass flow  Volume flow Corrected volume flow	Control totalizer value.	<ul><li>Totalize</li><li>Reset + hold</li><li>Preset + hold</li></ul>	Totalize
Preset value 1 to n	In the Assign process variable parameter one of the following options is selected:  Volume flow  Mass flow  Corrected volume flow  Total mass flow  Condensate mass flow  Energy flow  Heat flow difference	Specify start value for totalizer.	Signed floating-point number	0 kg
Reset all totalizers	-	Reset all totalizers to 0 and start.	<ul><li>Cancel</li><li>Reset + totalize</li></ul>	Cancel

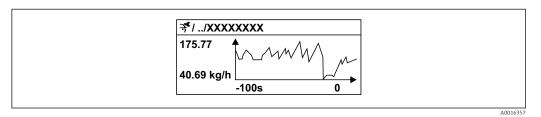
## 11.7 Showing data logging

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

Data logging is also available via:
Plant Asset Management Tool FieldCare → 🗎 53.

#### **Function range**

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



■ 17 Chart of a measured value trend

- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.
- If the length of the logging interval or the assignment of the process variables to the channels is changed, the content of the data logging is deleted.

#### **Navigation**

"Diagnostics" menu → Data logging

► Data logging		
	Assign channel 1	→ 🖺 100
	Assign channel 2	→ 🖺 100
	Assign channel 3	→ 🖺 100
	Assign channel 4	→ 🖺 100
	Logging interval	→ 🖺 100
	Clear logging data	→ 🖺 100
	▶ Display channel 1	
	▶ Display channel 2	

▶ Display channel 3

▶ Display channel 4

## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign channel 1	The <b>Extended HistoROM</b> 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>Density</li> <li>Reference density</li> <li>Temperature</li> <li>Electronic temperature</li> <li>Oscillation frequency</li> <li>Oscillation amplitude</li> <li>Oscillation damping</li> <li>Signal asymmetry</li> </ul>	Off
Assign channel 2	The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter.	Assign process variable to logging channel.	Picklist, see <b>Assign channel 1</b> parameter (→ 🖺 100)	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 process variable to logging channel.	Picklist, see <b>Assign channel 1</b> parameter (→ 🖺 100)	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 process variable to logging channel.	Picklist, see <b>Assign channel 1</b> parameter (→ 🖺 100)	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.	1.0 to 3 600.0 s	10.0 s
Clear logging data	The <b>Extended HistoROM</b> application package is available.	Clear the entire logging data.	<ul><li>Cancel</li><li>Clear data</li></ul>	Cancel

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## 12 Diagnostics and troubleshooting

## 12.1 General troubleshooting

For local display

Error	Possible causes	Solution
Local display dark and no output signals	Supply voltage does not match the value indicated on the nameplate.	Apply the correct supply voltage → 🖺 32.
Local display dark and no output signals	The polarity of the supply voltage is wrong.	Correct the polarity.
Local display dark and no output signals	No contact between connecting cables and terminals.	Check the connection of the cables and correct if necessary.
Local display dark and no output signals	Terminals are not plugged into the I/O electronics module correctly.	Check terminals.
Local display dark and no output signals	I/O electronics module is defective.	Order spare part → 🖺 129.
Local display is dark, but signal output is within the valid range	Display is set too bright or too dark.	<ul> <li>Set the display brighter by simultaneously pressing ± + €.</li> <li>Set the display darker by simultaneously pressing □ + €.</li> </ul>
Local display is dark, but signal output is within the valid range	The cable of the display module is not plugged in correctly.	Insert the plug correctly into the main electronics module and display module.
Local display is dark, but signal output is within the valid range	Display module is defective.	Order spare part → 🖺 129.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures
Text on local display appears in a foreign language and cannot be understood.	Incorrect operating language is configured.	1. Press □ + ⊕ for 2 s ("home position"). 2. Press □. 3. Set the desired language in the <b>Display language</b> parameter (→ □ 87).
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 →   129.</li> </ul>

#### For output signals

Error	Possible causes	Solution
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 🖺 129.
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Configuration error	Check and correct the parameter configuration.
Device measures incorrectly.	Configuration error or device is operated outside the application.	Check and correct parameter configuration.     Observe limit values specified in the "Technical Data".

#### For access

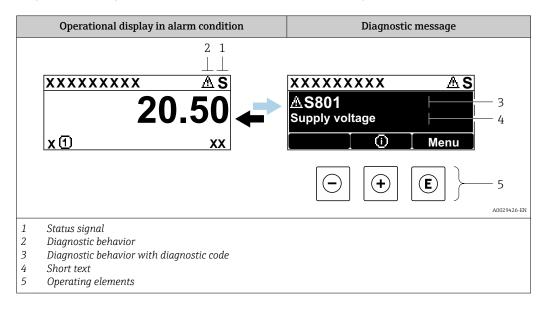
Error	Possible causes	Solution
No write access to parameters	Hardware write protection enabled	Set the write protection switch on main electronics module to the <b>OFF</b> position → 🖺 92.
No write access to parameters	Current user role has limited access authorization	1. Check user role → 🗎 51. 2. Enter correct customer-specific access code → 🗎 51.
No connection via PROFIBUS PA	PROFIBUS PA cable incorrectly terminated	Check terminating resistor .
No connection via service interface	Incorrect configuration of USB interface on PC or driver not installed correctly.	Observe the documentation for the Commubox.  FXA291: Document  "Technical Information"  TI00405C

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## 12.2 Diagnostic information on local display

#### 12.2.1 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
  - Via submenus → 🖺 122

#### Status signals

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

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

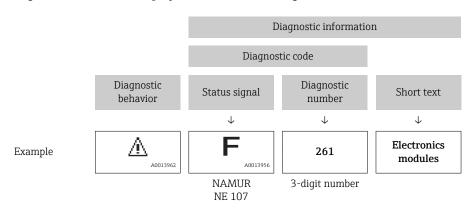
Symbol	Meaning
F	Failure A device error has occurred. The measured value is no longer valid.
С	Function check The device is in service mode (e.g. during a simulation).
S	Out of specification The device is operated: Outside its technical specification limits (e.g. outside the process temperature range)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

#### Diagnostic behavior

Symbol	Meaning
8	<ul> <li>Alarm</li> <li>Measurement is interrupted.</li> <li>Signal outputs and totalizers assume the defined alarm condition.</li> <li>A diagnostic message is generated.</li> <li>For local display with touch control: the background lighting changes to red.</li> </ul>
Δ	Warning Measurement is resumed. The signal outputs and totalizers are not affected. A diagnostic message is generated.

#### Diagnostic information

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



#### Operating elements

Key	Meaning
<b>(+)</b>	Plus key In a menu, submenu
	Opens the message about remedy information.
E	Enter key
	In a menu, submenu Opens the operating menu.

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

3.

 $| \ominus | + | \oplus |$ 

#### 12.2.2 Calling up remedial measures

A0029431-EN

- 18 Message about remedial measures
- 1 Diagnostic information
- 2 Short text
- 3 Service ID
- 4 Diagnostic behavior with diagnostic code
- 5 Operation time of occurrence
- 6 Remedial measures
- 1. The user is in the diagnostic message.

Press ± (① symbol).

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

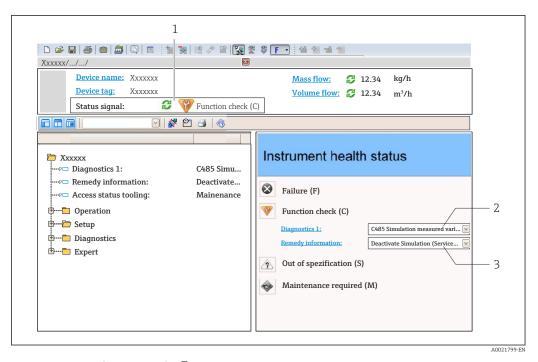
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or **Previous diagnostics** parameter.

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

## 12.3 Diagnostic information in FieldCare or DeviceCare

#### 12.3.1 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→ 🖺 103
- 2 Diagnostic information → 🖺 104
- 3 Remedy information with Service ID
- In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
  - Via parameter
  - Via submenu → 🖺 122

#### Status signals

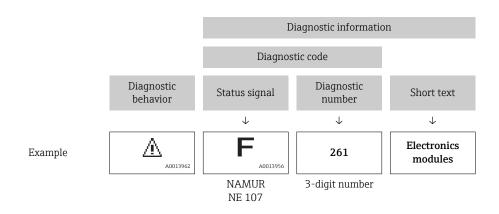
The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

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).
<u>^</u>	Out of specification The device is operated: Outside its technical specification limits (e.g. outside the process temperature range)
<b>&amp;</b>	Maintenance required Maintenance is required. The measured value is still valid.

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

#### 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.



#### 12.3.2 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.

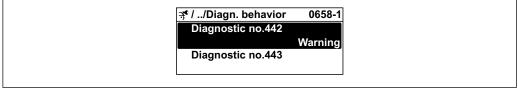
## 12.4 Adapting the diagnostic information

### 12.4.1 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.

Diagnostic behavior in accordance with Specification PROFIBUS PA Profile 3.02, Condensed Status.

 $\texttt{Expert} \rightarrow \texttt{System} \rightarrow \texttt{Diagnostic handling} \rightarrow \texttt{Diagnostic behavior}$ 



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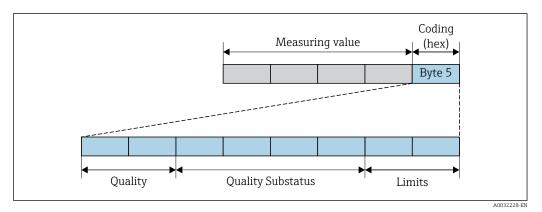
#### Available diagnostic behaviors

The following diagnostic behaviors can be assigned:

Diagnostic behavior	Description
Alarm	The device stops measurement. The totalizers assume the defined alarm condition. A diagnostic message is generated. For local display with touch control: the background lighting changes to red.
Warning	The device continues to measure. The measured value output via PROFIBUS and the totalizers are not affected. A diagnostic message is generated.
Logbook entry only	The device continues to measure. The diagnostic message is displayed only in the <b>Event logbook</b> submenu ( <b>Event list</b> submenu) and not in alternation with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

#### Displaying the measured value status

If the Analog Input, Digital Input and Totalizer function blocks are configured for cyclic data transmission, the device status is coded as per PROFIBUS PA Profile 3.02 Specification and transmitted along with the measured value to the PROFIBUS Master (Class 1) via the coding byte (byte 5). The coding byte is split into three segments: Quality, Quality Substatus and Limits.



Structure of the coding byte

The content of the coding byte depends on the configured failsafe mode in the particular function block. Depending on which failsafe mode has been configured, status information in accordance with PROFIBUS PA Profile Specification 3.02 is transmitted to the PROFIBUS Master (Class 1) via the coding byte .

#### Determining the measured value status and device status via the diagnostic behavior

When the diagnostic behavior is assigned, this also changes the measured value status and device status for the diagnostic information. The measured value status and device status depend on the choice of diagnostic behavior and on the group in which the diagnostic information is located.

The diagnostic information is grouped as follows:

- Diagnostic information pertaining to the sensor: diagnostic number 000 to 199
   → 109
- Diagnostic information pertaining to the electronics: diagnostic number 200 to 399
   → 

  109
- Diagnostic information pertaining to the configuration: diagnostic number 400 to 599
   → 110
- Diagnostic information pertaining to the process: diagnostic number 800 to 999
   → 

  110

Depending on the group in which the diagnostic information is located, the following measured value status and device status are firmly assigned to the particular diagnostic behavior:

Diagnostic information pertaining to the sensor: diagnostic number 000 to 199

Diagnostic behavior	Measured value status (fixed assignment)				Device diagnosis
(configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	(fixed assignment)
Alarm	BAD	Maintenance alarm	0x24 to 0x27	F (Failure)	Maintenance alarm
Warning	GOOD	Maintenance demanded	0xA8 to 0xAB	M (Maintenance)	Maintenance demanded
Logbook entry only	GOOD	ok	0x80 to 0x8E	_	_
Off	GOOD	UK	UXOU IU UXOE	_	_

Diagnostic information pertaining to the electronics: diagnostic number 200 to 399

Diagnostic number 200 to 301, 303 to 399

Diagnostic behavior	IV	leasured value sta	atus (fixed assig	Device diagnosis	
(configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	(fixed assignment)
Alarm	BAD	Maintenance	0x24 to 0x27	F	Maintenance
Warning	BAD	alarm	0.824 (0.0827	(Failure)	alarm
Logbook entry only	GOOD	ok	0x80 to 0x8E	-	-
Off	GOOD				

### Diagnostic information 302

Diagnostic behavior	N	leasured value sta	Device diagnosis		
(configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	(fixed assignment)
Alarm	BAD	Function check, local override	0x24 to 0x27	С	Function check
Warning	GOOD	Function check	0xBC to 0xBF	-	-

Diagnostic information 302 (device verification active) is output during internal or external Heartbeat verification.

- Signal status: Function check
- Choice of diagnostic behavior: alarm or warning (factory setting)

When Heartbeat verification starts, data logging is interrupted, the last valid measured value is output and the totalizers are stopped.

Diagnostic information	pertaining to the	configuration: diag	mostic number 400 to 599

Diagnostic behavior	Measured value status (fixed assignment)				
(configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	Device diagnosis (fixed assignment)
Alarm	BAD	Process related	0x28 to 0x2B	F (Failure)	Invalid process condition
Warning	UNCERTA IN	Process related	0x78 to 0x7B	S (Out of specification)	Invalid process condition
Logbook entry only	GOOD	GOOD ok	0x80 to 0x8E		
Off	GOOD	ÜK	OXOU TO OXOE	_	_

Diagnostic information pertaining to the process: diagnostic number 800 to 999

Diagnostic behavior	Measured value status (fixed assignment)				Davies dis sussis
(configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	Device diagnosis (fixed assignment)
Alarm	BAD	Process related	0x28 to 0x2B	F (Failure)	Invalid process condition
Warning	UNCERTA IN	Process related	0x78 to 0x7B	S (Out of specification)	Invalid process condition
Logbook entry only	GOOD	ok	0x80 to 0x8E	_	_
Off	GOOD	JOOD OK	OXOO TO OXOE		

# 12.5 Overview of diagnostic information

- The amount of diagnostic information and the number of measured variables affected increase if the measuring device has one or more application packages.
- In the case of some items of diagnostic information, the diagnostic behavior can be changed. Change the diagnostic information  $\rightarrow \triangleq 107$

# 12.5.1 Diagnostic of sensor

	Diagnostic	information	Remedy instructions	Influenced measured
No.	Short text			variables
022	Sensor temperature		1. Change main electronic module	Density     Maconflows
	_	_	2. Change sensor	<ul><li>Mass flow</li><li>Reference density</li></ul>
	Status signal	F		Corrected volume flow
	Diagnostic behavior	Alarm		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
046	Sensor limit exceeded		Inspect sensor     Check process condition	<ul><li>Density</li><li>Mass flow</li></ul>
	Status signal	S		<ul><li>Reference density</li><li>Corrected volume flow</li></ul>
	Diagnostic behavior	Warning		Volume flow

	No. Diagnostic information  Short text		Remedy instructions	Influenced measured
No.				variables
062	Sensor connection		Change main electronic module     Change sensor	<ul><li>Mass flow</li><li>Corrected volume flow</li></ul>
	Status signal	F		<ul><li>Volume flow</li></ul>
	Diagnostic behavior	Alarm		

	Diagnostic	information	Remedy instructions	Influenced measured
No.	. Short text			variables
082	Data storage		Change main electronic module     Change sensor	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal F	F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
083	Memory content		Restart device     Restore S-Dat data	<ul><li>Density</li><li>Empty pipe detection</li></ul>
Status signal	Status signal	F	3. Change sensor	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
140	Sensor signal		Check or change main electronics     Change sensor	<ul><li>Density</li><li>Mass flow</li></ul>
	Status signal	S		<ul><li>Reference density</li><li>Corrected volume flow</li></ul>
	Diagnostic behavior	Warning		Temperature

# 12.5.2 Diagnostic of electronic

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
242	Software incompatible		Check software     Flash or change main electronics	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F	module	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
252	Modules incompatible		Check electronic modules     Change I/O or main electronic module	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic	information	Remedy instructions	Influenced measured variables
No.	S	hort text		variables
261	Electronic modules		Restart device     Check electronic modules	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F	3. Change I/O Modul or main electronics	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
262	Module connection		Check module connections     Change electronic modules	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		Low flow cut off     Mass flow
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	s	hort text		variables
270	Main electronic failure		Change main electronic module	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Status</li> <li>Volume flow</li> </ul>

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
271	Main electronic failure		Restart device     Change main electronic module	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F	-	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	Si	hort text		variables
272	Main electronic failure		Restart device     Contact service	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
273	Main electronic failure		Emergency operation via display     Change main electronics	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
274	Main electronic failure		Unstable measurement  1. Change main electronics	<ul><li>Mass flow</li><li>Corrected volume flow</li></ul>
	Status signal	S		<ul><li>Volume flow</li></ul>
	Diagnostic behavior	Warning		

No.	Diagnostic information  No. Short text		Remedy instructions	Influenced measured variables
275	I/O module failure  Status signal  Diagnostic behavior	F Alarm	Change I/O module	<ul> <li>Density</li> <li>Empty pipe detection</li> <li>Low flow cut off</li> <li>Mass flow</li> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> </ul>
				<ul><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
276	I/O module failure		Restart device     Change I/O module	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
282	Data storage		Restart device     Contact service	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
283	Memory content		Transfer data or reset device     Contact service	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		Low flow cut off     Mass flow
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
302	Device verification active		Device verification active, please wait.	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	С		Low flow cut off     Mass flow
	Diagnostic behavior	Warning		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
311	Electronic failure		Transfer data or reset device     Contact service	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
311	Electronic failure		Maintenance required! 1. Do not perform reset	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	M	2. Contact service	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Warning		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
362	Main electronic failure		Change main electronic module     Change sensor	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

# 12.5.3 Diagnostic of configuration

No.	Diagnostic information  No. Short text		Remedy instructions	Influenced measured variables
410	Data transfer	1. Check connection 2. Retry data transfer	Check connection     Retry data transfer	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
412	Processing Download		Download active, please wait	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	С		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Warning		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
437	Configuration incompatible		Restart device     Contact service	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
438	Dataset		Check data set file     Check device configuration	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	M	3. Up- and download new configuration	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Warning		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	Short text			variables
442	Frequency output		Check process     Check frequency output settings	_
	Status signal	S		
	Diagnostic behavior	Warning		

No	Diagnostic information  No. Short text		Remedy instructions	Influenced measured variables
No.	31	nort text		
443	Pulse output		1. Check process	_
			2. Check pulse output settings	
	Status signal	S		
	Diagnostic behavior	Warning		

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
453	Flow override		Deactivate flow override	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	С		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Warning		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured variables
No.	SI	hort text		variables
482	FB not Auto/Cas		Set Block in AUTO mode	-
	Ctatus signal	E		
	Status signal	Г		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
484	Simulation failure mode  Status signal  Diagnostic behavior	C	Deactivate simulation	<ul> <li>Density</li> <li>Empty pipe detection</li> <li>Low flow cut off</li> <li>Mass flow</li> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	nort text		variables
	Simulation measured variable  Status signal  Diagnostic behavior	C Warning	Deactivate simulation	<ul> <li>Density</li> <li>Empty pipe detection</li> <li>Low flow cut off</li> <li>Mass flow</li> </ul>
	2.23.0000 20.0000			<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

No.	Diagnostic information  No. Short text		Remedy instructions	Influenced measured variables
492	Simulation frequency output  Status signal  Diagnostic behavior	C Warning	Deactivate simulation frequency output	<ul> <li>Density</li> <li>Empty pipe detection</li> <li>Low flow cut off</li> <li>Mass flow</li> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	s	hort text		variables
493	Simulation pulse output		Deactivate simulation pulse output	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	С		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Warning		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
494	Switch output simulation		Deactivate simulation switch output	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	С		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Warning		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
495	Simulation diagnostic event		Deactivate simulation	-
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured variables
No.	SI	hort text		variables
497	Simulation block output		Deactivate simulation	_
	Status signal	С		
	Diagnostic behavior	Warning		

# 12.5.4 Diagnostic of process

No.	Diagnostic information  No. Short text		Remedy instructions	Influenced measured variables
801	Supply voltage too low	c	Increase supply voltage	<ul><li>Density</li><li>Empty pipe detection</li><li>Low flow cut off</li></ul>
	Status signal Diagnostic behavior	Warning		<ul><li>Mass flow</li><li>Switch output status</li><li>Reference density</li></ul>
				<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
830	Sensor temperature too high		Reduce ambient temp. around the sensor housing	<ul><li>Density</li><li>Mass flow</li></ul>
	Status signal	S		<ul><li>Reference density</li><li>Corrected volume flow</li></ul>
	Diagnostic behavior	Warning		Volume flow

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
831	Sensor temperature too low		Increase ambient temp. around the sensor housing	<ul><li>Density</li><li>Mass flow</li></ul>
	Status signal	S		<ul><li>Reference density</li><li>Corrected volume flow</li></ul>
	Diagnostic behavior	Warning		Volume flow

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
832	Electronic temperature too hig	h	Reduce ambient temperature	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	S		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Warning		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
833	Electronic temperature too low Status signal Diagnostic behavior	S Warning	Increase ambient temperature	<ul> <li>Density</li> <li>Empty pipe detection</li> <li>Low flow cut off</li> <li>Mass flow</li> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
834	Process temperature too high		Reduce process temperature	<ul><li>Density</li><li>Mass flow</li></ul>
	Status signal	S		<ul><li>Reference density</li><li>Corrected volume flow</li></ul>
	Diagnostic behavior	Warning		<ul><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
835	Process temperature too low		Increase process temperature	<ul><li>Density</li><li>Mass flow</li></ul>
	Status signal	S		<ul><li>Reference density</li><li>Corrected volume flow</li></ul>
	Diagnostic behavior	Warning		<ul><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
842	Process limit		Low flow cut off active!  1. Check low flow cut off configuration	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	S		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Warning		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
862	Partly filled pipe		Check for gas in process     Adjust detection limits	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	S		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Warning		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
882	Input signal		Check input configuration     Check external device or process	<ul><li>Density</li><li>Mass flow</li></ul>
	Status signal	F	conditions	<ul><li>Reference density</li><li>Corrected volume flow</li></ul>
	Diagnostic behavior	Alarm		Volume flow

	Diagnostic information		Remedy instructions	Influenced measured
No.	s	hort text		variables
910	Tubes not oscillating		Check process conditions     Increase supply	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	F	3. Check main electronic or sensor	Low flow cut off     Mass flow
	Diagnostic behavior	Alarm		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
912	Medium inhomogeneous		Check process cond.     Increase system pressure	<ul><li>Density</li><li>Empty pipe detection</li></ul>
	Status signal	S		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Diagnostic behavior	Warning		<ul> <li>Switch output status</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	nort text		variables
913	Medium unsuitable		Check process conditions     Increase supply	<ul><li>Density</li><li>Mass flow</li></ul>
	Status signal	S	3. Check main electronic or sensor	<ul><li>Reference density</li><li>Corrected volume flow</li></ul>
	Diagnostic behavior	Warning		<ul> <li>Volume flow</li> </ul>

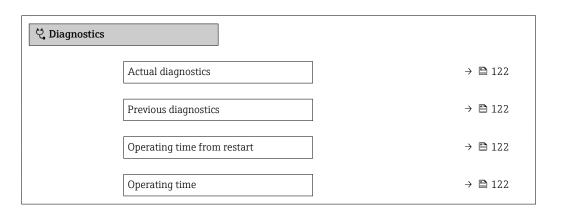
# 12.6 Pending diagnostic events

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 → 105
    - Via "FieldCare" operating tool → 🗎 107
    - Via "DeviceCare" operating tool → 🗎 107
- Other pending diagnostic events can be displayed in the **Diagnostic list** submenu  $\rightarrow \stackrel{\cong}{=} 122$

### **Navigation**

"Diagnostics" menu



### Parameter overview with brief description

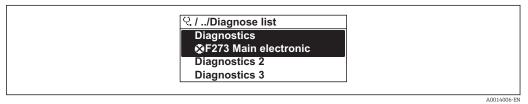
Parameter	Prerequisite	Description	User interface
Actual diagnostics	A diagnostic event has occurred.	Shows the current occured diagnostic event along with its diagnostic information.	Symbol for diagnostic behavior, diagnostic code and short message.
		If two or more messages occur simultaneously, the 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)

#### 12.7 Diagnostic list

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

### Navigation path

Diagnostics → Diagnostic list



■ 20 Taking the example of the local display

To call up the measures to rectify a diagnostic event:

- Via local display  $\rightarrow$  🗎 105

  - Via "DeviceCare" operating tool → 🗎 107

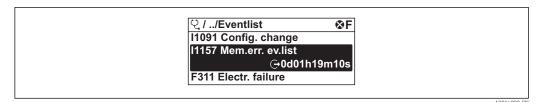
#### 12.8 Event logbook

### Reading out the event logbook

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

#### Navigation path

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



■ 21 Taking the example of the local display

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

The event history includes entries for:

- Diagnostic events → 🖺 110
- Information events  $\rightarrow$   $\blacksquare$  123

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

- Diagnostic event
  - ①: Occurrence of the event
  - 🕒: End of the event
- Information event
  - €: Occurrence of the event
- To call up the measures to rectify a diagnostic event:
- 💳 ∎ Via local display → 🖺 105
  - Via "FieldCare" operating tool → 🖺 107
  - Via "DeviceCare" operating tool → 🖺 107
- For filtering the displayed event messages  $\rightarrow \triangleq 123$

### 12.8.2 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)

### 12.8.3 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
11000	(Device ok)
I1079	Sensor changed
11089	Power on
11090	Configuration reset
I1091	Configuration changed

Info number	Info name
I1092	Trend data deleted
I1110	Write protection switch changed
I1111	Density adjust failure
I1137	Electronic changed
I1151	History reset
I1154	Reset terminal voltage min/max
I1155	Reset electronic temperature
I1156	Memory error trend
I1157	Memory error event list
I1185	Display backup done
I1186	Restore via display done
I1187	Settings downloaded with display
I1188	Display data cleared
I1189	Backup compared
I1209	Density adjustment ok
I1221	Zero point adjust failure
I1222	Zero point adjustment ok
I1227	Sensor emergency mode activated
I1228	Sensor emergency mode failed
I1256	Display: access status changed
I1264	Safety sequence aborted
I1335	Firmware changed
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1440	Main electronic module changed
I1442	I/O module changed
I1444	Device verification passed
I1445	Device verification failed
I1450	Monitoring off
I1451	Monitoring on
I1459	Failed: I/O module verification
I1461	Failed: Sensor verification
I1512	Download started
I1513	Download finished
I1514	Upload started
I1515	Upload finished
I1552	Failed: Main electronic verification
I1554	Safety sequence started
I1555	Safety sequence confirmed
I1556	Safety mode off

# 12.9 Resetting the measuring device

Using the **Device reset** parameter ( $\rightarrow \triangleq 88$ ) it is possible to reset the entire device configuration or some of the configuration to a defined state.

# 12.9.1 Function scope of the "Device reset" parameter

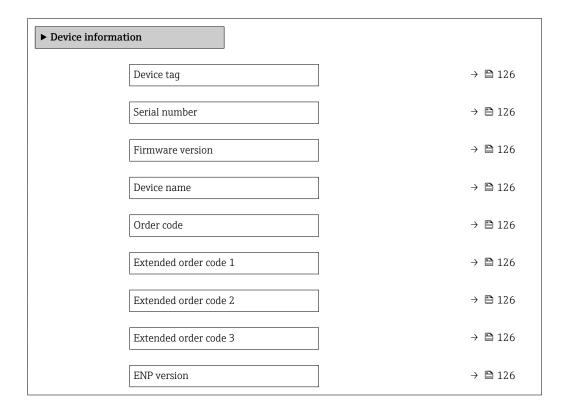
Options	Description
Cancel	No action is executed and the user exits the parameter.
To fieldbus defaults	Every parameter is reset to fieldbus default values.
To factory defaults	Every parameter is reset to its factory setting.
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting.  This option is not visible if no customer-specific settings have been ordered.
	1 The option is not reside in no customer specime sectangs have seen state as
Restart device	The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

## 12.10 Device information

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

## Navigation

"Diagnostics" menu  $\rightarrow$  Device information



# Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Device tag	Shows name of measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).	Promass
Serial number	Shows the serial number of the measuring device.	Max. 11-digit character string comprising letters and numbers.	-
Firmware version	Shows the device firmware version installed.	Character string in the format xx.yy.zz	-
Device name	Shows the name of the transmitter.  The name can be found on the nameplate of the transmitter.	Max. 32 characters such as letters or numbers.	Promass 200
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
PROFIBUS ident number	Displays the PROFIBUS identification number.	0 to FFFF	0x155F
Status PROFIBUS Master Config	Displays the status of the PROFIBUS Master configuration.	Active Not active	Not active

# 12.11 Firmware history

Release date	Firmwar e version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
05.2018	01.01.zz	Option 71	Original firmware	Operating Instructions	BA01828D/06/EN/ 01.18

- It is possible to flash the firmware to the current version or the previous version using the service interface.
- For the compatibility of the firmware version with the previous version, the installed device description files and operating tools, observe the information about the device in the "Manufacturer's information" document.
- The manufacturer's information is available:
  - $\blacksquare$  In the Download Area of the Endress+Hauser web site: www.endress.com  $\to$  Downloads
  - Specify the following details:
    - Product root: e.g. 8A2B
       The product root is the first part of the order code: see the nameplate on the device.
    - Text search: Manufacturer's information
    - Media type: Documentation Technical Documentation

# 13 Maintenance

## 13.1 Maintenance tasks

No special maintenance work is required.

## 13.1.1 Exterior cleaning

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

## 13.1.2 Interior cleaning

Observe the following points for CIP and SIP cleaning:

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

# 13.2 Measuring and test equipment

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

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

List of some of the measuring and testing equipment:  $\rightarrow \implies 132 \rightarrow \implies 134$ 

## 13.3 Endress+Hauser services

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

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

# 14 Repair

## 14.1 General notes

## 14.1.1 Repair and conversion concept

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

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

## 14.1.2 Notes for repair and conversion

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

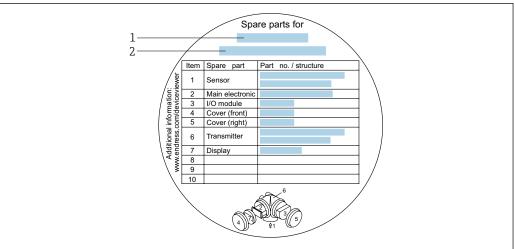
- ▶ Use only original Endress+Hauser spare parts.
- ► Carry out the repair according to the Installation Instructions.
- ▶ Observe the applicable standards, federal/national regulations, Ex documentation (XA) and certificates.
- ▶ Document every repair and each conversion and enter them into the *W@M* life cycle management database.

# 14.2 Spare parts

Some interchangeable measuring device components are listed on an overview sign in the connection compartment cover.

The spare part overview sign contains the following information:

- A list of the most important spare parts for the measuring device, including their ordering information.
- The URL for the *W@M Device Viewer* (www.endress.com/deviceviewer):
  All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.



Δ003223

- 22 Example for "Spare part overview sign" in connection compartment cover
- 1 Measuring device name
- 2 Measuring device serial number
- Measuring device serial number:
  - Is located on the device nameplate and the spare part overview sign.
  - Can be read out via the **Serial number** parameter (→ 🖺 126) in the **Device information** submenu.

## 14.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

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

### 14.4 Return

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

- 1. Refer to the website for more information: http://www.endress.com/support/return-material
- 2. Return the device if repairs or a factory calibration are required, or if the wrong device was ordered or delivered.

# 14.5 Disposal



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

### 14.5.1 Removing the measuring device

1. Switch off the device.

## **A** WARNING

### Danger to persons from process conditions.

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

# 14.5.2 Disposing of the measuring device

### **WARNING**

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

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

Observe the following notes during disposal:

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

# 15 Accessories

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

# 15.1 Device-specific accessories

### 15.1.1 For the transmitter

Accessories	Description	
Promass 200 transmitter	Transmitter for replacement or storage. Use the order code to define the following specifications:  Approvals Output Display/operation Housing Software Installation Instructions EA00104D  (Order number: 8X2CXX)	
Remote display FHX50	FHX50 housing for accommodating a display module .  FHX50 housing suitable for: SD02 display module (push buttons) SD03 display module (touch control) Length of connecting cable: up to max. 60 m (196 ft) (cable lengths available for order: 5 m (16 ft), 10 m (32 ft), 20 m (65 ft), 30 m (98 ft))  The measuring device can be ordered with the FHX50 housing and a display module. The following options must be selected in the separate order codes: Order code for measuring device, feature 030: Option L or M "Prepared for FHX50 display" Order code for FHX50 housing, feature 050 (device version): Option A "Prepared for FHX50 display" Order code for FHX50 housing, depends on the desired display module in feature 020 (display, operation): Option C: for an SD02 display module (push buttons) Option E: for an SD03 display module (touch control)  The FHX50 housing can also be ordered as a retrofit kit. The measuring device display module is used in the FHX50 housing. The following options must be selected in the order code for the FHX50 housing: Feature 050 (measuring device version): option B "Not prepared for FHX50 display" Feature 020 (display, operation): option A "None, existing displayed used"  Special Documentation SD01007F (Order number: FHX50)	

Accessories	Description
Overvoltage protection for 2-wire devices	Ideally, the overvoltage protection module should be ordered directly with the device. See product structure, feature 610 "Accessory mounted", option NA "Overvoltage protection". Separate order necessary only if retrofitting.
	<ul> <li>OVP10: For 1-channel devices (feature 020, option A):</li> <li>OVP20: For 2-channel devices (feature 020, options B, C, E or G)</li> </ul>
	Special Documentation SD01090F
	(Order number OVP10: 71128617) (Order number OVP20: 71128619)
Protective cover	Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight or extreme cold in winter.
	Special Documentation SD00333F
	(Order number: 71162242)

# 15.1.2 For the sensor

Accessories	Description
Heating jacket	Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids.
	If using oil as a heating medium, please consult with Endress+Hauser.
	■ If ordered together with the measuring device:
	order code for "Enclosed accessories"
	<ul><li>Option RB "heating jacket, G 1/2" internal thread"</li></ul>
	<ul> <li>Option RD "Heating jacket, NPT 1/2" internal thread"</li> </ul>
	If ordered subsequently:
	Use the order code with the product root DK8003.
	Special Documentation SD02173D
Sensor holder	For wall, tabletop and pipe mounting.
	Order number: 71392563

# 15.2 Communication-specific accessories

Accessories	Description
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.  Technical Information TI405C/07
Fieldgate FXA42	Is used to transmit the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices  Technical Information TI01297S Operating Instructions BA01778S Product page: www.endress.com/fxa42

Field Xpert SMT70	The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.  This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.
	<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 devices:  Choice of measuring devices for industrial requirements  Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy.  Graphic illustration of the calculation results  Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.  Applicator is available:  Via the Internet: https://portal.endress.com/webapp/applicator  As a downloadable DVD for local PC installation.
W@M	W@M Life Cycle Management Improved productivity with information at your fingertips. Data relevant to a plant and its components is generated from the first stages of planning and during the asset's complete life cycle.  W@M Life Cycle Management is an open and flexible information platform with online and on-site tools. Instant access for your staff to current, in-depth data shortens your plant's engineering time, speeds up procurement processes and increases plant uptime.  Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit www.endress.com/lifecyclemanagement
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.  Operating Instructions BA00027S and BA00059S
DeviceCare	Tool to connect and configure Endress+Hauser field devices.  Innovation brochure IN01047S

# 15.4 System components

Accessories	Description	
Memograph M graphic data manager	The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.	
	<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 gasteam 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>	

# 16 Technical data

# 16.1 Application

- The measuring device is intended only for the flow measurement of liquids and gases.
- The measuring device is intended only for the flow measurement of liquids with a minimum conductivity of 20  $\mu$ S/cm.

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

To ensure that the device remains in proper operating condition for its service life, use the measuring device only for media against which the process-wetted materials are sufficiently resistant.

# 16.2 Function and system design

Measuring principle	Mass flow measurement based on the Coriolis measuring principle	
Measuring system	The device consists of a transmitter and a sensor.	
	The device is available as a compact version: The transmitter and sensor form a mechanical unit.	
	For information on the structure of the device $\rightarrow \blacksquare 13$	

# **16.3** Input

#### Measured variable

#### Direct measured variables

- Mass flow
- Density
- Temperature

#### Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

### Measuring range

### Measuring range for liquids

DN		Measuring range full scal	e values $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$
[mm]	[in]	[kg/h]	[lb/min]
1	1/24	0 to 20	0 to 0.735
2	1/12	0 to 100	0 to 3.675
4	1/8	0 to 450	0 to 16.54

## Measuring range for gases

The full scale value depends on the density and the sound velocity of the gas used and can be calculated with the formula below:

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

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 $\dot{m}_{ max(F)}$	
$ ho_{G}$	Gas density in [kg/m³] at operating conditions	
х	Constant dependent on nominal diameter	
$c_G$	Sound velocity (gas) [m/s]	
d <sub>i</sub>	Measuring tube internal diameter [m]	

DN		x	
[mm]	[in]	[kg/m³]	
1	1/24	32	
2	1/12	32	
4	1/8	32	

### Calculation example for gas

- Sensor: Promass A, DN 2
- Gas: Air with a density of 11.9 kg/m³ (at 20 °C and 10 bar)
- Measuring range (liquid): 100 kg/h
- $x = 32 \text{ kg/m}^3 \text{ (for Promass A DN 2)}$

Maximum possible full scale value:

 $\dot{m}_{max(G)}=\dot{m}_{max(F)}\cdot\rho_G$  : x = 100 kg/h  $\cdot$  11.9 kg/m³ : 32 kg/m³ = 37.2 kg/h

### Recommended measuring range



Flow limit → 🗎 148

#### Operable flow range

Over 1000:1.

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

## Input signal

### External measured values

To increase the accuracy of certain measured variables or to calculate the corrected volume flow for gases, the automation system can continuously write the operating pressure to the measuring device. Endress+Hauser recommends the use of a pressure measuring device for absolute pressure, e.g. Cerabar M or Cerabar S.



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

- Mass flow
- Corrected volume flow

Digital communication

The measured values are written from the automation system to the measuring device via PROFIBUS PA.

# 16.4 Output

### Output signal

### Pulse/frequency/switch output

Function	Can be set to pulse, frequency or switch output		
Version	Passive, open collector		
Maximum input values	■ DC 35 V ■ 50 mA		
Voltage drop	<ul><li>For ≤ 2 mA: 2 V</li><li>For 10 mA: 8 V</li></ul>		
Residual current	≤ 0.05 mA		
Pulse output	Pulse output		
Pulse width	Adjustable: 5 to 2 000 ms		
Maximum pulse rate	100 Impulse/s		
Pulse value	Adjustable		
Assignable measured variables	<ul><li>Mass flow</li><li>Volume flow</li><li>Corrected volume flow</li></ul>		
Frequency output			
Output frequency	Adjustable: 0 to 1000 Hz		
Damping	Adjustable: 0 to 999 s		
Pulse/pause ratio	1:1		

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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>
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Adjustable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	<ul> <li>Off</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit value</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> </ul>

### **PROFIBUS PA**

PROFIBUS PA	In accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), galvanically isolated
Data transmission	31.25 kbit/s
<b>Current consumption</b>	16 mA
Permitted supply voltage	9 to 32 V
Bus connection	With integrated reverse polarity protection

Signal on alarm

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

## Pulse/frequency/switch output

Pulse output		
Failure mode	Choose from:  • Actual value  • No pulses	
Frequency output		
Failure mode	Choose from:  Actual value  O Hz  Defined value: 0 to 1250 Hz	
Switch output		
Failure mode	Choose from:  Current status  Open Closed	

### **PROFIBUS PA**

Status and alarm messages	Diagnostics in accordance with PROFIBUS PA Profile 3.02
Failure current FDE (Fault Disconnection Electronic)	0 mA

# Local display

Plain text display	With information on cause and remedial measures
Backlight	Additionally for device version with SD03 local display: red lighting indicates a device error.



Status signal as per NAMUR recommendation NE 107

## Interface/protocol

- Via digital communication: PROFIBUS PA
- Via service interface CDI service interface

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

Low flow cut off

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

Galvanic isolation

All outputs are galvanically isolated from one another.

## Protocol-specific data

Manufacturer ID	0x11	
Ident number	0x155F	
Profile version	3.02	
Device description files (GSD, DTM, DD)	Information and files under:  www.endress.com www.profibus.org	
Supported functions	<ul> <li>Identification &amp; Maintenance         Simple device identification via control system and nameplate</li> <li>PROFIBUS upload/download         Reading and writing parameters is up to ten times faster with PROFIBUS upload/download</li> <li>Condensed status         Simplest and self-explanatory diagnostic information by categorizing diagnostic messages that occur</li> </ul>	
Configuration of the device address	<ul> <li>DIP switches on the I/O electronics module</li> <li>Local display</li> <li>Via operating tools (e. g. FieldCare)</li> </ul>	
System integration	For information on system integration, see .→   Cyclic data transmission  Block model  Description of the modules	

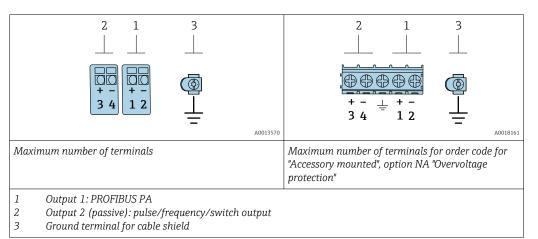
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# 16.5 Power supply

#### Terminal assignment

#### **Transmitter**

Connection version for PROFIBUS PA, pulse/frequency/switch output



Order code for "Output"	Terminal numbers			
	Output 1		Output 2	
	1 (+)	2 (-)	3 (+)	4 (-)
Option G 1) 2)	PROFIBUS PA		Pulse/frequency/switch output (passive)	

- 1) Output 1 must always be used; output 2 is optional.
- 2) PROFIBUS PA with integrated reverse polarity protection.

## Supply voltage

### Transmitter

An external power supply is required for each output.

The following supply voltage values apply for the outputs available:

Order code for "Output"	Minimum terminal voltage	Maximum terminal voltage
Option G: PROFIBUS PA, pulse/frequency/switch output	≥ DC 9 V	DC 32 V

## Power consumption

### Transmitter

Order code for "Output; input"	Maximum power consumption
Option G: PROFIBUS PA, pulse/frequency/switch output	<ul><li>Operation with output 1: 512 mW</li><li>Operation with output 1 and 2: 2512 mW</li></ul>

### Current consumption

#### **PROFIBUS PA**

16 mA

### Power supply failure

- Totalizers stop at the last value measured.
- Depending on the device version, the configuration is retained in the device memoryor in the pluggable data memory (HistoROM DAT).
- Error messages (incl. total operated hours) are stored.

Electrical connection	→ 🗎 32
Potential equalization	→ 🖺 34
Terminals	<ul> <li>For device version without integrated overvoltage protection: plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm<sup>2</sup> (20 to 14 AWG)</li> <li>For device version with integrated overvoltage protection: screw terminals for wire cross-sections 0.2 to 2.5 mm<sup>2</sup> (24 to 14 AWG)</li> </ul>
Cable entries	<ul> <li>Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)</li> <li>Thread for cable entry:</li> <li>NPT ½"</li> <li>G ½"</li> </ul>
Cable specification	→ <b>2</b> 9

### Overvoltage protection

The device can be ordered with integrated overvoltage protection for diverse approvals: *Order code for "Accessory mounted", option NA "Overvoltage protection"* 

Input voltage range	Values correspond to supply voltage specifications $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
Resistance per channel	$2 \cdot 0.5 \Omega$ max.
DC sparkover voltage	400 to 700 V
Trip surge voltage	< 800 V
Capacitance at 1 MHz	< 1.5 pF
Nominal discharge current (8/20 μs)	10 kA
Temperature range	-40 to +85 °C (-40 to +185 °F)

- 1) The voltage is reduced by the amount of the internal resistance  $I_{min} \cdot R_i$
- Depending on the temperature class, restrictions apply to the ambient temperature for device versions with overvoltage protection .
- For detailed information on the temperature tables, see the "Safety Instructions" (XA) for the device.

# 16.6 Performance characteristics

# Reference operating conditions

- Error limits based on ISO 11631
- Water with +15 to +45 °C (+59 to +113 °F) at 2 to 6 bar (29 to 87 psi)
- Specifications as per calibration protocol
- Accuracy based on accredited calibration rigs that are traced to ISO 17025.
- To obtain measured errors, use the *Applicator* sizing tool  $\rightarrow \triangleq 134$

Maximum measured error

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

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### Base accuracy

i

Mass flow and volume flow (liquids)

 $\pm 0.10$  % o.r.

Mass flow (gases)

±0.35 % o.r.

Density (liquids)

Under reference conditions	Standard density calibration 1)	Wide-range Density specification <sup>2) 3)</sup>
[g/cm³]	[g/cm³]	[g/cm³]
±0.0005	±0.02	±0.002

- 1) Valid over the entire temperature and density range
- Valid range for special density calibration: 0 to 2 g/cm<sup>3</sup>, +5 to +80 °C (+41 to +176 °F)
- 3) Order code for "Application package", option EE "Special density"

### **Temperature**

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

### Zero point stability

Standard version: order code for "Measuring tube mat., wetted surface", option BB, BF, HA, SA

DN		Zero point stability		
[mm]	[in]	[kg/h]	[lb/min]	
1	1/24	0.0010	0.000036	
2	1/12	0.0050	0.00018	
4	1/8	0.0200	0.00072	

High-pressure version: order code for "Measuring tube mat., wetted surface", option HB

DN		Zero point stability		
[mm]	[mm] [in]		[lb/min]	
1	1/24	0.0016	0.0000576	
2	1/12	0.0080	0.000288	
4	1/8	0.0320	0.001152	

### Flow values

Flow values as turndown parameter 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]
1	20	2	1	0.4	0.2	0.04
2	100	10	5	2	1	0.2
4	450	45	22.5	9	4.5	0.9

#### 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]
1/24	0.735	0.074	0.037	0.015	0.007	0.001
1/12	3.675	0.368	0.184	0.074	0.037	0.007
1/8	16.54	1.654	0.827	0.331	0.165	0.033

### Accuracy of outputs

The outputs have the following base accuracy specifications.

Pulse/frequency output

o.r. = of reading

Accuracy	Max. ±100 ppm o.r.
	F F

Repeatability

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

### Base repeatability



Page 145 Design fundamentals → 145

Mass flow and volume flow (liquids)

±0.05 % o.r.

Mass flow (gases)

±0.15 % o.r.

Density (liquids)

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

*Temperature* 

 $\pm 0.25$  °C  $\pm 0.0025$  · T °C ( $\pm 0.45$  °F  $\pm 0.0015$  · (T-32) °F)

### Response time

- The response time depends on the configuration (damping).
- ullet Response time in the event of erratic changes in the measured variable: After 500 ms o95 % of full scale value

### Influence of ambient temperature

### Pulse/frequency output

o.r. = of reading

Temperature coefficient	Max. ±100 ppm o.r.
-------------------------	--------------------

Influence of medium temperature

#### Mass flow and volume flow

o.f.s. = of full scale value

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

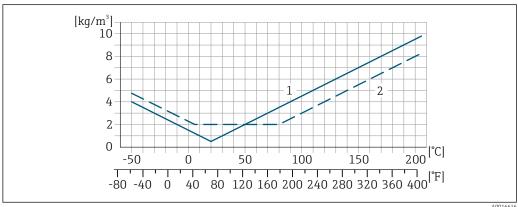
The effect is reduced if zero point adjustment is performed at process temperature.

#### Density

When there is a difference between the density calibration temperature and the process temperature, the typical measured error of the sensor is  $\pm 0.00005 \text{ g/cm}^3 \text{ /°C } (\pm 0.000025 \text{ g/cm}^3 \text{ /°F})$ . Field density calibration is possible.

# Wide-range density specification (special density calibration)

If the process temperature is outside the valid range ( $\rightarrow \equiv 142$ ) the measured error is  $\pm 0.00005$  g/cm<sup>3</sup> /°C ( $\pm 0.000025$  g/cm<sup>3</sup> /°F)



A0016616

- Field density calibration, for example at +20  $^{\circ}$ C (+68  $^{\circ}$ F)
- Special density calibration

Influence of medium pressure

A difference between the calibration pressure and process pressure does not affect accuracy.

Design fundamentals

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

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

MeasValue = measured value; ZeroPoint = zero point stability

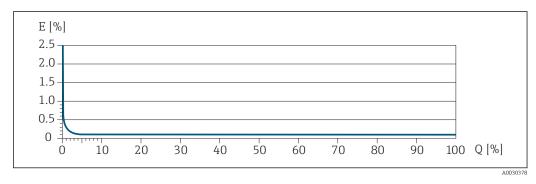
Calculation of the maximum measured error as a function of the flow rate

Flow rate	Maximum measured error in % o.r.
$\geq \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$	± BaseAccu
A0021332	
< ZeroPoint · 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.
$\geq \frac{4/\cancel{5} \cdot \text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$	± ½ · BaseAccu
A0021341	
$<\frac{\sqrt[4]{3} \cdot \text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$	$\pm \frac{2}{3} \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$
A0021342	A0021344

#### Example for maximum measured error



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

# 16.7 Installation

Installation conditions

→ 🖺 20

#### 16.8 Environment

Ambient temperature range

## 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

 $-40 \text{ to } +80 \,^{\circ}\text{C} \, (-40 \text{ to } +176 \,^{\circ}\text{F}), \text{ preferably at } +20 \,^{\circ}\text{C} \, (+68 \,^{\circ}\text{F})$ 

Climate class

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

#### Degree of protection

#### Transmitter

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

#### Sensor

IP66/67, type 4X enclosure

#### Connector

IP67, only in screwed situation

#### Vibration resistance

- Oscillation, sinusoidal, following IEC 60068-2-6
  - 2 to 8.4 Hz, 3.5 mm peak
  - 8.4 to 2000 Hz, 1 g peak
- Oscillation, broadband noise following IEC 60068-2-64
  - 10 to 200 Hz,  $0.003 \, q^2/Hz$
  - 200 to 2 000 Hz, 0.001 q<sup>2</sup>/Hz
  - Total: 1.54 g rms

#### Shock resistance

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

Shock resistance

Shock due to rough handling following IEC 60068-2-31

#### Interior cleaning

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

#### **Options**

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

## Electromagnetic compatibility (EMC)

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



Details are provided in the Declaration of Conformity.

#### 16.9 **Process**

Medium temperature range

 $-50 \text{ to } +205 ^{\circ}\text{C} (-58 \text{ to } +401 ^{\circ}\text{F})$ 

Density

0 to  $2000 \text{ kg/m}^3$  (0 to 125 lb/cf)

#### Pressure-temperature ratings



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

## 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 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.



🚹 High-pressure devices are always fitted with a rupture disk: order code for "Measuring tube mat., wetted surface", option HB

#### Burst pressure of the sensor housing

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]
1	1/24	220	3 190
2	1/12	140	2 0 3 0
4	1/8	105	1520

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 10 to 15 bar (145 to 217.5 psi)can be used (order code for "Sensor option", option CA "rupture disk").

#### Drain connection for rupture disk

To allow any escaping medium to drain in a controlled manner in the event of an error, an optional drain connection can be ordered in addition to the rupture disk.

The function of the rupture disk is not compromised in any way.

#### 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  $\rightarrow \stackrel{ riangle}{=} 137$
- 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  $\rightarrow \triangleq 137$

Pressure loss

System pressure

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# 16.10 Mechanical construction

Design, dimensions



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

Weight

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

# Weight in SI units

DN	Weight [kg]	
[mm]	Order code for "Housing", option C "GT20 dual compartment, aluminum, coated, compact"	Order code for "Housing", option B "GT18 dual compartment, 316L, compact"
1	5.5	8.2
2	7.1	9.8
4	9	11.7

# Weight in US units

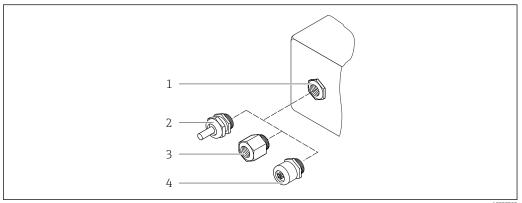
DN	Weight [lbs]	
[in]	Order code for "Housing", option C "GT20 dual compartment, aluminum, coated, compact"	Order code for "Housing", option B "GT18 dual compartment, 316L, compact"
1/24	12	18
1/12	16	22
1/8	20	26

#### Materials

# Transmitter housing

- Order code for "Housing", option B "Compact, stainless": Stainless steel CF-3M (316L, 1.4404)
- Order code for "Housing", option C "Compact, aluminum coated": Aluminum, AlSi10Mg, coated
- Window material: glass

# Cable entries/cable glands



A002835

■ 23 Possible cable entries/cable glands

- 1 Female thread  $M20 \times 1.5$
- 2 Cable gland M20 × 1.5
- 3 Adapter for cable entry with female thread G ½" or NPT ½"
- 4 Device plugs

Order code for "Housing", option B "GT18 dual compartment, 316L"

Cable entry/cable gland	Type of protection	Material
Cable gland M20 × 1.5	<ul> <li>Non-Ex</li> <li>Ex ia</li> <li>Ex ic</li> <li>Ex nA</li> <li>Ex tb</li> </ul>	Stainless steel ,1.4404
Adapter for cable entry with female thread G ½"	For non-Ex and Ex (except for CSA Ex d/XP)	Stainless steel, 1.4404 (316L)
Adapter for cable entry with female thread NPT ½"	For non-Ex and Ex	

Order code for "Housing", option C "GT20 dual compartment, aluminum coated"

Cable entry/cable gland	Type of protection	Material
Cable gland M20 × 1.5	<ul><li>Non-Ex</li><li>Ex ia</li><li>Ex ic</li></ul>	Plastic
	Adapter for cable entry with female thread G ½"	Nickel-plated brass
Adapter for cable entry with female thread NPT ½"	For non-Ex and Ex (except for CSA Ex d/XP)	Nickel-plated brass
Thread NPT ½" via adapter	For non-Ex and Ex	

# Device plug

Electrical connection	Material
Plug M12x1	<ul> <li>Socket: stainless steel, 1.4401/316</li> <li>Contact housing: plastic, PUR, black</li> <li>Contacts: metal, CuZn, gold-plated</li> <li>Threaded connection seal: NBR</li> </ul>

#### Sensor housing

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

#### Measuring tubes

Order code for "Measuring tube mat., wetted surface", option BB, BF, SA Stainless steel, 1.4435 (316/316L)

Order code for "Measuring tube mat., wetted surface", option HA, HB, HC, HD Alloy C22, 2.4602 (UNS N06022)

## **Process connections**

Order code for "Measuring tube mat., wetted surface", option SA

VCO coupling	Stainless steel, 1.4404 (316/316L)
G¼", G½" female thread	Stainless steel, 1.4404 (316/316L)
NPT1/4", NPT1/2" female thread	Stainless steel, 1.4404 (316/316L)
Tri-Clamp½"	Stainless steel, 1.4435 (316L)
Fixed flange EN 1092-1, ASME B16.5, JIS B2220	Stainless steel, 1.4404 (316/316L)

Order code for "Measuring tube mat., wetted surface", option BB, BF

VCO coupling	Stainless steel, 1.4404 (316/316L)
Tri-Clamp½"	Stainless steel, 1.4435 (316L)

Order code for "Measuring tube mat., wetted surface", option HC, HD

VCO coupling	Alloy C22, 2.4602 (UNS N06022)
Tri-Clamp½"	Alloy C22, 2.4602 (UNS N06022)

Order code for "Measuring tube mat., wetted surface", option HA

VCO coupling	Alloy C22, 2.4602 (UNS N06022)	
G¼", G½" female thread Alloy C22, 2.4602 (UNS N06022)		
NPT1/4", NPT1/2" female thread	1/2" female Alloy C22, 2.4602 (UNS N06022)	
Fixed flange EN 1092-1, ASME B16.5, JIS B2220	Alloy C22, 2.4602 (UNS N06022)	
Lap joint flange EN 1092-1, ASME B16.5, JIS B2220	Stainless steel, 1.4301 (F304), wetted parts Alloy C22, 2.4602 (UNS N06022)	

Order code for "Measuring tube mat., wetted surface", option HB (high-pressure option)

VCO coupling	Alloy C22, 2.4602 (UNS N06022)
G¼", G½" female thread	Alloy C22, 2.4602 (UNS N06022)

NPT¼", NPT½" female thread	Alloy C22, 2.4602 (UNS N06022)
Fixed flange EN 1092-1, ASME B16.5, JIS B2220	Stainless steel, 1.4404 (316/316L); Alloy C22, 2.4602 (UNS N06022)



Process connections → 152

#### Seals

Welded process connections without internal seals

#### Accessories

Sensor holder

Stainless steel, 1.4404 (316L)

#### Heating jacket

- Heating jacket housing: stainless steel, 1.4571 (316Ti)
- NPT adapter ½": stainless steel, 1.4404 (316)
- G½" adapter: stainless steel, 1.4404

Protective cover

Stainless steel, 1.4404 (316L)

Remote display FHX50

Housing material:

- Plastic PBT
- Stainless steel CF-3M (316L, 1.4404)

#### Process connections

- Fixed flange connections:
  - EN 1092-1 (DIN 2501) flange
  - EN 1092-1 (DIN 2512N) flange
  - ASME B16.5 flange
  - JIS B2220 flange
- Clamp connections:

Tri-Clamp (OD tubes), DIN 11866 series C

- VCO connections:
  - 4-VCO-4
- Female thread:
  - Cylindrical female thread BSPP (G) in accordance with ISO 228-1



Process connection materials  $\rightarrow = 151$ 

#### Surface roughness

All data relate to parts in contact with fluid. The following surface roughness quality can be ordered.

- Not polished
- $Ra_{max} = 0.76 \mu m$  (30  $\mu in$ ) mechanically polished
- $Ra_{max} = 0.38 \mu m$  (15  $\mu in$ ) mechanically polished

# 16.11 Operability

#### Languages

Can be operated in the following languages:

Via local display:

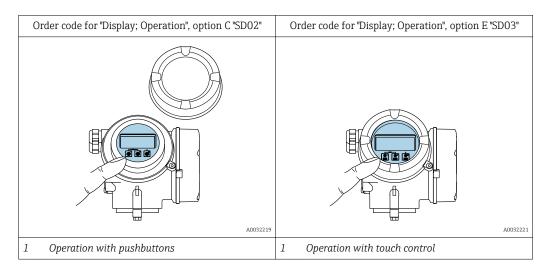
English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Swedish, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech

Via "FieldCare" operating tool:
 English, German, French, Spanish, Italian, Chinese, Japanese

#### Local operation

#### Via display module

Two display modules are available:



#### Display elements

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

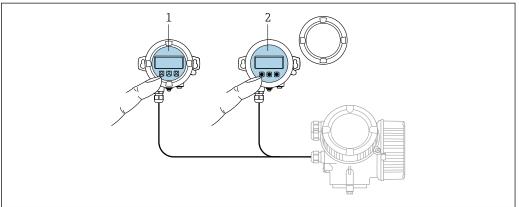
# Operating elements

- lacksquare Operation with 3 push buttons with open housing: lacksquare, lacksquare
- External operation via touch control (3 optical keys) without opening the housing: ±,
   □, □
- $\ \ \, \bullet$  Operating elements also accessible in the various zones of the hazardous area

#### Additional functionality

- Data backup function
- The device configuration can be saved in the display module.
- Data comparison function
  - The device configuration saved in the display module can be compared to the current device configuration.
- Data transfer function
  - The transmitter configuration can be transmitted to another device using the display module.

# Via remote display FHX50



A003221

#### ■ 24 FHX50 operating options

- 1 SD02 display and operating module, push buttons: cover must be opened for operation
- 2 SD03 display and operating module, optical buttons: operation possible through cover glass

# Display and operating elements

The display and operating elements correspond to those of the display module .

Remote operation	→ ■ 52	
Service interface	→ 🖺 53	
	16.12 Certificates and approvals	
	Currently available certificates and approvals can be called up via the product configurator.	
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.	
C-Tick symbol	The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".	
Ex approval	The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.	
Sanitary compatibility	<ul> <li>3-A approval</li> <li>Only devices with the order code for "Additional approval", option LP "3A" have</li> <li>3-A approval.</li> </ul>	

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• Food Contact Materials Regulation (EC) 1935/2004

■ FDA

# Pharmaceutical compatibility

- FDA
- USP Class VI
- TSE/BSE Certificate of Suitability

#### Certification PROFIBUS

#### **PROFIBUS** interface

The measuring device is certified and registered by the PNO (PROFIBUS User Organization Organization). The measuring system meets all the requirements of the following specifications:

- Certified in accordance with PROFIBUS PA Profile 3.02
- The device can also be operated with certified devices of other manufacturers (interoperability)

# Other standards and guidelines

#### ■ EN 60529

Degrees of protection provided by enclosures (IP code)

■ IEC/EN 60068-2-6

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

■ IEC/EN 60068-2-31

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

■ EN 61010-1

Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements

■ IEC/EN 61326

Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).

■ IEC 61508

Functional safety of electrical/electronic/programmable electronic safety-related systems

■ NAMUR NE 21

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

■ NAMUR NE 32

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

■ NAMUR NE 43

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

■ NAMUR NE 53

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

■ NAMUR NE 105

Specifications for integrating fieldbus devices in engineering tools for field devices

■ NAMUR NE 107

Self-monitoring and diagnosis of field devices

■ NAMUR NE 131

Requirements for field devices for standard applications

■ NAMUR NE 132

Coriolis mass meter

# 16.13 Application packages

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

The application packages can be ordered with the device or subsequently from Endress+Hauser. Detailed information on the order code in question is available from your

local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.



Detailed information on the application packages: Special Documentation for the device  $\rightarrow \implies 157$ 

#### Diagnostics functions

Package	Description	
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.	
	<ul> <li>Data logging (line recorder):</li> <li>Memory capacity for up to 1000 measured values is activated.</li> <li>250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user.</li> <li>Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server.</li> </ul>	

## Heartbeat Technology

Package	Description
Heartbeat Verification	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.

## Special density

Package	Description
Special density	Many applications use density as a key measured value for monitoring quality or controlling processes. The device measures the density of the fluid as standard and makes this value available to the control system.  The "Special Density" application package offers high-precision density measurement over a wide density and temperature range particularly for applications subject to varying process conditions.

# 16.14 Accessories



Overview of accessories available for order  $\rightarrow \triangleq 132$ 

# Supplementary documentation



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

- *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from nameplate
- *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2D matrix code (QR code) on the nameplate

# Standard documentation Brief Operating Instructions

# *Brief Operating Instructions for the sensor*

Measuring device	Documentation code
Proline Promass A	KA01282D

# Brief Operating Instructions for transmitter

Measuring device	Documentation code
Proline Promass 200	KA01269D

## **Technical Information**

Measuring device	Documentation code
Promass A 200	TI01380D

Supplementary device- Safety instructions dependent documentation

Contents	Documentation code
ATEX/IECEx Ex i	XA00144D
ATEX/IECEx Ex d	XA00143D
ATEX/IECEx Ex nA	XA00145D
cCSAus IS	XA00151D
cCSAus XP	XA00152D
INMETRO Ex i	XA01300D
INMETRO Ex d	XA01305D
INMETRO Ex nA	XA01306D
NEPSI Ex i	XA00156D
NEPSI Ex d	XA00155D
NEPSI Ex nA	XA00157D
NEPSI Ex i	XA1755D
NEPSI Ex d	XA1754D
NEPSI Ex nA	XA1756D
JPN Ex d	XA01763D

# **Special Documentation**

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Display and operating module FHX50	SD01007F
Heartbeat Technology	SD01850D

## **Installation Instructions**

Contents	Comment
Installation instructions for spare part sets and accessories	<ul> <li>Access the overview of all the available spare part sets via W@M Device Viewer →          □ 129</li> <li>Accessories available for order with Installation Instructions →          □ 132</li> </ul>

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