

# Proline Promass F 100 Coriolis Flowmeter Modbus RS485

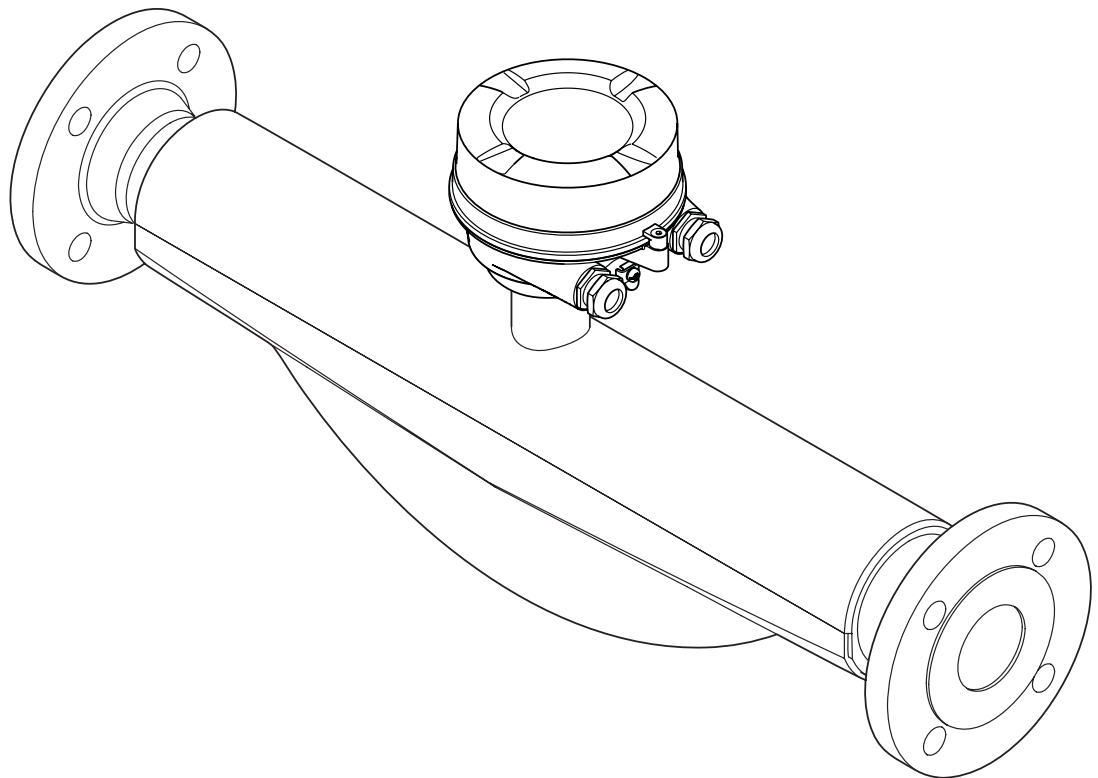
## Operating Instructions Manual

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BA016590/06/EN/02.17

Valid as of version 01.03 zz (Device firmware)

71382654



- 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.

## ***Important***

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All information and technical specifications in this documentation have been carefully checked and compiled by the author. However, we cannot completely exclude the possibility of errors. TechnipFMC is always grateful to be informed of any errors. Contact us on the website.

Smith Meter® is a registered trademark of TechnipFMC.

## ***Technical Support***

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Contact Information:

### ***Field Service Response Center***

24/7 Technical Support/Schedule a Technician: 1-844-798-3819

System Installation Supervision, Start-Up, and Commissioning Services Available

## ***Customer Support***

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[TechnipFMC.com](http://TechnipFMC.com)

Literature Library:

<http://fmctechnologies.com/en/MeasurementSolutions/OnlineServices.aspx>

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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 used



### 1.2.1 Safety symbols

Symbol	Meaning
	<b>DANGER!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
	<b>WARNING!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	<b>CAUTION!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
	<b>NOTE!</b> This symbol contains information on procedures and other facts which do not result in personal injury.













### 1.2.2 Electrical symbols

Symbol	Meaning
	Direct current
	Alternating current
	Direct current and alternating current
	<b>Ground connection</b> A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	<b>Protective Earth (PE)</b> A terminal which must be connected to ground prior to establishing any other connections.  The ground terminals are situated inside and outside the device: <ul style="list-style-type: none"> <li>▪ Inner ground terminal: Connects the protective earth to the mains supply.</li> <li>▪ Outer ground terminal: Connects the device to the plant grounding system.</li> </ul>




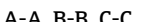



### 1.2.3 Tool symbols

Symbol	Meaning
	Allen key
	Open-ended wrench

### 1.2.4 Symbols for certain types of information

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

### 1.2.5 Symbols in graphics

Symbol	Meaning
	Item numbers
	Series of steps
	Views
	Sections
	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:

- The *W@M Device Viewer* : Enter the serial number from the nameplate ([www.endress.com/deviceviewer](http://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.

 For a detailed list of the individual documents along with the documentation code  
→  115

### 1.3.1 Standard documentation

Document type	Purpose and content of the document
Technical Information	<b>Planning aid for your device</b> 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	<b>Guides you quickly to the 1st measured value - Part 1</b> The Sensor Brief Operating Instructions are aimed at specialists with responsibility for installing the measuring device. <ul style="list-style-type: none"> <li>▪ Incoming acceptance and product identification</li> <li>▪ Storage and transport</li> <li>▪ Installation</li> </ul>
Transmitter Brief Operating Instructions	<b>Guides you quickly to the 1st measured value - Part 2</b> 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 style="list-style-type: none"> <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	<b>Reference for your parameters</b> 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. The document provides Modbus-specific information for each individual parameter in the Expert operating menu.

### 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

**Modbus®**

Registered trademark of SCHNEIDER AUTOMATION, INC.



**Microsoft®**

Registered trademark of the Microsoft Corporation, Redmond, Washington, USA

**TRI-CLAMP®**

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

## 2 Basic 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 these Brief Operating Instructions is intended only for flow measurement of liquids and gases.

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 measuring device is not operated at atmospheric temperature, compliance with the relevant basic conditions specified in the associated device documentation is absolutely essential: "Documentation" section → 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!**

- ▶ 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!**

- ▶ In the event of a measuring tube breakage for a device version without rupture disk it is possible for the pressure loading capacity of the sensor housing to be exceeded. This can lead to rupture or failure of the sensor housing.

## 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

We only provide a warranty 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 device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

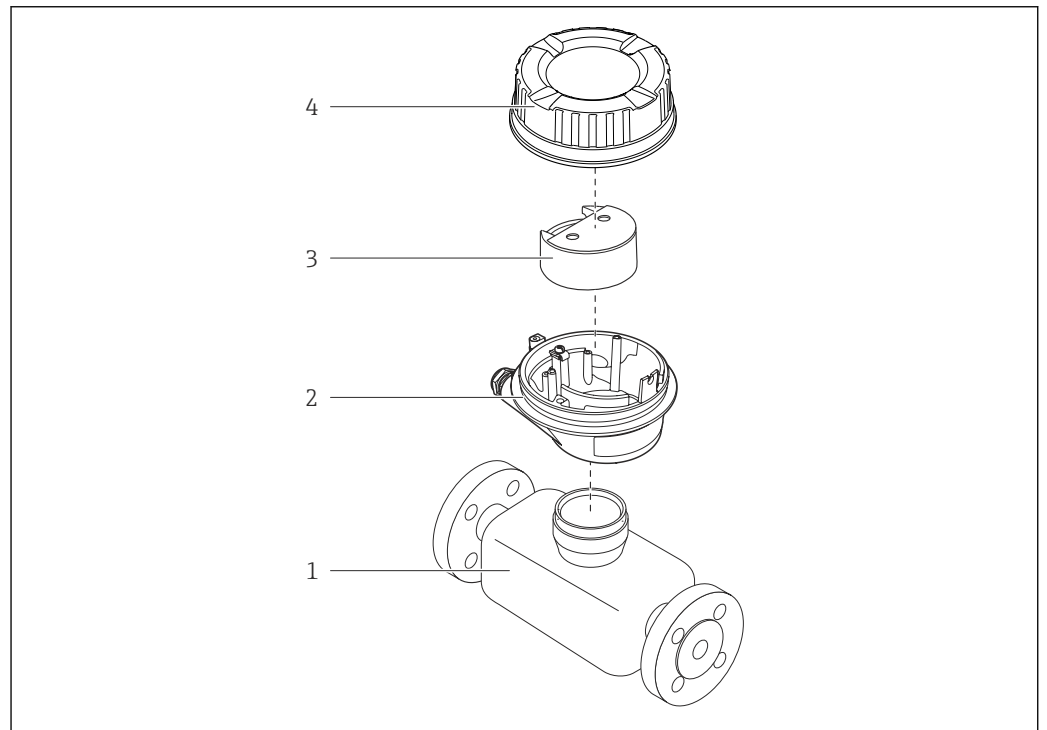
## 3 Product description

The device consists of a transmitter and a sensor. The Safety Barrier Promass 100 is part of the scope of supply and must be implemented to operate the device.

The device is available as a compact version:  
The transmitter and sensor form a mechanical unit.

### 3.1 Product design


#### 3.1.1 Device version with Modbus RS485 communication type



A0017609

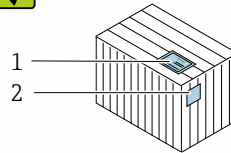
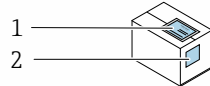
#### 1 Important components of a measuring device

- 1 Sensor
- 2 Transmitter housing
- 3 Main electronics module
- 4 Transmitter housing cover

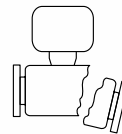
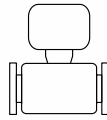
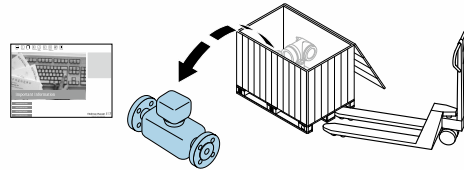
 In the case of the device version with Modbus RS485 intrinsically safe, the Safety Barrier Promass 100 forms part of the scope of supply.

## 4 Incoming acceptance and product identification

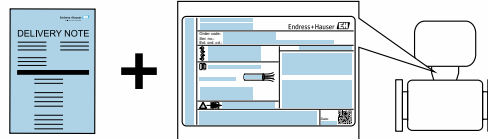
### 4.1 Incoming acceptance



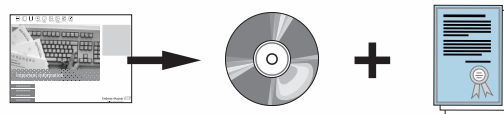
Are the order codes on the delivery note (1) and the product sticker (2) identical?





Are the goods undamaged?



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



Is the CD-ROM with the Technical Documentation (depends on device version) and documents present?

-  ■ 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

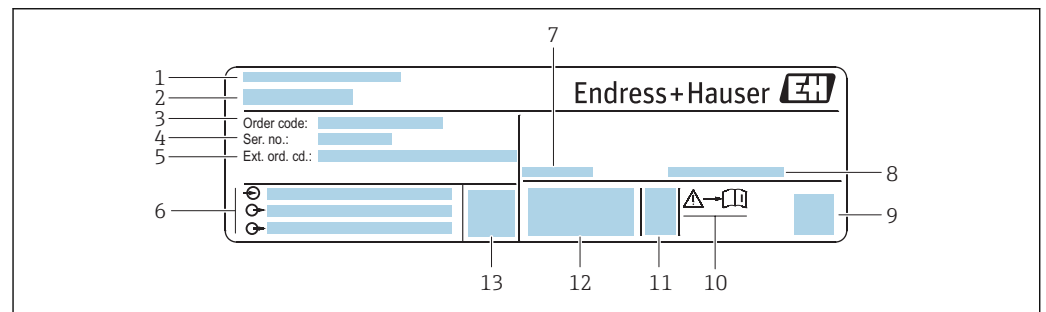
The following options are available for identification of the measuring device:

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

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

- The chapters "Additional standard documentation on the device" → 8 and "Supplementary device-dependent documentation" → 8
- The *W@M Device Viewer*: Enter the serial number from the nameplate ([www.endress.com/deviceviewer](http://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

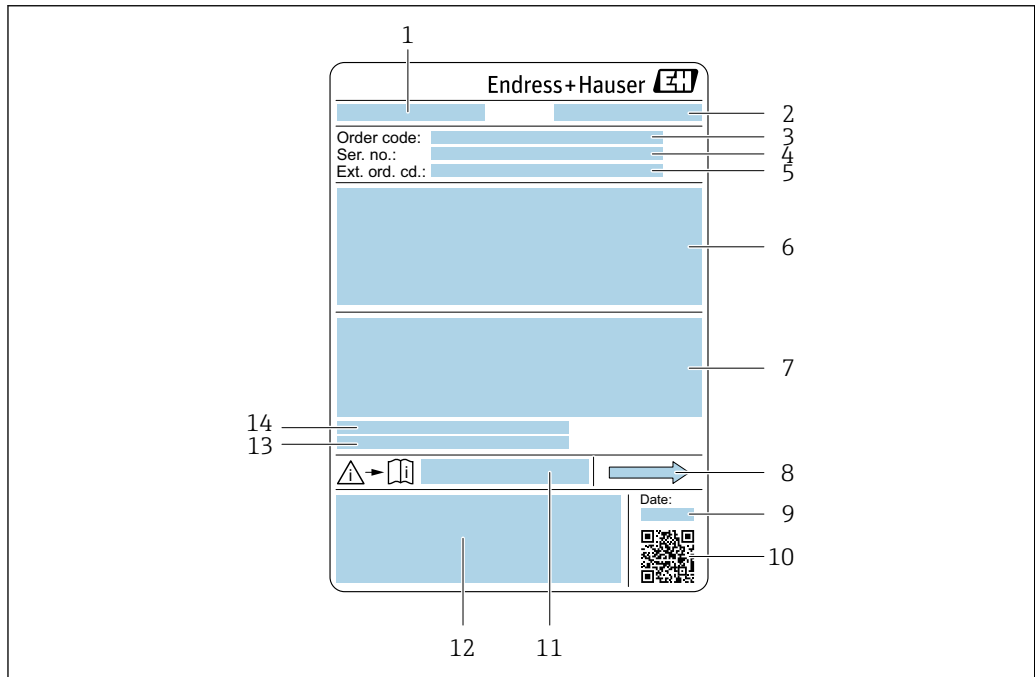


A0030222


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 Permitted ambient temperature ( $T_a$ )
- 8 Degree of protection
- 9 2-D matrix code
- 10 Document number of safety-related supplementary documentation → 116
- 11 Manufacturing date: year-month
- 12 CE mark, C-Tick
- 13 Firmware version (FW)

## 4.2.2 Sensor nameplate



A0029199

 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 secondary containment, 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

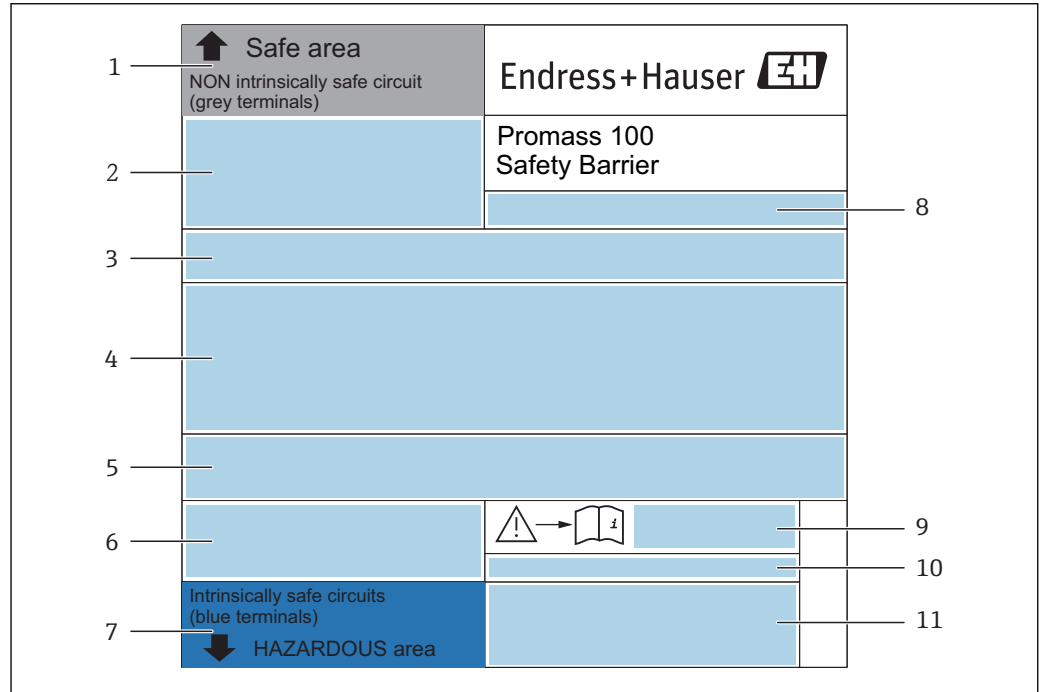
The measuring device is reordered using the order code.

#### 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 approval-related specifications are listed (e.g. LA). If other optional specifications are also ordered, these are indicated collectively using the # placeholder symbol (e.g. #LA#).
- If the ordered optional specifications do not include any safety and approval-related specifications, they are indicated by the + placeholder symbol (e.g. XXXXXX-ABCDE +).



### 4.2.3 Promass 100 safety barrier nameplate



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4 Example of a Promass 100 safety barrier nameplate

- 1 Non-hazardous area or Zone 2/Div. 2
- 2 Serial number, material number and 2-D matrix code of the Promass 100 safety barrier
- 3 Electrical connection data, e.g. available inputs and outputs, supply voltage
- 4 Approval information for explosion protection
- 5 Safety warning
- 6 Communication-specific information
- 7 Intrinsically safe area
- 8 Manufacturing location
- 9 Document number of safety-related supplementary documentation
- 10 Permitted ambient temperature ( $T_a$ )
- 11 CE mark, C-Tick

### 4.2.4 Symbols on measuring device

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

## 5 Storage and transport

### 5.1 Storage conditions

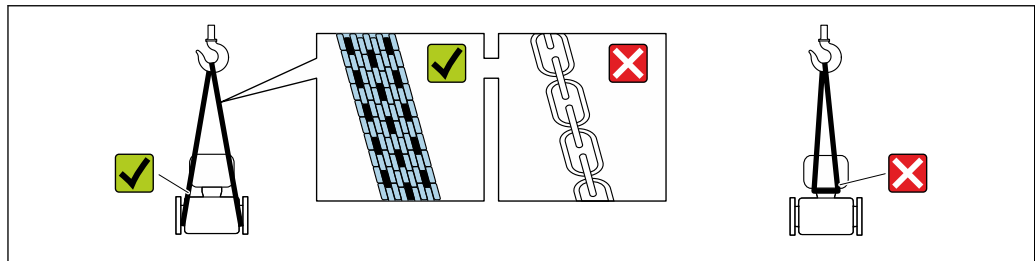
Observe the following notes for storage:

- ▶ 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 → 📄 105

### 5.2 Transporting the product

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



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

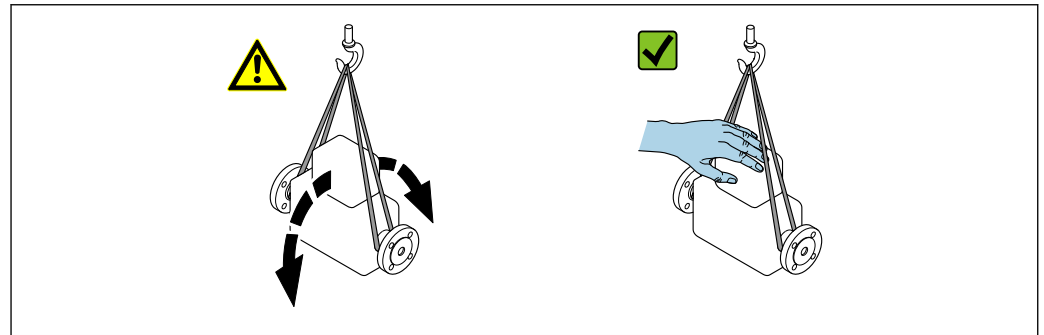
#### 5.2.1 Measuring devices without lifting lugs

##### **⚠ WARNING**

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

Risk of injury if the measuring device slips.

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



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## 5.2.2 Measuring devices with lifting lugs

### ⚠ CAUTION

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

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

## 5.2.3 Transporting with a fork lift

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

## 5.3 Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:

- Measuring device secondary packaging: polymer stretch film that conforms to EC Directive 2002/95/EC (RoHS).
- Packaging:
  - Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
  - or
  - Carton in accordance with European Packaging Directive 94/62EC; recyclability is confirmed by the affixed RESY symbol.
- Seaworthy packaging (optional): Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
- Carrying and mounting hardware:
  - Disposable plastic pallet
  - Plastic straps
  - Plastic adhesive strips
- Dunnage: Paper cushion

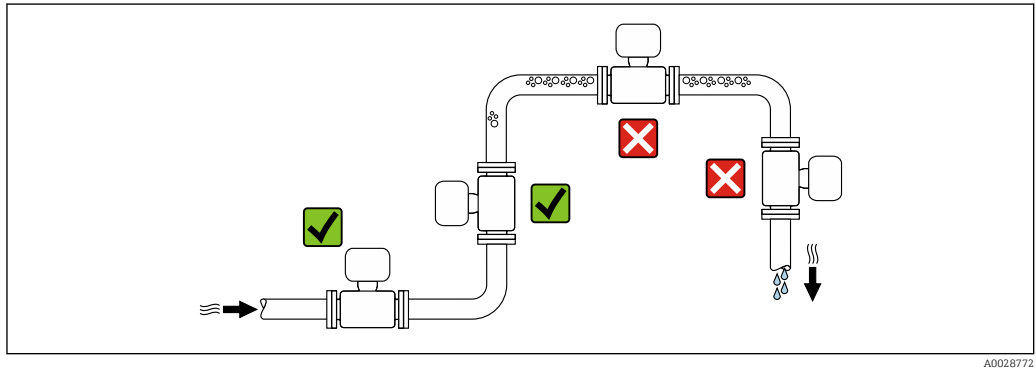
## 6 Installation

### 6.1 Installation conditions

No special measures such as supports are necessary. External forces are absorbed by the construction of the device.

#### 6.1.1 Mounting position

##### Mounting location

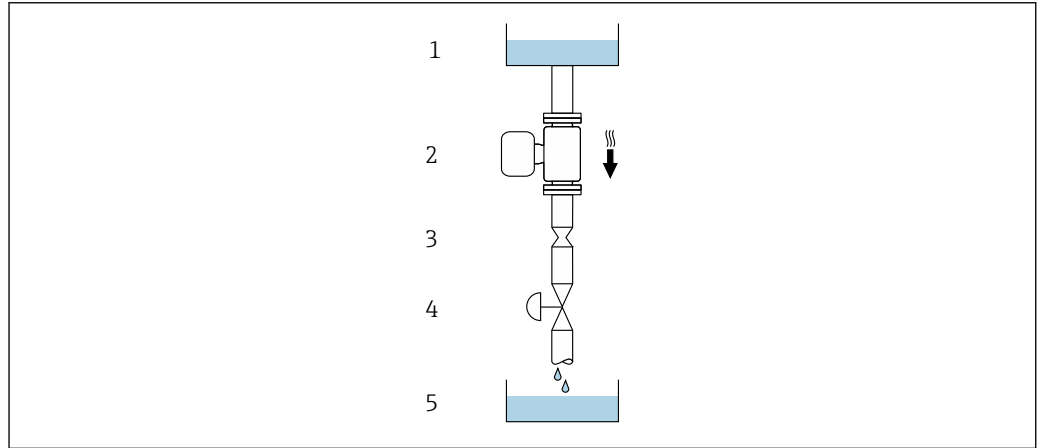


To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:

- 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.



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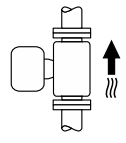
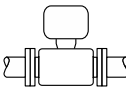
5 Installation in a down pipe (e.g. for batching applications)

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

DN		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
8	3/8	6	0.24
15	1/2	10	0.40
25	1	14	0.55
40	1 1/2	22	0.87
50	2	28	1.10
80	3	50	1.97
100	4	65	2.60
150	6	90	3.54
250	10	150	5.91

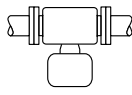




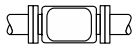

**Orientation**

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

Orientation		Recommendation
A	Vertical orientation	 <small>A0015591</small>
B	Horizontal orientation, transmitter at top	 <small>A0015589</small>

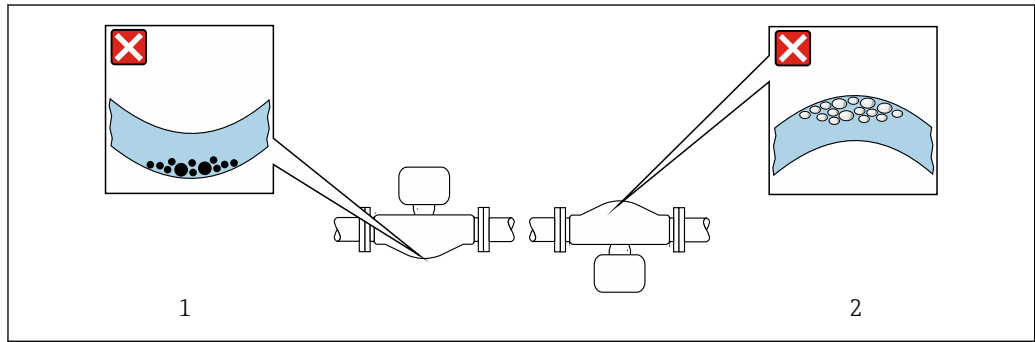
✓✓

✓✓<sup>1)</sup>  
 Exceptions:  
 → 6, 22


Orientation		Recommendation
C	Horizontal orientation, transmitter at bottom  A0015590	  <sup>2)</sup> Exceptions: →  , 
D	Horizontal orientation, transmitter at side  A0015592	

- 1) Applications with low process temperatures may decrease the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
- 2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.

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




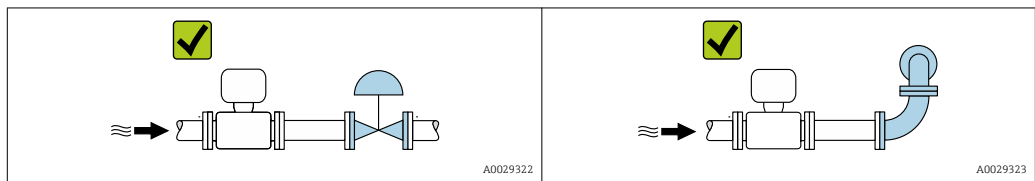
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 6 Orientation of sensor with curved measuring tube

- 1 Avoid this orientation for fluids with entrained solids: Risk of solids accumulating.
- 2 Avoid this orientation for outgassing fluids: Risk of gas accumulating.

**Inlet and outlet runs**


No special precautions need to be taken for fittings which create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs →  23.



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*Installation dimensions*

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

### 6.1.2 Requirements from environment and process

#### Ambient temperature range

Measuring device	<ul style="list-style-type: none"> <li>▪ -40 to +60 °C (-40 to +140 °F)</li> <li>▪ Order code for "Test, certificate", option <b>JM</b>: -50 to +60 °C (-58 to +140 °F)</li> </ul>
Safety Barrier Promass 100	-40 to +60 °C (-40 to +140 °F)

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

#### System pressure

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

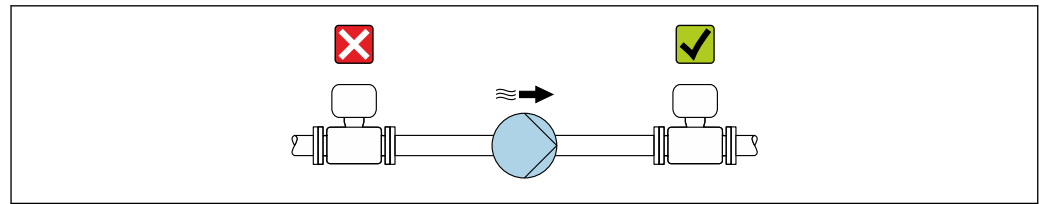
Cavitation is caused if the pressure drops below the vapor pressure:

- 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)



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#### Thermal insulation

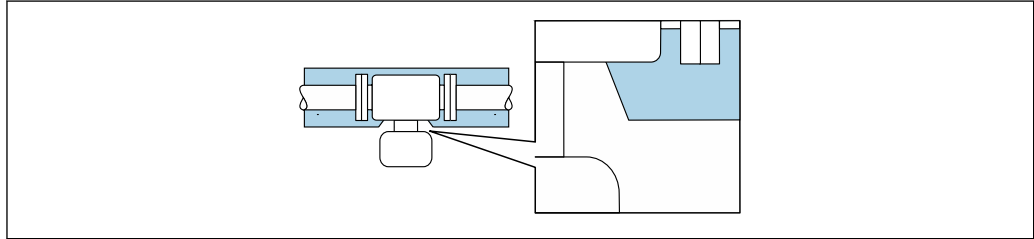
In the case of some fluids, it is important to keep the heat radiated from the sensor to the transmitter to a low level. A wide range of materials can be used for the required insulation.

The following device versions are recommended for versions with thermal insulation:

- Version with extended neck for insulation:  
Order code for "Sensor option", option **CG** with an extended neck length of 105 mm (4.13 in).
- Extended temperature version:  
Order code for "Measuring tube material", option **SD, SE, SF** or **TH** with an extended neck length of 105 mm (4.13 in).

**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 °C (176 °F)
- ▶ Thermal insulation with extended neck free: the insulation is omitted around the extended neck. We recommend that you do not insulate the extended neck in order to ensure optimum dissipation of heat.



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7 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 °C (176 °F).
- ▶ Ensure that convection takes place on a sufficiently large scale at the transmitter neck.
- ▶ Ensure that a sufficiently large area of the housing support remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.

*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

*Using an electrical trace heating system*

If heating is regulated via phase angle control or pulse packages, magnetic fields can affect the measured values (= for values that are greater than the values permitted by the EN standard (sine 30 A/m)).

For this reason, the sensor must be magnetically shielded: the housing can be shielded with tin plates or electric sheets without a privileged direction (e.g. V330-35A).



The sheet must have the following properties:


- Relative magnetic permeability  $\mu_r \geq 300$
- Plate thickness  $d \geq 0.35 \text{ mm}$  ( $d \geq 0.014 \text{ in}$ )

### 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

### Rupture disk

Information that is relevant to the process: →  108.

#### WARNING


#### Limited functional reliability of the rupture disk.

Danger to persons from escaping fluids!

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

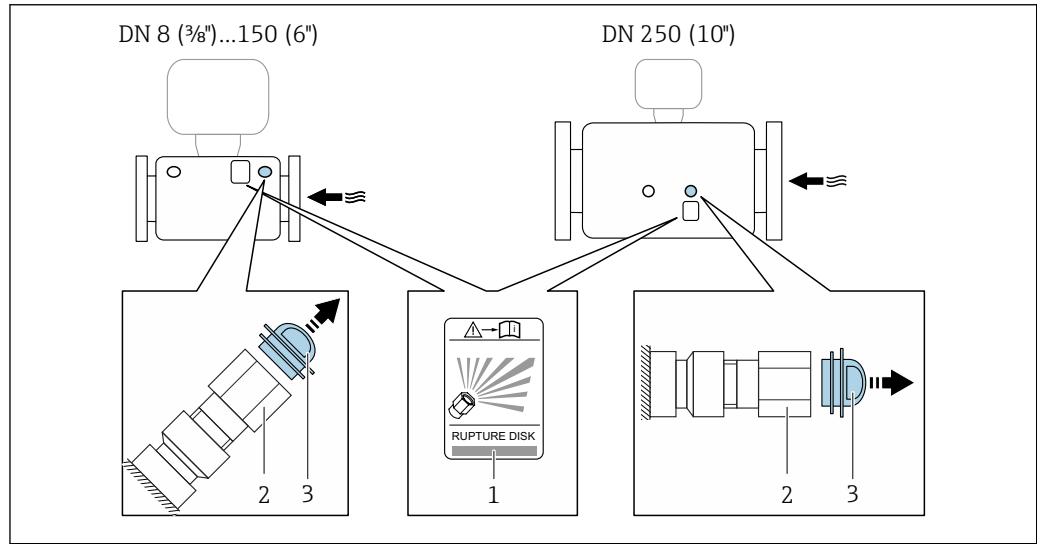
The position of the rupture disk is indicated on a sticker beside it.

The transportation guard must be removed.

 For information on the dimensions: see the "Mechanical construction" section

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

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



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- 1 Rupture disk label
- 2 Rupture disk with 1/2" NPT internal thread with 1" width across flat
- 3 Transport protection

### Zero point adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 100. 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).

## 6.2 Mounting the measuring device

### 6.2.1 Required tools

#### For sensor

For flanges and other process connections: Corresponding mounting tools

### 6.2.2 Preparing the measuring device

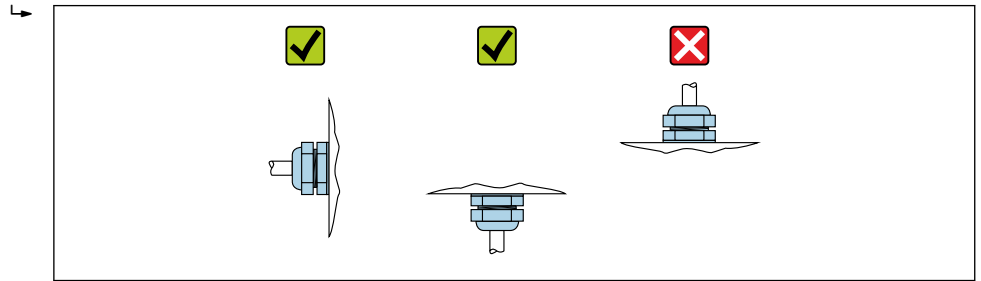
1. Remove all remaining transport packaging.
2. Remove any protective covers or protective caps present from the sensor.
3. Remove stick-on label on the electronics compartment cover.

### 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 gaskets are clean and undamaged.
  - ▶ Install the gaskets 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.



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### 6.3 Post-installation check

Is the device undamaged (visual inspection)?	<input type="checkbox"/>
Does the measuring device conform to the measuring point specifications? For example: <ul style="list-style-type: none"> <li>▪ Process temperature → 106</li> <li>▪ Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document)</li> <li>▪ Ambient temperature</li> <li>▪ Measuring range</li> </ul>	<input type="checkbox"/>
Has the correct orientation for the sensor been selected ? <ul style="list-style-type: none"> <li>▪ According to sensor type</li> <li>▪ According to medium temperature</li> <li>▪ According to medium properties (outgassing, with entrained solids)</li> </ul>	<input type="checkbox"/>
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping → 21?	<input type="checkbox"/>
Are the measuring point identification and labeling correct (visual inspection)?	<input type="checkbox"/>
Is the device adequately protected from precipitation and direct sunlight?	<input type="checkbox"/>
Are the securing screw and securing clamp tightened securely?	<input type="checkbox"/>

## 7 Electrical connection

### NOTICE

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.
- ▶ Although the measuring device is equipped with a fuse, additional overcurrent protection (maximum 16 A) should be integrated into the system installation.

### 7.1 Connection conditions

#### 7.1.1 Required tools

- For cable entries: Use corresponding tools
- For securing clamp (on aluminum housing): Allen screw 3 mm
- For securing screw (for stainless steel housing): open-ended wrench 8 mm
- Wire stripper
- When using stranded cables: crimper for wire end ferrule

#### 7.1.2 Requirements for connecting cable

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.

##### Power supply cable

Standard installation cable is sufficient.

##### Signal cable

*Modbus RS485*

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

Cable type	A
Characteristic impedance	135 to 165 $\Omega$ at a measuring frequency of 3 to 20 MHz
Cable capacitance	< 30 pF/m
Wire cross-section	> 0.34 mm <sup>2</sup> (22 AWG)
Cable type	Twisted pairs
Loop resistance	$\leq$ 110 $\Omega$ /km

<b>Signal damping</b>	Max. 9 dB over the entire length of the cable cross-section
<b>Shield</b>	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

### Connecting cable between Safety Barrier Promass 100 and measuring device

<b>Cable type</b>	Shielded twisted-pair cable with 2x2 wires. When grounding the cable shield, observe the grounding concept of the plant.
<b>Maximum cable resistance</b>	2.5 $\Omega$ , one side

 Comply with the maximum cable resistance specifications to ensure the operational reliability of the measuring device.

The maximum cable length for individual wire cross-sections is specified in the table below. Observe the maximum capacitance and inductance per unit length of the cable and the connection values in the Ex documentation .

Wire cross-section		Maximum cable length	
[mm <sup>2</sup> ]	[AWG]	[m]	[ft]
0.5	20	70	230
0.75	18	100	328
1.0	17	100	328
1.5	16	200	656
2.5	14	300	984

#### Cable diameter

- Cable glands supplied:  
M20 × 1.5 with cable  $\varnothing$  6 to 12 mm (0.24 to 0.47 in)
- Spring terminals:  
Wire cross-sections 0.5 to 2.5 mm<sup>2</sup> (20 to 14 AWG)
- With Safety Barrier Promass 100:  
Plug-in screw terminals for wire cross-sections 0.5 to 2.5 mm<sup>2</sup> (20 to 14 AWG)

### 7.1.3 Terminal assignment

#### Transmitter

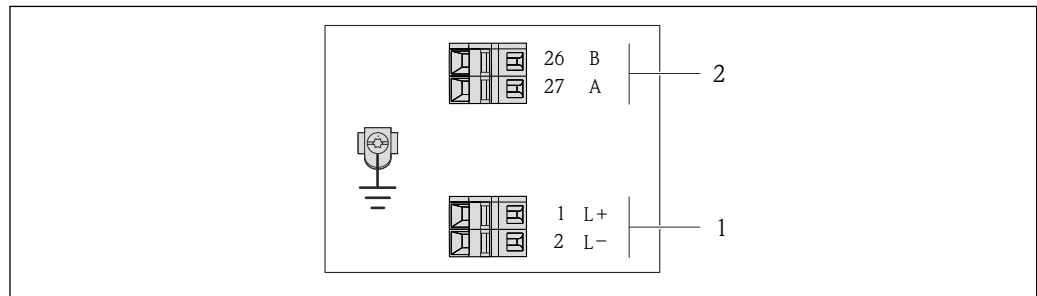
*Modbus RS485 connection version*

 For use in the non-hazardous area and Zone 2/Div. 2

Order code for "Output", option **M**

Depending on the housing version, the transmitters can be ordered with terminals or device plugs.

Order code "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options A, B	Terminals	Terminals	<ul style="list-style-type: none"> <li>▪ Option A: coupling M20x1</li> <li>▪ Option B: thread M20x1</li> <li>▪ Option C: thread G ½"</li> <li>▪ Option D: thread NPT ½"</li> </ul>
Options A, B	Device plugs → 32	Terminals	<ul style="list-style-type: none"> <li>▪ Option L: plug M12x1 + thread NPT ½"</li> <li>▪ Option N: plug M12x1 + coupling M20</li> <li>▪ Option P: plug M12x1 + thread G ½"</li> <li>▪ Option U: plug M12x1 + thread M20</li> </ul>
Options A, B, C	Device plugs → 32	Device plugs → 32	Option Q: 2 x plug M12x1
Order code for "Housing": <ul style="list-style-type: none"> <li>▪ Option A: compact, coated aluminum</li> <li>▪ Option B: compact, hygienic, stainless</li> <li>▪ Option C: ultra-compact, hygienic, stainless</li> </ul>			



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8 Modbus RS485 terminal assignment, connection version for use in non-hazardous areas and Zone 2/Div. 2

- 1 Power supply: DC 24 V
- 2 Modbus RS485


Order code "Output"	Terminal number			
	Power supply		Output	
	1 (L+)	2 (L-)	26 (B)	27 (A)
Option M	DC 24 V		Modbus RS485	
Order code for "Output": Option M: Modbus RS485, for use in non-hazardous areas and Zone 2/Div. 2				

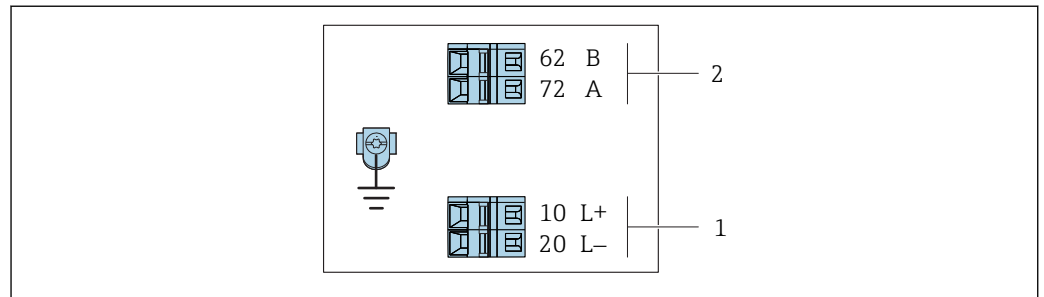
*Modbus RS485 connection version*

For use in the intrinsically safe area. Connection via Safety Barrier Promass 100.


Order code for "Output", option **M**

Depending on the housing version, the transmitters can be ordered with terminals or device plugs.

Order code "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options A, B	Terminals	Terminals	<ul style="list-style-type: none"> <li>▪ Option A: coupling M20x1</li> <li>▪ Option B: thread M20x1</li> <li>▪ Option C: thread G ½"</li> <li>▪ Option D: thread NPT ½"</li> </ul>
A, B, C	Device plugs →  32		Option I: plug M12x1
Order code for "Housing": <ul style="list-style-type: none"> <li>▪ Option A: compact, coated aluminum</li> <li>▪ Option B: compact, hygienic, stainless</li> <li>▪ Option C: ultra-compact, hygienic, stainless</li> </ul>			



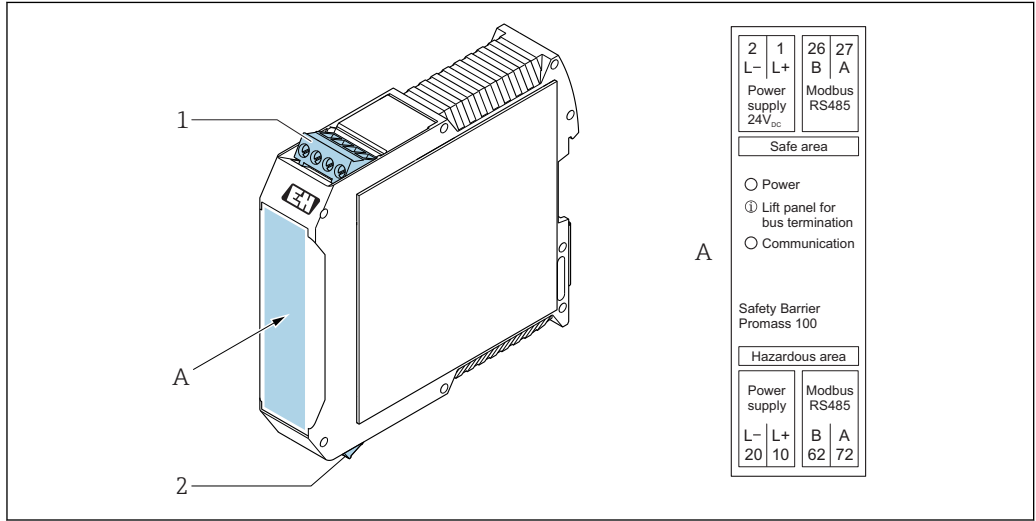
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 9 Modbus RS485 terminal assignment, connection version for use in intrinsically safe areas (connection via Safety Barrier Promass 100)

- 1 Intrinsically safe power supply
- 2 Modbus RS485

Order code "Output"	10 (L+)	20 (L-)	62 (B)	72 (A)
Option M	Intrinsically safe supply voltage		Modbus RS485 intrinsically safe	
Order code for "Output": Option M: Modbus RS485, for use in the intrinsically safe area (connection via Safety Barrier Promass 100)				

**Safety Barrier Promass 100**



10 Safety Barrier Promass 100 with terminals

- 1 Non-hazardous area, Zone 2, Class I Division 2
- 2 Intrinsically safe area

**7.1.4 Pin assignment, device plug**

**Supply voltage**

Promass 100

Device plug for signal transmission with supply voltage (device side), MODBUS RS485 (intrinsically safe)

Pin	Assignment	
	1	L+
2	A	Modbus RS485 intrinsically safe
3	B	
4	L-	Supply voltage, intrinsically safe
5		Grounding/shielding
Coding		Plug/socket
A		Plug

Device plug for supply voltage (device side), MODBUS RS485 (not intrinsically safe)

**i** For use in the non-hazardous area and Zone 2/Div. 2.

Pin	Assignment	
	1	L+
2		Not assigned
3		Not assigned
4	L-	DC 24 V



	5		Grounding/shielding
	<b>Coding</b>		<b>Plug/socket</b>
	A		Plug

**Signal transmission**

Promass

Device plug for signal transmission (device side), MODBUS RS485 (not intrinsically safe)

**i** For use in the non-hazardous area and Zone 2/Div. 2.

	<b>Pin</b>		<b>Assignment</b>	
	1		Not assigned	
	2	A	Modbus RS485	
	3		Not assigned	
	4	B	Modbus RS485	
	5		Grounding/shielding	
	<b>Coding</b>		<b>Plug/socket</b>	
	B		Socket	

**7.1.5 Shielding and grounding**

**Shielding and grounding concept**

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

**Grounding of the cable shield**

**NOTICE**

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

Damage to the bus cable shield.

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

To comply with EMC requirements:

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


### 7.1.6 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 →  28.

## 7.2 Connecting the measuring device

#### NOTICE

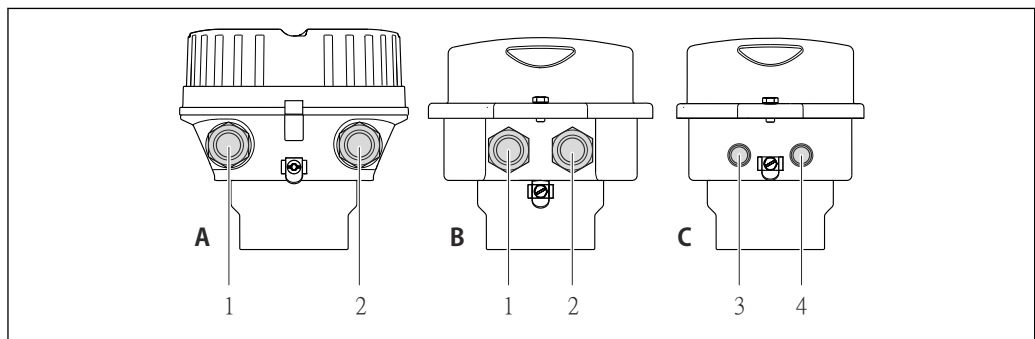
##### Limitation of electrical safety due to incorrect connection!

- ▶ 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.
- ▶ The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).


### 7.2.1 Connecting the transmitter

The connection of the transmitter depends on the following order codes:

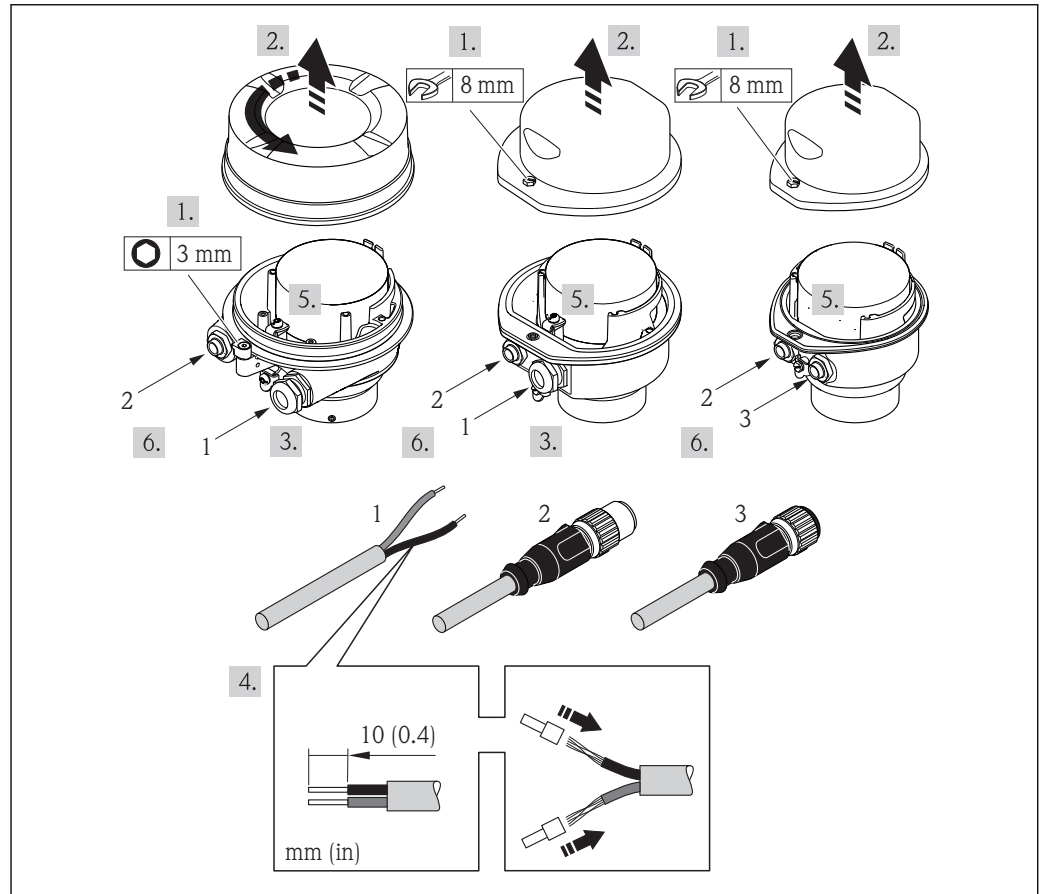
- Housing version: compact or ultra-compact
- Connection version: device plug or terminals



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 11 Housing versions and connection versions

- A Compact, coated aluminum
- B Compact hygienic, stainless or compact, stainless
- 1 Cable entry or device plug for signal transmission
- 2 Cable entry or device plug for supply voltage
- C Ultra-compact hygienic, stainless or ultra-compact, stainless
- 3 Device plug for signal transmission
- 4 Device plug for supply voltage



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12 Device versions with connection examples

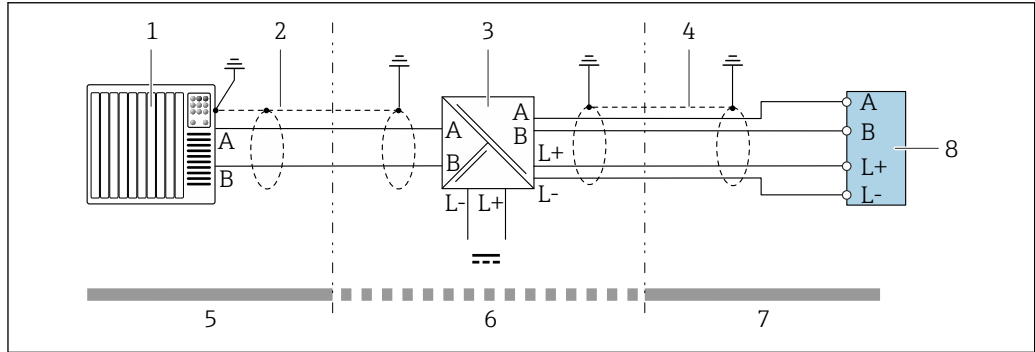
- 1 Cable
- 2 Device plug for signal transmission
- 3 Device plug for supply voltage

► Connect the cable in accordance with the terminal assignment or the device plug pin assignment .

### 7.2.2 Connecting the Safety Barrier Promass 100

In the case of the device version with Modbus RS485 intrinsically safe, the transmitter must be connected to the Safety Barrier Promass 100.

1. Strip the cable ends. In the case of stranded cables, also fit ferrules.
2. Connect the cable in accordance with the terminal assignment → 29.
3. Where applicable, enable the terminating resistor in the Safety Barrier Promass 100 .



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13 Electrical connection between the transmitter and Safety Barrier Promass 100

- 1 Control system (e.g. PLC)
- 2 Observe cable specifications → 28
- 3 Safety Barrier Promass 100: terminal assignment → 32
- 4 Observe cable specifications → 28
- 5 Non-hazardous area
- 6 Non-hazardous area and Zone 2/Div. 2
- 7 Intrinsically safe area
- 8 Transmitter: terminal assignment → 29

### 7.2.3 Ensure potential equalization

#### Requirements

No special measures for potential equalization are required.

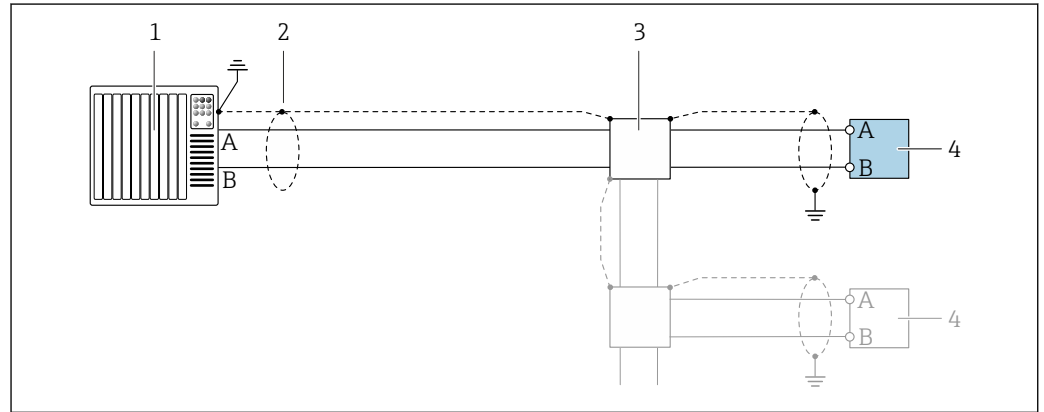
-  For devices intended for use in hazardous locations, please observe the guidelines in the Ex documentation (XA).

### 7.3 Special connection instructions

#### 7.3.1 Connection examples

##### Modbus RS485

Modbus RS485, non-hazardous area and Zone 2/Div. 2

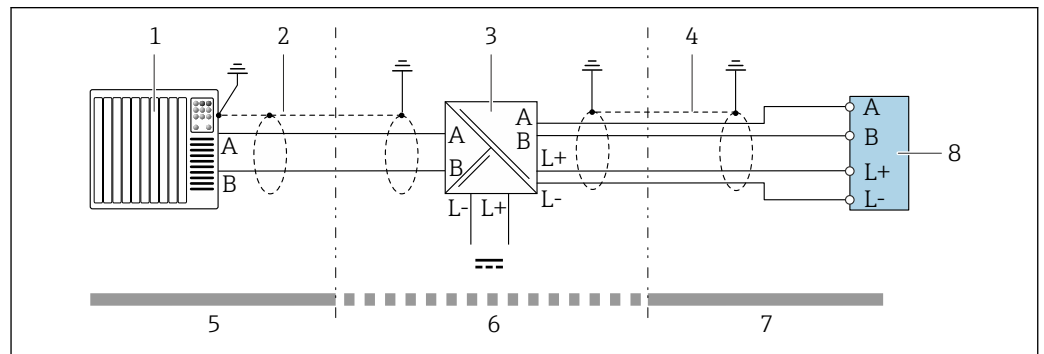


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14 Connection example for Modbus RS485, non-hazardous area and Zone 2/Div. 2

- 1 Control system (e.g. PLC)
- 2 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 28
- 3 Distribution box
- 4 Transmitter

##### Modbus RS485 intrinsically safe



A0028766

15 Connection example for Modbus RS485 intrinsically safe

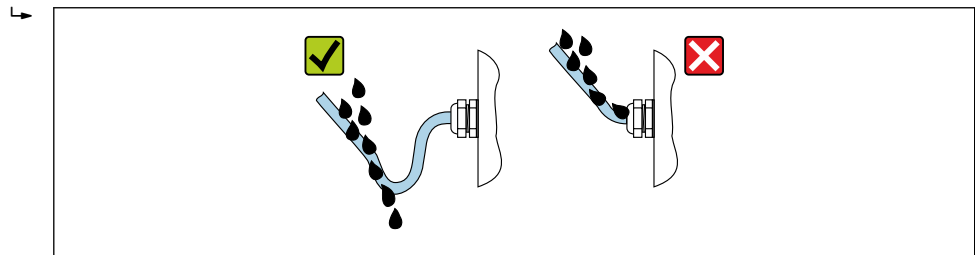
- 1 Control system (e.g. PLC)
- 2 Cable shield, observe cable specifications
- 3 Safety Barrier Promass 100
- 4 Observe cable specifications
- 5 Non-hazardous area
- 6 Non-hazardous area and Zone 2/Div. 2
- 7 Intrinsically safe area
- 8 Transmitter

## 7.4 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.
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").



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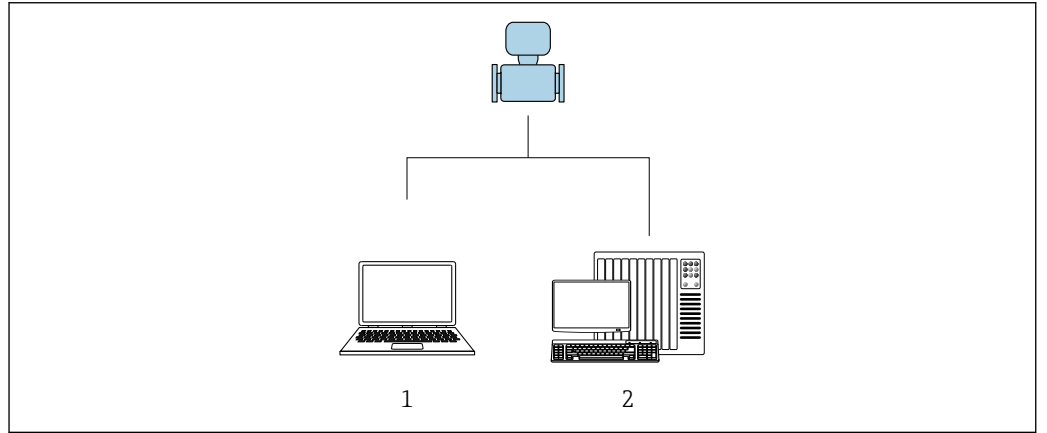
6. Insert dummy plugs into unused cable entries.

## 7.5 Post-connection check

Are cables or the device undamaged (visual inspection)?	<input type="checkbox"/>
Do the cables used meet the requirements → 28?	<input type="checkbox"/>
Do the cables have adequate strain relief?	<input type="checkbox"/>
Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" → 38?	<input type="checkbox"/>
Depending on the device version: are all the device plugs firmly tightened?	<input type="checkbox"/>
<ul style="list-style-type: none"> <li>▪ Does the supply voltage match the specifications on the transmitter nameplate → 98?</li> <li>▪ For device version with Modbus RS485 intrinsically safe: does the supply voltage match the specifications on the nameplate of the Safety Barrier Promass 100 → 98?</li> </ul>	<input type="checkbox"/>
Is the terminal assignment → 29 or pin assignment of the connector → 32 correct?	<input type="checkbox"/>
<ul style="list-style-type: none"> <li>▪ If supply voltage is present, is the power LED on the electronics module of the transmitter lit green → 13?</li> <li>▪ For device version with Modbus RS485 intrinsically safe, if supply voltage is present, is the power LED on the Safety Barrier Promass 100 lit → 13?</li> </ul>	<input type="checkbox"/>
Depending on the device version, is the securing clamp or fixing screw firmly tightened?	<input type="checkbox"/>

## 8 Operation options

### 8.1 Overview of operating options




A0017760

- 1 Computer with "FieldCare" or "DeviceCare" operating tool via Commubox FXA291 and service interface
- 2 Control system (e.g. PLC)

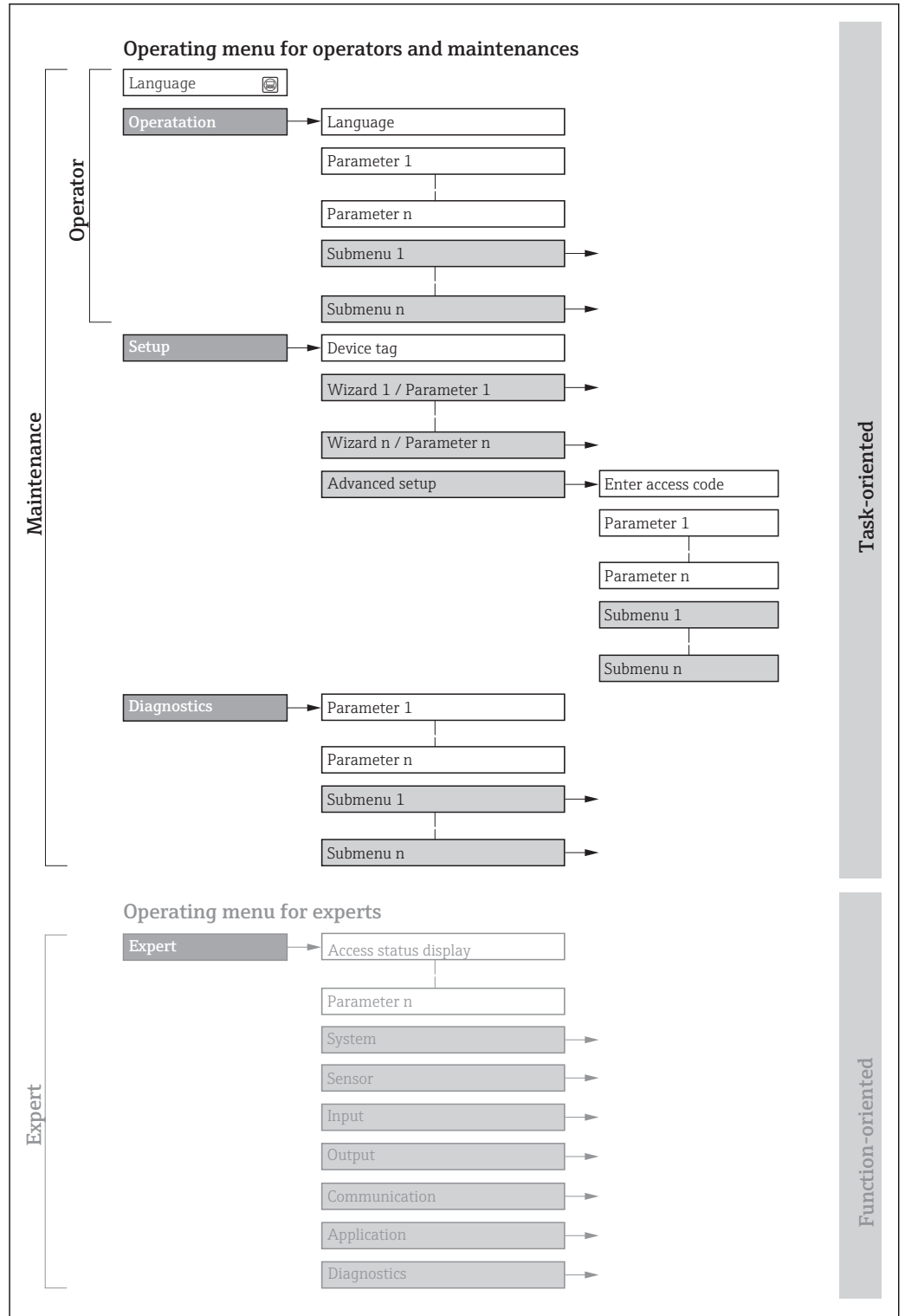
## 8.2 Structure and function of the operating menu

### 8.2.1 Structure of the operating menu



For an overview of the operating menu for experts: "Description of Device Parameters" document supplied with the device →  116





A0018237-EN

16 Schematic structure of the operating menu

### 8.2.2 Operating philosophy

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

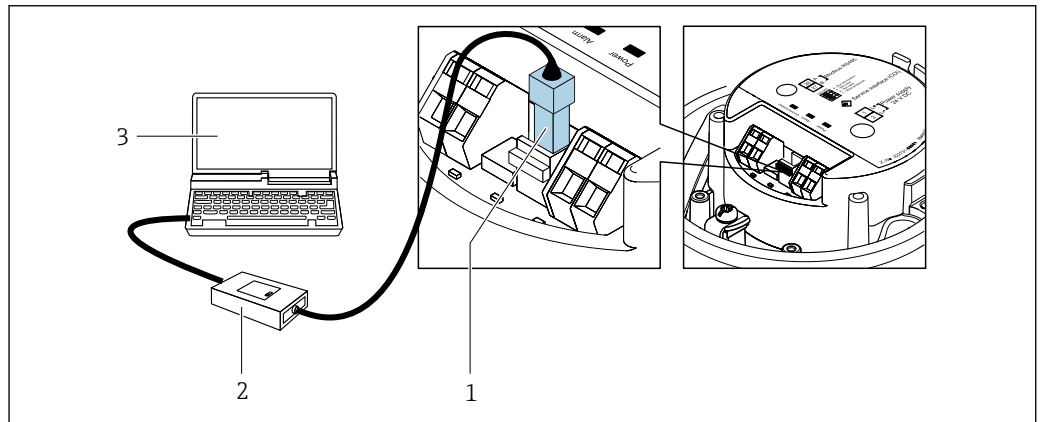
Menu/parameter		User role and tasks	Content/meaning
Language	task-oriented	<b>Role "Operator", "Maintenance"</b> Tasks during operation: Reading measured values	<ul style="list-style-type: none"> <li>▪ Defining the operating language</li> <li>▪ Resetting and controlling totalizers</li> </ul>
Operation			Resetting and controlling totalizers
Setup		<b>"Maintenance" role</b> Commissioning: <ul style="list-style-type: none"> <li>▪ Configuration of the measurement</li> <li>▪ Configuration of the communication interface</li> </ul>	Submenus for fast commissioning: <ul style="list-style-type: none"> <li>▪ Set the system units</li> <li>▪ Define the medium</li> <li>▪ Configuration of the digital communication interface</li> <li>▪ Configuring the operational display</li> <li>▪ Set the low flow cut off</li> <li>▪ Configure partial and empty pipe detection</li> </ul> Advanced setup <ul style="list-style-type: none"> <li>▪ For more customized configuration of the measurement (adaptation to special measuring conditions)</li> <li>▪ Configuration of totalizers</li> <li>▪ Configure the WLAN settings</li> <li>▪ Administration (define access code, reset measuring device)</li> </ul>
Diagnostics	<b>"Maintenance" role</b> Fault elimination: <ul style="list-style-type: none"> <li>▪ Diagnostics and elimination of process and device errors</li> <li>▪ Measured value simulation</li> </ul>	Contains all parameters for error detection and analyzing process and device errors: <ul style="list-style-type: none"> <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>▪ 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: <ul style="list-style-type: none"> <li>▪ Commissioning measurements under difficult conditions</li> <li>▪ Optimal adaptation of the measurement to difficult conditions</li> <li>▪ Detailed configuration of the communication interface</li> <li>▪ Error diagnostics in difficult cases</li> </ul>	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: <ul style="list-style-type: none"> <li>▪ System Contains all higher-order device parameters which do not concern the measurement or the communication interface.</li> <li>▪ Sensor Configuration of the measurement.</li> <li>▪ Communication Configuration of the digital communication interface.</li> <li>▪ Application Configure the functions that go beyond the actual measurement (e.g. totalizer).</li> <li>▪ Diagnostics Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology.</li> </ul>

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

#### 8.3.1 Connecting the operating tool

##### Via service interface (CDI)

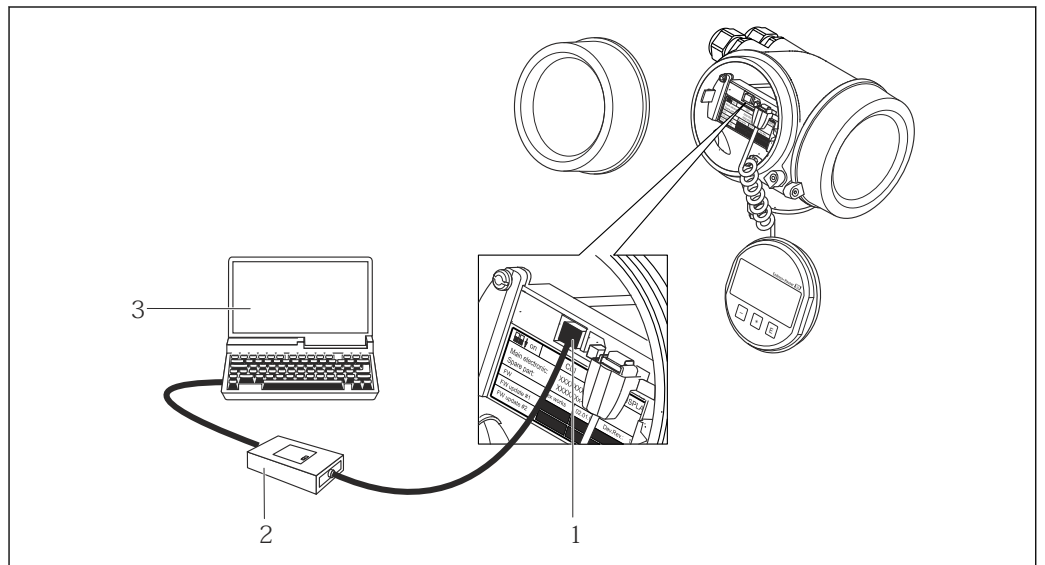
*Modbus RS485*



A0030216

- 1 Service interface (CDI) of measuring device
- 2 Commubox FXA291
- 3 Computer with "FieldCare" operating tool with COM DTM "CDI Communication FXA291"

##### Via service interface (CDI)



A0014019

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

## 8.3.2 FieldCare

### Function scope

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

Access is via:

CDI service interface →  43

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 →  46

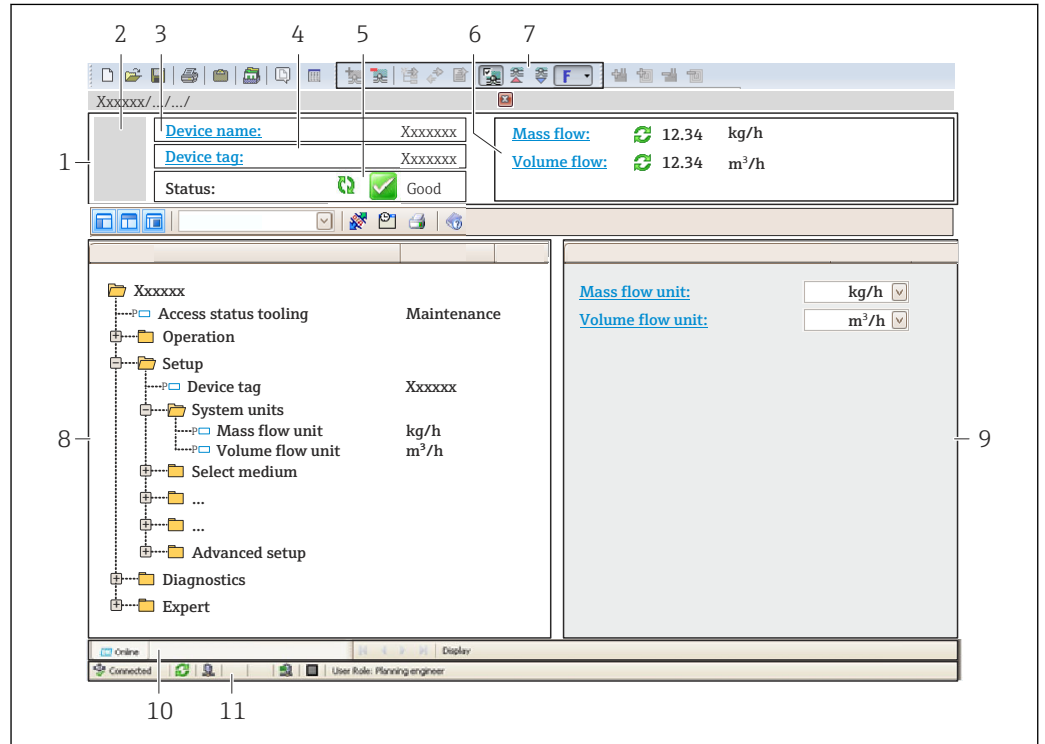
### Establishing a connection

1. Start FieldCare and launch the project.
2. In the network: Add a device.
  - ↳ The **Add device** window opens.
3. Select the **CDI Communication FXA291** option from the list and press **OK** to confirm.
4. Right-click **CDI Communication FXA291** and select the **Add device** option in the context menu that opens.
5. Select the desired device from the list and press **OK** to confirm.
6. Establish the online connection to the device.



For additional information, see Operating Instructions BA00027S and BA00059S

User interface



A0021051-EN

- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Tag name
- 5 Status area with status signal → 78
- 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

### 8.3.3 DeviceCare


#### Function scope

Tool to connect and configure Endress+Hauser field devices.

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

 For details, see Innovation Brochure IN01047S

#### Source for device description files


See information →  46

## 9 System integration

### 9.1 Overview of device description files

#### 9.1.1 Current version data for the device

Firmware version	01.03.zz	<ul style="list-style-type: none"> <li>▪ On the title page of the Operating Instructions</li> <li>▪ On the transmitter nameplate</li> <li>▪ Firmware version Diagnostics → Device information → Firmware version</li> </ul>
Release date of firmware version	10.2014	---

 For an overview of the different firmware versions for the device

#### 9.1.2 Operating tools






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


FieldCare	<ul style="list-style-type: none"> <li>▪ <a href="http://www.endress.com">www.endress.com</a> → Download Area</li> <li>▪ CD-ROM (contact Endress+Hauser)</li> <li>▪ DVD (contact Endress+Hauser)</li> </ul>
DeviceCare	<ul style="list-style-type: none"> <li>▪ <a href="http://www.endress.com">www.endress.com</a> → Download Area</li> <li>▪ CD-ROM (contact Endress+Hauser)</li> <li>▪ DVD (contact Endress+Hauser)</li> </ul>

## 9.2 Modbus RS485 information


### 9.2.1 Function codes

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

Code	Name	Description	Application
03	Read holding register	<p>Master reads one or more Modbus registers from the device. A maximum of 125 consecutive registers can be read with 1 telegram: 1 register = 2 bytes</p> <p> The measuring device does not make a distinction between function codes 03 and 04; these codes therefore yield the same result.</p>	<p>Read device parameters with read and write access</p> <p>Example: Read mass flow</p>
04	Read input register	<p>Master reads one or more Modbus registers from the device. A maximum of 125 consecutive registers can be read with 1 telegram: 1 register = 2 bytes</p> <p> The measuring device does not make a distinction between function codes 03 and 04; these codes therefore yield the same result.</p>	<p>Read device parameters with read access</p> <p>Example: Read totalizer value</p>
06	Write single registers	<p>Master writes a new value to <b>one</b> Modbus register of the measuring device.</p> <p> Use function code 16 to write multiple registers with just 1 telegram.</p>	<p>Write only 1 device parameter</p> <p>Example: reset totalizer</p>
08	Diagnostics	<p>Master checks the communication connection to the measuring device.</p> <p>The following "Diagnostics codes" are supported:</p> <ul style="list-style-type: none"> <li>▪ Sub-function 00 = Return query data (loopback test)</li> <li>▪ Sub-function 02 = Return diagnostics register</li> </ul>	
16	Write multiple registers	<p>Master writes a new value to multiple Modbus registers of the device. A maximum of 120 consecutive registers can be written with 1 telegram.</p> <p> If the required device parameters are not available as a group, yet must nevertheless be addressed with a single telegram, use Modbus data map →  49</p>	<p>Write multiple device parameters</p> <p>Example:</p> <ul style="list-style-type: none"> <li>▪ Mass flow unit</li> <li>▪ Mass unit</li> </ul>
23	Read/Write multiple registers	<p>Master reads and writes a maximum of 118 Modbus registers of the measuring device simultaneously with 1 telegram. Write access is executed <b>before</b> read access.</p>	<p>Write and read multiple device parameters</p> <p>Example:</p> <ul style="list-style-type: none"> <li>▪ Read mass flow</li> <li>▪ Reset totalizer</li> </ul>

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

## 9.2.2 Register information

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

## 9.2.3 Response time

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

## 9.2.4 Data types

The measuring device supports the following data types:

<b>FLOAT</b> (floating point number IEEE 754) Data length = 4 bytes (2 registers)			
Byte 3	Byte 2	Byte 1	Byte 0
SEEEEEEE	EMMMMMMMM	MMMMMMMMM	MMMMMMMMM
S = sign, E = exponent, M = mantissa			

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

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

## 9.2.5 Byte transmission sequence

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

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

<b>FLOAT</b>				
	Sequence			
Options	1.	2.	3.	4.
1 - 0 - 3 - 2 *	Byte 1 (MMMMMMMMM)	Byte 0 (MMMMMMMMM)	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMMM)
0 - 1 - 2 - 3	Byte 0 (MMMMMMMMM)	Byte 1 (MMMMMMMMM)	Byte 2 (EMMMMMMMM)	Byte 3 (SEEEEEEE)
2 - 3 - 0 - 1	Byte 2 (EMMMMMMMM)	Byte 3 (SEEEEEEE)	Byte 0 (MMMMMMMMM)	Byte 1 (MMMMMMMMM)



3 - 2 - 1 - 0	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM)	Byte 1 (MMMMMMMM)	Byte 0 (MMMMMMMM)
* = factory setting, S = sign, E = exponent, M = mantissa				

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

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

### 9.2.6 Modbus data map

#### Function of the Modbus data map


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

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

#### Structure of the Modbus data map

The Modbus data map consists of two data sets:

- Scan list: Configuration area  
The device parameters to be grouped are defined in a list in that their Modbus RS485 register addresses are entered in the list.
- Data area  
The measuring device reads out the register addresses entered in the scan list cyclically and writes the associated device data (values) to the data area.

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

### Scan list configuration

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

<b>Max. entries</b>	16 device parameters
<b>Supported device parameters</b>	Only parameters with the following characteristics are supported: <ul style="list-style-type: none"> <li>▪ Access type: read or write access</li> <li>▪ Data type: float or integer</li> </ul>

#### *Configuring the scan list via FieldCare or DeviceCare*

Carried out using the operating menu of the measuring device:

Expert → Communication → Modbus data map → Scan list register 0 to 15

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

#### *Configuring the scan list via Modbus RS485*

Carried out using register addresses 5001 - 5016

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

### Reading out data via Modbus RS485

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

<b>Master access to data area</b>	Via register addresses 5051-5081
-----------------------------------	----------------------------------

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

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



Data area				
Device parameter value	Modbus RS485 register		Data type*	Access**
	Start register	End register (Float only)		
Value of scan list register ...	...	...	...	...
Value of scan list register 15	5081	5082	Integer/float	Read/write

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



## 10 Commissioning

### 10.1 Function check

Before commissioning the measuring device:

- ▶ Make sure that the post-installation and post-connection checks have been performed.
- "Post-installation check" checklist →  27
- "Post-connection check" checklist →  38

### 10.2 Connecting via FieldCare

- For FieldCare connection
- For connecting via FieldCare →  44
- For the FieldCare →  45 user interface

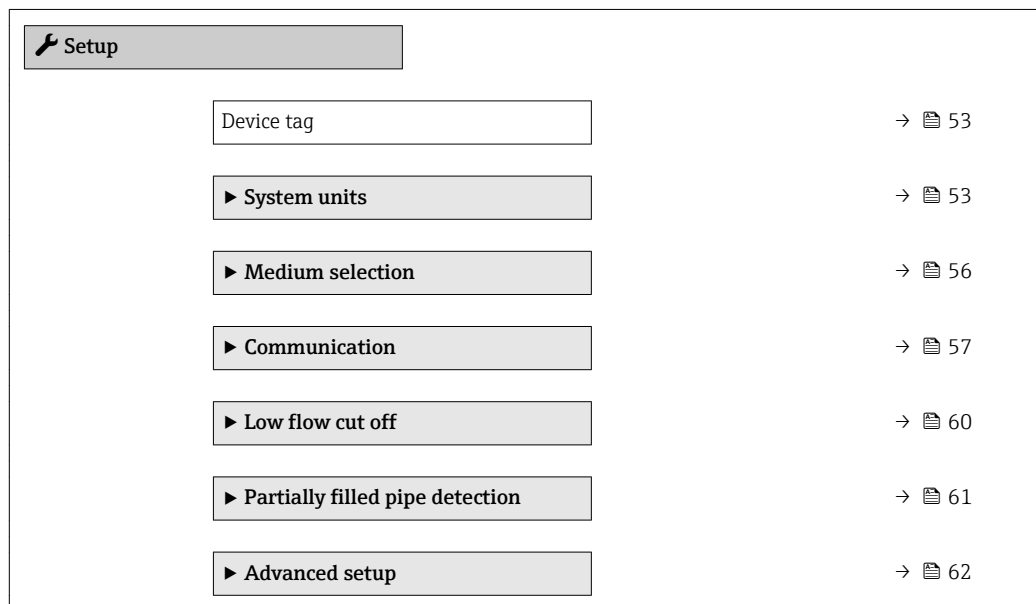
### 10.3 Setting the operating language

Factory setting: English or ordered local language

The operating language can be set in FieldCare or DeviceCare: Operation → Display language



### 10.4 Configuring the measuring device

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



### 10.4.1 Defining the tag name

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

 Enter the tag name in the "FieldCare" operating tool →  45

#### Navigation


"Setup" menu → Device tag

#### Parameter overview with brief description

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

### 10.4.2 Setting the system units









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

 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 → Advanced setup → System units

▶ System units

Mass flow unit	→  54
Mass unit	→  54
Volume flow unit	→  54
Volume unit	→  54
Corrected volume flow unit	→  54
Corrected volume unit	→  54
Density unit	→  54
Reference density unit	→  54
Temperature unit	→  55
Pressure unit	→  55

## Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Mass flow unit	Select mass flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>▪ Output</li> <li>▪ Low flow cut off</li> <li>▪ Simulation process variable</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ kg/h</li> <li>▪ lb/min</li> </ul>
Mass unit	Select mass unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ kg</li> <li>▪ lb</li> </ul>
Volume flow unit	Select volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>▪ Output</li> <li>▪ Low flow cut off</li> <li>▪ Simulation process variable</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ l/h</li> <li>▪ gal/min (us)</li> </ul>
Volume unit	Select volume unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ l (DN &gt; 150 (6"): m<sup>3</sup>)</li> <li>▪ gal (us)</li> </ul>
Corrected volume flow unit	Select corrected volume flow unit. <i>Result</i> The selected unit applies for: <b>Corrected volume flow</b> parameter (→  71)	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ NI/h</li> <li>▪ Sft<sup>3</sup>/min</li> </ul>
Corrected volume unit	Select corrected volume unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ NI</li> <li>▪ Sft<sup>3</sup></li> </ul>
Density unit	Select density unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>▪ Output</li> <li>▪ Simulation process variable</li> <li>▪ Density adjustment (<b>Expert</b> menu)</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ kg/l</li> <li>▪ lb/ft<sup>3</sup></li> </ul>
Reference density unit	Select reference density unit.	Unit choose list	Country-dependent <ul style="list-style-type: none"> <li>▪ kg/NI</li> <li>▪ lb/Sft<sup>3</sup></li> </ul>

Parameter	Description	Selection	Factory setting
Temperature unit	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>▪ <b>Electronic temperature</b> parameter (6053)</li> <li>▪ <b>Maximum value</b> parameter (6051)</li> <li>▪ <b>Minimum value</b> parameter (6052)</li> <li>▪ <b>External temperature</b> parameter (6080)</li> <li>▪ <b>Maximum value</b> parameter (6108)</li> <li>▪ <b>Minimum value</b> parameter (6109)</li> <li>▪ <b>Carrier pipe temperature</b> parameter (6027)</li> <li>▪ <b>Maximum value</b> parameter (6029)</li> <li>▪ <b>Minimum value</b> parameter (6030)</li> <li>▪ <b>Reference temperature</b> parameter (1816)</li> <li>▪ <b>Temperature</b> parameter</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ °C</li> <li>▪ °F</li> </ul>
Pressure unit	Select process pressure unit. <i>Result</i> The unit is taken from: <ul style="list-style-type: none"> <li>▪ <b>Pressure value</b> parameter (→ 57)</li> <li>▪ <b>External pressure</b> parameter (→ 57)</li> <li>▪ Pressure value</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ bar a</li> <li>▪ psi a</li> </ul>

### 10.4.3 Selecting and setting the medium

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

#### Navigation

"Setup" menu → Medium selection

► Medium selection	
Select medium	→ 57
Select gas type	→ 57
Reference sound velocity	→ 57
Temperature coefficient sound velocity	→ 57
Pressure compensation	→ 57
Pressure value	→ 57
External pressure	→ 57



## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Select medium	–	Select medium type.	<ul style="list-style-type: none"> <li>▪ Liquid</li> <li>▪ Gas</li> </ul>	Liquid
Select gas type	The <b>Gas</b> option is selected in the <b>Select medium</b> parameter.	Select measured gas type.	<ul style="list-style-type: none"> <li>▪ Air</li> <li>▪ Ammonia NH3</li> <li>▪ Argon Ar</li> <li>▪ Sulfur hexafluoride SF6</li> <li>▪ Oxygen O2</li> <li>▪ Ozone O3</li> <li>▪ Nitrogen oxide NOx</li> <li>▪ Nitrogen N2</li> <li>▪ Nitrous oxide N2O</li> <li>▪ Methane CH4</li> <li>▪ Hydrogen H2</li> <li>▪ Helium He</li> <li>▪ Hydrogen chloride HCl</li> <li>▪ Hydrogen sulfide H2S</li> <li>▪ Ethylene C2H4</li> <li>▪ Carbon dioxide CO2</li> <li>▪ Carbon monoxide CO</li> <li>▪ Chlorine Cl2</li> <li>▪ Butane C4H10</li> <li>▪ Propane C3H8</li> <li>▪ Propylene C3H6</li> <li>▪ Ethane C2H6</li> <li>▪ Others</li> </ul>	Methane CH4
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 °C (32 °F).	1 to 99 999.9999 m/s	415.0 m/s
Temperature coefficient sound velocity	The <b>Others</b> option is selected in the <b>Select gas type</b> parameter.	Enter temperature coefficient for the gas sound velocity.	Positive floating-point number	0 (m/s)/K
Pressure compensation	–	Select pressure compensation type.	<ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ Fixed value</li> <li>▪ External value</li> </ul>	Off
Pressure value	The <b>Fixed value</b> option is selected in the <b>Pressure compensation</b> parameter.	Enter process pressure to be used for pressure correction.	Positive floating-point number	0 bar
External pressure	The <b>External value</b> option is selected in the <b>Pressure compensation</b> parameter.		Positive floating-point number	0 bar

#### 10.4.4 Configuring the communication interface

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

**Navigation**

"Setup" menu → Communication

► Communication	
Bus address	→ 58
Baudrate	→ 58
Data transfer mode	→ 58
Parity	→ 58
Byte order	→ 58
Failure mode	→ 59

**Parameter overview with brief description**

Parameter	Description	User entry / Selection	Factory setting
Bus address	Enter device address.	1 to 247	247
Baudrate	Define data transfer speed.	<ul style="list-style-type: none"> <li>■ 1200 BAUD</li> <li>■ 2400 BAUD</li> <li>■ 4800 BAUD</li> <li>■ 9600 BAUD</li> <li>■ 19200 BAUD</li> <li>■ 38400 BAUD</li> <li>■ 57600 BAUD</li> <li>■ 115200 BAUD</li> </ul>	19200 BAUD
Data transfer mode	Select data transfer mode.	<ul style="list-style-type: none"> <li>■ ASCII</li> <li>■ RTU</li> </ul>	RTU
Parity	Select parity bits.	Picklist <b>ASCII</b> option: <ul style="list-style-type: none"> <li>■ 0 = <b>Even</b> option</li> <li>■ 1 = <b>Odd</b> option</li> </ul> Picklist <b>RTU</b> option: <ul style="list-style-type: none"> <li>■ 0 = <b>Even</b> option</li> <li>■ 1 = <b>Odd</b> option</li> <li>■ 2 = <b>None / 1 stop bit</b> option</li> <li>■ 3 = <b>None / 2 stop bits</b> option</li> </ul>	Even
Byte order	Select byte transmission sequence.	<ul style="list-style-type: none"> <li>■ 0-1-2-3</li> <li>■ 3-2-1-0</li> <li>■ 1-0-3-2</li> <li>■ 2-3-0-1</li> </ul>	1-0-3-2

Parameter	Description	User entry / Selection	Factory setting
Assign diagnostic behavior	Select diagnostic behavior for MODBUS communication.	<ul style="list-style-type: none"><li>▪ Off</li><li>▪ Alarm or warning</li><li>▪ Warning</li><li>▪ Alarm</li></ul>	Alarm
Failure mode	Select measured value output behavior when a diagnostic message occurs via Modbus communication. NaN <sup>1)</sup>	<ul style="list-style-type: none"><li>▪ NaN value</li><li>▪ Last valid value</li></ul>	NaN value

1) Not a Number

### 10.4.5 Configuring the low flow cut off

The **Low flow cut off** submenu contains the parameters that must be set in order to configure the low flow cut off.

#### Navigation

"Setup" menu → Low flow cut off

► Low flow cut off	
Assign process variable	→ 60
On value low flow cutoff	→ 60
Off value low flow cutoff	→ 60
Pressure shock suppression	→ 60

#### Parameter overview with brief description

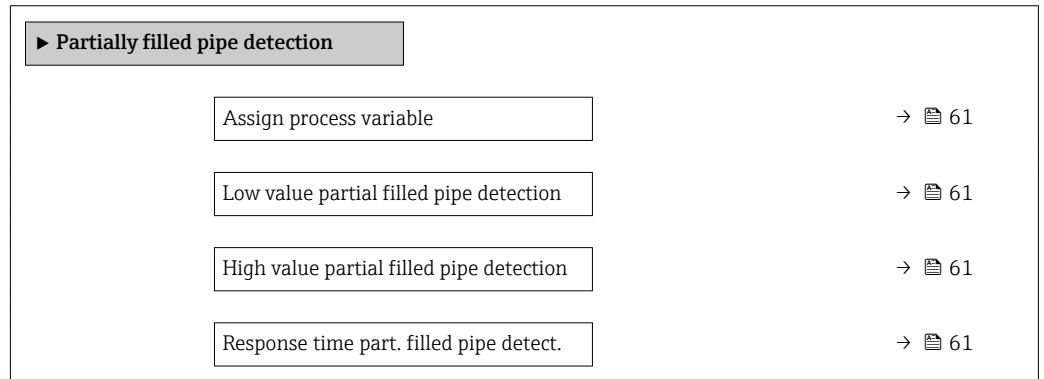
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for low flow cut off.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> </ul>	Mass flow
On value low flow cutoff	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 60): <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> </ul>	Enter on value for low flow cut off.	Positive floating-point number	Depends on country and nominal diameter
Off value low flow cutoff	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 60): <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> </ul>	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 60): <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> </ul>	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

### 10.4.6 Configuring the partial filled pipe detection

The **Partially filled pipe detection** submenu contains parameters that have to be set for configuring empty pipe detection.

#### Navigation

"Setup" menu → 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 style="list-style-type: none"> <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 variable</b> parameter (→ 61): <ul style="list-style-type: none"> <li>■ Density</li> <li>■ Reference density</li> </ul>	Enter lower limit value for deactivating partially filled pipe detection.	Signed floating-point number	200
High value partial filled pipe detection	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 61): <ul style="list-style-type: none"> <li>■ Density</li> <li>■ Reference density</li> </ul>	Enter upper limit value for deactivating partially filled pipe detection.	Signed floating-point number	6000
Response time part. filled pipe detect.	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 61): <ul style="list-style-type: none"> <li>■ Density</li> <li>■ Reference density</li> </ul>	Enter time before diagnostic message is displayed for partially filled pipe detection.	0 to 100 s	1 s

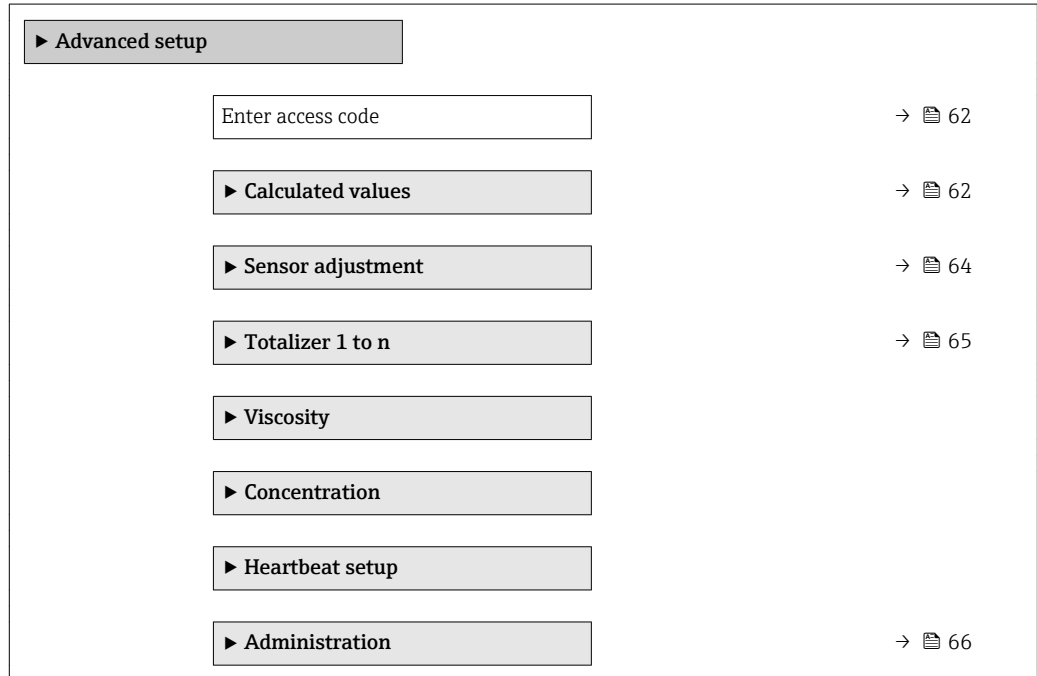
## 10.5 Advanced settings

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

 The number of submenus can vary depending on the device version, e.g. viscosity is available only with the Promass I.

### Navigation

"Setup" menu → Advanced setup



### 10.5.1 Using the parameter to enter the access code

#### Navigation

"Setup" menu → Advanced setup

#### Parameter overview with brief description

Parameter	Description	User entry
Enter access code	Enter access code to disable write protection of parameters.	0 to 9999

### 10.5.2 Calculated values

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

### Navigation

"Setup" menu → Advanced setup → Calculated values

▶ Calculated values	
▶ Corrected volume flow calculation	
Corrected volume flow calculation	→ 63
External reference density	→ 63
Fixed reference density	→ 63
Reference temperature	→ 63
Linear expansion coefficient	→ 64
Square expansion coefficient	→ 64

### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Corrected volume flow calculation	–	Select reference density for calculating the corrected volume flow.	<ul style="list-style-type: none"> <li>■ Fixed reference density</li> <li>■ Calculated reference density</li> <li>■ Reference density by API table 53</li> <li>■ External reference density</li> </ul>	Calculated reference density
External reference density	In the <b>Corrected volume flow calculation</b> parameter, the <b>External reference density</b> option is selected.	Shows external reference density.	Floating point number with sign	–
Fixed reference density	The <b>Fixed reference density</b> option is selected in the <b>Corrected volume flow calculation</b> parameter.	Enter fixed value for reference density.	Positive floating-point number	1 kg/Nl
Reference temperature	The <b>Calculated reference density</b> option is selected in the <b>Corrected volume flow calculation</b> parameter.	Enter reference temperature for calculating the reference density.	–273.15 to 99 999 °C	Country-specific: <ul style="list-style-type: none"> <li>■ +20 °C</li> <li>■ +68 °F</li> </ul>

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Linear expansion coefficient	The <b>Calculated reference density</b> option is selected in the <b>Corrected volume flow calculation</b> parameter parameter.	Enter linear, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0
Square expansion coefficient	The <b>Calculated reference density</b> option is selected in the <b>Corrected volume flow calculation</b> parameter parameter.	For media with a non-linear expansion pattern: enter the quadratic, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0

### 10.5.3 Carrying out a sensor adjustment

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

#### Navigation

"Setup" menu → Advanced setup → Sensor adjustment

► Sensor adjustment	
Installation direction	→ ⓘ 64
► Zero point adjustment	→ ⓘ 64

#### 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 style="list-style-type: none"> <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 → ⓘ 100. Therefore, a zero point adjustment in the field is generally not required.

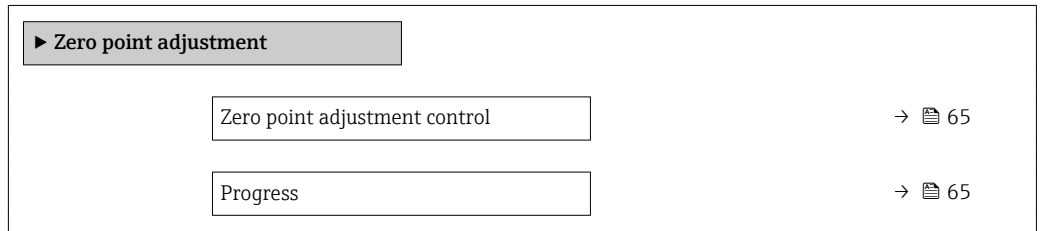
Experience shows that zero point adjustment is advisable only in special cases:

- 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 → Advanced setup → Sensor adjustment → Zero point adjustment



**Parameter overview with brief description**

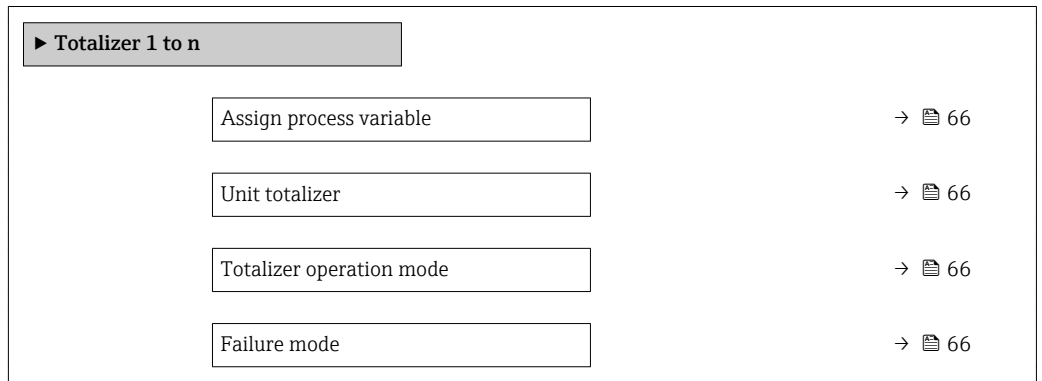
Parameter	Description	Selection / User interface	Factory setting
Zero point adjustment control	Start zero point adjustment.	<ul style="list-style-type: none"> <li>■ Cancel</li> <li>■ Busy</li> <li>■ Zero point adjust failure</li> <li>■ Start</li> </ul>	Cancel
Progress	Shows the progress of the process.	0 to 100 %	–

**10.5.4 Configuring the totalizer**

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

**Navigation**

"Setup" menu → Advanced setup → Totalizer 1 to n



### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable	–	Select process variable for totalizer.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow<sup>*</sup></li> <li>■ Carrier mass flow<sup>*</sup></li> </ul>	Mass flow
Unit totalizer	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 66) of the <b>Totalizer 1 to n</b> submenu: <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow<sup>*</sup></li> <li>■ Carrier mass flow<sup>*</sup></li> </ul>	Select process variable totalizer unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>■ kg</li> <li>■ lb</li> </ul>
Totalizer operation mode	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 66) of the <b>Totalizer 1 to n</b> submenu: <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow<sup>*</sup></li> <li>■ Carrier mass flow<sup>*</sup></li> </ul>	Select totalizer calculation mode.	<ul style="list-style-type: none"> <li>■ Net flow total</li> <li>■ Forward flow total</li> <li>■ Reverse flow total</li> </ul>	Net flow total
Failure mode	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 66) of the <b>Totalizer 1 to n</b> submenu: <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow<sup>*</sup></li> <li>■ Carrier mass flow<sup>*</sup></li> </ul>	Define totalizer behavior in alarm condition.	<ul style="list-style-type: none"> <li>■ Stop</li> <li>■ Actual value</li> <li>■ Last valid value</li> </ul>	Stop

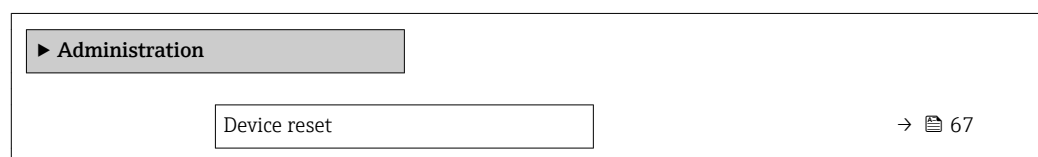
\* Visibility depends on order options or device settings

### 10.5.5 Using parameters for device administration

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

#### Navigation

"Setup" menu → Advanced setup → Administration



**Parameter overview with brief description**

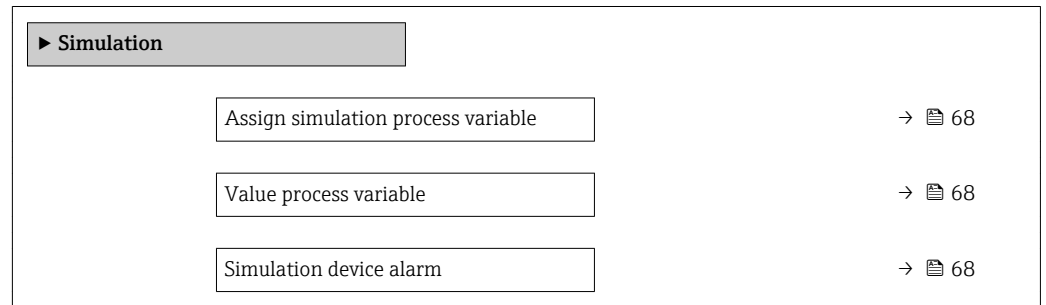
Parameter	Description	Selection	Factory setting
Device reset	Reset the device configuration - either entirely or in part - to a defined state.	<ul style="list-style-type: none"> <li>▪ Cancel</li> <li>▪ To delivery settings</li> <li>▪ Restart device</li> </ul>	Cancel

## 10.6 Simulation


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

**Navigation**

"Diagnostics" menu → Simulation




### 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 style="list-style-type: none"> <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>■ Concentration *</li> <li>■ Target mass flow *</li> <li>■ Carrier mass flow *</li> </ul>	Off
Value process variable	One of the following options is selected in the <b>Assign simulation process variable</b> parameter (→  68): <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Density</li> <li>■ Reference density</li> <li>■ Temperature</li> <li>■ Concentration *</li> <li>■ Target mass flow *</li> <li>■ Carrier mass flow *</li> </ul>	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Simulation device alarm	–	Switch the device alarm on and off.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> </ul>	Off

\* Visibility depends on order options or device settings

## 10.7 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 write protection switch →  68

### 10.7.1 Write protection via write protection switch

The write protection switch makes it possible to block write access to the entire operating menu with the exception of the following parameters:

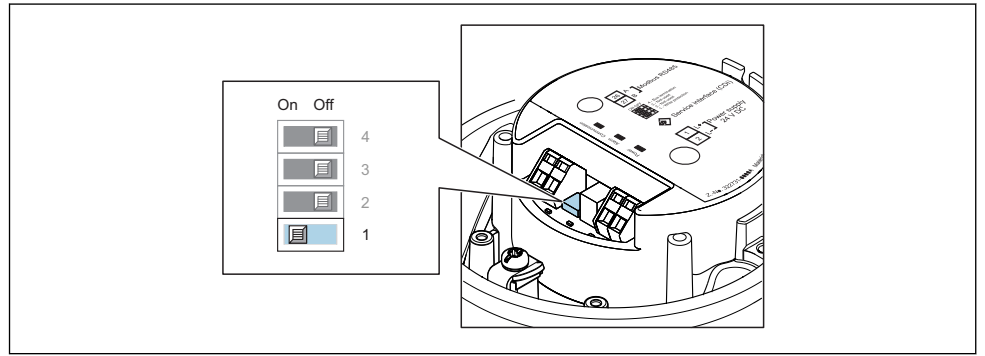
- External pressure
- External temperature
- Reference density
- All parameters for configuring the totalizer

The parameter values are now read only and cannot be edited any more:

- Via service interface (CDI)
- Via Modbus RS485

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

3.



A0030224

Setting the write protection switch on the main electronics module to the **On** position enables hardware write protection. Setting the write protection switch on the main electronics module to the **Off** position (factory setting) disables hardware write protection.

↳ If hardware write protection is enabled: the **Locking status** parameter displays the **Hardware locked** option ; if disabled, the **Locking status** parameter does not display any option .

4. Reverse the removal procedure to reassemble the transmitter.

## 11 Operation

### 11.1 Reading the device locking status

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


#### Navigation



"Operation" menu → Locking status

*Function scope of "Locking status" parameter*

Options	Description
Hardware locked	The locking switch (DIP switch) for locking the hardware is activated on the main electronic module. This prevents write access to the parameters .
Temporarily locked	Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset etc.). Once the internal processing has been completed, the parameters can be changed once again.

### 11.2 Adjusting the operating language

 Detailed information:



- To configure the operating language →  52
- For information on the operating languages supported by the measuring device →  113

### 11.3 Reading measured values

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

#### Navigation

"Diagnostics" menu → Measured values

▶ Measured values	
▶ Process variables	→  70
▶ Totalizer	→  72

#### 11.3.1 "Measured variables" submenu

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




**Navigation**

"Diagnostics" menu → Measured values → Measured variables

► Measured variables	
Mass flow	→ ⓘ 71
Volume flow	→ ⓘ 71
Corrected volume flow	→ ⓘ 71
Density	→ ⓘ 71
Reference density	→ ⓘ 72
Temperature	→ ⓘ 72
Pressure value	→ ⓘ 72
Concentration	→ ⓘ 72
Target mass flow	→ ⓘ 72
Carrier mass flow	→ ⓘ 72

**Parameter overview with brief description**

Parameter	Prerequisite	Description	User interface
Mass flow	-	Displays the mass flow currently measured. <i>Dependency</i> The unit is taken from the <b>Mass flow unit</b> parameter (→ ⓘ 54).	Signed floating-point number
Volume flow	-	Displays the volume flow currently calculated. <i>Dependency</i> The unit is taken from the <b>Volume flow unit</b> parameter (→ ⓘ 54).	Signed floating-point number
Corrected volume flow	-	Displays the corrected volume flow currently calculated. <i>Dependency</i> The unit is taken from the <b>Corrected volume flow unit</b> parameter (→ ⓘ 54).	Signed floating-point number
Density	-	Shows the density currently measured. <i>Dependency</i> The unit is taken from the <b>Density unit</b> parameter (→ ⓘ 54).	Signed floating-point number

Parameter	Prerequisite	Description	User interface
Reference density	–	Displays the reference density currently calculated. <i>Dependency</i> The unit is taken from the <b>Reference density unit</b> parameter (→ 54).	Signed floating-point number
Temperature	–	Shows the medium temperature currently measured. <i>Dependency</i> The unit is taken from the <b>Temperature unit</b> parameter (→ 55).	Signed floating-point number
Pressure value	–	Displays either a fixed or external pressure value. <i>Dependency</i> The unit is taken from the <b>Pressure unit</b> parameter (→ 55).	Signed floating-point number
Concentration	For the following order code: "Application package", option <b>ED</b> "Concentration"  The software options currently enabled are displayed in the <b>Software option overview</b> parameter.	Displays the concentration currently calculated. <i>Dependency</i> The unit is taken from the <b>Concentration unit</b> parameter.	Signed floating-point number
Target mass flow	With the following conditions: ▪ Order code for "Application package", option <b>ED</b> "Concentration" ▪ The <b>WT-%</b> option or the <b>User conc.</b> option is selected in the <b>Concentration unit</b> parameter.  The software options currently enabled are displayed in the <b>Software option overview</b> parameter.	Displays the target fluid mass flow currently measured. <i>Dependency</i> The unit is taken from the <b>Mass flow unit</b> parameter (→ 54).	Signed floating-point number
Carrier mass flow	With the following conditions: ▪ Order code for "Application package", option <b>ED</b> "Concentration" ▪ The <b>WT-%</b> option or the <b>User conc.</b> option is selected in the <b>Concentration unit</b> parameter.  The software options currently enabled are displayed in the <b>Software option overview</b> parameter.	Displays the carrier fluid mass flow currently measured. <i>Dependency</i> The unit is taken from the <b>Mass flow unit</b> parameter (→ 54).	Signed floating-point number

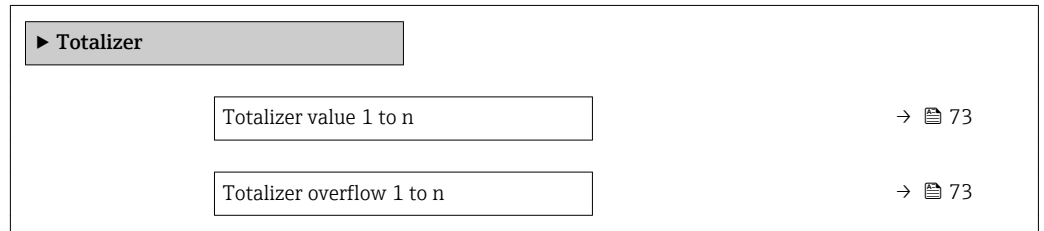
### 11.3.2 "Totalizer" submenu

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



**Navigation**

"Diagnostics" menu → Measured values → Totalizer



**Parameter overview with brief description**

Parameter	Prerequisite	Description	User interface
Totalizer value	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 66) <b>Totalizer 1 to n</b> submenu: <ul style="list-style-type: none"> <li>▪ Volume flow</li> <li>▪ Mass flow</li> <li>▪ Corrected volume flow</li> <li>▪ Target mass flow *</li> <li>▪ Carrier mass flow *</li> </ul>	Displays the current totalizer counter value.	Signed floating-point number
Totalizer overflow	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 66) <b>Totalizer 1 to n</b> submenu: <ul style="list-style-type: none"> <li>▪ Volume flow</li> <li>▪ Mass flow</li> <li>▪ Corrected volume flow</li> <li>▪ Target mass flow *</li> <li>▪ Carrier mass flow *</li> </ul>	Displays the current totalizer overflow.	Integer with sign

\* Visibility depends on order options or device settings

## 11.4 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu (→ 52)
- Advanced settings using the **Advanced setup** submenu (→ 62)

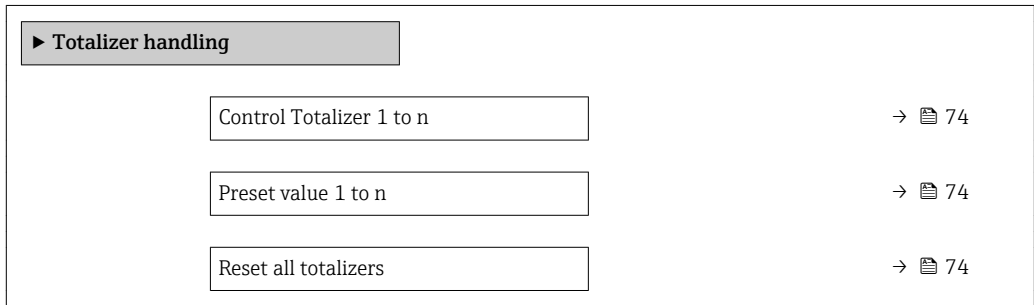
## 11.5 Performing a totalizer reset

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


- Control Totalizer
- Reset all totalizers

**Navigation**

"Operation" menu → Totalizer handling



**Parameter overview with brief description**

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Control Totalizer	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 66) of the <b>Totalizer 1 to n</b> submenu: <ul style="list-style-type: none"> <li>▪ Volume flow</li> <li>▪ Mass flow</li> <li>▪ Corrected volume flow</li> <li>▪ Target mass flow *</li> <li>▪ Carrier mass flow *</li> </ul>	Control totalizer value.	<ul style="list-style-type: none"> <li>▪ Totalize</li> <li>▪ Reset + hold</li> <li>▪ Preset + hold</li> <li>▪ Reset + totalize</li> <li>▪ Preset + totalize</li> </ul>	Totalize
Preset value	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 66) of the <b>Totalizer 1 to n</b> submenu: <ul style="list-style-type: none"> <li>▪ Volume flow</li> <li>▪ Mass flow</li> <li>▪ Corrected volume flow</li> <li>▪ Target mass flow *</li> <li>▪ Carrier mass flow *</li> </ul>	Specify start value for totalizer. <i>Dependency</i>  The unit of the selected process variable is specified for the totalizer depending on the selection made in the <b>Assign process variable</b> parameter: <ul style="list-style-type: none"> <li>▪ <b>Volume flow</b> option: <b>Volume flow unit</b> parameter</li> <li>▪ <b>Mass flow</b> option, <b>Target mass flow</b> option, <b>Carrier mass flow</b> option: <b>Mass flow unit</b> parameter</li> <li>▪ <b>Corrected volume flow</b> option: <b>Corrected volume unit</b> parameter</li> </ul>	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> <li>▪ 0 kg</li> <li>▪ 0 lb</li> </ul>
Reset all totalizers	–	Reset all totalizers to 0 and start.	<ul style="list-style-type: none"> <li>▪ Cancel</li> <li>▪ Reset + totalize</li> </ul>	Cancel

\* Visibility depends on order options or device settings

### 11.5.1 Function scope of the "Control Totalizer" parameter

Options	Description
Totalize	The totalizer is started or continues running.
Reset + hold	The totaling process is stopped and the totalizer is reset to 0.
Preset + hold	The totaling process is stopped and the totalizer is set to its defined start value from the <b>Preset value</b> parameter.
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.
Preset + totalize	The totalizer is set to the defined start value from the <b>Preset value</b> parameter and the totaling process is restarted.

### 11.5.2 Function scope of the "Reset all totalizers" parameter

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


## 12 Diagnostics and troubleshooting

### 12.1 General troubleshooting

*For output signals*

Error	Possible causes	Solution
Green power LED on the main electronics module of the transmitter is dark	Supply voltage does not match the value indicated on the nameplate.	Apply the correct supply voltage .
Green power LED on the main electronics module of the transmitter is dark	Power supply cable connected incorrectly	Check the terminal assignment → 29.
Green power LED on Safety Barrier Promass 100 is dark	Supply voltage does not match the value indicated on the nameplate.	Apply the correct supply voltage .
Green power LED on Safety Barrier Promass 100 is dark	Power supply cable connected incorrectly	Check the terminal assignment → 29.
Device measures incorrectly.	Configuration error or device is operated outside the application.	1. Check and correct parameter configuration. 2. Observe limit values specified in the "Technical Data".

*For access*

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 → 68.
No connection via Modbus RS485	Modbus RS485 bus cable connected incorrectly	Check terminal assignment → 29.
No connection via Modbus RS485	Device plug connected incorrectly	Check the pin assignment of the connector → 32.
No connection via Modbus RS485	Modbus RS485 cable incorrectly terminated	Check terminating resistor .
No connection via Modbus RS485	Incorrect settings for the communication interface	Check the Modbus RS485 configuration → 57.
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
Not connecting to Web server	Incorrect IP address	Check the IP address: 192.168.1.212

Error	Possible causes	Solution
Operation with FieldCare or DeviceCare via CDI-RJ45 service interface (port 8000)	Firewall of computer or network is preventing communication	Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access.
Flashing of firmware with FieldCare or DeviceCare via CDI-RJ45 service interface (via port 8000 or TFTP ports)	Firewall of computer or network is preventing communication	Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access.

## 12.2 Diagnostic information via light emitting diodes

### 12.2.1 Transmitter

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

LED	Color	Meaning
Supply voltage	Off	Supply voltage is off or too low
	Green	Supply voltage is ok
Alarm	Off	Device status is ok
	Flashing red	A device error of diagnostic behavior "Warning" has occurred
	Red	<ul style="list-style-type: none"> <li>■ A device error of diagnostic behavior "Alarm" has occurred</li> <li>■ Boot loader is active</li> </ul>
Communication	Flashing white	Modbus RS485 communication is active

### 12.2.2 Safety Barrier Promass 100

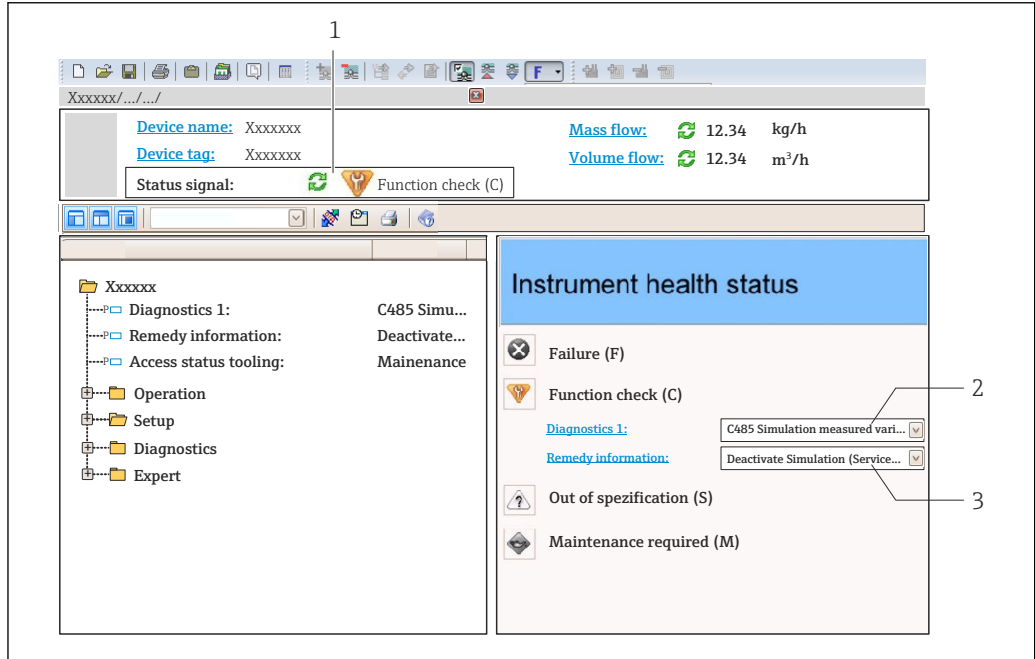
Various light emitting diodes (LEDs) on the Safety Barrier Promass 100 provide status information.

LED	Color	Color
Power	Off	Supply voltage is off or too low.
	Green	Supply voltage is ok.
Communication	Flashing white	Modbus RS485 communication is active.

## 12.3 Diagnostic information in DeviceCare or FieldCare

### 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.



A0021799-EN

- 1 Status area with status signal
- 2 Diagnostic information → 78
- 3 Remedy information with Service ID

**i** In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:

- Via parameter
- Via submenu → 83

### Status signals

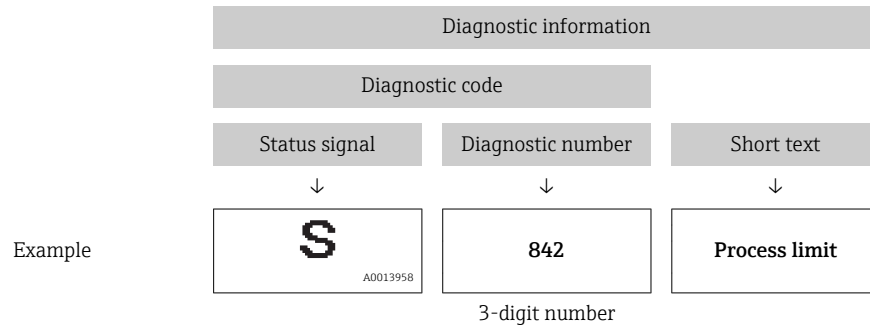
The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

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

**i** 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.



### 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 Diagnostic information via communication interface

### 12.4.1 Reading out diagnostic information

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

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

 For an overview of diagnostic events with diagnosis number and diagnosis code  
→  80



### 12.4.2 Configuring error response mode

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

#### Navigation path

Setup → Communication

*Parameter overview with brief description*

Parameters	Description	Selection	Factory setting
Failure mode	<p>Select measured value output behavior when a diagnostic message occurs via Modbus communication.</p> <p> This effect of this parameter depends on the option selected in the <b>Assign diagnostic behavior</b> parameter.</p>	<ul style="list-style-type: none"> <li>▪ NaN value</li> <li>▪ Last valid value</li> </ul> <p> NaN ≡ not a number</p>	NaN value

## 12.5 Adapting the diagnostic information

### 12.5.1 Adapting the diagnostic behavior


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



Expert → System → Diagnostic handling → Diagnostic behavior

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

Options	Description
Alarm	The device stops measurement. The measured value output via Modbus RS485 and the totalizers assume the defined alarm condition. A diagnostic message is generated.
Warning	The device continues to measure. The measured value output via Modbus RS485 and the totalizers are not affected. A diagnostic message is generated.
Logbook entry only	The device continues to measure. The diagnostic message is entered only in the <b>Event logbook</b> submenu.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

## 12.6 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 →  80

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
<b>Diagnostic of sensor</b>				
022	Sensor temperature	<ol style="list-style-type: none"> <li>1. Change main electronic module</li> <li>2. Change sensor</li> </ol>	F	Alarm




Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
046	Sensor limit exceeded	1. Inspect sensor 2. Check process condition	S	Alarm <sup>1)</sup>
062	Sensor connection	1. Change main electronic module 2. Change sensor	F	Alarm
082	Data storage	1. Check module connections 2. Contact service	F	Alarm
083	Memory content	1. Restart device 2. Contact service	F	Alarm
140	Sensor signal	1. Check or change main electronics 2. Change sensor	S	Alarm <sup>1)</sup>
144	Measuring error too high	1. Check or change sensor 2. Check process conditions	F	Alarm <sup>1)</sup>
190	Special event 1	Contact service	F	Alarm
191	Special event 5	Contact service	F	Alarm
192	Special event 9	Contact service	F	Alarm <sup>1)</sup>
<b>Diagnostic of electronic</b>				
242	Software incompatible	1. Check software 2. Flash or change main electronics module	F	Alarm
270	Main electronic failure	Change main electronic module	F	Alarm
271	Main electronic failure	1. Restart device 2. Change main electronic module	F	Alarm
272	Main electronic failure	1. Restart device 2. Contact service	F	Alarm
273	Main electronic failure	Change electronic	F	Alarm
274	Main electronic failure	Change electronic	S	Warning <sup>1)</sup>
311	Electronic failure	1. Reset device 2. Contact service	F	Alarm
390	Special event 2	Contact service	F	Alarm
391	Special event 6	Contact service	F	Alarm
392	Special event 10	Contact service	F	Alarm <sup>1)</sup>
<b>Diagnostic of configuration</b>				
410	Data transfer	1. Check connection 2. Retry data transfer	F	Alarm
411	Up-/download active	Up-/download active, please wait	C	Warning
438	Dataset	1. Check data set file 2. Check device configuration 3. Up- and download new configuration	M	Warning
453	Flow override	Deactivate flow override	C	Warning
484	Simulation failure mode	Deactivate simulation	C	Alarm



Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
485	Simulation measured variable	Deactivate simulation	C	Warning
590	Special event 3	Contact service	F	Alarm
591	Special event 7	Contact service	F	Alarm
592	Special event 11	Contact service	F	Alarm <sup>1)</sup>
<b>Diagnostic of process</b>				
830	Sensor temperature too high	Reduce ambient temp. around the sensor housing	S	Warning
831	Sensor temperature too low	Increase ambient temp. around the sensor housing	S	Warning
832	Electronic temperature too high	Reduce ambient temperature	S	Warning <sup>1)</sup>
833	Electronic temperature too low	Increase ambient temperature	S	Warning <sup>1)</sup>
834	Process temperature too high	Reduce process temperature	S	Warning <sup>1)</sup>
835	Process temperature too low	Increase process temperature	S	Warning <sup>1)</sup>
843	Process limit	Check process conditions	S	Warning
862	Partly filled pipe	1. Check for gas in process 2. Adjust detection limits	S	Warning
910	Tubes not oscillating	1. Check electronic 2. Inspect sensor	F	Alarm
912	Medium inhomogeneous	1. Check process cond. 2. Increase system pressure	S	Warning <sup>1)</sup>
912	Inhomogeneous		S	Warning <sup>1)</sup>
913	Medium unsuitable	1. Check process conditions 2. Check electronic modules or sensor	S	Alarm <sup>1)</sup>
944	Monitoring failed	Check process conditions for Heartbeat Monitoring	S	Warning <sup>1)</sup>
948	Tube damping too high	Check process conditions	S	Warning
990	Special event 4	Contact service	F	Alarm
991	Special event 8	Contact service	F	Alarm
992	Special event 12	Contact service	F	Alarm <sup>1)</sup>



1) Diagnostic behavior can be changed.

## 12.7 Pending diagnostic events

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

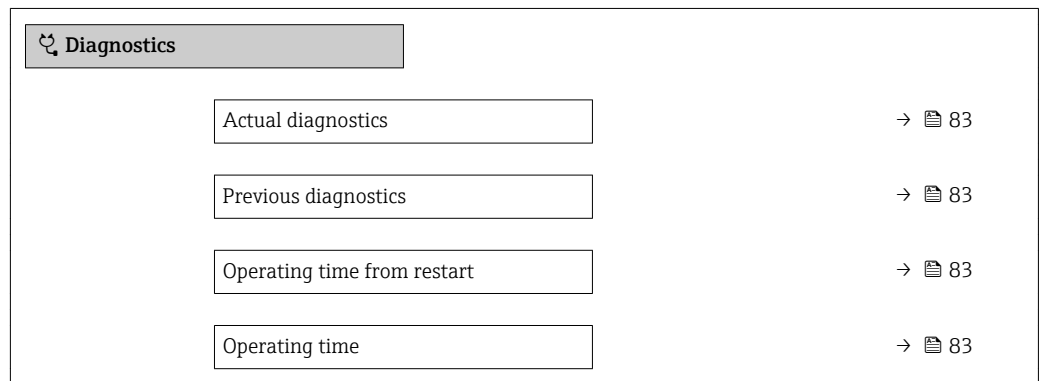
 To call up the measures to rectify a diagnostic event:

- Via "FieldCare" operating tool →  79
- Via "DeviceCare" operating tool →  79


 Other pending diagnostic events can be displayed in the **Diagnostic list** submenu →  83

### Navigation

"Diagnostics" menu



### Parameter overview with brief description




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

## 12.8 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



-  To call up the measures to rectify a diagnostic event:
  - Via "FieldCare" operating tool →  79
  - Via "DeviceCare" operating tool →  79

## 12.9 Event logbook



### 12.9.1 Reading the event logbook

A chronological overview of the event messages that have occurred is provided in the events list which contains a maximum of 20 message entries. This list can be displayed via FieldCare if necessary.




**Navigation path**Edit tool bar: **F** → Additional functions → Events list




-  The edit tool bar can be accessed via the FieldCare user interface →  44

This event history includes entries for:

- Diagnostic events →  80
- Information events →  85

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

- Diagnostic event
  - : Occurrence of the event
  - : End of the event
- Information event
  - : Occurrence of the event

-  To call up the measures to rectify a diagnostic event:
  - Via "FieldCare" operating tool →  79
  - Via "DeviceCare" operating tool →  79

-  For filtering the displayed event messages →  84

### 12.9.2 Filtering the event logbook

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

**Navigation path**

Diagnostics → Event logbook → Filter options

**Filter categories**


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

### 12.9.3 Overview of information events

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


Info number	Info name
I1000	----- (Device ok)
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed
I1110	Write protection switch changed
I1111	Density adjust failure
I1151	History reset
I1209	Density adjustment ok
I1221	Zero point adjust failure
I1222	Zero point adjustment ok
I1444	Device verification passed
I1445	Device verification failed
I1446	Device verification active
I1447	Record application reference data
I1448	Application reference data recorded
I1449	Recording application ref. data failed
I1450	Monitoring off
I1451	Monitoring on
I1457	Failed: Measured error verification
I1459	Failed: I/O module verification
I1460	Failed: Sensor integrity verification
I1461	Failed: Sensor verification
I1462	Failed: Sensor electronic module verific.

## 12.10 Resetting the measuring device

Using the **Device reset** parameter (→  67) it is possible to reset the entire device configuration or some of the configuration to a defined state.

### 12.10.1 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.










Options	Description
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.
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.

## 12.11 Device information

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






### Navigation

"Diagnostics" menu → Device information

► Device information	
Device tag	→  86
Serial number	→  86
Firmware version	→  87
Device name	→  87
Order code	→  87
Extended order code 1	→  87
Extended order code 2	→  87
Extended order code 3	→  87
ENP version	→  87




### 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 100
Serial number	Shows the serial number of the measuring device.	A maximum of 11-digit character string comprising letters and numbers.	–

Parameter	Description	User interface	Factory setting
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 100
Order code	Shows the device order code.  The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field.	Character string composed of letters, numbers and certain punctuation marks (e.g. /).	–
Extended order code 1	Shows the 1st part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–
Extended order code 2	Shows the 2nd part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–
Extended order code 3	Shows the 3rd part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–
ENP version	Shows the version of the electronic nameplate (ENP).	Character string	2.02.00

## 12.12 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
06.2012	01.01.00	Option 78	Original firmware	Operating Instructions	BA016590/06/EN/01.12
04.2013	01.02.zz	Option 74	Update	Operating Instructions	BA016590/06/EN/02.13
10.2014	01.03.zz	Option 72	<ul style="list-style-type: none"> <li>▪ New unit "Beer Barrel (BBL)"</li> <li>▪ Use of an external pressure value for "liquid" medium type</li> <li>▪ New parameter and diagnostic information for "oscillation damping" upper limit value</li> </ul>	Operating Instructions	BA016590/06/EN/03.14

-  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:
  - In the Download Area of the Endress+Hauser web site: [www.endress.com](http://www.endress.com) → Downloads
  - Specify the following details:
    - Product root, e.g. 8E1B  
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.
- Observe the maximum permitted medium temperature for the measuring device  
→  106.

### 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: →  92

### 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 Repairs

### 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


*W@M Device Viewer* ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)):

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

-  Measuring device serial number:
  - Is located on the nameplate of the device.
  - Can be read out via the **Serial number** parameter (→  86) 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 measuring device must be returned if it is need of repair or a factory calibration, or if the wrong measuring device has been delivered or ordered. Legal specifications require Endress+Hauser, as an ISO-certified company, to follow certain procedures when handling products that are in contact with the medium.

To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at <http://www.endress.com/support/return-material>

## 14.5 Disposal

### 14.5.1 Removing the measuring device

1. Switch off the device.

**⚠ WARNING**

**Danger to persons from process conditions.**

- ▶ Beware of hazardous process conditions such as pressure in the measuring device, high temperatures or aggressive 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](http://www.endress.com).

### 15.1 Device-specific accessories

#### 15.1.1 For the sensor




Accessories	Description
Heating jacket	<p>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. Heating jackets cannot be used with sensors fitted with a rupture disk.</p> <p> For details, see Operating Instructions BA00132D</p>

### 15.2 Communication-specific accessories



Accessories	Description
Commubox FXA291	<p>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.</p> <p> For details, see the "Technical Information" document TI405C/07</p>

### 15.3 Service-specific accessories

Accessories	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> <li>▪ Choice of measuring devices for industrial requirements</li> <li>▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy.</li> <li>▪ Graphic illustration of the calculation results</li> <li>▪ 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.</li> </ul> <p>Applicator is available:</p> <ul style="list-style-type: none"> <li>▪ Via the Internet: <a href="https://wapps.endress.com/applicator">https://wapps.endress.com/applicator</a></li> <li>▪ As a downloadable DVD for local PC installation.</li> </ul>
W@M	<p>W@M Life Cycle Management</p> <p>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.</p> <p>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.</p> <p>Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit <a href="http://www.endress.com/lifecyclemanagement">www.endress.com/lifecyclemanagement</a></p>

FieldCare	<p>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.</p> <p> For details, see Operating Instructions BA00027S and BA00059S</p>
DeviceCare	<p>Tool for connecting and configuring Endress+Hauser field devices.</p> <p> For details, see Innovation brochure IN01047S</p>
Commubox FXA291	<p>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.</p> <p> For details, see "Technical Information" TI00405C</p>

## 15.4 System components

Accessories	Description
Memograph M graphic data manager	<p>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.</p> <p> For details, see "Technical Information" TI00133R and Operating Instructions BA00247R</p>
iTEMP	<p>The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature.</p> <p> For details, see "Fields of Activity", FA00006T</p>

## 16 Technical data

### 16.1 Application


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

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

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Measuring principle	Mass flow measurement based on the Coriolis measuring principle
Measuring system	<p>The device consists of a transmitter and a sensor. The Safety Barrier Promass 100 is part of the scope of supply and must be implemented to operate the device.</p> <p>The device is available as a compact version: The transmitter and sensor form a mechanical unit.</p> <p>For information on the structure of the device →  13</p>

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## 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 ranges for liquids

DN		Measuring range full scale values $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$	
[mm]	[in]	[kg/h]	[lb/min]
8	$\frac{3}{8}$	0 to 2 000	0 to 73.50
15	$\frac{1}{2}$	0 to 6 500	0 to 238.9
25	1	0 to 18 000	0 to 661.5
40	$1\frac{1}{2}$	0 to 45 000	0 to 1 654
50	2	0 to 70 000	0 to 2 573
80	3	0 to 180 000	0 to 6 615
100	4	0 to 350 000	0 to 12 860
150	6	0 to 800 000	0 to 29 400
250	10	0 to 2 200 000	0 to 80 850

### Measuring ranges for gases

The full scale values depend on the density of the gas and can be calculated with the formula below:

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

$\dot{m}_{\max(G)}$	Maximum full scale value for gas [kg/h]
$\dot{m}_{\max(F)}$	Maximum full scale value for liquid [kg/h]
$\dot{m}_{\max(G)} < \dot{m}_{\max(F)}$	$\dot{m}_{\max(G)}$ can never be greater than $\dot{m}_{\max(F)}$
$\rho_G$	Gas density in [kg/m <sup>3</sup> ] at operating conditions
x	Constant dependent on nominal diameter

DN		x
[mm]	[in]	[kg/m <sup>3</sup> ]
8	$\frac{3}{8}$	60
15	$\frac{1}{2}$	80
25	1	90

DN		x
[mm]	[in]	[kg/m <sup>3</sup> ]
40	1½	90
50	2	90
80	3	110
100	4	130
150	6	200
250	10	200

**Calculation example for gas**

- Sensor: Promass F, DN 50
- Gas: Air with a density of 60.3 kg/m<sup>3</sup> (at 20 °C and 50 bar)
- Measuring range (liquid): 70 000 kg/h
- x = 90 kg/m<sup>3</sup> (for Promass F, DN 50)

Maximum possible full scale value:

$$\dot{m}_{\max(G)} = \dot{m}_{\max(F)} \cdot \rho_G : x = 70\,000 \text{ kg/h} \cdot 60.3 \text{ kg/m}^3 : 90 \text{ kg/m}^3 = 46\,900 \text{ kg/h}$$

**Recommended measuring range**

"Flow limit" section →  108

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.

## 16.4 Output

Output signal

**Modbus RS485**

<b>Physical interface</b>	In accordance with EIA/TIA-485-A standard
<b>Terminating resistor</b>	<ul style="list-style-type: none"> <li>■ For device version used in non-hazardous areas or Zone 2/Div. 2: integrated and can be activated via DIP switches on the transmitter electronics module</li> <li>■ For device version used in intrinsically safe areas: integrated and can be activated via DIP switches on the Safety Barrier Promass 100</li> </ul>

Signal on alarm

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



**Current output 4 to 20 mA**

4 to 20 mA

<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ 4 to 20 mA in accordance with NAMUR recommendation NE 43</li> <li>■ 4 to 20 mA in accordance with US</li> <li>■ Min. value: 3.59 mA</li> <li>■ Max. value: 22.5 mA</li> <li>■ Freely definable value between: 3.59 to 22.5 mA</li> <li>■ Actual value</li> <li>■ Last valid value</li> </ul>
---------------------	--

**Pulse/frequency/switch output**

<b>Pulse output</b>	
<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ Actual value</li> <li>■ No pulses</li> </ul>
<b>Frequency output</b>	
<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ Actual value</li> <li>■ 0 Hz</li> <li>■ Defined value: 0 to 12 500 Hz</li> </ul>
<b>Switch output</b>	
<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ Current status</li> <li>■ Open</li> <li>■ Closed</li> </ul>

**Modbus RS485**


<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ NaN value instead of current value</li> <li>■ Last valid value</li> </ul>
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**Interface/protocol**

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


<b>Plain text display</b>	With information on cause and remedial measures
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**Light emitting diodes (LED)**

<b>Status information</b>	Status indicated by various light emitting diodes The following information is displayed depending on the device version: <ul style="list-style-type: none"> <li>■ Supply voltage active</li> <li>■ Data transmission active</li> <li>■ Device alarm/error has occurred</li> </ul>  Diagnostic information via light emitting diodes
---------------------------	--

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

Galvanic isolation                      The following connections are galvanically isolated from each other:  
 ■ Outputs  
 ■ Power supply

Protocol-specific data	<b>Protocol</b>	Modbus Applications Protocol Specification V1.1
	<b>Device type</b>	Slave
	<b>Slave address range</b>	1 to 247
	<b>Broadcast address range</b>	0
	<b>Function codes</b>	<ul style="list-style-type: none"> <li>■ 03: Read holding register</li> <li>■ 04: Read input register</li> <li>■ 06: Write single registers</li> <li>■ 08: Diagnostics</li> <li>■ 16: Write multiple registers</li> <li>■ 23: Read/write multiple registers</li> </ul>
	<b>Broadcast messages</b>	Supported by the following function codes: <ul style="list-style-type: none"> <li>■ 06: Write single registers</li> <li>■ 16: Write multiple registers</li> <li>■ 23: Read/write multiple registers</li> </ul>
	<b>Supported baud rate</b>	<ul style="list-style-type: none"> <li>■ 1 200 BAUD</li> <li>■ 2 400 BAUD</li> <li>■ 4 800 BAUD</li> <li>■ 9 600 BAUD</li> <li>■ 19 200 BAUD</li> <li>■ 38 400 BAUD</li> <li>■ 57 600 BAUD</li> <li>■ 115 200 BAUD</li> </ul>
	<b>Data transfer mode</b>	<ul style="list-style-type: none"> <li>■ ASCII</li> <li>■ RTU</li> </ul>
	<b>Data access</b>	Each device parameter can be accessed via Modbus RS485.  For Modbus register information, see "Description of device parameters" documentation

## 16.5 Power supply

Terminal assignment                      ■ →  30  
 ■ →  29

Pin assignment, device plug            →  32

Supply voltage                              The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).

### Transmitter

- Modbus RS485, for use in non-hazardous areas and Zone 2/Div. 2:  
DC 20 to 30 V
- Modbus RS485, for use in intrinsically safe areas:  
Power supply via Safety Barrier Promass 100

**Promass 100 safety barrier**

DC 20 to 30 V

Power consumption

**Transmitter**

Order code for "Output"	Maximum Power consumption
Option <b>M</b> Modbus RS485, for use in non-hazardous areas and Zone 2/Div. 2	3.5 W
Option <b>M</b> : Modbus RS485, for use in intrinsically safe areas	2.45 W

*Promass 100 safety barrier*

Order code for "Output"	Maximum Power consumption
Option <b>M</b> : Modbus RS485, for use in intrinsically safe areas	4.8 W

Current consumption

**Transmitter**

Order code for "Output"	Maximum Current consumption	Maximum switch-on current
Option <b>M</b> Modbus RS485, for use in non-hazardous areas and Zone 2/Div. 2	90 mA	10 A (< 0.8 ms)
Option <b>M</b> : Modbus RS485, for use in intrinsically safe areas	145 mA	16 A (< 0.4 ms)

**Promass 100 safety barrier**

Order code for "Output"	Maximum Current consumption	Maximum switch-on current
Option <b>M</b> : Modbus RS485, for use in intrinsically safe areas	230 mA	10 A (< 0.8 ms)


Power supply failure

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

Electrical connection

→  34

Potential equalization

→  36

Terminals


**Transmitter**

Spring terminals for wire cross-sections 0.5 to 2.5 mm<sup>2</sup> (20 to 14 AWG)



**Promass 100 safety barrier**

Plug-in screw terminals for wire cross-sections 0.5 to 2.5 mm<sup>2</sup> (20 to 14 AWG)

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


Cable specification →  28

## 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 →  92

Maximum measured error o.r. = of reading; 1 g/cm<sup>3</sup> = 1 kg/l; T = medium temperature

### Base accuracy

 Design fundamentals →  104

#### *Mass flow and volume flow (liquids)*

±0.05 % o.r. (PremiumCal; order code for "Calibration flow", option **D**, for mass flow)  
 ±0.10 % o.r.

#### *Mass flow (gases)*

±0.35 % o.r.

#### *Density (liquids)*

Under reference operating conditions [g/cm <sup>3</sup> ]	Standard density calibration <sup>1)</sup> [g/cm <sup>3</sup> ]	Wide-range Density specification <sup>2) 3)</sup> [g/cm <sup>3</sup> ]
±0.0005	±0.01	±0.001

- 1) Valid over the entire temperature and density range
- 2) 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 EF "Special density"

#### *Temperature*

±0.5 °C ± 0.005 · T °C (±0.9 °F ± 0.003 · (T - 32) °F)

**Zero point stability**

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
8	$\frac{3}{8}$	0.030	0.001
15	$\frac{1}{2}$	0.200	0.007
25	1	0.540	0.019
40	$1\frac{1}{2}$	2.25	0.083
50	2	3.50	0.129
80	3	9.0	0.330
100	4	14.0	0.514
150	6	32.0	1.17
250	10	88.0	3.23

**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]
8	2000	200	100	40	20	4
15	6500	650	325	130	65	13
25	18000	1800	900	360	180	36
40	45000	4500	2250	900	450	90
50	70000	7000	3500	1400	700	140
80	180000	18000	9000	3600	1800	360
100	350000	35000	17500	7000	3500	700
150	800000	80000	40000	16000	8000	1600
250	2200000	220000	110000	44000	22000	4400

*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]
$\frac{3}{8}$	73.50	7.350	3.675	1.470	0.735	0.147
$\frac{1}{2}$	238.9	23.89	11.95	4.778	2.389	0.478
1	661.5	66.15	33.08	13.23	6.615	1.323
$1\frac{1}{2}$	1654	165.4	82.70	33.08	16.54	3.308
2	2573	257.3	128.7	51.46	25.73	5.146
3	6615	661.5	330.8	132.3	66.15	13.23
4	12860	1286	643.0	257.2	128.6	25.72

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]
6	29400	2940	1470	588	294	58.80
10	80850	8085	4043	1617	808.5	161.7

**Accuracy of outputs**

 The output accuracy must be factored into the measured error if analog outputs are used, but can be ignored for fieldbus outputs (e.g. Modbus RS485, EtherNet/IP).

The outputs have the following base accuracy specifications.

Repeatability o.r. = of reading; 1 g/cm<sup>3</sup> = 1 kg/l; T = medium temperature

**Base repeatability**

 Design fundamentals →  104

*Mass flow and volume flow (liquids)*

±0.025 % o.r. (PremiumCal, for mass flow)

±0.05 % o.r.

*Mass flow (gases)*

±0.25 % o.r.

*Density (liquids)*

±0.00025 g/cm<sup>3</sup>

*Temperature*

±0.25 °C ± 0.0025 · T °C (±0.45 °F ± 0.0015 · (T-32) °F)

Response time The response time depends on the configuration (damping).

**Current output**

Influence of ambient temperature o.r. = of reading

Temperature coefficient	Max. ±0.005 % o.r./°C
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**Pulse/frequency output**

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

**Mass flow and volume flow**

Influence of medium temperature 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 ±0.0002 % o.f.s./°C (±0.0001 % o. f.s./°F).

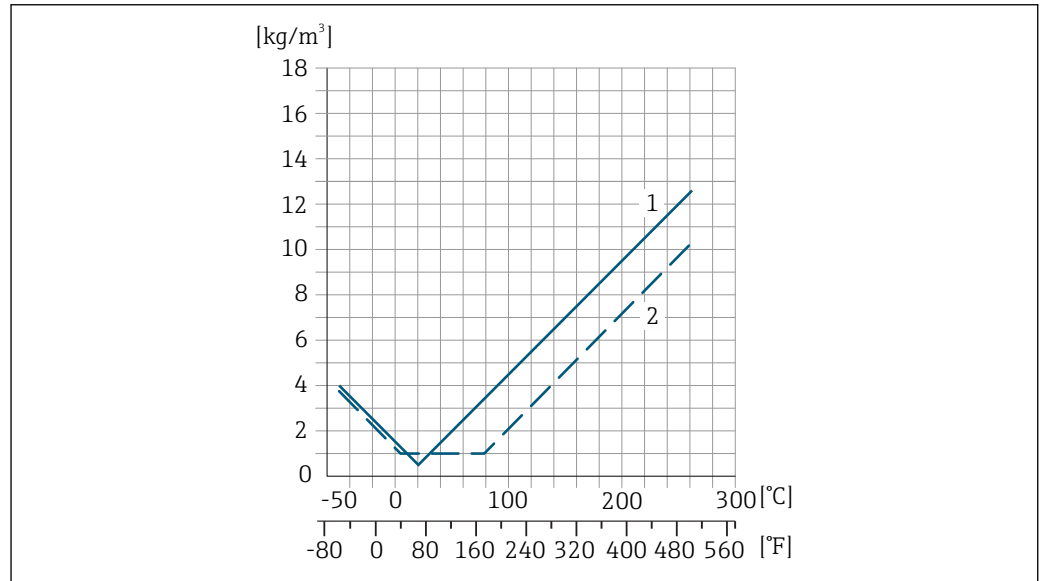
The effect is reduced if zero point adjustment is performed at process temperature.

**Density**

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

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

If the process temperature is outside the valid range ( $\rightarrow$  100) the measured error is  $\pm 0.00005 \text{ g/cm}^3 / ^\circ\text{C}$  ( $\pm 0.000025 \text{ g/cm}^3 / ^\circ\text{F}$ )



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

**Temperature**

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

Influence of medium pressure

The table below shows the effect on accuracy of mass flow due to a difference between calibration pressure and process pressure.

o.r. = of reading

- It is possible to compensate for the effect by:
  - Reading in the current pressure measured value via the current input.
  - Specifying a fixed value for the pressure in the device parameters.

Operating Instructions .

DN		[% o.r./bar]	[% o.r./psi]
[mm]	[in]		
8	3/8	no influence	
15	1/2	no influence	
25	1	no influence	
40	1 1/2	-0.003	-0.0002

DN		[% o.r./bar]	[% o.r./psi]
[mm]	[in]		
50	2	-0.008	-0.0006
80	3	-0.009	-0.0006
100	4	-0.007	-0.0005
150	6	-0.009	-0.0006
250	10	-0.009	-0.0006

Design fundamentals

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

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

MeasValue = measured value; ZeroPoint = zero point stability

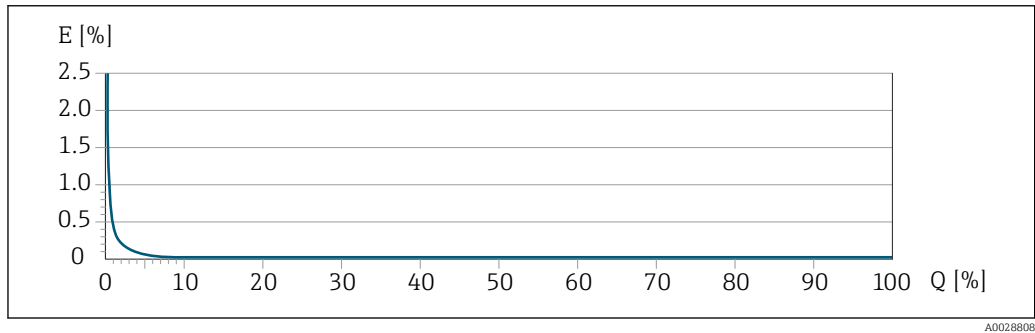
*Calculation of the maximum measured error as a function of the flow rate*

Flow rate	Maximum measured error in % o.r.
$\geq \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A0021332</small>	$\pm \text{BaseAccu}$ <small>A0021339</small>
$< \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A0021333</small>	$\pm \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ <small>A0021334</small>

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

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


**Example for maximum measured error**



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



## 16.7 Installation

"Mounting requirements" →  20

## 16.8 Environment

Ambient temperature range →  23

### 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 to +80 °C (-40 to +176 °F), preferably at +20 °C (+68 °F) (standard version)  
-50 to +80 °C (-58 to +176 °F) (Order code for "Test, certificate", option JM)

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

Degree of protection

### Transmitter and sensor

- As standard: IP66/67, type 4X enclosure
- With the order code for "Sensor options", option **CM**: IP69 can also be ordered
- When housing is open: IP20, type 1 enclosure
- Display module: IP20, type 1 enclosure

### Safety Barrier Promass 100

IP20

Vibration resistance

- Vibration, sinusoidal according to IEC 60068-2-6
  - 2 to 8.4 Hz, 3.5 mm peak
  - 8.4 to 2 000 Hz, 1 g peak
- Vibration broad-band random, according to IEC 60068-2-64
  - 10 to 200 Hz, 0.003 g<sup>2</sup>/Hz
  - 200 to 2 000 Hz, 0.001 g<sup>2</sup>/Hz
  - Total: 1.54 g rms

Shock resistance

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

Impact resistance

Rough handling shocks according to IEC 60068-2-31

Electromagnetic compatibility (EMC)

- As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)
- Complies with emission limits for industry as per EN 55011 (Class A)



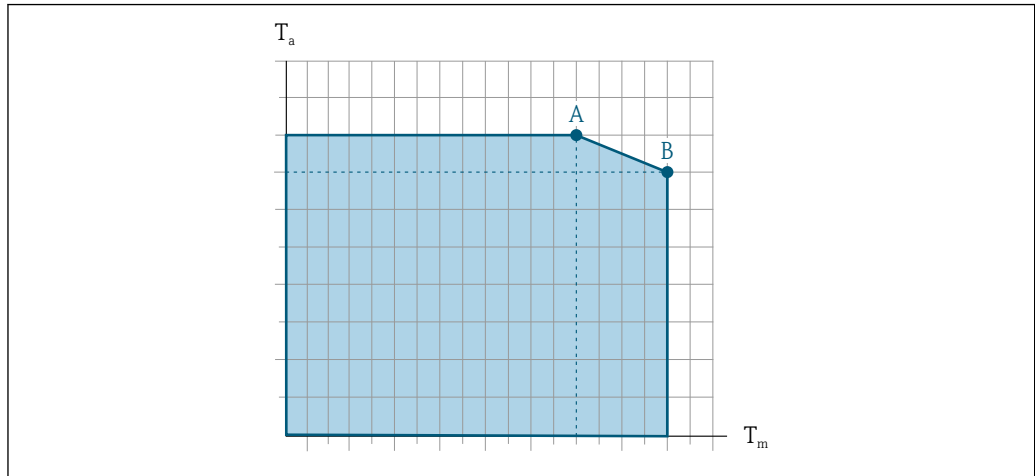
Details are provided in the Declaration of Conformity.

## 16.9 Process

### Medium temperature range

Standard version	-50 to +150 °C (-58 to +302 °F)	Order code for "Measuring tube mat., wetted surface", option <b>HA, SA, SB, SC</b>
Extended temperature version	-50 to +240 °C (-58 to +464 °F)	Order code for "Measuring tube mat., wetted surface", option <b>SD, SE, SF, TH</b>

### Dependency of ambient temperature on medium temperature



A0031121

17 Exemplary representation, values in the table below.

$T_a$  Ambient temperature

$T_m$  Medium temperature

A Maximum permitted medium temperature  $T_m$  at  $T_{a\max} = 60\text{ °C}$  (140 °F); higher medium temperatures  $T_m$  require a reduced ambient temperature  $T_a$

B Maximum permitted ambient temperature  $T_a$  for the maximum specified medium temperature  $T_m$  of the sensor

**i** Values for devices used in the hazardous area:  
Separate Ex documentation (XA) for the device .

Version	Not insulated				Insulated			
	A		B		A		B	
	$T_a$	$T_m$	$T_a$	$T_m$	$T_a$	$T_m$	$T_a$	$T_m$
Standard version	60 °C (140 °F)	150 °C (302 °F)	-	-	60 °C (140 °F)	110 °C (230 °F)	55 °C (131 °F)	150 °C (302 °F)
Extended temperature version	60 °C (140 °F)	170 °C (338 °F)	55 °C (131 °F)	240 °C (464 °F)	60 °C (140 °F)	110 °C (230 °F)	50 °C (122 °F)	240 °C (464 °F)

Density 0 to 5 000 kg/m<sup>3</sup> (0 to 312 lb/cf)

Pressure-temperature ratings



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

Secondary containment

For the Standard version with the temperature range -50 to +150 °C (-58 to +302 °F), the sensor housing is filled with dry nitrogen gas and protects the electronics and mechanics inside.

For all other temperature versions the sensor housing is filled with dry inert gas.

The following secondary containment pressure ratings/burst pressures are only valid for standard devices and/or devices equipped with closed purge connections (never opened/as delivered).

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

If the device is fitted with a rupture disk (order code for "Sensor option", option **CA** "Rupture disk"), the rupture disk trigger pressure is decisive for the maximum nominal pressure → 108.

The secondary containment burst pressure refers to a typical internal pressure achieved prior to mechanical failure of the secondary containment as determined during type testing. The corresponding type test declaration can be ordered with the device (order code for "Additional approval", option **LN** "Type test containment").

DN		Secondary containment pressure rating (designed with a safety factor ≥ 4)		Secondary containment burst pressure	
[mm]	[in]	[bar]	[psi]	[bar]	[psi]
8	3/8	40	580	255	3 698
15	1/2	40	580	200	2 900
25	1	40	580	280	4 060
40	1 1/2	40	580	180	2 610
50	2	40	580	195	2 828
80	3	25	362	105	1 522
100	4	16	232	85	1 232
150	6	16	232	80	1 160
250	10	10	145	57	826



If a measuring tube fails (e.g. due to process characteristics like corrosive or abrasive fluids), the fluid will be contained by the secondary containment.


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

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



Do not open the purge connections unless the containment can be filled immediately with a dry, inert gas. Use only low pressure to purge. Maximum pressure: 5 bar (72.5 psi).


In case of a tube failure, the pressure level inside the secondary containment will rise according to the operating process pressure. If the user judges that the secondary containment pressure rating/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 secondary containment. 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 secondary containment burst pressure.


 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").

Rupture disks cannot be combined with the separately available heating jacket .


Special mounting instructions: →  25



 For information on the dimensions: see the "Mechanical construction" section

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 →  95

- 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 →  95

 To calculate the flow limit, use the *Applicator* sizing tool →  92

Pressure loss

 To calculate the pressure loss, use the *Applicator* sizing tool →  92

Promass F with reduced pressure loss: order code for "Sensor option", option **CE** "reduced pressure loss"

System pressure

→  23

## 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 specifications including transmitter: order code for "Housing", option A "Compact, aluminum coated".

Different values due to different transmitter versions:

### Weight in SI units

DN [mm]	Weight [kg]
8	9
15	10
25	12
40	17
50	28
80	53
100	94
150	152
250	398

### Weight in US units

DN [in]	Weight [lbs]
3/8	20
1/2	22
1	26
1 1/2	37
2	62
3	117
4	207
6	335
10	878

### Safety Barrier Promass 100

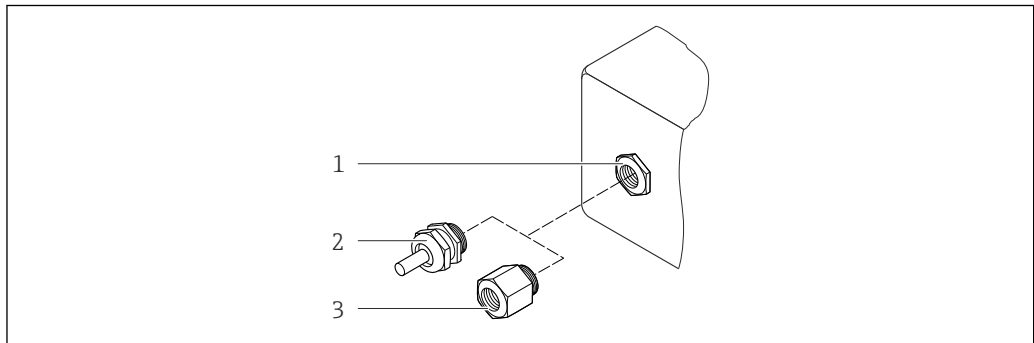
49 g (1.73 ounce)

Materials

**Transmitter housing**

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

**Cable entries/cable glands**



A0020640

18 Possible cable entries/cable glands

- 1 Female thread M20 × 1.5
- 2 Cable gland M20 × 1.5
- 3 Adapter for cable entry with internal thread G ½" or NPT ½"

*Order code for "Housing", option A "Compact, coated aluminum"*

The various cable entries are suitable for hazardous and non-hazardous areas.

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Nickel-plated brass
Adapter for cable entry with internal thread G ½"	
Adapter for cable entry with internal thread NPT ½"	

*Order code for "Housing", option B "Compact, hygienic, stainless"*

The various cable entries are suitable for hazardous and non-hazardous areas.

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Stainless steel, 1.4404 (316L)
Adapter for cable entry with internal thread G ½"	
Adapter for cable entry with internal thread NPT ½"	

### Device plug

Electrical connection	Material
Plug M12x1	<ul style="list-style-type: none"> <li>▪ Socket: Stainless steel, 1.4404 (316L)</li> <li>▪ Contact housing: Polyamide</li> <li>▪ Contacts: Gold-plated brass</li> </ul>

### Sensor housing

- Acid and alkali-resistant outer surface
- DN 08 to DN 150: stainless steel, 1.4301 (304)  
Optional: order code for "Sensor option", option **CC**: stainless steel, 1.4404 (316L)
- DN 250:
  - Order code for "Measuring tube material", option **SA, SD** (stainless steel, 1.4404 (316L)):  
Stainless steel 1.4301 (304)  
Optional: order code for "Sensor option", option **CC**: stainless steel, 1.4404 (316L)
  - Order code for "Measuring tube material", option **HA, TH** (Alloy C22):  
Stainless steel, 1.4404 (316L)

### Measuring tubes

- DN 8 to 100 (3/8...4"): stainless steel, 1.4539 (904L);  
Manifold: stainless steel, 1.4404 (316/316L)
- DN 150 (6"), DN 250 (10"): stainless steel, 1.4404 (316/316L);  
Manifold: stainless steel, 1.4404 (316/316L)
- DN 8 to 250 (3/8 to 10"): Alloy C22, 2.4602 (UNS N06022);  
Manifold: Alloy C22, 2.4602 (UNS N06022)

### Process connections

- Flanges according to EN 1092-1 (DIN2501) / according to ASME B 16.5 / as per JIS B2220:
  - Stainless steel, 1.4404 (F316/F316L)
  - Alloy C22, 2.4602 (UNS N06022)
  - Lap joint flanges: stainless steel, 1.4301 (F304); wetted parts Alloy C22
- All other process connections:  
Stainless steel, 1.4404 (316/316L)



List of all available process connections → 112

### Seals


Welded process connections without internal seals

### Safety Barrier Promass 100

Housing: Polyamide

Process connections

- Fixed flange connections:
  - EN 1092-1 (DIN 2501) flange
  - EN 1092-1 (DIN 2512N) flange
  - Namur lengths in accordance with NE 132
  - ASME B16.5 flange
  - JIS B2220 flange
  - DIN 11864-2 Form A flange, DIN 11866 series A, flange with notch
- Clamp connections
  - Tri-Clamp (OD tubes), DIN 11866 series C
- Thread:
  - DIN 11851 thread, DIN 11866 series A
  - SMS 1145 thread
  - ISO 2853 thread, ISO 2037
  - DIN 11864-1 Form A thread, DIN 11866 series A
- VCO connections
  - 8-VCO-4
  - 12-VCO-4

 For information on the different materials used in the process connections

Surface roughness

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

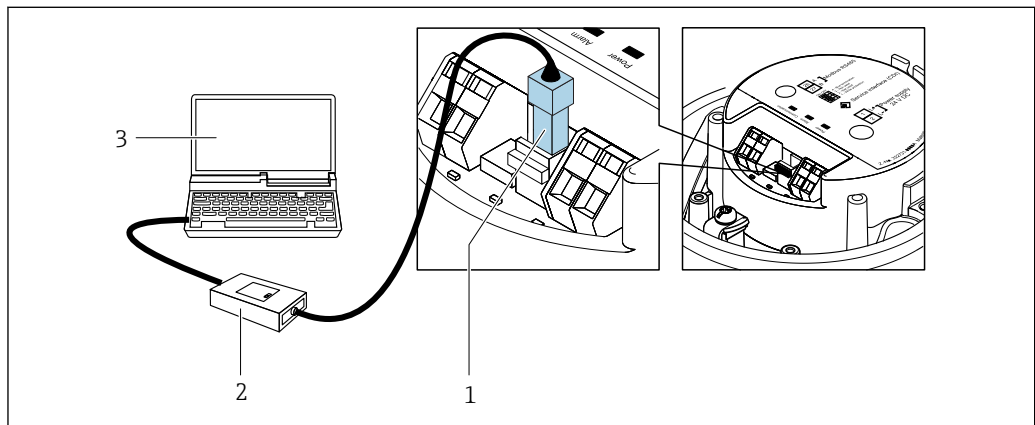
- Not polished
- $Ra_{max} = 0.8 \mu m$  (32  $\mu in$ )
- $Ra_{max} = 0.4 \mu m$  (16  $\mu in$ )

## 16.11 Operability

Service interface

**Via service interface (CDI)**

*Modbus RS485*



A00302.16

- 1 Service interface (CDI) of measuring device
- 2 Commubox FXA291
- 3 Computer with "FieldCare" operating tool with COM DTM "CDI Communication FXA291"



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Languages	Can be operated in the following languages: Via "FieldCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese
-----------	---

## 16.12 Certificates and approvals

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CE mark	The measuring system is in conformity with the statutory 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 style="list-style-type: none"> <li>■ 3-A approval Only devices with the order code for "Additional approval", option <b>LP</b> "3A" have 3-A approval.</li> <li>■ EHEDG-tested Only devices with the order code for "Additional approval", option <b>LT</b> "EHEDG" have been tested and meet the requirements of the EHEDG. To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy Cleanable Pipe Couplings and Process Connections" (<a href="http://www.ehedg.org">www.ehedg.org</a>).</li> </ul>
Modbus RS485 certification	The measuring device meets all the requirements of the MODBUS/TCP conformity test and has the "MODBUS/TCP Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out.
Pressure Equipment Directive	<ul style="list-style-type: none"> <li>■ With the identification PED/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms conformity with the "Essential Safety Requirements" specified in Appendix I of the Pressure Equipment Directive 2014/68/EC.</li> <li>■ Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Art. 4, Par. 3 of the Pressure Equipment Directive 2014/68/EU. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EC.</li> </ul>
Other standards and guidelines	<ul style="list-style-type: none"> <li>■ EN 60529 Degrees of protection provided by enclosures (IP code)</li> <li>■ IEC/EN 60068-2-6 Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal).</li> <li>■ IEC/EN 60068-2-31 Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.</li> </ul>


- 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).
- NAMUR NE 21  
Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32  
Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43  
Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53  
Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 80  
The application of the pressure equipment directive to process control devices
- NAMUR NE 105  
Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107  
Self-monitoring and diagnosis of field devices
- NAMUR NE 131  
Requirements for field devices for standard applications
- NAMUR NE 132  
Coriolis mass meter
- NACE MR0103  
Materials resistant to sulfide stress cracking in corrosive petroleum refining environments.
- NACE MR0175/ISO 15156-1  
Materials for use in H<sub>2</sub>S-containing Environments in Oil and Gas Production.

## 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](http://www.endress.com).





Detailed information on the application packages:  
Special Documentation for the device →  116


Heartbeat Technology	Package	Description
	Heartbeat Verification +Monitoring	<p><b>Heartbeat Verification</b> Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".</p> <ul style="list-style-type: none"> <li>▪ Functional testing in the installed state without interrupting the process.</li> <li>▪ Traceable verification results on request, including a report.</li> <li>▪ Simple testing process via local operation or other operating interfaces.</li> <li>▪ Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.</li> <li>▪ Extension of calibration intervals according to operator's risk assessment.</li> </ul> <p><b>Heartbeat Monitoring</b> Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:</p> <ul style="list-style-type: none"> <li>▪ Draw conclusions - using these data and other information - about the impact process influences (such as corrosion, abrasion, buildup etc.) have on the measuring performance over time.</li> <li>▪ Schedule servicing in time.</li> <li>▪ Monitor the process or product quality, e.g. gas pockets.</li> </ul>

Concentration	Package	Description
	Concentration measurement and special density	<p><b>Calculation and outputting of fluid concentrations</b> 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.</p> <p>The observed density is converted to the concentration of a substance of a binary mixture using the "Concentration Measurement" application package:</p> <ul style="list-style-type: none"> <li>▪ Choice of predefined fluids (e.g. various sugar solutions, acids, alkalis, salts, ethanol etc.)</li> <li>▪ Common or user-defined units (°Brix, °Plato, % mass, % volume, mol/l etc.) for standard applications.</li> <li>▪ Concentration calculation from user-defined tables.</li> </ul> <p>The measured values are output via the digital and analog outputs of the device.</p>

## 16.14 Accessories

 Overview of accessories available for order →  92

## 16.15 Supplementary documentation

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

- The *W@M Device Viewer* : Enter the serial number from the nameplate ([www.endress.com/deviceviewer](http://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.

Standard documentation

**Brief Operating Instructions**

*Brief Operating Instructions for the sensor*

Measuring device	Documentation code
Proline Promass F	KA013570

*Transmitter Brief Operating Instructions*

Measuring device	Documentation code
Proline Promass 100	KA01335D

**Technical Information**

Measuring device	Documentation code
Proline Promass F 100	TI013180

**Description of Device Parameters**

Measuring device	Documentation code
Proline Promass 100	GP011030

Supplementary device-dependent documentation



**Safety Instructions**

Content	Documentation code
ATEX/IECEX Ex i	XA00159D
ATEX/IECEX Ex nA	XA01029D
cCSAus IS	XA00160D
INMETRO Ex i	XA01219D
INMETRO Ex nA	XA01220D
NEPSI Ex i	XA01249D
NEPSI Ex nA	XA01262D

**Special Documentation**

Content	Documentation code
Information on the Pressure Equipment Directive	SD00142D
Modbus RS485 Register Information	SD019030
Concentration measurement	SD019050
Heartbeat Technology	SD019040

### Installation Instructions

Contents	Comment
Installation instructions for spare part sets and accessories	<ul style="list-style-type: none"><li>▪ Access the overview of all the available spare part sets via <i>W@M Device Viewer</i> →  90</li><li>▪ Accessories available for order with Installation Instructions →  92</li></ul>

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