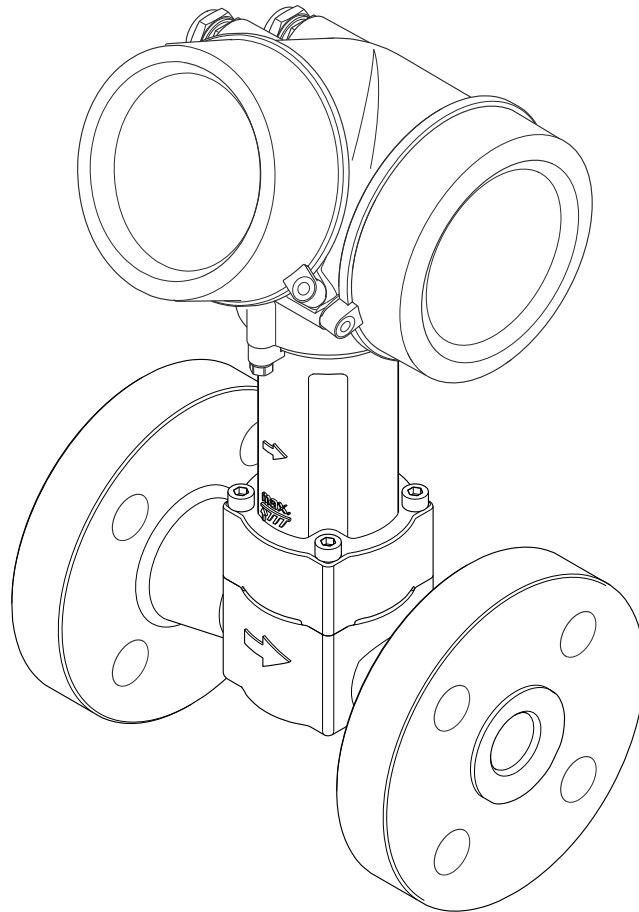


# Operating Instructions

## Proline Prowirl O 200

### PROFIBUS PA

Vortex flowmeter



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

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# 1 Document information

## 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


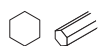

### 1.2.1 Safety symbols

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	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 ground connection</b> A terminal which must be connected to ground prior to establishing any other connections.		<b>Equipotential connection</b> A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.





### 1.2.3 Tool symbols

Symbol	Meaning
	Flat blade screwdriver
	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
	Series of steps
	Result of a sequence of actions
	Help in the event of a problem
	Visual inspection

### 1.2.5 Symbols in graphics

Symbol	Meaning	Symbol	Meaning
1, 2, 3,...	Item numbers		Series of steps
A, B, C, ...	Views	A-A, B-B, C-C, ...	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 CD-ROM provided for the device (depending on the device version, the CD-ROM might not be part of the delivery!)
  - 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

### 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.
Brief Operating Instructions	<b>Guide that takes you quickly to the 1st measured value</b> The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

### 1.3.2 Supplementary device-dependent documentation

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

## 1.4 Registered trademarks

### **PROFIBUS®**

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

### **KALREZ®, VITON®**

Registered trademarks of DuPont Performance Elastomers L.L.C., Wilmington, DE USA

### **GYLON®**

Registered trademark of Garlock Sealing Technologies, Palmyra, NY, USA

### **Applicator®, FieldCare®, Field Xpert™, HistoROM®, Heartbeat Technology™**

Registered or registration-pending trademarks of the Endress+Hauser Group



## 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 beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- ▶ Following instructions and basic conditions

The operating personnel must fulfill the following requirements:

- ▶ Being instructed and authorized according to the requirements of the task by the facility's owner-operator
- ▶ Following the instructions in these Operating Instructions


### 2.2 Designated use

#### Application and media

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

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

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

- ▶ 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 against which the process-wetted materials are adequately 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 (→  7).

#### 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 of the sensor 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.
- ▶ Observe the specified pressure and temperature range.

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

Possible burn hazard due to fluid temperatures!

- ▶ For elevated fluid temperature, ensure protection against contact to prevent burns.

## 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:

- ▶ It is recommended to wear gloves on account of the higher risk of electric shock.

## 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 EC directives listed in the device-specific EC 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

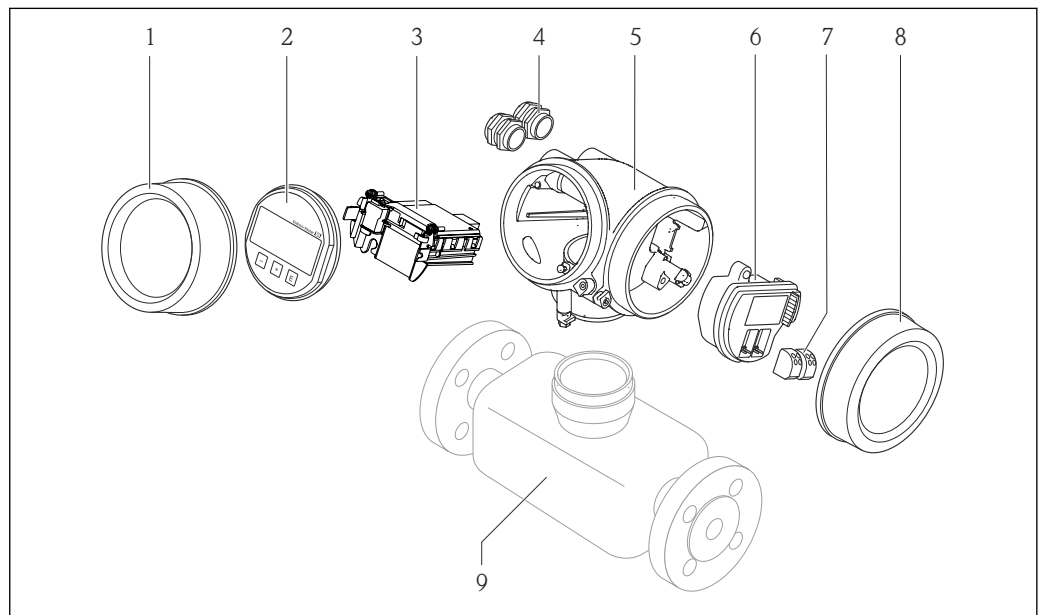
The device consists of a sensor and a transmitter.

Two device versions are available:

- Compact version - sensor and transmitter form a mechanical unit.
- Remote version - sensor and transmitter are mounted in separate locations.

 For detailed information on the product description, see the Operating Instructions for the device.

#### 3.1 Product design





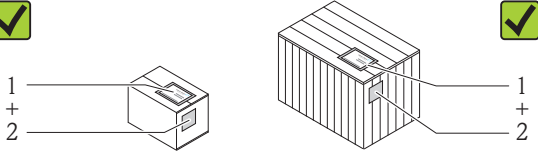

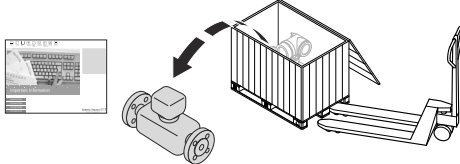






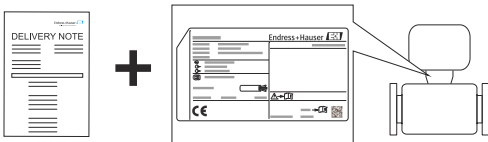





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##### 1 Important components of a measuring device

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

## 4 Incoming acceptance and product identification

### 4.1 Incoming acceptance

				<p>Are the order codes on the delivery note (1) and the product sticker (2) identical?</p>
				
				<p>Are the goods undamaged?</p>
				<p>Do the nameplate data match the ordering information on the delivery note?</p>
				<p>Is the CD-ROM with the Technical Documentation (depends on device version) and documents present?</p>

-  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 (→  13).

### 4.2 Product identification

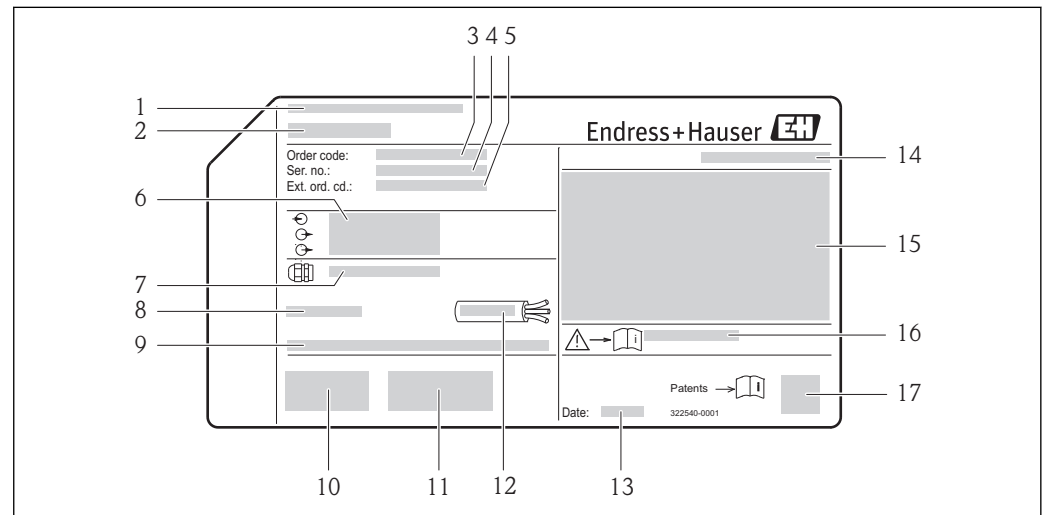
The following options are available for identification of the measuring device:

- 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

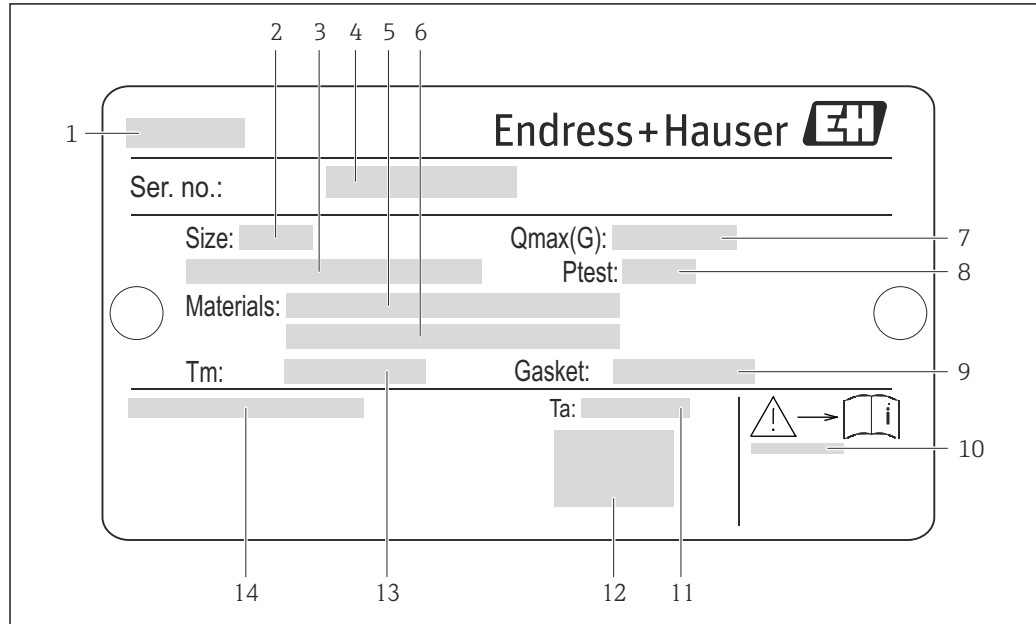


2 Example of a transmitter nameplate


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


## 4.2.2 Sensor nameplate

Order code for "Housing" option B "GT18 two-chamber, 316L" and option K "GT18 two-chamber, remote, 316L"

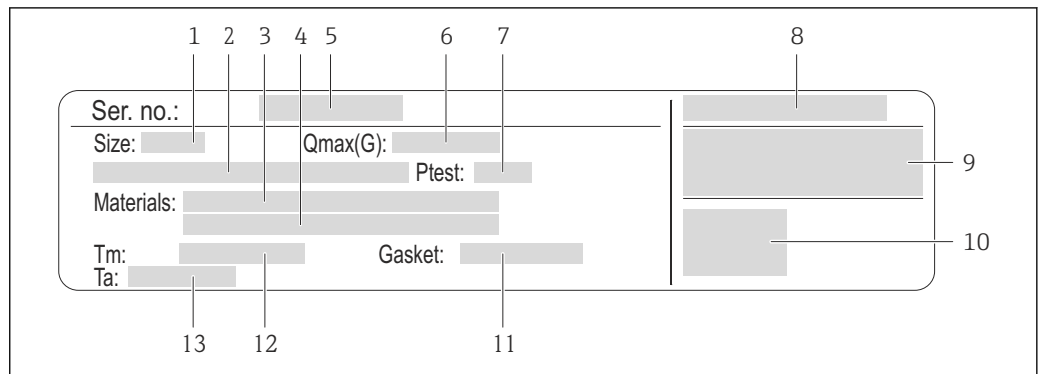


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 3 Example of a sensor nameplate

- 1 Name of the sensor
- 2 Nominal diameter of the sensor
- 3 Flange nominal diameter/nominal pressure
- 4 Serial number (Ser. no.)
- 5 Measuring tube material
- 6 Measuring tube material
- 7 Maximal permitted volume flow (gas/steam)
- 8 Test pressure of the sensor
- 9 Seal material
- 10 Document number of safety-related supplementary documentation (→  195)
- 11 Ambient temperature range
- 12 CE mark
- 13 Medium temperature range
- 14 Degree of protection

## Order code for "Housing" option C "GT20 two-chamber, aluminum coated"

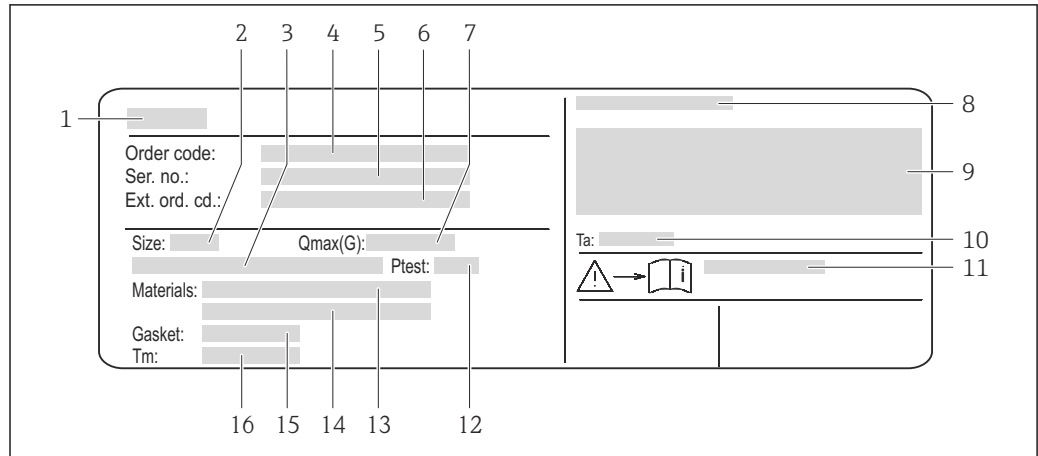


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4 Example of a sensor nameplate

- 1 Nominal diameter of the sensor
- 2 Flange nominal diameter/nominal pressure
- 3 Measuring tube material
- 4 Measuring tube material
- 5 Serial number (Ser. no.)
- 6 Maximal permitted volume flow (gas/steam)
- 7 Test pressure of the sensor
- 8 Degree of protection
- 9 Approval information for explosion protection and Pressure Equipment Directive
- 10 CE mark
- 11 Seal material
- 12 Medium temperature range
- 13 Ambient temperature range

**Order code for "Housing" option J "GT20 two-chamber, remote, aluminum coated"**



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**5** Example of a sensor nameplate

- 1 Name of the sensor
- 2 Nominal diameter of the sensor
- 3 Flange nominal diameter/nominal pressure
- 4 Order code
- 5 Serial number (Ser. no.)
- 6 Extended order code (Ext. ord. cd.)
- 7 Maximal permitted volume flow (gas/steam)
- 8 Degree of protection
- 9 Approval information for explosion protection and Pressure Equipment Directive
- 10 Ambient temperature range
- 11 Document number of safety-related supplementary documentation (→ 195)
- 12 Test pressure of the sensor
- 13 Measuring tube material
- 14 Measuring tube material
- 15 Seal material
- 16 Medium temperature range

**i** **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 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

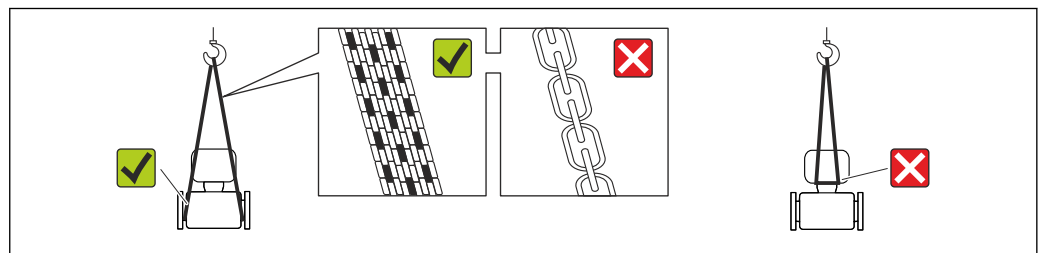
### 5.1 Storage conditions

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.
- Storage temperature:
  - All components apart from the display modules:  $-50$  to  $+80$  °C ( $-58$  to  $+176$  °F)
  - Display modules:  $-40$  to  $+80$  °C ( $-40$  to  $+176$  °F)
- Store in a dry and dust-free place.
- Do not store outdoors.

### 5.2 Transporting the product

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



A0015604

- 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.

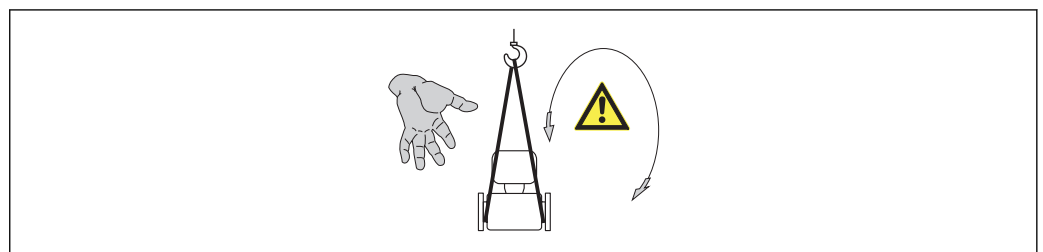
#### 5.2.1 Measuring devices without lifting lugs

##### **⚠ 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).



A0015606

## 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:

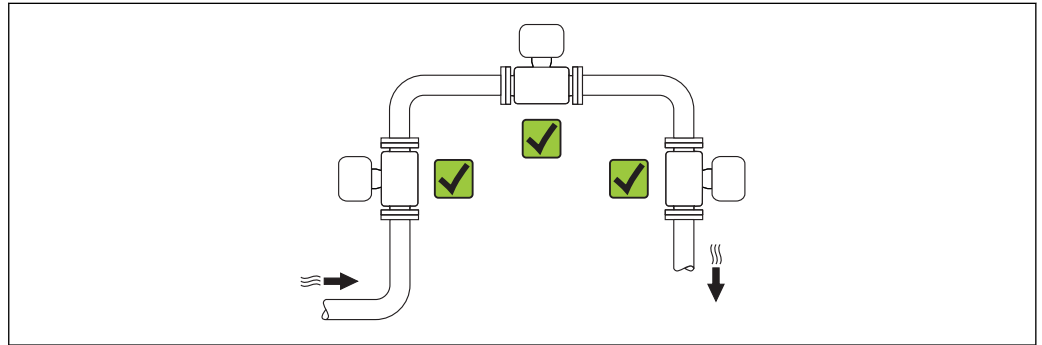
- Measuring device secondary packaging: polymer stretch film that conforms to EC Directive 2002/95/EC (RoHS).
- Packaging:
  - Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
  - or
  - Carton in accordance with European Packaging Directive 94/62EC; 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

#### 6.1.1 Mounting position

##### Mounting location



A0015543

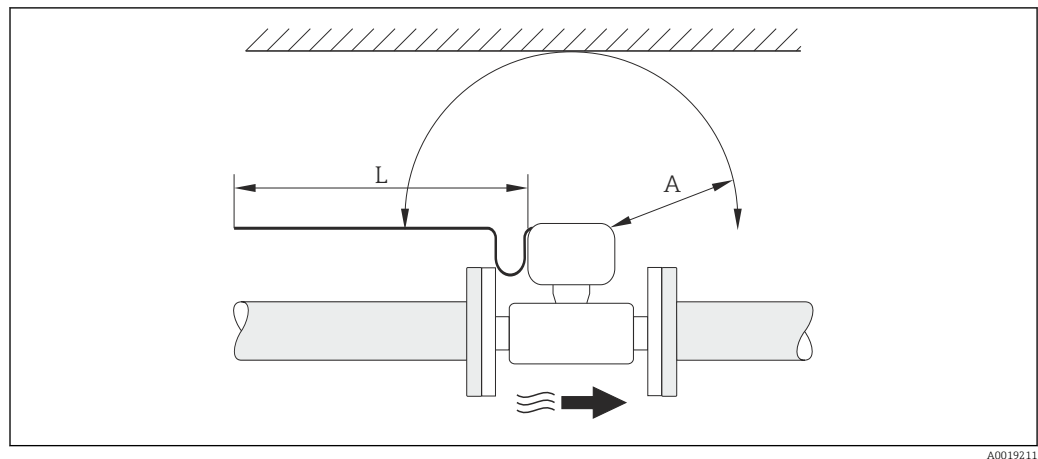
##### Orientation

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).

Vortex meters require a fully developed flow profile as a prerequisite for correct volume flow measurement. Therefore, please note the following:

Orientation		Compact version	Remote version
<b>A</b>	Vertical orientation	✓✓ <sup>1)</sup>	✓✓
<b>B</b>	Horizontal orientation, transmitter head up	✓✓ <sup>2) 3)</sup>	✓✓
<b>C</b>	Horizontal orientation, transmitter head down	✓✓ <sup>4) 5)</sup>	✓✓
<b>D</b>	Horizontal orientation, transmitter head at side	✓✓ <sup>4)</sup>	✓✓

- 1) In the case of liquids, there should be upward flow in vertical pipes to avoid partial pipe filling (Fig. A). Disruption in flow measurement! In the case of vertical orientation and downward flowing liquid, the pipe always needs to be completely filled to ensure correct liquid flow measurement.
- 2) Danger of electronics overheating! If the fluid temperature is  $\geq 200\text{ °C}$  (392 °F) orientation B is not permitted for the wafer version (Prowirl D) with nominal diameters DN 100 (4") and DN 150 (6").
- 3) In the case of hot media (e.g. steam or fluid temperature (TM)  $\geq 200\text{ °C}$  (392 °F): orientation C or D
- 4) In the case of very cold media (e.g. liquid nitrogen): orientation B or D
- 5) For "wet steam detection/measurement" option: orientation C

*Minimum spacing and cable length*

A0019211

- A Minimum spacing in all directions  
L Required cable length

The following dimensions must be observed to guarantee problem-free access to the device for service purposes:

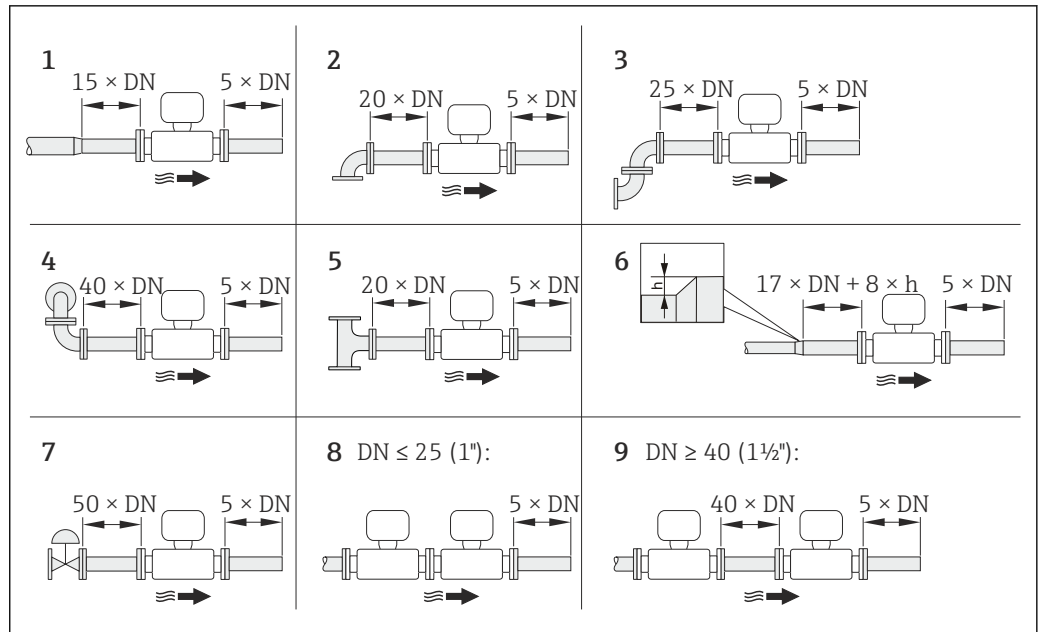
- A = 100 mm (3.94 in)
- L = L + 150 mm (5.91 in)

*Rotating the electronics housing and the display*

The electronics housing can be rotated continuously by 360 ° on the housing support. The display unit can be rotated in 45 ° stages. This means you can read the display comfortably from all directions.

**Inlet and outlet runs**

To attain the specified level of accuracy of the measuring device, the inlet and outlet runs mentioned below must be maintained at the very minimum.



A0019189

6 Minimum inlet and outlet runs with various flow obstructions

*h* Difference in expansion

1 Reduction by one nominal diameter size

2 Single elbow (90° elbow)

3 Double elbow (2 × 90° elbows, opposite)

4 Double elbow 3D (2 × 90° elbows, opposite, not on one plane)

5 T-piece

6 Expansion

7 Control valve

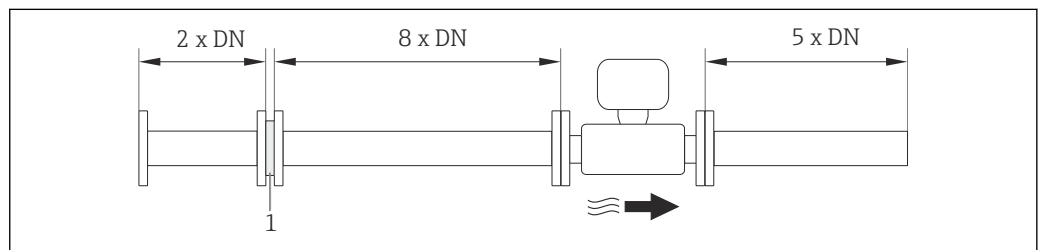
8 Two measuring devices in a row where  $DN \leq 25$  (1"): directly flange on flange

9 Two measuring devices in a row where  $DN \geq 40$  (1½"): for spacing, see graphic

- i** ■ If there are several flow disturbances present, the longest specified inlet run must be maintained.
- If the required inlet runs cannot be observed, it is possible to install a specially designed flow conditioner (→ 25).

*Flow conditioner*

If the required inlet runs cannot be observed, it is possible to install a specially designed flow conditioner which can be ordered from Endress+Hauser. The flow conditioner is fitted between two pipe flanges and centered by the mounting bolts. Generally this reduces the inlet run needed to  $10 \times DN$  with full accuracy.



A0019208

1 Flow conditioner

The pressure loss for flow conditioners is calculated as follows:  $\Delta p \text{ [mbar]} = 0.0085 \cdot \rho \text{ [kg/m}^3\text{]} \cdot v^2 \text{ [m/s]}$

Example for steam

$p = 10 \text{ bar abs.}$

$t = 240 \text{ }^\circ\text{C} \rightarrow \rho = 4.39 \text{ kg/m}^3$

$v = 40 \text{ m/s}$

$\Delta p = 0.0085 \cdot 4.39 \cdot 40^2 = 59.7 \text{ mbar}$

Example for H<sub>2</sub>O condensate (80 °C)

$\rho = 965 \text{ kg/m}^3$

$v = 2.5 \text{ m/s}$

$\Delta p = 0.0085 \cdot 965 \cdot 2.5^2 = 51.3 \text{ mbar}$

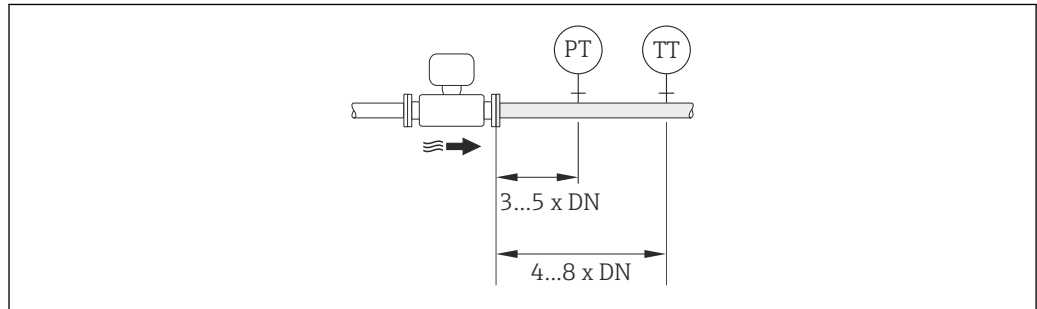
$\rho$  : density of the process medium

v: average flow velocity

abs. = absolute

*Outlet runs when installing external devices*

If installing an external device, observe the specified distance.




A0019205

PT Pressure transmitter

TT Temperature transmitter

*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

*Compact version*

<b>Measuring device</b>	Non-Ex:	-40 to +80 °C (-40 to +176 °F) <sup>1)</sup>
	Ex i:	-40 to +70 °C (-40 to +158 °F) <sup>1)</sup>
	EEx d/XP version:	-40 to +60 °C (-40 to +140 °F) <sup>1)</sup>
	ATEX II1/2G Ex d, Ex ia:	-40 to +60 °C (-40 to +140 °F) <sup>1)</sup>
<b>Local display</b>		-20 to +60 °C (-4 to +140 °F)

1) Additionally available as order code for "Test, certificate", option JN "Transmitter ambient temperature -50 °C (-58 °F)".

*Remote version*

<b>Transmitter</b>	Non-Ex:	-40 to +80 °C (-40 to +176 °F) <sup>1)</sup>
	Ex i:	-40 to +80 °C (-40 to +176 °F) <sup>1)</sup>
	Ex d:	-40 to +60 °C (-40 to +140 °F) <sup>1)</sup>
	ATEX II1/2G Ex d, Ex ia:	-40 to +60 °C (-40 to +140 °F) <sup>1)</sup>
<b>Sensor</b>	Non-Ex:	-40 to +85 °C (-40 to +185 °F) <sup>1)</sup>
	Ex i:	-40 to +85 °C (-40 to +185 °F) <sup>1)</sup>
	Ex d:	-40 to +85 °C (-40 to +185 °F) <sup>1)</sup>
	ATEX II1/2G Ex d, Ex ia:	-40 to +85 °C (-40 to +185 °F) <sup>1)</sup>
<b>Local display</b>		-20 to +60 °C (-4 to +140 °F)

1) Additionally available as order code for "Test, certificate", option JN "Transmitter ambient temperature -50 °C (-58 °F)".

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

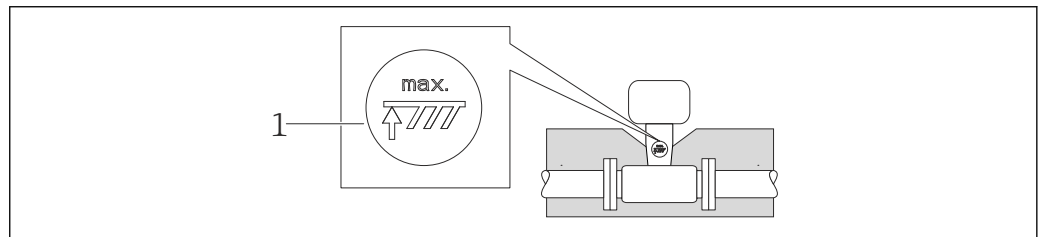
**Thermal insulation**

For optimum temperature measurement and mass calculation, heat transfer at the sensor must be avoided for some fluids. This can be ensured by installing thermal insulation. A wide range of materials can be used for the required insulation.

This applies for:

- Compact version
- Remote sensor version

The maximum insulation height permitted is illustrated in the diagram:



A0019212

1 Maximum insulation height

- ▶ When insulating, 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.

**NOTICE****Electronics overheating on account of thermal insulation!**

- ▶ Observe the maximum permitted insulation height of the transmitter neck so that the transmitter head and/or the connection housing of the remote version is completely free.
- ▶ Observe information on the permissible temperature ranges (→ ☰ 185).
- ▶ Note that a certain orientation might be required, depending on the fluid temperature (→ ☰ 19).

**Vibrations**

The correct operation of the measuring system is not affected by plant vibrations up to 1 g, 10 to 500 Hz. Therefore no special measures are needed to secure the sensors.




## 6.1.3 Special mounting instructions

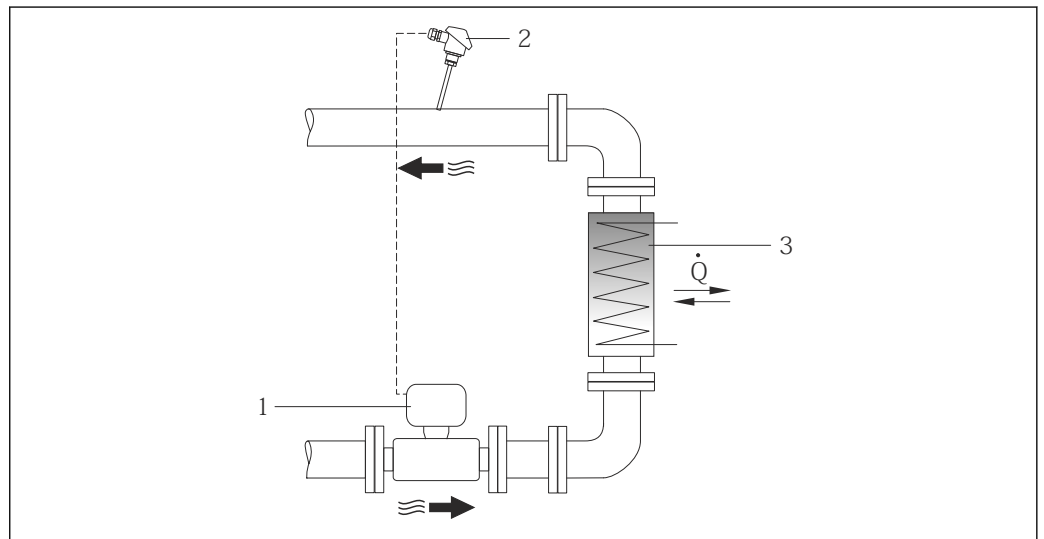
### Installation for delta heat measurements


Order code for "Sensor version", option 3 "Mass flow (integrated temperature measurement)"

The second temperature measurement is taken using a separate temperature sensor. The measuring device reads in this value via a communication interface.

- In the case of saturated steam delta heat measurements, the Prowirl 200 must be installed on the steam side.
- In the case of water delta heat measurements, the Prowirl 200 can be installed on the cold or warm side.

**i** In the case of saturated steam delta heat measurements, the value **0 bar abs.** must be set in the **Fixed process pressure** parameter (→  80) for the measuring device to calculate on the saturated steam curve. The current input can then be used to read in the temperature.



 7 Layout for delta heat measurement of saturated steam and water

- 1 Prowirl
- 2 Temperature sensor
- 3 Heat exchanger
- Q Heat flow

### Weather protection cover

Observe the following minimum head clearance: 222 mm (8.74 in)

**i** For information the weather protection cover, see (→  166)

## 6.2 Mounting the measuring device

### 6.2.1 Required tools

#### For transmitter

- For turning the transmitter housing: Open-ended wrench 8 mm
- For opening the securing clamps: Allen key 3 mm

**For sensor**

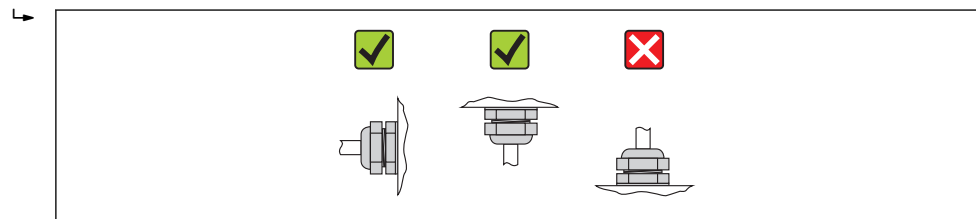
For flanges and other process connections: Corresponding mounting tools

**6.2.2 Preparing the measuring device**

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

**6.2.3 Mounting the sensor****⚠ 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 sensor matches the flow direction of the medium.
  2. To ensure compliance with device specifications, install the measuring device between the pipe flanges in a way that it is centered in the measurement section.
  3. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.



A0013964

**6.2.4 Mounting the transmitter of the remote version****⚠ CAUTION****Ambient temperature too high!**

Danger of electronics overheating and housing deformation.

- ▶ Do not exceed the permitted maximum ambient temperature (→ 22).
- ▶ If operating outdoors: Avoid direct sunlight and exposure to weathering, particularly in warm climatic regions.

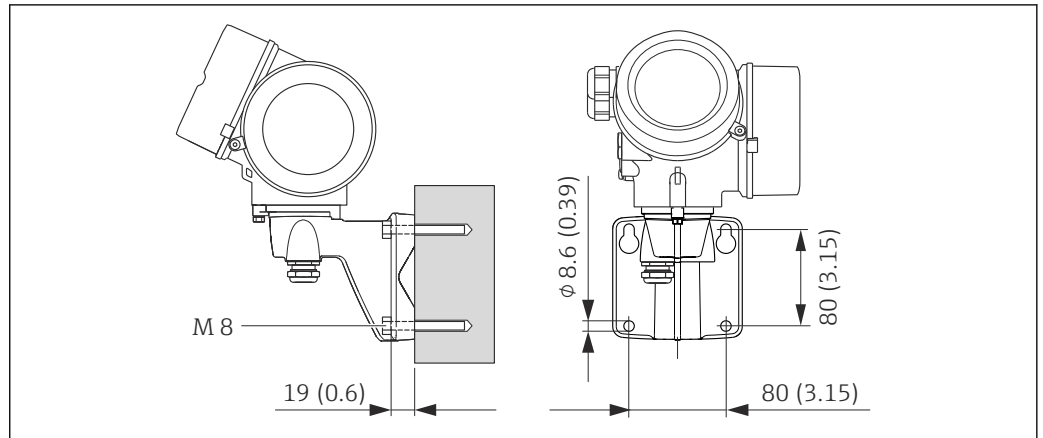
**⚠ CAUTION****Excessive force can damage the housing!**

- ▶ Avoid excessive mechanical stress.

The transmitter of the remote version can be mounted in the following ways:

- Wall mounting
- Pipe mounting

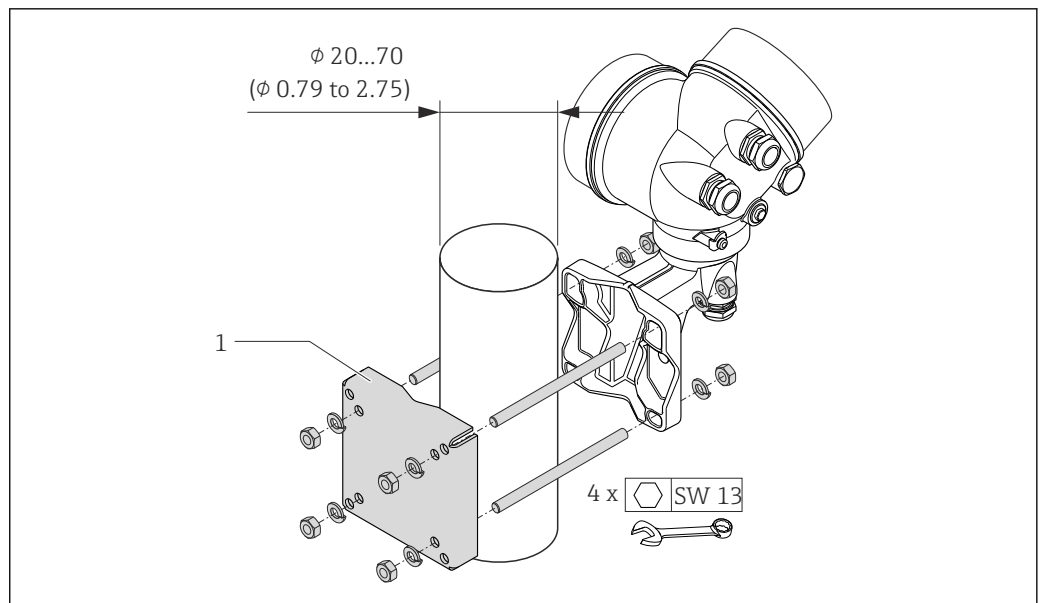
### Wall mounting



8 Engineering unit mm (in)

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

### Post mounting

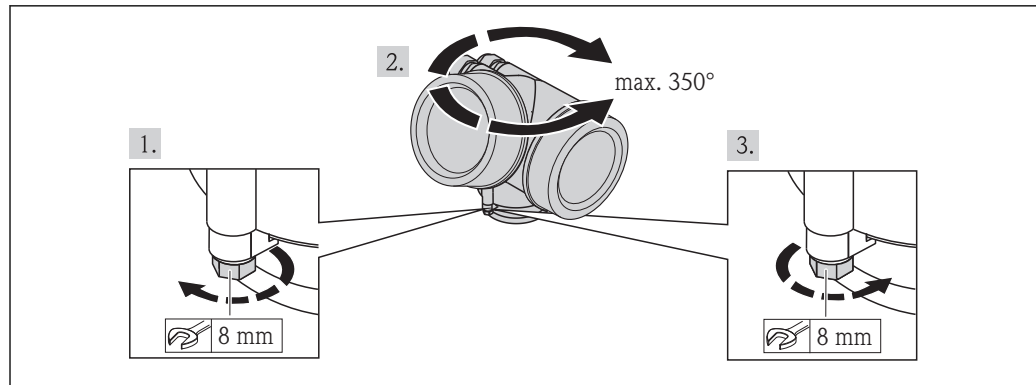


9 Engineering unit mm (in)

1 Post retainer kit for post mounting

### 6.2.5 Turning the transmitter housing

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

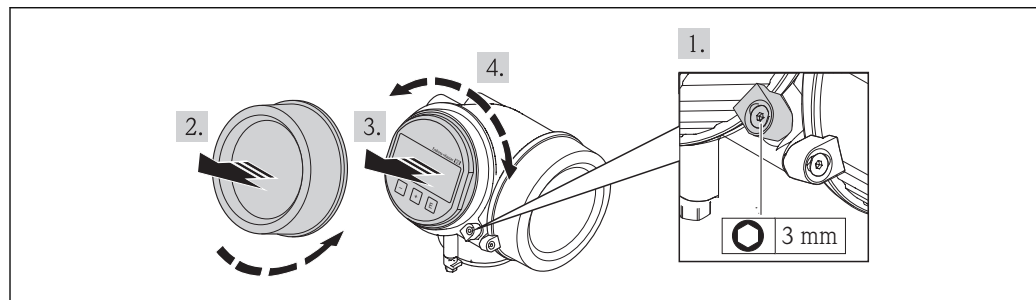


A0013713

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

### 6.2.6 Turning the display module

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



A0013905


1. Loosen the securing clamp of the electronics compartment cover using an Allen key.
2. Unscrew cover of the electronics compartment from the transmitter housing.
3. Optional: pull out the display module with a gentle rotational movement.
4. Rotate the display module into the desired position: Max.  $8 \times 45^\circ$  in each direction.
5. Without display module pulled out:  
Allow display module to engage at desired position.
6. With display module pulled out:  
Feed the cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment until it engages.
7. Reverse the removal procedure to reassemble the transmitter.

## 6.3 Post-installation check

Is the device undamaged (visual inspection)?	<input type="checkbox"/>
--	--------------------------

<p>Does the measuring device conform to the measuring point specifications?</p> <p>For example:</p> <ul style="list-style-type: none"> <li>▪ Process temperature (→ 185)</li> <li>▪ Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document )</li> <li>▪ Ambient temperature (→ 22)</li> <li>▪ Measuring range (→ 175)</li> </ul>	<input type="checkbox"/>
<p>Has the correct orientation for the sensor been selected (→ 19)?</p> <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"/>
<p>Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping (→ 19)?</p>	<input type="checkbox"/>
<p>Are the measuring point identification and labeling correct (visual inspection)?</p>	<input type="checkbox"/>
<p>Is the device adequately protected from precipitation and direct sunlight?</p>	<input type="checkbox"/>
<p>Are the securing screw and securing clamp tightened securely?</p>	<input type="checkbox"/>

## 7 Electrical connection

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

### 7.1 Connection conditions

#### 7.1.1 Required tools

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

#### 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

- $-40$  °C ( $-40$  °F) to  $+80$  °C ( $+176$  °F)
- Minimum requirement: cable temperature range  $\geq$  ambient temperature  $+20$  K

##### Signal cable

###### PROFIBUS PA

Twisted, shielded two-wire cable. Cable type A is recommended ( $\rightarrow$   31).

 For further information on planning and installing PROFIBUS PA networks see:

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

##### Pulse/frequency/switch output

Standard installation cable is sufficient.

##### Connecting cable for remote version

###### Connecting cable (standard)

<b>Standard cable</b>	$4 \times 2 \times 0.34$ mm <sup>2</sup> (22 AWG) PVC cable with common shield (4 pairs, pair-stranded)
<b>Flame resistance</b>	According to DIN EN 60332-1-2
<b>Oil-resistance</b>	According to DIN EN 60811-2-1
<b>Shielding</b>	Galvanized copper-braid, opt. density approx. 85%

<b>Cable length</b>	5 m (16 ft), 10 m (32 ft), 20 m (65 ft), 30 m (98 ft)
<b>Operating temperature</b>	When mounted in a fixed position: -50 to +105 °C (-58 to +221 °F); when cable can move freely: -25 to +105 °C (-13 to +221 °F)

### Connecting cable (reinforced)

<b>Cable, reinforced</b>	4 × 2 × 0.34 mm <sup>2</sup> (22 AWG) PVC cable with common shield (4 pairs, pair-stranded) and additional steel-wire braided sheath
<b>Flame resistance</b>	According to DIN EN 60332-1-2
<b>Oil-resistance</b>	According to DIN EN 60811-2-1
<b>Shielding</b>	Galvanized copper-braid, opt. density approx. 85%
<b>Strain relief and reinforcement</b>	Steel-wire braid, galvanized
<b>Cable length</b>	5 m (16 ft), 10 m (32 ft), 20 m (65 ft), 30 m (98 ft)
<b>Operating temperature</b>	When mounted in a fixed position: -50 to +105 °C (-58 to +221 °F); when cable can move freely: -25 to +105 °C (-13 to +221 °F)

### Cable diameter

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

### Fieldbus cable specification

#### PROFIBUS PA

#### Cable type

In accordance with IEC 61158-2 (MBP), cable type A is recommended. Cable type A has a cable shielding that guarantees adequate protection from electromagnetic interference and thus the most reliable data transfer.

The electrical data of the fieldbus cable have not been specified but determine important characteristics of the design of the fieldbus, such as distances bridged, number of users, electromagnetic compatibility, etc.

<b>Cable type</b>	A
<b>Cable structure</b>	Twisted, shielded twin-core cable
<b>Wire cross-section</b>	0.8 mm <sup>2</sup> (AWG 18)
<b>Loop resistance (direct current)</b>	44 $\Omega$ /km
<b>Characteristic impedance at 31.25 kHz</b>	100 $\Omega$ $\pm$ 20%
<b>Attenuation constant at 39.0 kHz</b>	3 dB/km
<b>Capacitive asymmetry</b>	2 nF/km
<b>Envelope delay distortion (7.9 to 39 kHz)</b>	1.7 ms/km
<b>Shield coverage</b>	90 %

The following are examples of suitable cable types:

Non-hazardous area:

- Siemens 6XV1 830-5BH10
- Belden 3076F
- Kerpen CEL-PE/OSCR/PVC/FRLA FB-02YS(ST)YFL

#### *Maximum overall cable length*

The maximum network expansion depends on the type of protection and the cable specifications. The overall cable length combines the length of the main cable and the length of all spurs >1 m (3.28 ft).

The maximum overall cable length for cable type A: 1 900 m (6 200 ft)

If repeaters are used, the maximum permissible cable length is doubled. A maximum of three repeaters are permitted between the user and master.

#### *Maximum spur length*

The line between the distribution box and field device is described as a spur. In the case of non-Ex applications, the max. length of a spur depends on the number of spurs >1 m (3.28 ft):

Number of spurs	Max. length per spur
1...12	120 m (400 ft)
13...14	90 m (300 ft)
15...18	60 m (200 ft)
19...24	30 m (100 ft)
25...32	1 m (3 ft)

#### *Number of field devices*

In the case of systems in accordance with the Fieldbus Intrinsically Safe Concept (FISCO) with EEx ia explosion protection, the cable length is limited to a maximum length of 1000 m (3300 ft). A maximum of 32 users per segment in non-Ex areas or a maximum of 10 users in an Ex-area (EEx ia IIC) is possible. The actual number of users must be determined during the planning stage.

#### *Bus termination*

The start and end of each fieldbus segment must always be terminated by a bus terminator. With various junction boxes (non-Ex), the bus termination can be activated via a switch. If this is not the case, a separate bus terminator must be installed. Please also note the following:

- In the case of a branched bus segment, the device furthest from the segment coupler represents the end of the bus.
- If the fieldbus is extended with a repeater then the extension must also be terminated at both ends.



### 7.1.3 Terminal assignment

#### Transmitter

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

<p style="text-align: right; font-size: small;">A0013570</p>	<p style="text-align: right; font-size: small;">A0018161</p>
<p><i>Maximum number of terminals</i></p>	<p><i>Maximum number of terminals for order code for "Accessory mounted", option NA "Overvoltage protection"</i></p>
<p>1    Output 1: PROFIBUS PA                  2    Output 2 (passive: pulse/frequency/switch output)                  3    Ground terminal for cable shield</p>	

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

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

#### Remote version

In the case of the remote version, the sensor and transmitter are mounted separately from one another and connected by a connecting cable. The sensor is connected via the connection housing while the transmitter is connected via the connection compartment of the wall holder unit.

**i** The way the transmitter wall holder is connected depends on the measuring device approval and the version of the connecting cable used.

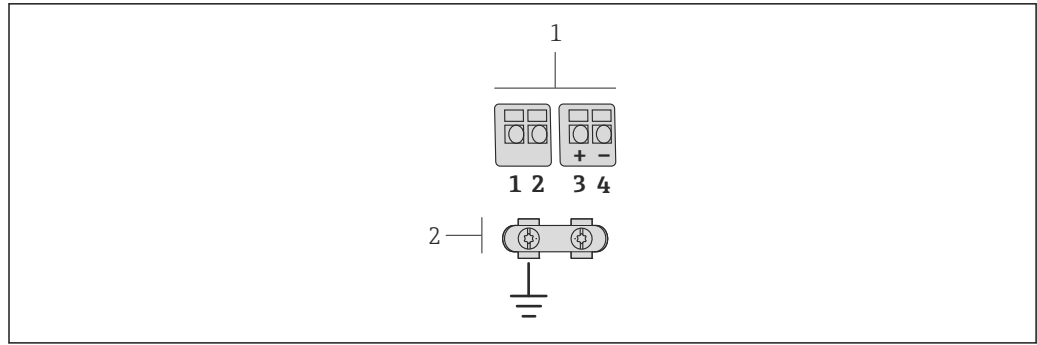
Connection is only possible via terminals:

- For approvals Ex n, Ex tb and cCSAus Div. 1
- If a reinforced connecting cable is used

The connection is via an M12 connector:

- For all other approvals
- If the standard connecting cable is used

Connection to the connection housing of the sensor is always via terminals.



A0019335

10 Terminals for connection compartment in the transmitter wall holder and the sensor connection housing

1 Terminals for connecting cable

2 Grounding via the cable strain relief

Terminal number	Assignment	Cable color Connecting cable
1	Supply voltage	Brown
2	Grounding	White
3	RS485 (+)	Yellow
4	RS485 (-)	Green

#### 7.1.4 Pin assignment, device plug

##### PROFIBUS PA

Device plug for signal transmission (device side)

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

#### 7.1.5 Shielding and grounding

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

- To ensure an optimum EMC protective effect, connect the shield as often as possible to the reference ground.
- For reasons of explosion protection, you should refrain from grounding however.

To comply with both requirements, the fieldbus system allows three different types of shielding:

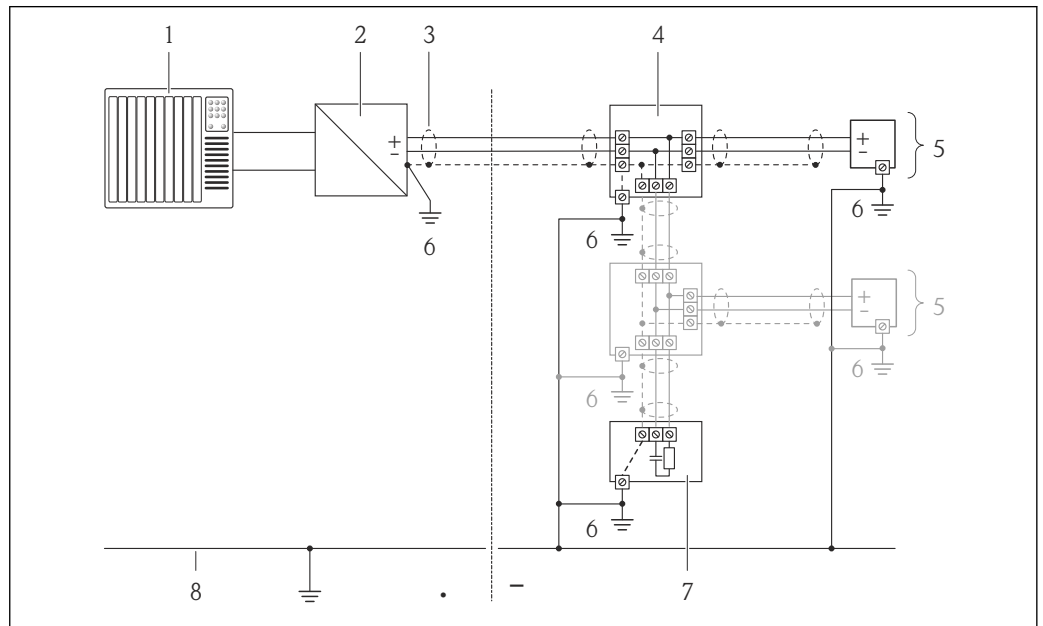
- Shielding at both ends.
- Shielding at one end on the feed side with capacitance termination at the field device.
- Shielding at one end on the feed side.

Experience shows that the best results with regard to EMC are achieved in most cases in installations with one-sided shielding on the feed side (without capacitance termination at the field device). Appropriate measures with regard to input wiring must be taken to allow unrestricted operation when EMC interference is present. These measures have been

taken into account for this device. Operation in the event of disturbance variables as per NAMUR NE21 is thus guaranteed.

Where applicable, national installation regulations and guidelines must be observed during the installation!

Where there are large differences in potential between the individual grounding points, only one point of the shielding is connected directly with the reference ground. In systems without potential equalization, therefore, cable shielding of fieldbus systems should only be grounded on one side, for example at the fieldbus supply unit or at safety barriers.



A0019004

- 1 Controller (e.g. PLC)
- 2 Segment coupler PROFIBUS DP/PA
- 3 Cable shield
- 4 T-box
- 5 Measuring device
- 6 Local grounding
- 7 Bus terminator
- 8 Potential matching line

#### 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.

### 7.1.6 Requirements for the supply unit

#### Supply voltage

##### Transmitter

An external power supply is required for each output. The following supply voltage values apply for PROFIBUS PA and the pulse/frequency/switch output:

*Supply voltage for a compact version without a local display <sup>1)</sup>*

Order code for "Output"	Minimum terminal voltage <sup>2)</sup>	Maximum terminal voltage
Option G: PROFIBUS PA, pulse/frequency/switch output	≥DC 9 V	DC 32 V



1) In event of external supply voltage of the PROFIBUS DP/PA coupler

2) The minimum terminal voltage increases if local operation is used: see the following table

*Increase in minimum terminal voltage*

Local operation	Increase in minimum terminal voltage
Order code for "Display; Operation", option C: Local operation SD02	+ DC 1 V
Order code for "Display; Operation", option E: Local operation SD03 with lighting (backlighting <b>not used</b> )	+ DC 1 V
Order code for "Display; Operation", option E: Local operation SD03 with lighting (backlighting <b>used</b> )	+ DC 3 V

**7.1.7 Preparing the measuring device**

1. Remove dummy plug if present.
2. **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.  
If measuring device is delivered without cable glands:  
Provide suitable cable gland for corresponding connecting cable (→  30).
3. If measuring device is delivered with cable glands:  
Observe cable specification (→  30).

**7.2 Connecting the measuring device****NOTICE****Limitation of electrical safety due to incorrect connection!**

- ▶ Have electrical connection work carried out by correspondingly trained specialists only.
- ▶ Observe applicable federal/national installation codes and regulations.
- ▶ Comply with local workplace safety regulations.
- ▶ For use in potentially explosive atmospheres, observe the information in the device-specific Ex documentation.

**7.2.1 Connecting the remote version**** WARNING****Risk of damaging the electronic components!**

- ▶ Ground the remote version and in doing so connect the sensor and transmitter to the same potential equalization.
- ▶ Only connect the sensor to a transmitter with the same serial number.

The following procedure (in the action sequence given) is recommended for the remote version:

1. Mount the transmitter and sensor.

2. Connect the connecting cable.
3. Connect the transmitter.

**i** The way the transmitter wall holder is connected depends on the measuring device approval and the version of the connecting cable used.

Connection is only possible via terminals:

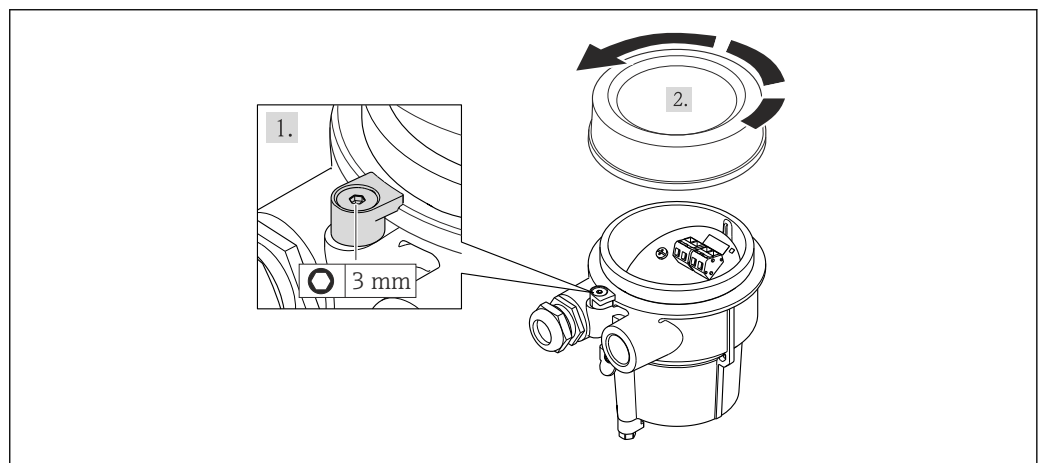
- For approvals Ex n, Ex tb and cCSAus Div. 1
- If a reinforced connecting cable is used

The connection is via an M12 connector:

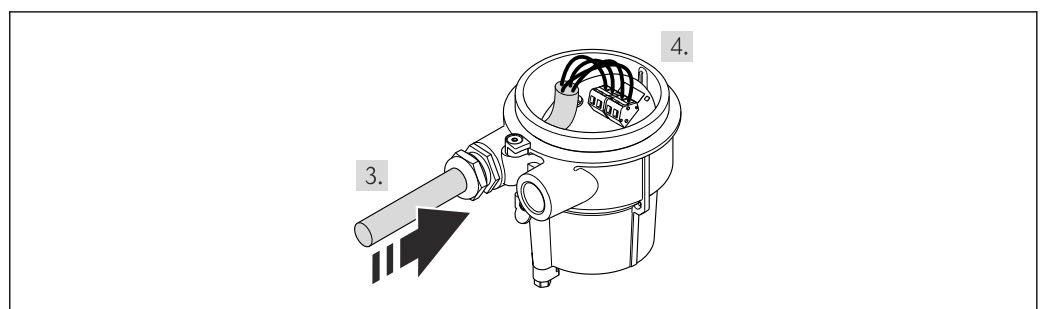
- For all other approvals
- If the standard connecting cable is used

Connection to the connection housing of the sensor is always via terminals.

### Connecting the sensor connection housing



A0020410



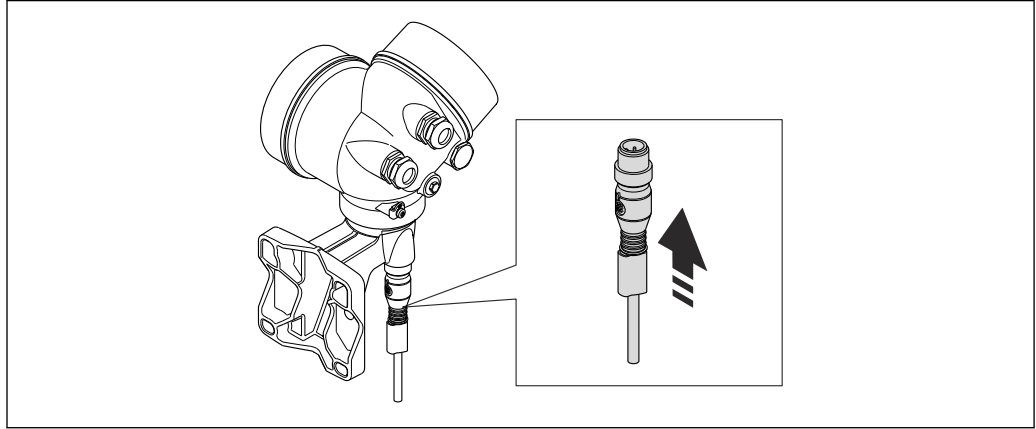
A0020411

1. Loosen the securing clamp.
2. Unscrew the housing cover.
3. Guide the connecting cable through the cable entry and into the connection housing (if using a connecting cable without an M12 device plug, use the shorter stripped end of the connecting cable).
4. Wire the connecting cable:
  - ↳ Terminal 1 = brown cable
  - Terminal 2 = white cable
  - Terminal 3 = yellow cable
  - Terminal 4 = green cable
5. Connect the cable shield via the cable strain relief.

6. Reverse the removal procedure to reassemble the transmitter.

**Connection to the wall holder of the transmitter**

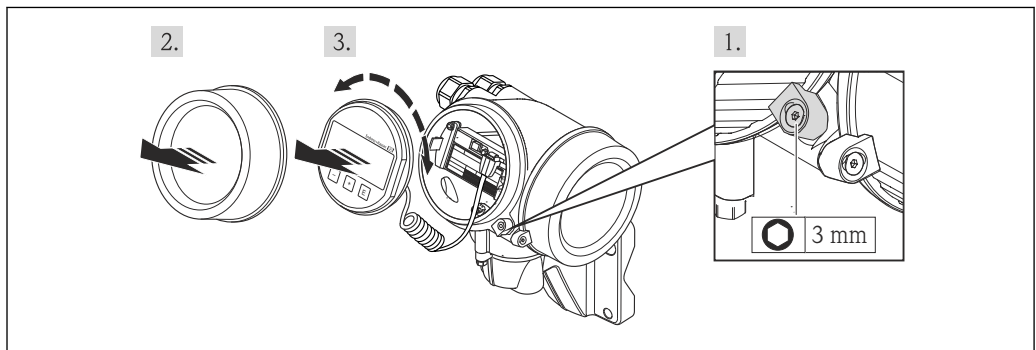
*Connecting the transmitter via plug*



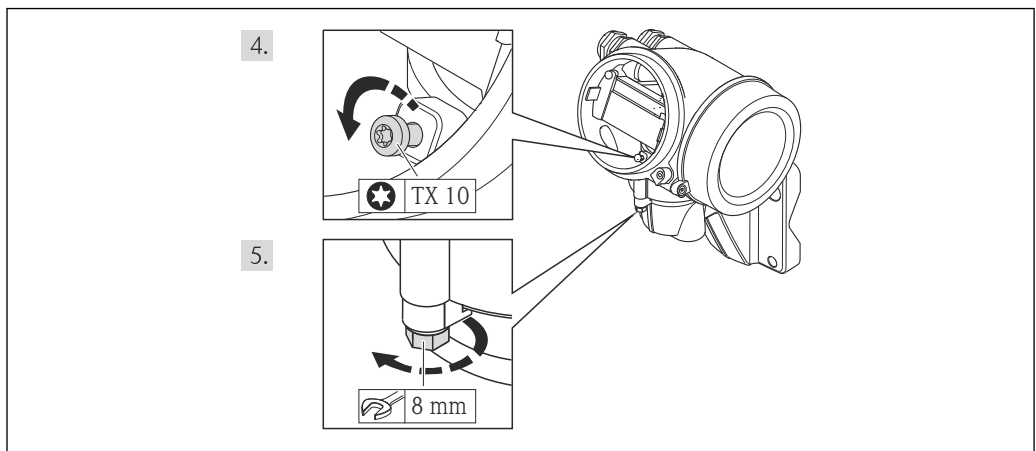
A0020412

- ▶ Connect the plug.

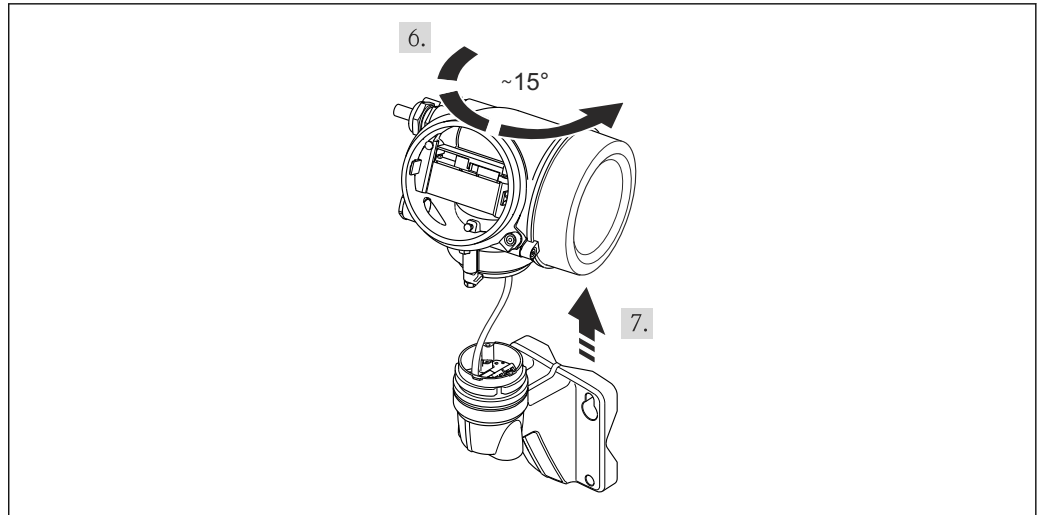
*Connecting the transmitter via terminals*



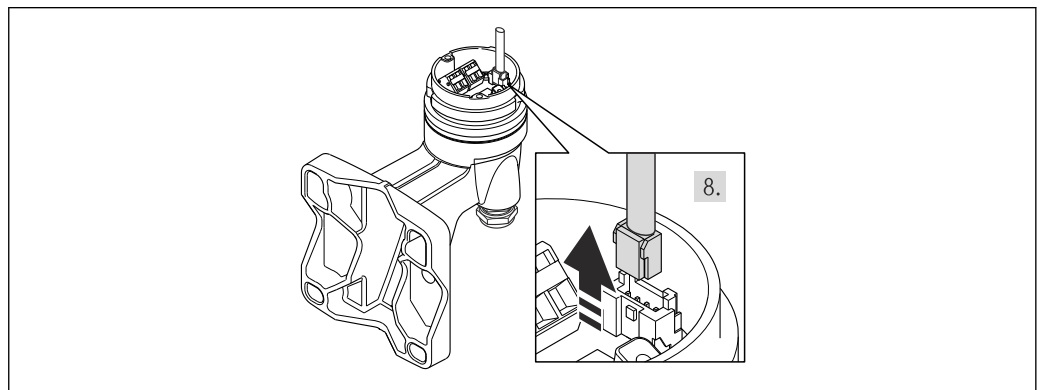
A0020404



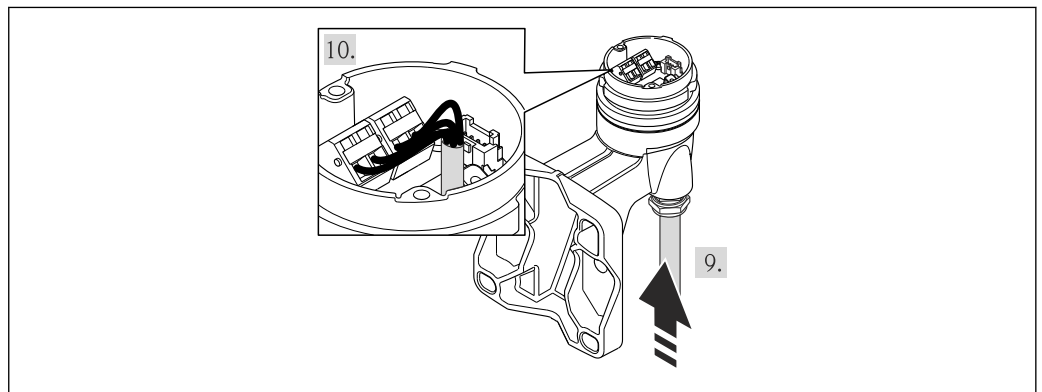
A0020405



A0020406



A0020407



A0020409

1. Loosen the securing clamp of the transmitter housing.
2. Loosen the securing clamp of the electronics compartment cover.
3. Unscrew the electronics compartment cover.
4. Pull out the display module with a gentle rotational movement. To make it easier to access the lock switch, attach the display module to the edge of the electronics compartment.
5. Loosen the locking screw of the transmitter housing.
6. Turn the transmitter housing to the right until the mark and lift it up. The connection board of the wall housing is connected to the electronics board of the transmitter via a signal cable. Pay attention to the signal cable when lifting the transmitter housing!

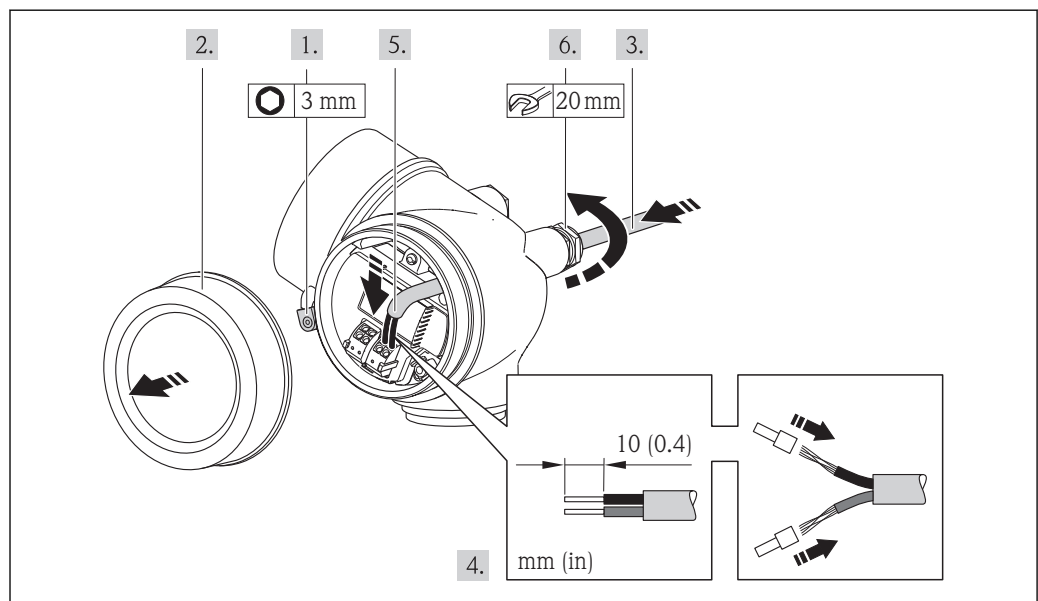
7. Disconnect the signal cable from the connection board of the wall housing by pressing in the locking clip on the connector.
8. Remove the transmitter housing.
9. Guide the connecting cable through the cable entry and into the connection housing (if using a connecting cable without an M12 device plug, use the shorter stripped end of the connecting cable).
10. Wire the connecting cable:
  - ↳ Terminal 1 = brown cable
  - Terminal 2 = white cable
  - Terminal 3 = yellow cable
  - Terminal 4 = green cable
11. Connect the cable shield via the cable strain relief.
12. Reverse the removal procedure to reassemble the transmitter.

### 7.2.2 Connecting the transmitter

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

Connection version: terminals or device plug

#### Connection via terminals

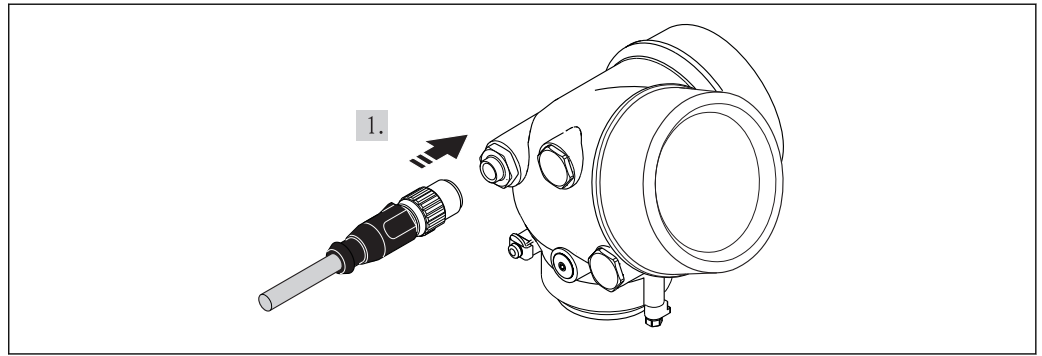


A0013836

1. Loosen the securing clamp of the connection compartment cover.
2. Unscrew the connection compartment cover.
3. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
4. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.
5. Connect the cable in accordance with the terminal assignment .
6. **WARNING!** Housing degree of protection may be voided due to insufficient sealing of the housing. Screw in the screw without using any lubricant. The threads on the cover are coated with a dry lubricant.  
Reverse the removal procedure to reassemble the transmitter.



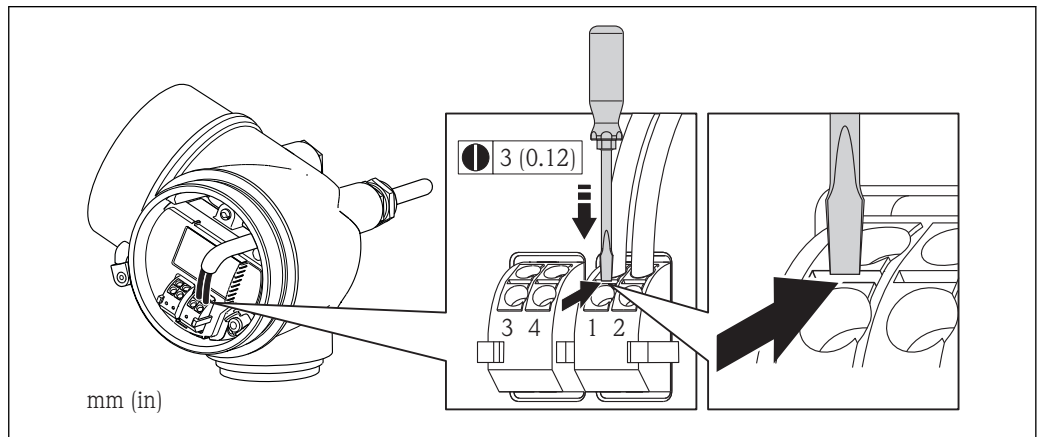
### Connection via device plug



A0019147

- ▶ Plug in the device plug and tighten firmly.

### Removing a cable



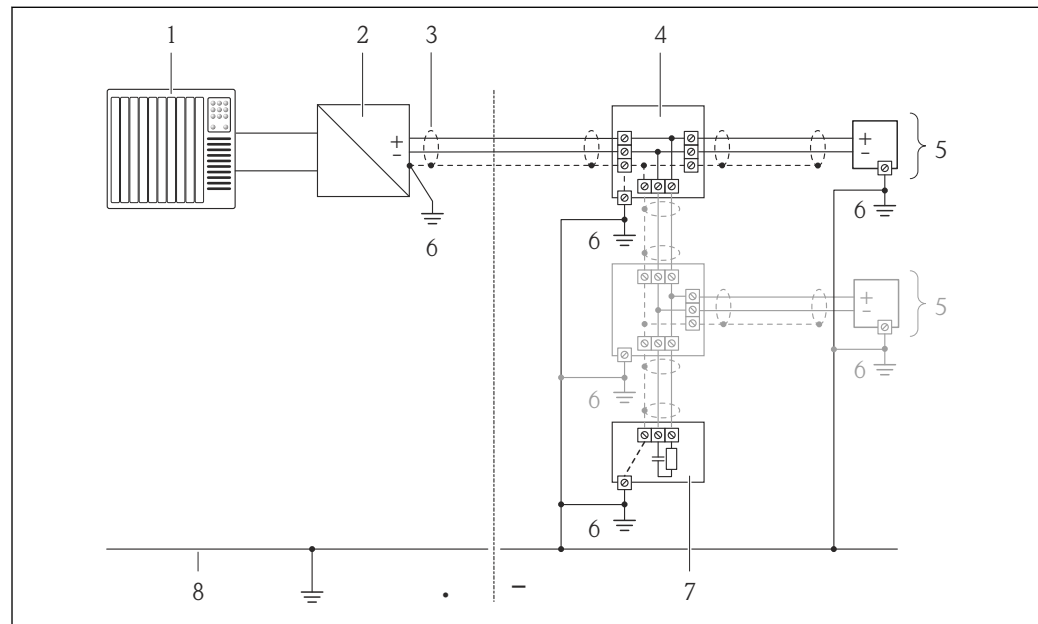
A0013835

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

## 7.3 Special connection instructions

### 7.3.1 Connection examples

#### PROFIBUS-PA



11 Connection example for PROFIBUS-PA

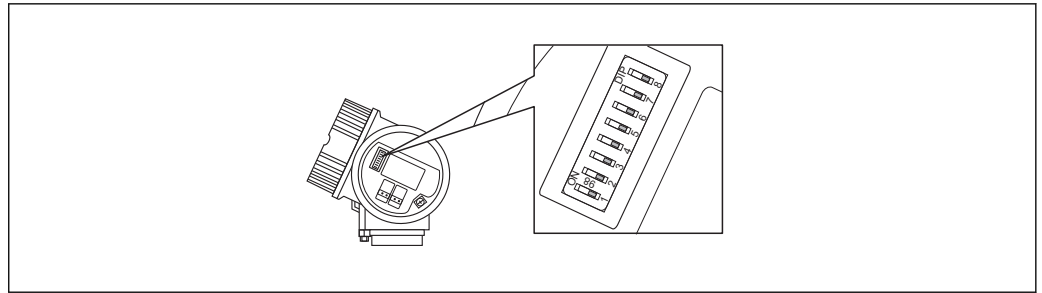
- 1 Control system (e.g. PLC)
- 2 Segment coupler PROFIBUS DP/PA
- 3 Cable shield
- 4 T-box
- 5 Measuring device
- 6 Local grounding
- 7 Bus terminator
- 8 Potential matching line

## 7.4 Hardware settings

### 7.4.1 Setting the device address

#### PROFIBUS PA

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



A0015686

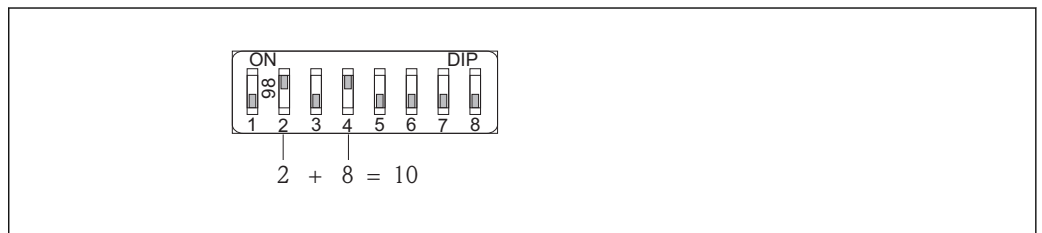
12 Address switch in the connection compartment

Hardware addressing

1. Set switch 8 to the "OFF" position.
2. Using switches 1 to 7, set the address as indicated in the table below.

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

Switch	1	2	3	4	5	6	7
Value in "ON" position	1	2	4	8	16	32	64
Value in "OFF" position	0	0	0	0	0	0	0

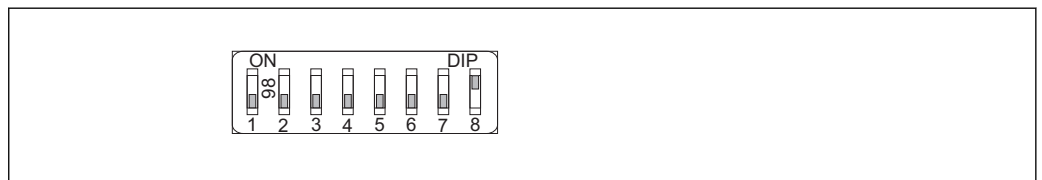


A0015902

13 Example of hardware addressing; switch 8 is set to the "OFF" position; switches 1 to 7 define the address.

Software addressing (→ 72)

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



A0015903

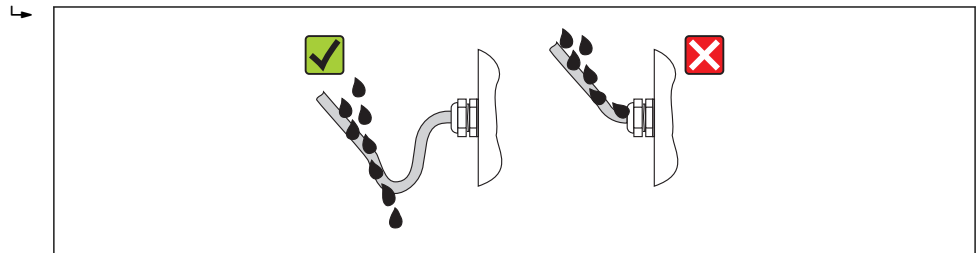
14 Example of software addressing; switch 8 is set to the "ON" position; the address is defined in the operating menu ("Setup" menu → "Communication" submenu → "Device address" parameter).

## 7.5 Ensuring the degree of protection

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

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

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



A0013960

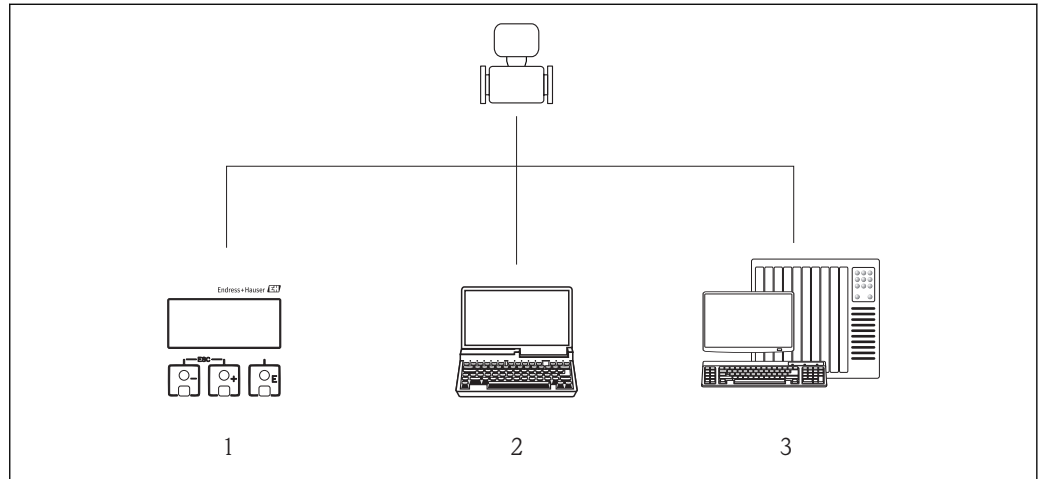
5. Insert dummy plugs into unused cable entries.

## 7.6 Post-connection check

Are cables or the device undamaged (visual inspection)?	<input type="checkbox"/>
Do the cables comply with the requirements (→ 30)?	<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" (→ 43) ?	<input type="checkbox"/>
Depending on the device version: are all the device plugs firmly tightened ?	<input type="checkbox"/>
Does the supply voltage match the specifications on the transmitter nameplate (→ 35)?	<input type="checkbox"/>
Is the terminal assignment correct ?	<input type="checkbox"/>
Is the terminal assignment or the pin assignment of the device plug correct?	<input type="checkbox"/>
If supply voltage is present, do values appear on the display module?	<input type="checkbox"/>
Are all housing covers installed and firmly tightened?	<input type="checkbox"/>
Is the securing clamp tightened correctly?	<input type="checkbox"/>

## 8 Operation options

### 8.1 Overview of operation options





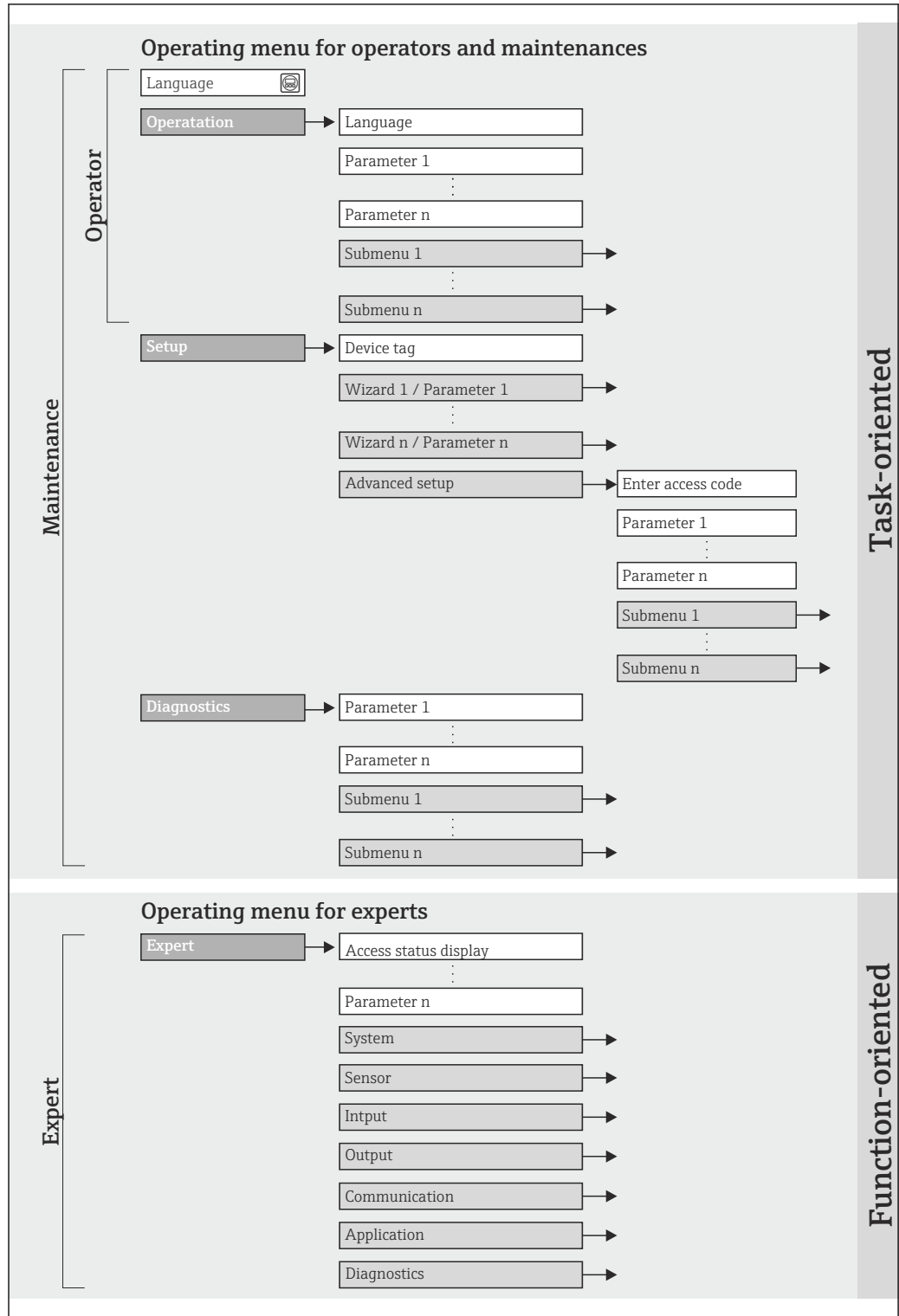
A0019091


- 1 Local operation via display module
- 2 Computer with operating tool (e.g. FieldCare, SIMATIC PDM)
- 3 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 with menus and parameters (→  197)



 15 Schematic structure of the operating menu

A0018237-EN

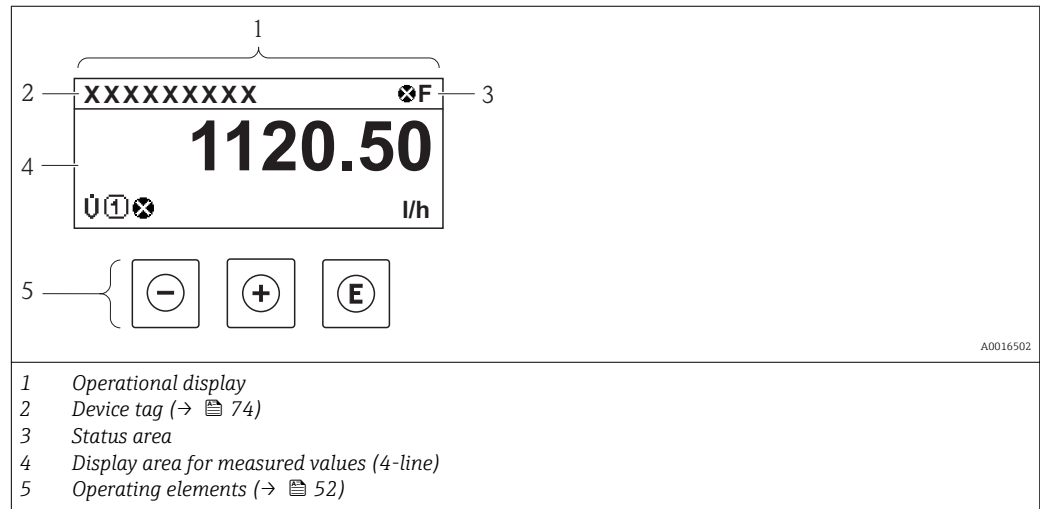
### 8.2.2 Operating philosophy

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		User role and tasks	Content/meaning
Language	task-oriented	<b>Role "Operator", "Maintenance"</b> Tasks during operation:	Defining the operating language
Operation		<ul style="list-style-type: none"> <li>▪ Configuring the operational display</li> <li>▪ Reading measured values</li> </ul>	<ul style="list-style-type: none"> <li>▪ Configuring the operational display (e.g. display format, display contrast)</li> <li>▪ Resetting and controlling totalizers</li> </ul>
Setup		<b>"Maintenance" role</b> Commissioning: <ul style="list-style-type: none"> <li>▪ Configuration of the measurement</li> <li>▪ Configuration of the inputs and outputs</li> </ul>	Wizards for fast commissioning: <ul style="list-style-type: none"> <li>▪ Configuring the outputs</li> <li>▪ Configuring the operational display</li> <li>▪ Defining the output conditioning</li> <li>▪ Configuring the low flow cut off</li> </ul> <b>"Advanced setup" submenu:</b> <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>▪ 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>▪ <b>"Diagnostic list" submenu</b> Contains up to 5 currently pending diagnostic messages.</li> <li>▪ <b>"Event logbook" submenu</b> Contains up to 20 or 100 (order option "Extended HistoROM") event messages that have occurred.</li> <li>▪ <b>"Device information" submenu</b> Contains information for identifying the device.</li> <li>▪ <b>"Measured values" submenu</b> Contains all current measured values.</li> <li>▪ <b>"Analog inputs" submenu</b> Is used to display the analog input.</li> <li>▪ <b>"Heartbeat Technology" submenu</b> The functionality of the device is checked on demand and the verification results are documented.</li> <li>▪ <b>"Simulation" submenu</b> 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>▪ <b>"System" submenu</b> Contains all higher-order device parameters that do not pertain either to measurement or the measured value communication.</li> <li>▪ <b>"Sensor" submenu</b> Configuration of the measurement.</li> <li>▪ <b>"Output" submenu</b> Configuration of the pulse/frequency/status output.</li> <li>▪ <b>"Communication" submenu</b> Configuration of the digital communication interface.</li> <li>▪ <b>Submenus for function blocks (e.g. "Analog inputs")</b> Configuration of function blocks.</li> <li>▪ <b>"Application" submenu</b> Configuration of the functions that go beyond the actual measurement (e.g. totalizer).</li> <li>▪ <b>"Diagnostics" submenu</b> 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 local display

### 8.3.1 Operational display



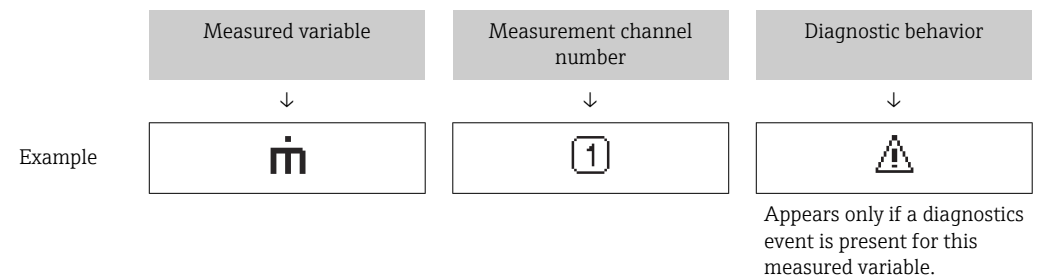
#### Status area

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

- Status signals(→ 130)
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
  - **M**: Maintenance required
- Diagnostic behavior(→ 131)
  - : Alarm
  - : Warning
- : Locking (the device is locked via the hardware (→ 118))
- : Communication (communication via remote operation is active)

#### Display area

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



#### Measured variables

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



Measurement channel numbers

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

Diagnostic behavior

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable. For information on the symbols (→ 131)

The number and display format of the measured values can be configured via the **"Format display" parameter**(→ 81). "Operation" menu → Display → Format display

8.3.2 Navigation view

In the submenu	In the wizard
A0013993-EN	A0016327-EN
<p>1 Navigation view                  2 Navigation path to current position                  3 Status area                  4 Display area for navigation                  5 Operating elements (→  52)</p>	

Navigation path




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

	<ul style="list-style-type: none"> <li>In the submenu: Display symbol for menu</li> <li>In the wizard: Display symbol for wizard</li> </ul>	Omission symbol for operating menu levels in between	Name of current <ul style="list-style-type: none"> <li>Submenu</li> <li>Wizard</li> <li>Parameter</li> </ul>
	↓	↓	↓
Examples		/ .. /	Display
		/ .. /	Display

For more information about the menu icons, refer to the "Display area" section (→ 50)





**Status area**

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





- Of the submenu
  - The direct access code for the parameter you are navigating to (e.g. 0022-1)
  - If a diagnostic event is present, the diagnostic behavior and status signal
- In the wizard
  - If a diagnostic event is present, the diagnostic behavior and status signal
-  ▪ For information on the diagnostic behavior and status signal (→  130)
- For information on the function and entry of the direct access code (→  55)

**Display area**




*Menus*

Symbol	Meaning
	<b>Operation</b> Appears: <ul style="list-style-type: none"> <li>▪ In the menu next to the "Operation" selection</li> <li>▪ At the left in the navigation path in the "Operation" menu</li> </ul>
	<b>Setup</b> Appears: <ul style="list-style-type: none"> <li>▪ In the menu next to the "Setup" selection</li> <li>▪ At the left in the navigation path in the "Setup" menu</li> </ul>
	<b>Diagnostics</b> Appears: <ul style="list-style-type: none"> <li>▪ In the menu next to the "Diagnostics" selection</li> <li>▪ At the left in the navigation path in the "Diagnostics" menu</li> </ul>
	<b>Expert</b> Appears: <ul style="list-style-type: none"> <li>▪ In the menu next to the "Expert" selection</li> <li>▪ At the left in the navigation path in the "Expert" menu</li> </ul>




*Submenus, wizards, parameters*

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

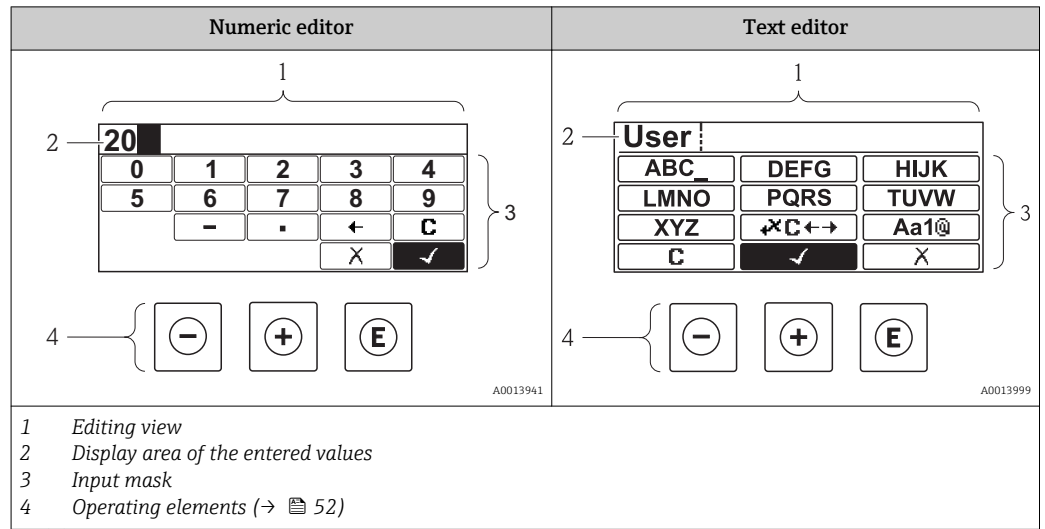
*Locking*

Symbol	Meaning
	<b>Parameter locked</b> When displayed in front of a parameter name, indicates that the parameter is locked. <ul style="list-style-type: none"> <li>▪ By a user-specific access code (→  117)</li> <li>▪ By the hardware write protection switch (→  118)</li> </ul>

*Wizard operation*

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

### 8.3.3 Editing view



#### Input mask









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


##### Numeric editor





Symbol	Meaning
0 ... 9	Selection of numbers from 0 to 9.
.	Inserts decimal separator at the input position.
-	Inserts minus sign at the input position.
✓	Confirms selection.
←	Moves the input position one position to the left.
X	Exits the input without applying the changes.
C	Clears all entered characters.

##### Text editor



Symbol	Meaning
Aa1@ ... XYZ	Toggle <ul style="list-style-type: none"> <li>Between upper-case and lower-case letters</li> <li>For entering numbers</li> <li>For entering special characters</li> </ul>
ABC_ ... XYZ	Selection of letters from A to Z.

 	Selection of letters from a to z.
 	Selection of special characters.
	Confirms selection.
	Switches to the selection of the correction tools.
	Exits the input without applying the changes.
	Clears all entered characters.

Correction symbols under 

Symbol	Meaning
	Clears all entered characters.
	Moves the input position one position to the right.
	Moves the input position one position to the left.
	Deletes one character immediately to the left of the input position.

### 8.3.4 Operating elements

Key	Meaning
	<p><b>Minus key</b></p> <p><i>In a menu, submenu</i>                      Moves the selection bar upwards in a choose list.</p> <p><i>With a Wizard</i>                      Confirms the parameter value and goes to the previous parameter.</p> <p><i>With a text and numeric editor</i>                      In the input mask, moves the selection bar to the left (backwards).</p>
	<p><b>Plus key</b></p> <p><i>In a menu, submenu</i>                      Moves the selection bar downwards in a choose list.</p> <p><i>With a Wizard</i>                      Confirms the parameter value and goes to the next parameter.</p> <p><i>With a text and numeric editor</i>                      Moves the selection bar to the right (forwards) in an input screen.</p>

Key	Meaning
Ⓔ	<p><b>Enter key</b></p> <p><i>For operational display</i></p> <ul style="list-style-type: none"> <li>Pressing the key briefly opens the operating menu.</li> <li>Pressing the key for 2 s opens the context menu.</li> </ul> <p><i>In a menu, submenu</i></p> <ul style="list-style-type: none"> <li>Pressing the key briefly:                     <ul style="list-style-type: none"> <li>Opens the selected menu, submenu or parameter.</li> <li>Starts the wizard.</li> <li>If help text is open, closes the help text of the parameter.</li> </ul> </li> <li>Pressing the key for 2 s for parameter:                     <ul style="list-style-type: none"> <li>If present, opens the help text for the function of the parameter.</li> </ul> </li> </ul> <p><i>With a Wizard</i></p> <p>Opens the editing view of the parameter.</p> <p><i>With a text and numeric editor</i></p> <ul style="list-style-type: none"> <li>Pressing the key briefly:                     <ul style="list-style-type: none"> <li>Opens the selected group.</li> <li>Carries out the selected action.</li> </ul> </li> <li>Pressing the key for 2 s confirms the edited parameter value.</li> </ul>
⊖ + ⊕	<p><b>Escape key combination (press keys simultaneously)</b></p> <p><i>In a menu, submenu</i></p> <ul style="list-style-type: none"> <li>Pressing the key briefly:                     <ul style="list-style-type: none"> <li>Exits the current menu level and takes you to the next higher level.</li> <li>If help text is open, closes the help text of the parameter.</li> </ul> </li> <li>Pressing the key for 2 s returns you to the operational display ("home position").</li> </ul> <p><i>With a Wizard</i></p> <p>Exits the wizard and takes you to the next higher level.</p> <p><i>With a text and numeric editor</i></p> <p>Closes the text or numeric editor without applying changes.</p>
⊖ + Ⓔ	<p><b>Minus/Enter key combination (press the keys simultaneously)</b></p> <p>Reduces the contrast (brighter setting).</p>
⊕ + Ⓔ	<p><b>Plus/Enter key combination (press and hold down the keys simultaneously)</b></p> <p>Increases the contrast (darker setting).</p>
⊖ + ⊕ + Ⓔ	<p><b>Minus/Plus/Enter key combination (press the keys simultaneously)</b></p> <p><i>For operational display</i></p> <p>Enables or disables the keypad lock (only SD02 display module).</p>

### 8.3.5 Opening the context menu

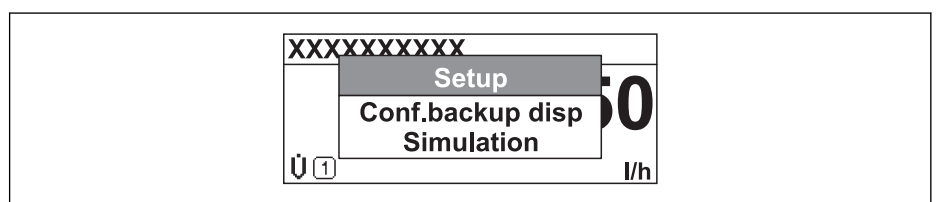
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Conf. backup disp.
- Simulation

#### Calling up and closing the context menu

The user is in the operational display.

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



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2. Press  $\square + \boxplus$  simultaneously.
  - ↳ The context menu is closed and the operational display appears.

**Calling up the menu via the context menu**

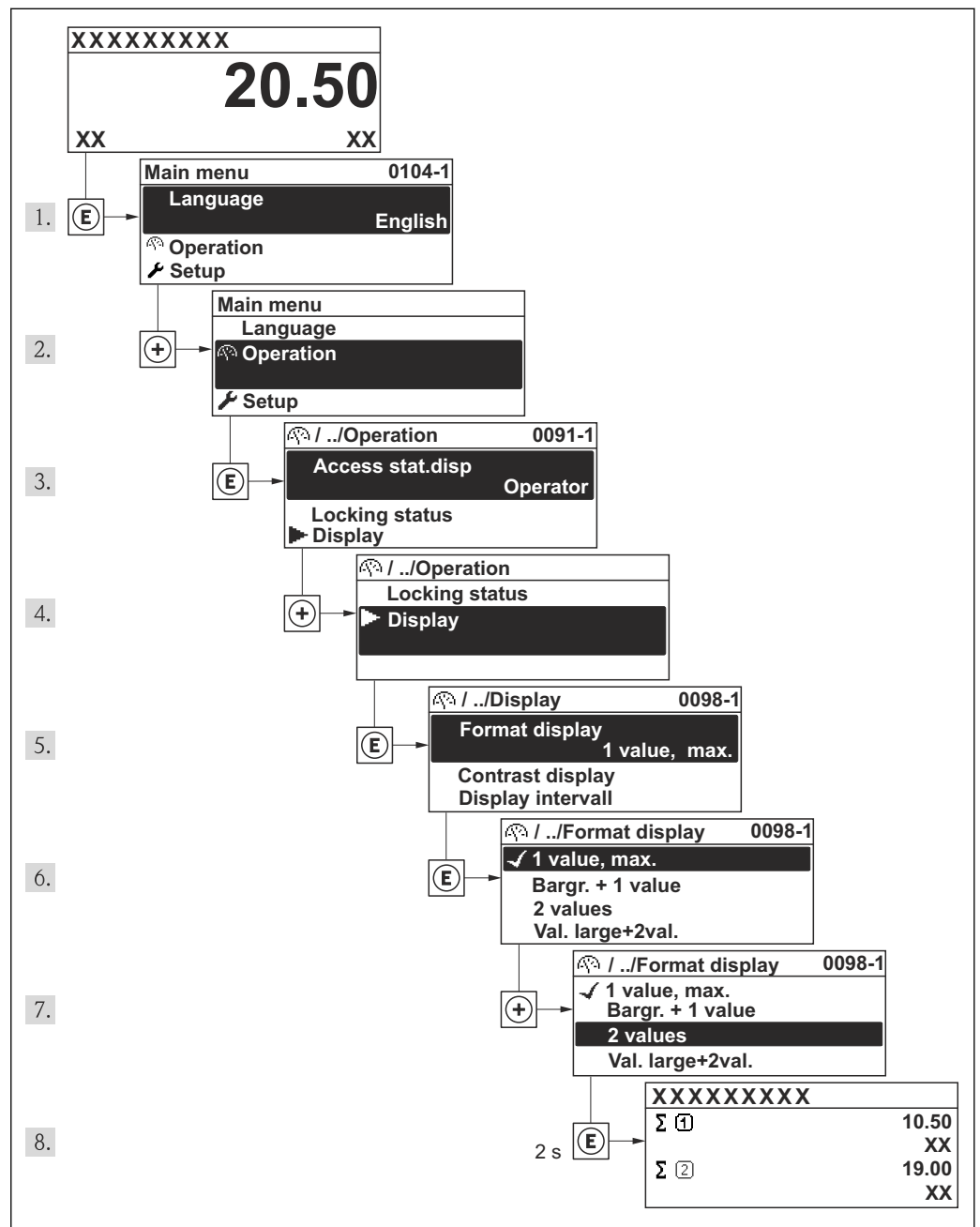
1. Open the context menu.
2. Press  $\boxplus$  to navigate to the desired menu.
3. Press  $\boxtimes$  to confirm the selection.
  - ↳ The selected menu opens.

### 8.3.6 Navigating and selecting from list

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

**i** For an explanation of the navigation view with symbols and operating elements (→ 49)

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



A0014010-EN

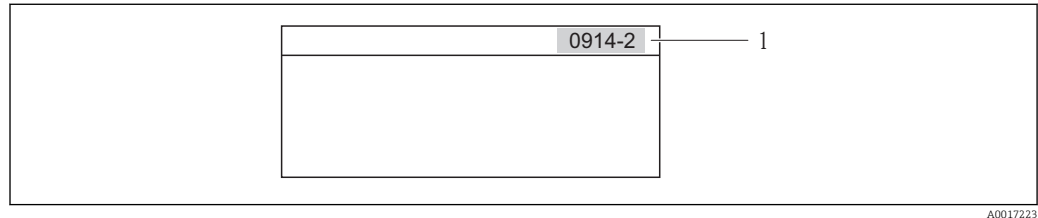
### 8.3.7 Calling the parameter directly

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

### Navigation path

"Expert" menu → Direct access


The direct access code consists of a 4-digit number and the channel number, which identifies the channel of a process variable: e.g. 0914-1. In the navigation view, this appears on the right-hand side in the header of the selected parameter.



1 Direct access code

Note the following when entering the direct access code:

- The leading zeros in the direct access code do not have to be entered.  
Example: Input of "914" instead of "0914"
- If no channel number is entered, channel 1 is jumped to automatically.  
Example: Input of "0914" → Parameter **Totalizer 1**
- If a different channel is jumped to: Enter the direct access code with the corresponding channel number.  
Example: Input of "0914-2" → Parameter **Totalizer 2**


 For the direct access codes of the individual parameters

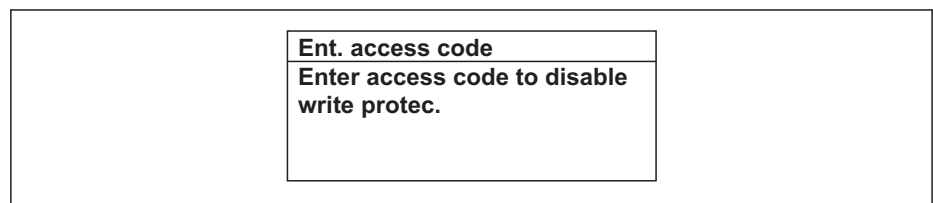
### 8.3.8 Calling up help text


For some parameters, help texts exist, which the user can call up from the navigation view. These briefly describe the function of the parameter and thus support fast and reliable commissioning.



#### Calling up and closing the help text

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

1. Press  for 2 s.  
↳ The help text for the selected parameter opens.



 16 Example: Help text for parameter "Enter access code"

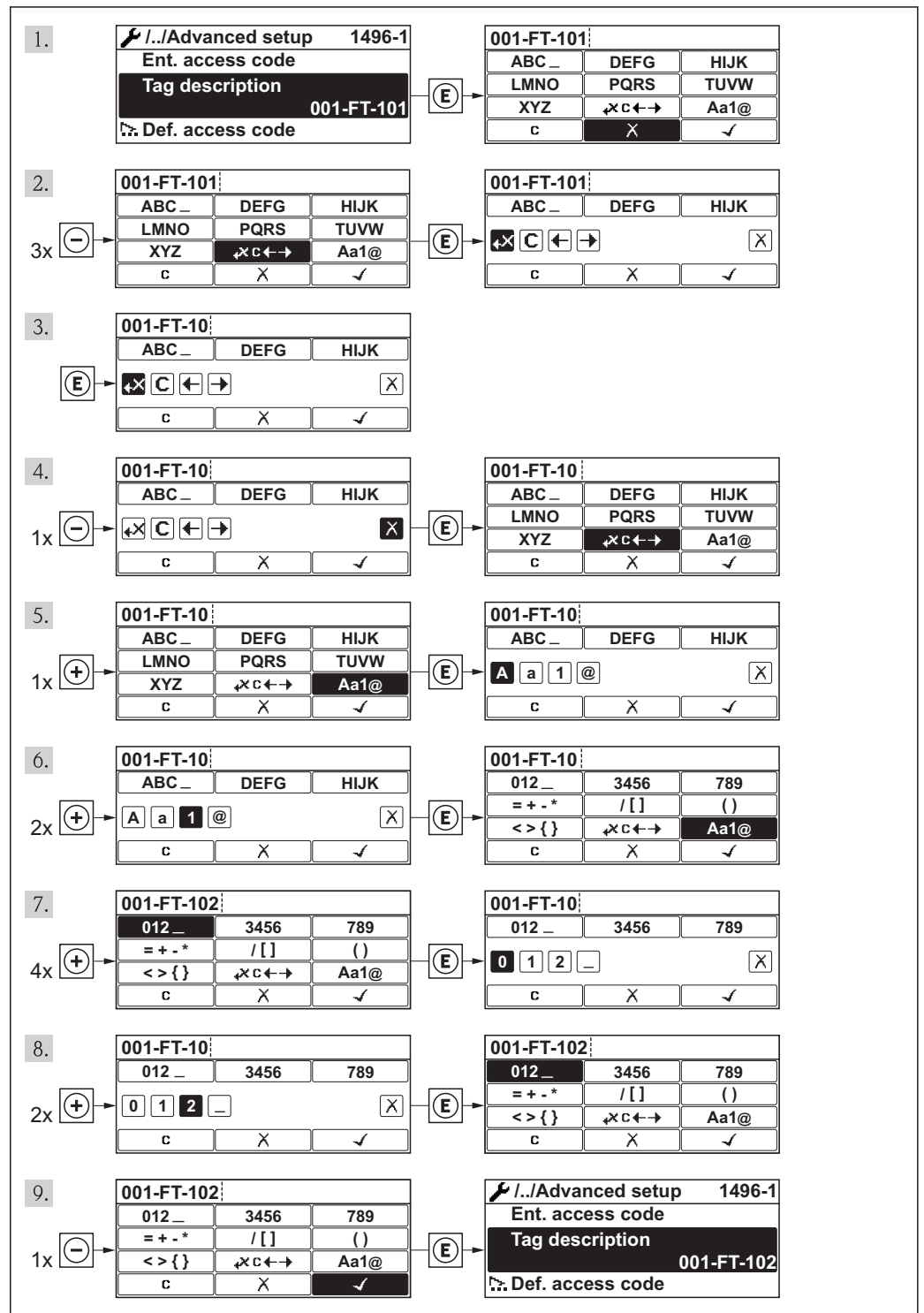
2. Press  +  simultaneously.  
↳ The help text is closed.




### 8.3.9 Changing the parameters

**i** For a description of the editing display - consisting of text editor and numeric editor - with symbols (→ 51), for a description of the operating elements (→ 52)

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



### 8.3.10 User roles and related access authorization


The two user roles "Operator" and "Maintenance" have different write access to the parameters if the customer defines a user-specific access code. This protects the device configuration via the local display from unauthorized access (→  117).

#### Access authorization to parameters



User role	Read access		Write access	
	Without access code (from the factory)	With access code	Without access code (from the factory)	With access code
Operator	✓	✓	✓	-- 1)
Maintenance	✓	✓	✓	✓

- 1) Despite the defined access code, certain parameters can always be modified and thus are excepted from the write protection, as they do not affect the measurement. Refer to the "Write protection via access code" section



If an incorrect access code is entered, the user obtains the access rights of the "Operator" role.

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

### 8.3.11 Disabling write protection via access code

If the -symbol appears on the local display in front of a parameter, the parameter is write-protected by a user-specific access code and its value cannot be changed at the moment using the local display (→  117).

The locking of the write access via local operation can be disabled by entering the customer-defined access code via the respective access option.

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

### 8.3.12 Enabling and disabling the keypad lock




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


#### Local operation with mechanical push buttons (display module SD02)

 Display module SD02: order characteristic "Display; Operation", option C




The keypad lock is switched on and off in the same way:

#### Switching on the keypad lock

- ▶ The device is in the measured value display. Press the  +  +  keys simultaneously.
  - ↳ The message **Keylock on** appears on the display: The keypad lock is switched on.

 If the user attempts to access the operating menu while the keypad lock is active, the message **Keylock on** appears.

*Switching off the keypad lock*

- ▶ The keypad lock is switched on.  
Press the  +  +  keys simultaneously.
  - ↳ The message **Keylock off** appears on the display: The keypad lock is switched off.

**Local operation with touch control (display module SD03)**


 Display module SD03: Order characteristic "Display; Operation", option **E**


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

*Switching on the keypad lock*


The keypad lock is switched on automatically:

- Each time the device is restarted.
- If the device has not been operated for longer than one minute in the measured value display.

1. The device is in the measured value display.  
Press the  key for longer than 2 seconds.
  - ↳ A context menu appears.
2. In the context menu, select the **Keylock on** option.
  - ↳ The keypad lock is switched on.

 If the user attempts to access the operating menu while the keypad lock is active, the message **Keylock on** appears.

*Switching off the keypad lock*

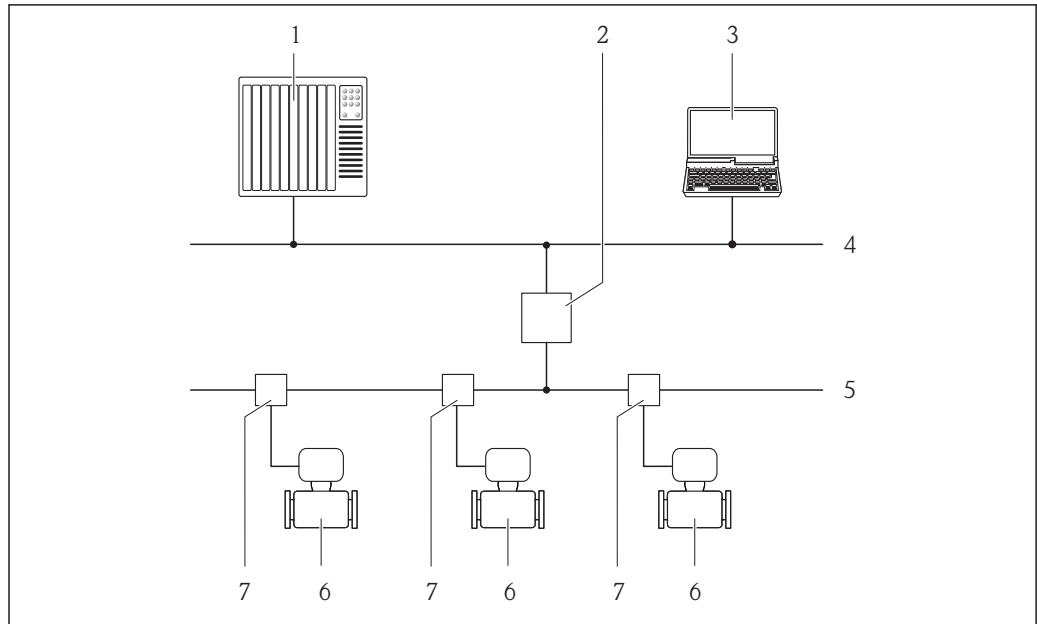
1. The keypad lock is switched on.  
Press the  key for longer than 2 seconds.
  - ↳ A context menu appears.
2. In the context menu, select the **Keylock off** option.
  - ↳ The keypad lock is switched off.

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

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

### 8.4.1 Connecting the operating tool

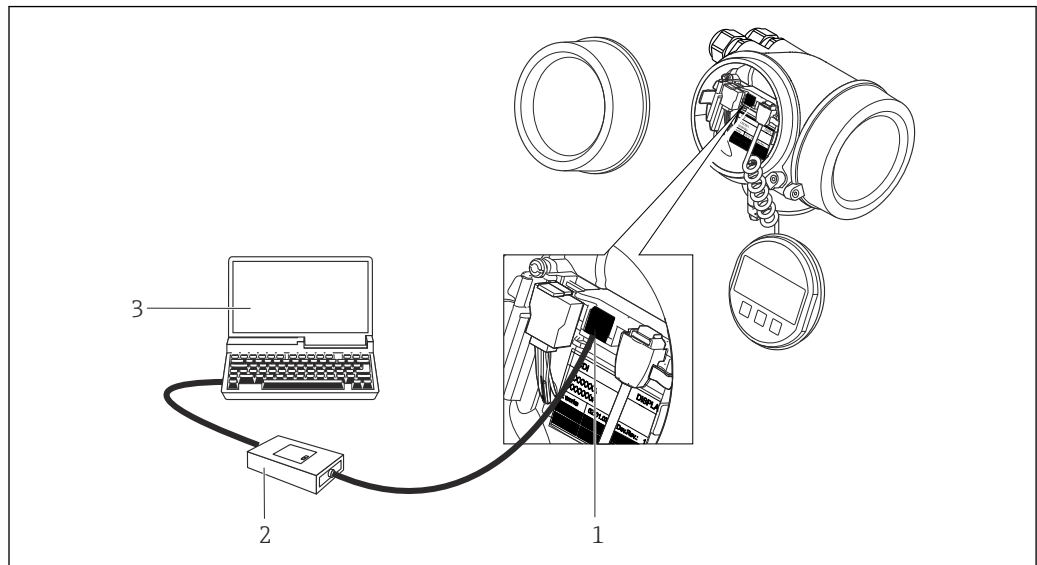
#### Via PROFIBUS PA network



A0019013

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

#### Via service interface (CDI)



A0020545

- 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"

## 8.4.2 FieldCare

### Function scope

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

Access takes place via:

- PROFIBUS PA protocol (→ 60)
- Service interface CDI (→ 60)

Typical functions:

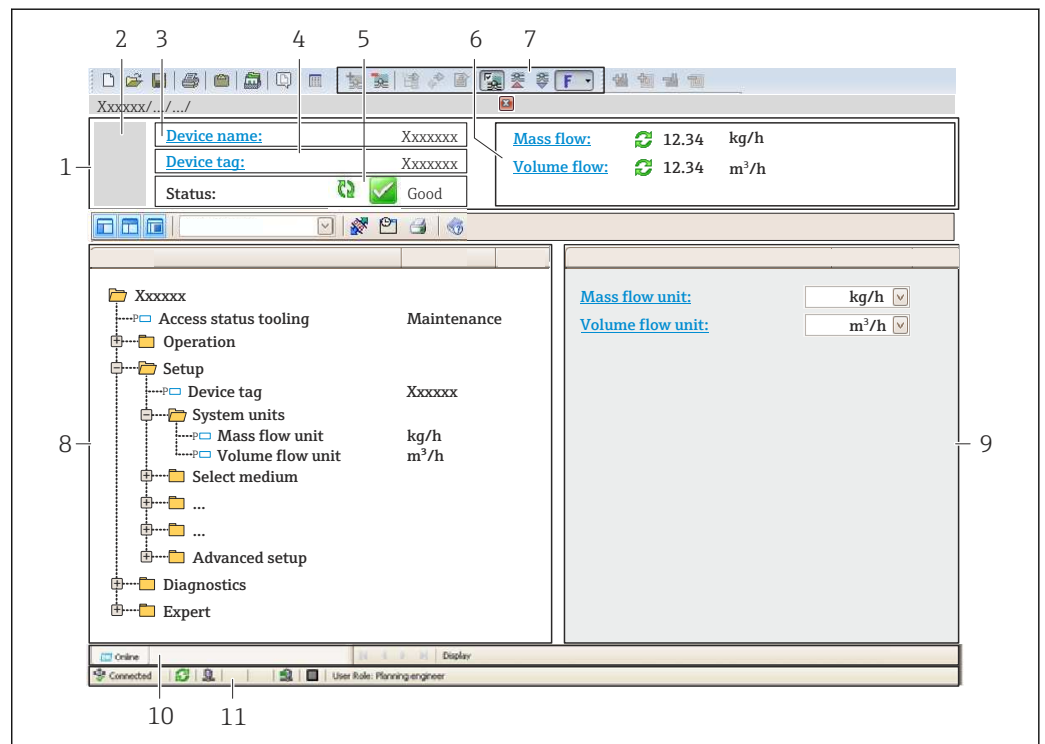
- Configuring parameters of transmitters
- Loading and saving device data (upload/download)
- Documentation of the measuring point
- Visualization of the measured value memory (line recorder) and event logbook

 For details, see Operating Instructions BA00027S and BA00059S

### Source for device description files

See data (→ 63)

### User interface




- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Device tag (→ 74)
- 5 Status area with status signal
- 6 Display area for current measured values
- 7 Event list with additional functions such as save/load, events list and document creation
- 8 Navigation area with operating menu structure
- 9 Operating range
- 10 Range of action
- 11 Status area

### 8.4.3 SIMATIC PDM

#### Function scope

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

#### Source for device description files

See data (→  63)

## 9 System integration

### 9.1 Overview of device description files

#### 9.1.1 Current version data for the device

Firmware version	01.01.00	<ul style="list-style-type: none"> <li>▪ On the title page of the Operating instructions</li> <li>▪ On transmitter nameplate</li> <li>▪ Parameter <b>firmware version</b> Diagnostics → Device info → Firmware version</li> </ul>
Release date of firmware version	10.2014	---
Manufacturer ID	0x11	---
Ident number	0x1564	---
Profile version	3.02	---

#### 9.1.2 Operating tools

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

Operating tool via PROFIBUS protocol	Sources for obtaining device descriptions
FieldCare	<ul 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>
SIMATIC PDM (Siemens)	<a href="http://www.endress.com">www.endress.com</a> → Download Area


## 9.2 Device master file (GSD)

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

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

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

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

-  ▪ Before configuring, the user must decide which GSD should be used to operate the system.
- The setting can be changed via a Class 2 master.

#### 9.2.1 Manufacturer-specific GSD

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

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

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



Where to acquire the manufacturer-specific GSD:

[www.endress.com](http://www.endress.com) → Download Area

### 9.2.2 Profile GSD

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

ID number	Supported blocks	Supported channels
0x9740	<ul style="list-style-type: none"> <li>▪ 1 Analog Input</li> <li>▪ 1 Totalizer</li> </ul>	<ul style="list-style-type: none"> <li>▪ Channel Analog Input: volume flow</li> <li>▪ Channel totalizer: volume flow</li> </ul>
0x9741	<ul style="list-style-type: none"> <li>▪ 2 Analog Input</li> <li>▪ 1 Totalizer</li> </ul>	<ul style="list-style-type: none"> <li>▪ Channel Analog Input 1: volume flow</li> <li>▪ Channel Analog Input 2: mass flow</li> <li>▪ Channel totalizer: volume flow</li> </ul>
0x9742	<ul style="list-style-type: none"> <li>▪ 3 Analog Input</li> <li>▪ 1 Totalizer</li> </ul>	<ul style="list-style-type: none"> <li>▪ Channel Analog Input 1: volume flow</li> <li>▪ Channel Analog Input 2: mass flow</li> <li>▪ Channel Analog Input 3: corrected volume flow</li> <li>▪ Channel totalizer: volume flow</li> </ul>

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

### 9.2.3 Compatibility with other Endress+Hauser measuring devices

The Prowirl 200 PROFIBUS PA guarantees compatibility during cyclic data exchange with the automation system (Class 1 master) for the following measuring devices:

- Prowirl 72 PROFIBUS PA (Profile version 3.0, ID number 0x153B)
- Prowirl 73 PROFIBUS PA (Profile version 3.0, ID number 0x153C)

It is possible to replace these measuring devices with a Prowirl 200 PROFIBUS PA without the need to reconfigure the PROFIBUS network in the automation unit even though the names and ID numbers of the measuring devices differ. Once replaced, the device is either identified automatically (factory setting) or device identification can be set manually.

#### Automatic identification (factory setting)

The Prowirl 200 PROFIBUS PA automatically identifies the measuring device configured in the automation system (Prowirl 72 PROFIBUS PA or Prowirl 73 PROFIBUS PA) and makes the same input and output data and measured value status information available for cyclic data exchange.


Automatic identification is set in the **Ident number selector** parameter using the **Auto** option (factory setting).

#### Manual setting

The manual setting is made in the **Ident number selector** parameter using the Prowirl 72 (0x153B) or Prowirl 73 (0x153C) option.

Afterwards, the Prowirl 200 PROFIBUS PA makes the same input and output data and measured status information available for cyclic data exchange.



- 
 ■ If the Prowirl 200 PROFIBUS PA is acyclically configured via an operating program (Class 2 master), access is directly via the block structure or the parameters of the measuring device.
- If parameters have been changed in the device to be replaced (Prowirl 72 PROFIBUS PA or Prowirl 73 PROFIBUS PA) (parameter setting no longer corresponds to the original factory setting), these parameters must be changed accordingly in the new replacement Prowirl 200 PROFIBUS PA via an operating program (Class 2 master).

*Example*

The setting for low flow cut off has been changed from mass flow (factory setting) to corrected volume flow in a Prowirl 72 PROFIBUS PA currently in operation. This device is now replaced by a Prowirl 200 PROFIBUS PA device. After replacing the device, the assignment for the low flow cut off must be changed manually in the Prowirl 200 PROFIBUS, i.e. to corrected volume flow, to ensure the measuring device behaves identically.

**Replacing the measuring devices without changing the GSD file or restarting the controller**

In the procedure described below, the device can be replaced without interrupting ongoing operation or restarting the controller. However with this procedure the measuring device is not fully integrated!

1. Replace the measuring device Prowirl 72 or 73 PROFIBUS PA by a Prowirl 200 PROFIBUS PA device.
2. Set the device address: The same device address that was set for the Prowirl 72, Prowirl 73 or PROFIBUS PA Profile GSD must be used.
3. Connect the Prowirl 200 PROFIBUS PA.

If the factory setting had been changed on the replaced device (Prowirl 72 or Prowirl 73), the following settings may need to be changed:

1. Configuration of the application-specific parameters.
2. Choice of process variables to be transmitted via the CHANNEL parameter in the Analog Input or Totalizer function block.
3. Setting of the units for the process variables.

**9.3 Cyclic data transmission**

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

**9.3.1 Block model**

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

Measuring device		Control system
<b>Transducer Block</b>	Analog Input block 1 to 4 (→ ⓘ 66)	Output value AI →
		Output value TOTAL →
	Totalizer block 1 to 3 (→ ⓘ 67)	Controller SETTOT ←
		Configuration MODETOT ←
	Analog Output block 1 (→ ⓘ 69)	Input values AO ←
	Discrete Input block 1 to 2 (→ ⓘ 70)	Output values DI →
	Discrete Output block 1 to 3 (→ ⓘ 70)	Input values DO ←
		<b>PROFIBUS DP</b>

### Defined order of modules

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

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

Slot	Module	Function block
1...4	AI	Analog Input block 1 to 4
5	TOTAL or SETTOT_TOTAL or SETTOT_MODETOT_TOTAL	Totalizer block 1
6		Totalizer block 2
7		Totalizer block 3
8	AO	Analog Output block 1
9...10	DI	Discrete Input block 1 to 2
11...13	DO	Discrete Output block 1 to 3

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

### 9.3.2 Description of the modules



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

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

#### AI module (Analog Input)

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

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

Four Analog Input blocks are available (slot 1 to 4).

*Selection: input variable*

The input variable can be specified using the CHANNEL parameter.

CHANNEL	Input variable
33122	Volume flow
32961	Mass flow
33093	Corrected volume flow
708	Flow velocity
33101	Temperature
709	Calculated saturated steam pressure
710	Steam quality
466	Total mass flow
69	Energy flow
465	Heat flow difference

CHANNEL	Input variable
711	Reynolds number
32850	Density
1159	Pressure
2006	Specific volume
1305	Degree of overheating

#### Factory setting

Function block	Factory setting
AI 1	Volume flow
AI 2	Mass flow
AI 3	Corrected volume flow
AI 4	Density

#### Data structure

##### Input data of Analog Input

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

#### TOTAL module

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

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

Three totalizer blocks are available (slot 5 to 7).

##### Selection: totalizer value

The totalizer value can be specified using the CHANNEL parameter.

CHANNEL	Input variable
33122	Volume flow
32961	Mass flow
33093	Corrected volume flow
466	Total mass flow
467	Condensate mass flow
69	Energy flow
465	Heat flow difference

#### Factory setting

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

*Data structure**Input data of TOTAL*

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

**SETTOT\_TOTAL module**

The module combination consists of the SETTOT and TOTAL functions:

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

Three totalizer blocks are available (slot 5 to 7).

*Selection: control totalizer*

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

*Factory setting*

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

*Data structure**Output data of SETTOT*

Byte 1
Control variable 1

*Input data of TOTAL*

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

**SETTOT\_MODETOT\_TOTAL module**

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

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

Three totalizer blocks are available (slot 5 to 7).

*Selection: totalizer configuration*

CHANNEL	MODETOT value	Totalizer configuration
33306	0	Balancing
33028	1	Balance the positive flow

CHANNEL	MODETOT value	Totalizer configuration
32976	2	Balance the negative flow
32928	3	Stop totalizing

*Factory setting*

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

*Data structure*

*Output data of SETTOT and MODETOT*

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

*Input data of TOTAL*

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

**AO module (Analog Output)**

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

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

One Analog Output block is available (slot 8).

*Assigned compensation values*

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

CHANNEL	Function block	Compensation value
1507	AO 1	External compensation



The selection is made via: "Expert" menu → Sensor → External compensation

*Data structure*

*Output data of Analog Output*

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

**DI module (Discrete Input)**

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

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

Two Discrete Input blocks are available (slot 9 to 10).

*Selection: device function*

The device function can be specified using the CHANNEL parameter.

CHANNEL	Device function	Factory setting: state (meaning)
893	Switch output state	<ul style="list-style-type: none"> <li>▪ 0 (device function not active)</li> <li>▪ 1 (device function active)</li> </ul>
895	Low flow cut off	
1430	Status verification <sup>1)</sup>	

1) Only available with the "Heartbeat Verification" application package

*Factory setting*

Function block	Factory setting
DI 1	Switch output state
DI 2	Low flow cut off

*Data structure**Input data of Discrete Input*

Byte 1	Byte 2
Discrete	Status

**DO module (Discrete Output)**

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

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

Three Discrete Output blocks are available (slot 11 to 13).

*Assigned device functions*

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


CHANNEL	Function block	Device function	Values: control (meaning)
891	DO 1	Flow override	<ul style="list-style-type: none"> <li>▪ 0 (disable device function)</li> <li>▪ 1 (enable device function)</li> </ul>
1429	DO 2	Start verification <sup>1)</sup>	

1) Only available with the "Heartbeat Verification" application package

*Data structure**Output data of Discrete Output*

Byte 1	Byte 2
Discrete	Status



**EMPTY\_MODULE module**

This module is used to assign empty spaces arising from modules not being used in the slots (→  66).

## 10 Commissioning

### 10.1 Function check



Before commissioning the device, make sure that the post-installation and post-connection checks have been performed.

- "Post-installation check" checklist (→  28)
- "Post-connection check" checklist (→  44)

### 10.2 Switching on the measuring device

After a successful function check, switch on the measuring device.

After a successful startup, the local display switches automatically from the startup display to the operational display.

 If nothing appears on the local display or a diagnostic message is displayed, refer to the section on "Diagnostics and troubleshooting" (→  128).

### 10.3 Configuring the device address via software

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

#### Navigation

"Setup" menu → Communication → Device address

#### 10.3.1 PROFIBUS network

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

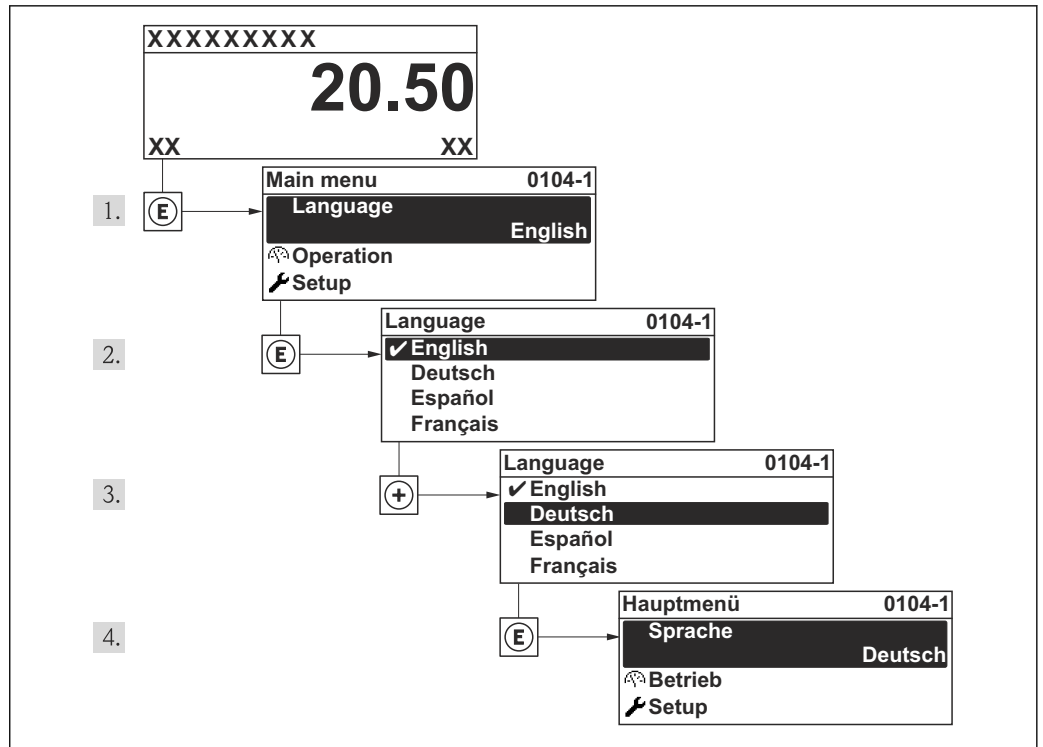
Device address	126
----------------	-----

 If hardware addressing is active, software addressing is blocked (→  42)

### 10.4 Setting the operating language

Factory setting: English or ordered local language





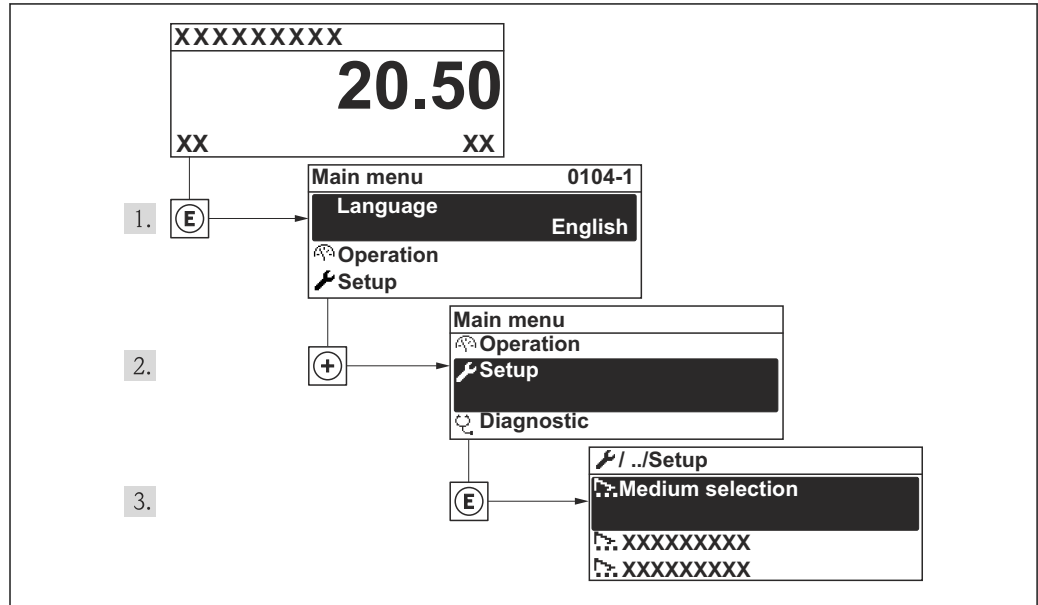
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17 Using the example of the local display

## 10.5 Configuring the measuring device

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

Navigation to the **Setup** menu



18 Using the example of the local display



**Setup**

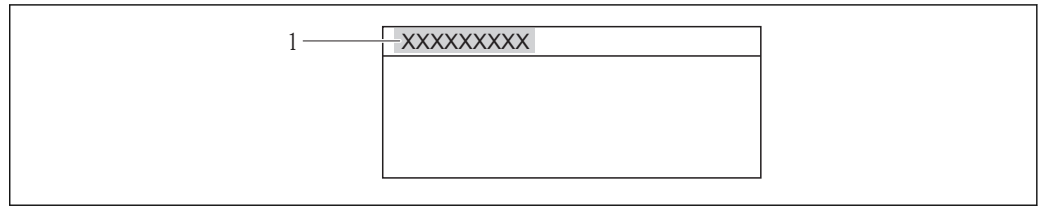
- Device tag (→ ⓘ 75)
- ▶ Medium selection (→ ⓘ 79)
- ▶ System units (→ ⓘ 75)
- ▶ Communication (→ ⓘ 83)
- ▶ Analog inputs (→ ⓘ 81)
- ▶ Display (→ ⓘ 81)
- ▶ Low flow cut off (→ ⓘ 84)
- ▶ Advanced setup (→ ⓘ 85)

### 10.5.1 Defining the tag name


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

**i** The number of characters displayed depends on the characters used.

 For information on the tag name in the "FieldCare" operating tool (→  61)



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 19 Header of the operational display with tag name

1 Device tag

**Navigation**

"Setup" menu → Device tag

**Parameter overview with brief description**

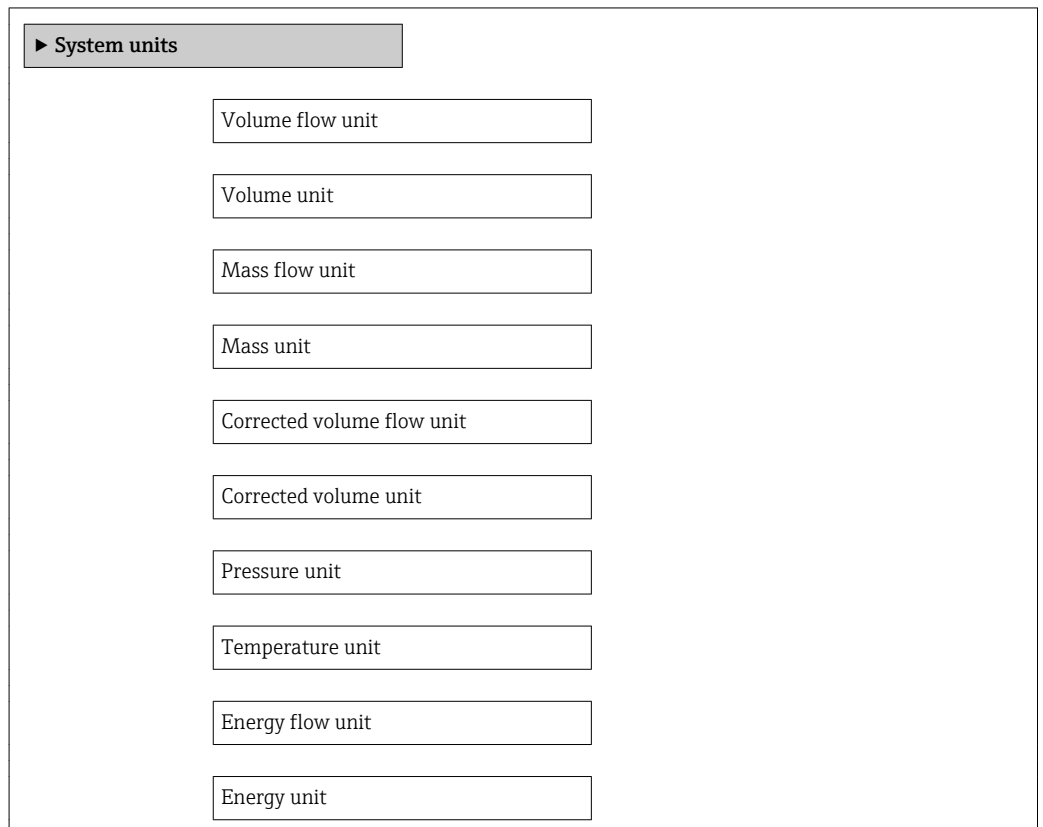
Parameter	Description	User entry	Factory setting
Device tag	Enter the name for the measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).	Prowirl 200PA

**10.5.2 Setting the system units**

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

**Navigation**

"Setup" menu → System units



Calorific value unit
Calorific value unit
Velocity unit
Density unit
Specific volume unit
Dynamic viscosity unit
Length unit

**Parameter overview with brief description**

Parameter	Prerequisite	Description	Selection	Factory setting
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. <b>Result</b> The selected unit is taken from: <b>Volume flow unit</b> parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ l</li> <li>▪ gal (us)</li> </ul>
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. <i>Result</i> The selected unit is taken from: <b>Mass flow unit</b> parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ kg</li> <li>▪ lb</li> </ul>
Corrected volume flow unit	-	Select corrected 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>▪ NI/h</li> <li>▪ Sft<sup>3</sup>/h</li> </ul>
Corrected volume unit	-	Select corrected volume unit. <b>Result</b> The selected unit is taken from: <b>Corrected volume flow unit</b> parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ NI</li> <li>▪ Sft<sup>3</sup></li> </ul>

Parameter	Prerequisite	Description	Selection	Factory setting
Pressure unit	For the following order code: "Sensor version", option "Mass flow"	Select process pressure unit. <i>Result</i> The unit is taken from: <ul style="list-style-type: none"> <li>▪ Calculated saturated steam pressure</li> <li>▪ Atmospheric pressure</li> <li>▪ Maximum value</li> <li>▪ Fixed process pressure</li> <li>▪ Pressure</li> <li>▪ Reference pressure</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ bar</li> <li>▪ psi</li> </ul>
Temperature unit	–	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>▪ Output</li> <li>▪ Reference temperature</li> <li>▪ Simulation process variable</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ °C (Celsius)</li> <li>▪ °F (Fahrenheit)</li> </ul>
Energy flow unit	For the following order code: "Sensor version", option "Mass flow"	Select energy flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>▪ Outputs</li> <li>▪ Low flow cut off</li> </ul> The selected unit is taken from: <ul style="list-style-type: none"> <li>▪ Heat flow difference</li> <li>▪ Energy flow</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ kW</li> <li>▪ Btu/h</li> </ul>
Energy unit	For the following order code: "Sensor version", option "Mass flow"	Select energy unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ kWh</li> <li>▪ Btu</li> </ul>
Calorific value unit	For the following order code: "Sensor version", option "Mass flow" If the calorific value is given in volume.	Select calorific value unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ kWh/Nm<sup>3</sup></li> <li>▪ Btu/Sft<sup>3</sup></li> </ul>
Calorific value unit	For the following order code: "Sensor version", option "Mass flow" If the calorific value is given in mass.	Select calorific value unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ kJ/kg</li> <li>▪ Btu/lb</li> </ul>
Velocity unit	–	Select velocity unit. <i>Result</i> The selected unit is taken from: <ul style="list-style-type: none"> <li>▪ Flow velocity</li> <li>▪ Maximum value</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ m/s</li> <li>▪ ft/s</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> </ul> The selected unit is taken from: <ul style="list-style-type: none"> <li>▪ Density</li> <li>▪ Fixed density</li> <li>▪ Reference density</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>

Parameter	Prerequisite	Description	Selection	Factory setting
Dynamic viscosity unit	–	Select dynamic viscosity unit. <i>Result</i> The selected unit is taken from: Dynamic viscosity	Unit choose list	Pa s
Length unit	–	Select length unit for nominal diameter. <i>Result</i> The selected unit is taken from: <ul style="list-style-type: none"> <li>▪ Inlet run</li> <li>▪ Mating pipe diameter</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ mm</li> <li>▪ in</li> </ul>

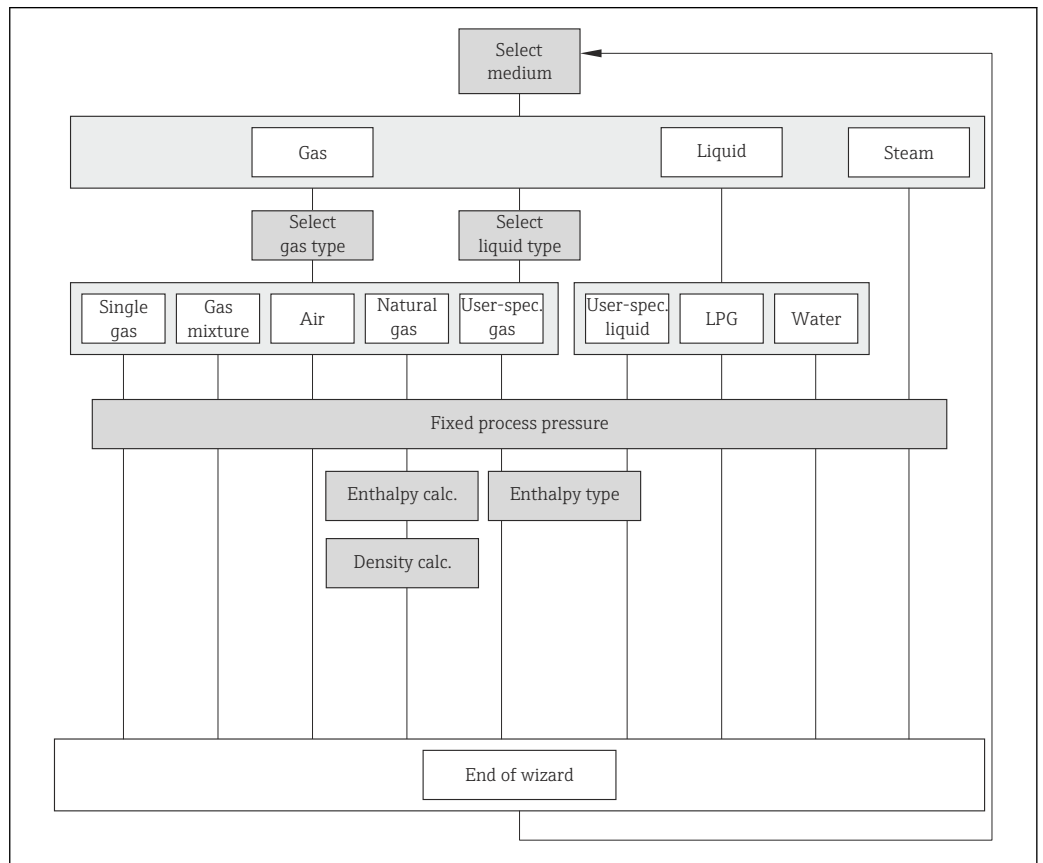
### 10.5.3 Selecting and setting the medium

The **Medium selection** wizard guides you systematically through all the parameters that have to be configured for selecting and setting the medium.

#### Navigation

"Setup" menu → Medium selection

#### Structure of the wizard





20 "Medium selection" wizard in the "Setup" menu

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#### 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>■ Gas</li> <li>■ Liquid</li> <li>■ Steam</li> </ul>	Steam
Select gas type	For the following order codes: <ul style="list-style-type: none"> <li>■ "Sensor version", option "Mass flow"</li> <li>■ "Application package", option "Air + Industrial gases" or option "Natural gas"</li> </ul> In the <b>Select medium</b> parameter the <b>Gas</b> option must be selected.	Select measured gas type.	<ul style="list-style-type: none"> <li>■ Single gas</li> <li>■ Gas mixture</li> <li>■ Air</li> <li>■ Natural gas</li> <li>■ User-specific gas</li> </ul>	User-specific gas

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Select liquid type	For the following order code: "Sensor version", option "Mass flow"  In the <b>Select medium</b> parameter the <b>Liquid</b> option must be selected.	Select measured liquid type.	<ul style="list-style-type: none"> <li>▪ Water</li> <li>▪ LPG</li> <li>▪ User-specific liquid</li> </ul>	Water
Fixed process pressure	<ul style="list-style-type: none"> <li>▪ Order code for "Sensor version", option "Mass flow (integrated temperature measurement)"</li> <li>▪ In the <b>External value</b> parameter (→ 100), the <b>Pressure</b> option is not selected.</li> </ul>	Enter fixed value for process pressure.  <i>Dependency</i> The unit is taken from the <b>Pressure unit</b> parameter   For detailed information on the calculation of the measured variables with steam: (→ 172)   For detailed information on setting the parameter in steam applications, see the Special Documentation for the <b>Wet Steam Detection</b> and <b>Wet Steam Measurement</b> (→ 195) application package.	0 to 250 bar abs.	0 bar abs.
Enthalpy calculation	For the following order codes: <ul style="list-style-type: none"> <li>▪ "Sensor version", option "Mass flow (integrated temperature measurement)"</li> <li>▪ "Application package", option "Natural gas"</li> </ul> In the <b>Select medium</b> parameter the <b>Gas</b> option must be selected and in the <b>Select gas type</b> parameter the <b>Natural gas</b> option must be selected.	Select the norm the enthalpy calculation is based on.	<ul style="list-style-type: none"> <li>▪ AGA5</li> <li>▪ ISO 6976</li> </ul>	AGA5
Density calculation	In the <b>Select medium</b> parameter the <b>Gas</b> option must be selected and in the <b>Select gas type</b> parameter the <b>Natural gas</b> option must be selected.	Select the norm the density calculation is based on.	<ul style="list-style-type: none"> <li>▪ AGA Nx19</li> <li>▪ ISO 12213- 2</li> <li>▪ ISO 12213- 3</li> </ul>	AGA Nx19
Enthalpy type	If one of the following conditions is met: <ul style="list-style-type: none"> <li>▪ In the <b>Select gas type</b> parameter, the <b>User-specific gas</b> option is selected.</li> <li>▪ In the <b>Select liquid type</b> parameter, the <b>User-specific liquid</b> option is selected.</li> </ul>	Define which kind of enthalpy is used.	<ul style="list-style-type: none"> <li>▪ Heat</li> <li>▪ Calorific value</li> </ul>	Heat

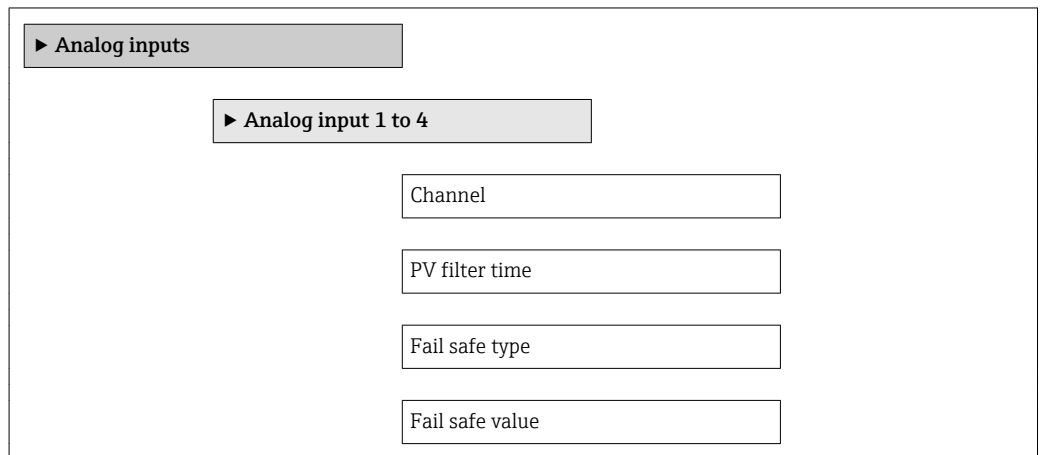


### 10.5.4 Configuring the analog inputs

The **Analog inputs** submenu guides you systematically to the individual **Analog input 1 to 4** submenu. From here you get to the parameters of the individual analog input.

**Navigation**

"Setup" menu → Analog inputs



**Parameter overview with brief description**

Parameter	Description	Selection / User entry	Factory setting
Channel	Select the process variable.	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Flow velocity</li> <li>■ Temperature</li> <li>■ Calculated saturated steam pressure</li> <li>■ Steam quality</li> <li>■ Total mass flow</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> <li>■ Reynolds number</li> <li>■ Density</li> <li>■ Pressure</li> <li>■ Specific volume</li> <li>■ Degrees of superheat</li> </ul>	Volume flow
PV filter time	Specify a time to suppress signal peaks. During the specified time the totalizer does not respond to an erratic increase in the process variable.	Positive floating-point number	0
Fail safe type	Select the failure mode.	<ul style="list-style-type: none"> <li>■ Fail safe value</li> <li>■ Fallback value</li> <li>■ Off</li> </ul>	Off
Fail safe value	Specify the value to be output when an error occurs.	Signed floating-point number	0

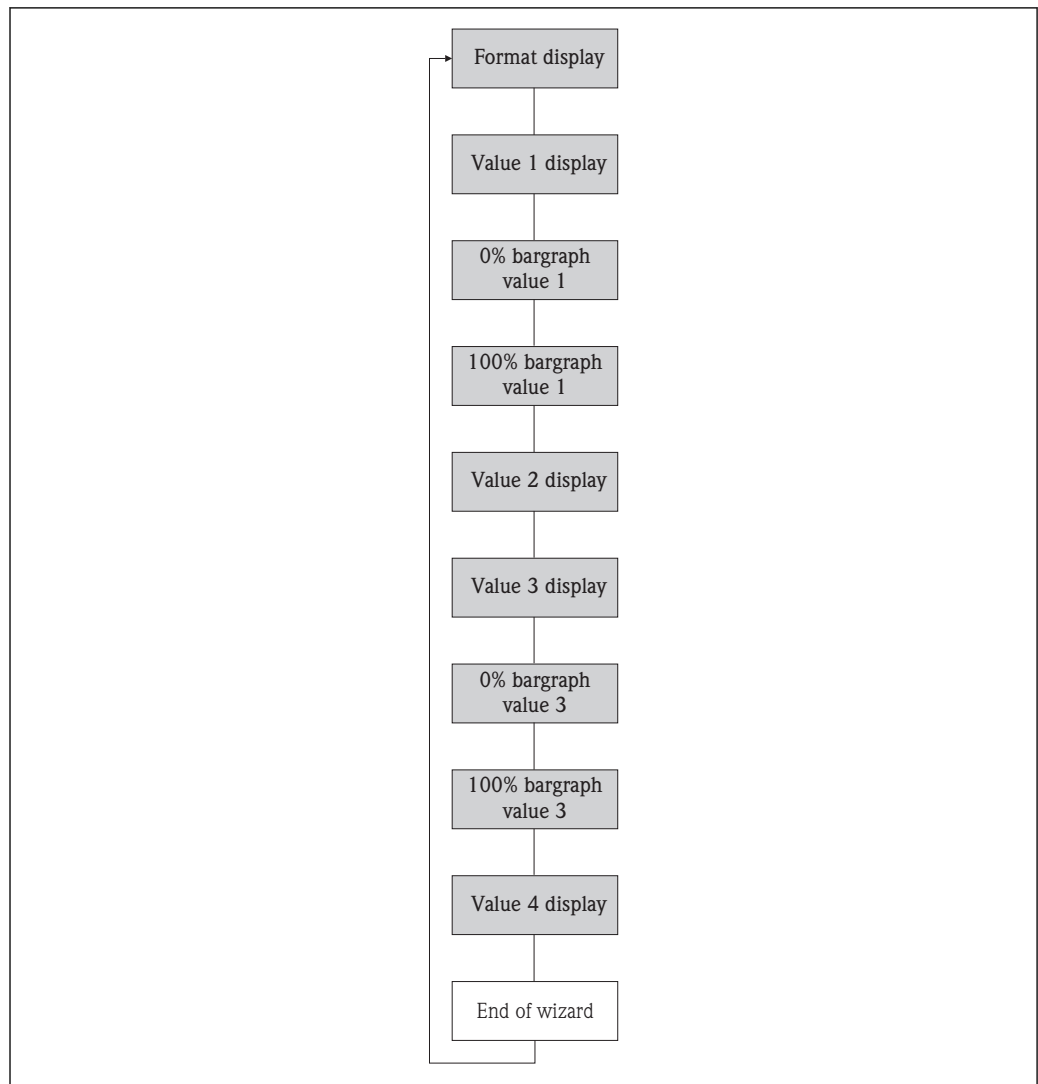
### 10.5.5 Configuring the local display

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

**Navigation**

"Setup" menu → Display

## Structure of the wizard



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21 "Display" wizard in the "Setup" menu

## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	–	Select how measured values are shown on the display.	<ul style="list-style-type: none"> <li>■ 1 value, max. size</li> <li>■ 1 bargraph + 1 value</li> <li>■ 2 values</li> <li>■ 1 value large + 2 values</li> <li>■ 4 values</li> </ul>	1 value, max. size
Value 1 display	–	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Mass flow</li> <li>■ Flow velocity</li> <li>■ Temperature</li> <li>■ Calculated saturated steam pressure</li> <li>■ Steam quality</li> <li>■ Total mass flow</li> <li>■ Condensate mass flow</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> <li>■ Reynolds number</li> <li>■ Density</li> <li>■ Pressure</li> <li>■ Specific volume</li> <li>■ Degrees of superheat</li> <li>■ Totalizer 1</li> <li>■ Totalizer 2</li> <li>■ Totalizer 3</li> </ul>	Volume flow
0% bargraph value 1	–	Enter 0% value for bar graph display.	Signed floating-point number	0 m <sup>3</sup> /h
100% bargraph value 1	–	Enter 100% value for bar graph display.	Signed floating-point number	1 m <sup>3</sup> /h
Value 2 display	–	Select the measured value that is shown on the local display.	Picklist (see 1st display value)	None
Value 3 display	–	Select the measured value that is shown on the local display.	Picklist (see 1st display value)	None
0% bargraph value 3	An option was selected in the <b>Value 3 display</b> parameter.	Enter 0% value for bar graph display.	Signed floating-point number	0
100% bargraph value 3	An option was selected in the <b>Value 3 display</b> parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Value 4 display	–	Select the measured value that is shown on the local display.	Picklist (see 1st display value)	None

### 10.5.6 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

Device address

**Parameter overview with brief description**

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

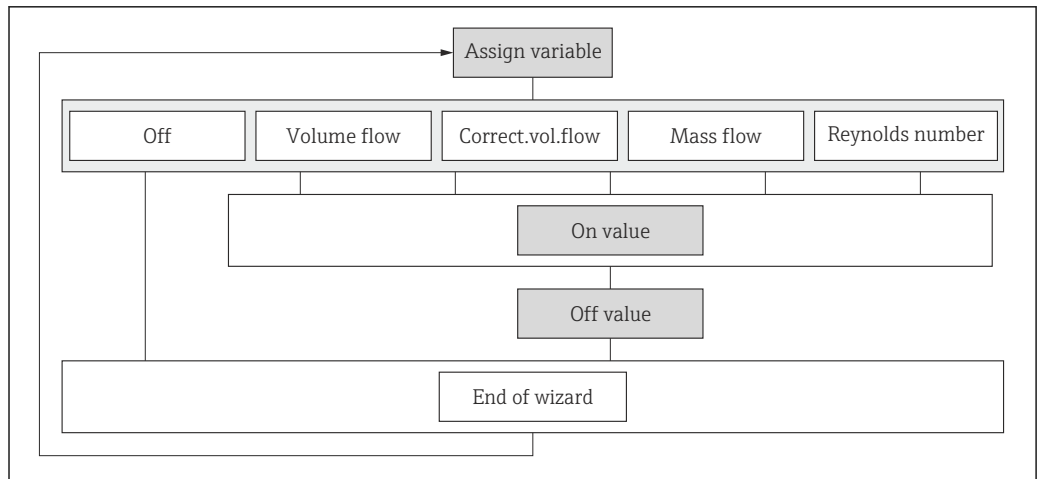
**10.5.7 Configuring the low flow cut off**

The **Low flow cut off** wizard guides you systematically through all the parameters that have to be set for configuring the low flow cut off.

**Navigation**

"Setup" menu → Low flow cut off

**Structure of the wizard**



22 "Low flow cut off" wizard in the "Setup" menu

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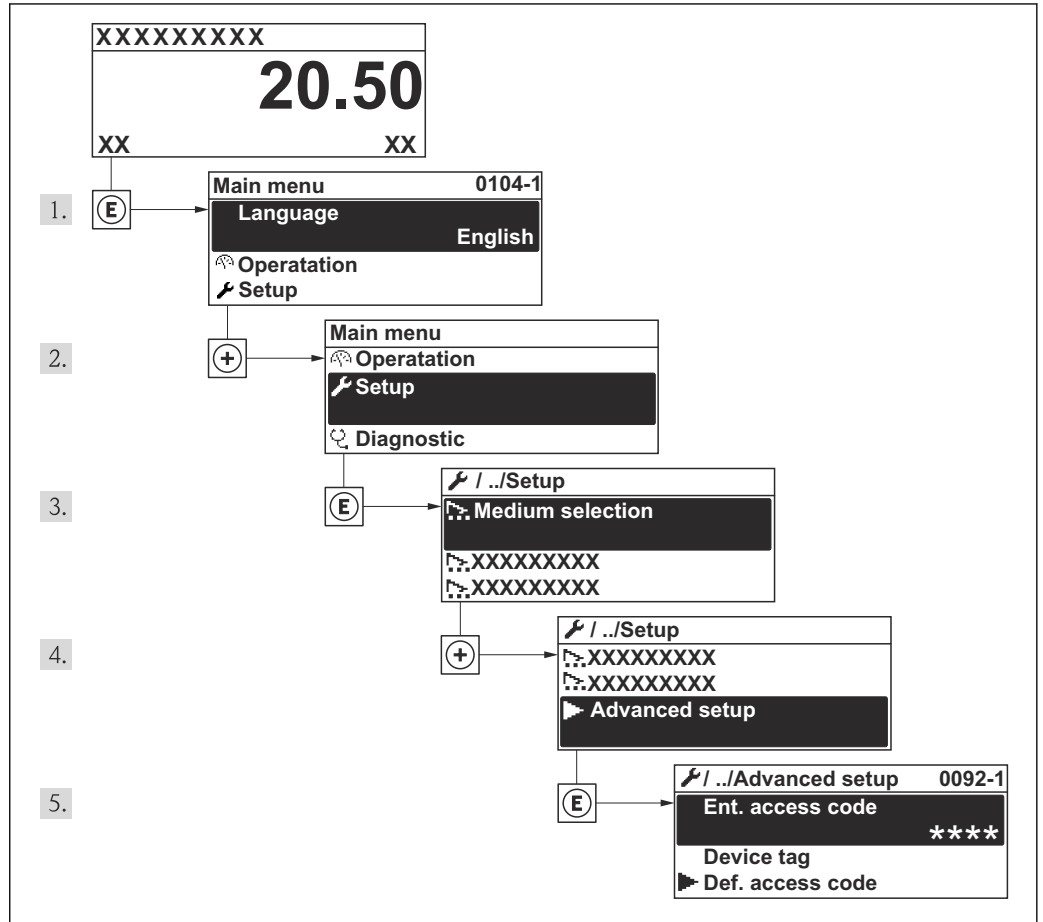
**Parameter overview with brief description**

Parameter	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>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Mass flow</li> <li>■ Reynolds number</li> </ul>	Off
On value low flow cutoff	Enter on value for low flow cut off.	Positive floating-point number	0
Off value low flow cutoff	Enter off value for low flow cut off.	0 to 100.0 %	50 %

## 10.6 Advanced settings

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

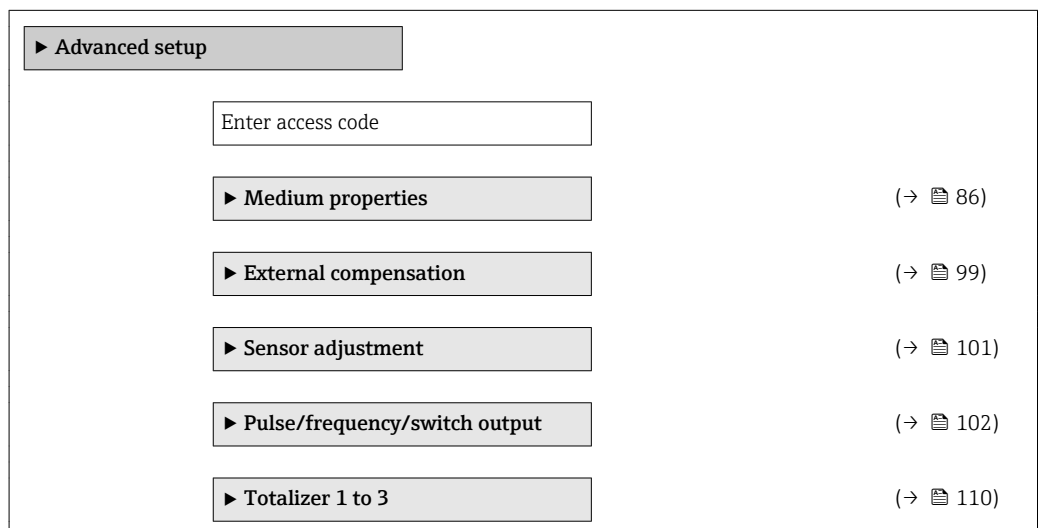
*Navigation to the "Advanced setup" submenu*



23 Using the example of the local display

### Navigation

"Setup" menu → Advanced setup



▶ Display	(→ 📄 112)
▶ Heartbeat setup	
▶ Configuration backup display	(→ 📄 114)
▶ Administration	(→ 📄 159)

### 10.6.1 Setting the medium properties

In the **Medium properties** submenu the reference values for the measuring application can be set.

#### Navigation

"Setup" menu → Advanced setup → Medium properties

▶ Medium properties
Enthalpy type
Calorific value type
Reference combustion temperature
Reference density
Reference gross calorific value
Reference pressure
Reference temperature
Reference Z-factor
Linear expansion coefficient
Relative density
Specific heat capacity
Calorific value
Z-factor
Dynamic viscosity
Dynamic viscosity
▶ Gas composition

## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Enthalpy type	If one of the following conditions is met: <ul style="list-style-type: none"> <li>▪ In the <b>Select gas type</b> parameter, the <b>User-specific gas</b> option is selected.</li> <li>▪ In the <b>Select liquid type</b> parameter, the <b>User-specific liquid</b> option is selected.</li> </ul>	Define which kind of enthalpy is used.	<ul style="list-style-type: none"> <li>▪ Heat</li> <li>▪ Calorific value</li> </ul>	Heat
Calorific value type	If the <b>Calorific value type</b> parameter is visible.	Select calculation based on gross calorific value or net calorific value.	<ul style="list-style-type: none"> <li>▪ Gross calorific value volume</li> <li>▪ Net calorific value volume</li> <li>▪ Gross calorific value mass</li> <li>▪ Net calorific value mass</li> </ul>	Gross calorific value mass
Reference combustion temperature	If the <b>Reference combustion temperature</b> parameter is visible.	Enter reference combustion temperature to calculate the natural gas energy value.	-200 to 450 °C	20 °C
Reference density	If one of the following conditions is met: <ul style="list-style-type: none"> <li>▪ In the <b>Select gas type</b> parameter, the <b>User-specific gas</b> option is selected.</li> <li>▪ In the <b>Select liquid type</b> parameter, the <b>Water</b> option or the <b>User-specific liquid</b> option is selected.</li> </ul>	Enter fixed value for reference density.	0.01 to 15 000 kg/m <sup>3</sup>	1 000 kg/m <sup>3</sup>
Reference gross calorific value	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213-3</b> option is selected.</li> </ul>	Enter reference gross calorific value of the natural gas.	Positive floating-point number	50 000 kJ/Nm <sup>3</sup>
Reference pressure	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ Order code for "<i>Sensor version</i>", option "<i>Mass flow (integrated temperature measurement)</i>"</li> <li>▪ If the <b>Gas</b> option is selected in the <b>Select medium</b> parameter.</li> </ul>	Enter reference pressure for the calculation of the reference density. <i>Dependency</i> The unit is taken from the <b>Pressure unit</b> parameter	0 to 250 bar	1.01325 bar
Reference temperature	If one of the following conditions is met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select medium</b> parameter, the <b>Liquid</b> option is selected.</li> </ul>	Enter reference temperature for calculating the reference density.	-200 to 450 °C	20 °C

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Reference Z-factor	If the <b>User-specific gas</b> option is selected in the <b>Select gas type</b> parameter.	Enter real gas constant Z for gas under reference conditions.	0.1 to 2	1
Linear expansion coefficient	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Liquid</b> option is selected.</li> <li>▪ In the <b>Select liquid type</b> parameter, the <b>User-specific liquid</b> option is selected.</li> </ul>	Enter linear, medium-specific expansion coefficient for calculating the reference density.	$1.0^{-6}$ to $2.0^{-3}$	$2.06^{-4}$
Relative density	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213-3</b> option is selected.</li> </ul>	Enter a relative density of the natural gas.	0.55 to 0.9	0.664
Specific heat capacity	If the following conditions are met: <ul style="list-style-type: none"> <li>▪ Selected medium: <ul style="list-style-type: none"> <li>– In the <b>Select gas type</b> parameter, the <b>User-specific gas</b> option is selected.</li> <li>– Or in the <b>Select liquid type</b> parameter, the <b>User-specific liquid</b> option is selected.</li> </ul> </li> <li>▪ In the <b>Enthalpy type</b> parameter, the <b>Heat</b> option is selected.</li> </ul>	Enter the specific heat capacity of the medium.	0 to 50 kJ/(kgK)	4.187 kJ/(kgK)
Calorific value	If the following conditions are met: <ul style="list-style-type: none"> <li>▪ Selected medium: <ul style="list-style-type: none"> <li>– In the <b>Select gas type</b> parameter, the <b>User-specific gas</b> option is selected.</li> <li>– Or in the <b>Select liquid type</b> parameter, the <b>User-specific liquid</b> option is selected.</li> </ul> </li> <li>▪ In the <b>Enthalpy type</b> parameter, the <b>Calorific value</b> option is selected.</li> <li>▪ In the <b>Calorific value type</b> parameter, the <b>Gross calorific value volume</b> option or the <b>Gross calorific value mass</b> option is selected.</li> </ul>	Enter gross calorific value to calculate the energy flow.	Positive floating-point number	50000 kJ/kg
Z-factor	If the <b>User-specific gas</b> option is selected in the <b>Select gas type</b> parameter.	Enter real gas constant Z for gas under operation conditions.	0.1 to 2.0	1



Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Dynamic viscosity	If the following conditions are met: <ul style="list-style-type: none"> <li>▪ Order code for "Sensor version", option "Volume flow"</li> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option or <b>Steam</b> option is selected.</li> <li>▪ Or in the <b>Select gas type</b> parameter, the <b>User-specific gas</b> option is selected.</li> </ul>	Enter the value of dynamic viscosity for a user-specific gas.	Positive floating-point number	0.015 cP
Dynamic viscosity	If the following conditions are met: <ul style="list-style-type: none"> <li>▪ Order code for "Sensor version", option "Volume flow"</li> <li>▪ In the <b>Select medium</b> parameter, the <b>Liquid</b> option is selected.</li> <li>▪ Or in the <b>Select liquid type</b> parameter, the <b>User-specific liquid</b> option is selected.</li> </ul>	Enter the value of dynamic viscosity for a user-specific liquid.	Positive floating-point number	1 cP

### Configuring the gas composition

In the **Gas composition** submenu the gas composition for the measuring application can be set.

#### Navigation

"Setup" menu → Advanced setup → Medium properties → Gas composition

▶ Gas composition

Mol% CO <sub>2</sub>
Mol% H <sub>2</sub>
Mol% H <sub>2</sub> O
Mol% H <sub>2</sub> S
Mol% HCl
Mol% He
Mol% i-C <sub>4</sub> H <sub>10</sub>
Mol% i-C <sub>5</sub> H <sub>12</sub>
Mol% Kr
Mol% N <sub>2</sub>
Mol% n-C <sub>10</sub> H <sub>22</sub>
Mol% n-C <sub>4</sub> H <sub>10</sub>
Mol% n-C <sub>5</sub> H <sub>12</sub>
Mol% n-C <sub>6</sub> H <sub>14</sub>
Mol% n-C <sub>7</sub> H <sub>16</sub>
Mol% n-C <sub>8</sub> H <sub>18</sub>
Mol% n-C <sub>9</sub> H <sub>20</sub>
Mol% Ne
Mol% NH <sub>3</sub>
Mol% O <sub>2</sub>
Mol% SO <sub>2</sub>
Mol% Xe
Mol% other gas
Relative humidity

## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Gas type	<p>If all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Single gas</b> option is selected.</li> </ul>	Select measured gas type.	<ul style="list-style-type: none"> <li>▪ Hydrogen H2</li> <li>▪ Helium He</li> <li>▪ Neon Ne</li> <li>▪ Argon Ar</li> <li>▪ Krypton Kr</li> <li>▪ Xenon Xe</li> <li>▪ Nitrogen N2</li> <li>▪ Oxygen O2</li> <li>▪ Chlorine Cl2</li> <li>▪ Ammonia NH3</li> <li>▪ Carbon monoxide CO</li> <li>▪ Carbon dioxide CO2</li> <li>▪ Sulfur dioxide SO2</li> <li>▪ Hydrogen sulfide H2S</li> <li>▪ Hydrogen chloride HCl</li> <li>▪ Methane CH4</li> <li>▪ Ethane C2H6</li> <li>▪ Propane C3H8</li> <li>▪ Butane C4H10</li> <li>▪ Ethylene C2H4</li> <li>▪ Vinyl Chloride C2H3Cl</li> </ul>	Methane CH4
Gas mixture	<p>If all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected.</li> </ul>	Select measured gas mixture.	<ul style="list-style-type: none"> <li>▪ Hydrogen H2</li> <li>▪ Helium He</li> <li>▪ Neon Ne</li> <li>▪ Argon Ar</li> <li>▪ Krypton Kr</li> <li>▪ Xenon Xe</li> <li>▪ Nitrogen N2</li> <li>▪ Oxygen O2</li> <li>▪ Chlorine Cl2</li> <li>▪ Ammonia NH3</li> <li>▪ Carbon monoxide CO</li> <li>▪ Carbon dioxide CO2</li> <li>▪ Sulfur dioxide SO2</li> <li>▪ Hydrogen sulfide H2S</li> <li>▪ Hydrogen chloride HCl</li> <li>▪ Methane CH4</li> <li>▪ Ethane C2H6</li> <li>▪ Propane C3H8</li> <li>▪ Butane C4H10</li> <li>▪ Ethylene C2H4</li> <li>▪ Vinyl Chloride C2H3Cl</li> <li>▪ Others</li> </ul>	Methane CH4

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Mol% Ar	<p>If the following conditions are met:            In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</p> <ul style="list-style-type: none"> <li>- In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter, the <b>Argon Ar</b> option is selected.</li> <li>- Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected and in the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% C2H3Cl	<p>If all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected.</li> <li>▪ In the <b>Gas mixture</b> parameter, the <b>Vinyl Chloride C2H3Cl</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% C2H4	<p>If all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected.</li> <li>▪ In the <b>Gas mixture</b> parameter, the <b>Ethylene C2H4</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% C2H6	<p>If the following conditions are met:            In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</p> <ul style="list-style-type: none"> <li>- In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter, the <b>Ethane C2H6</b> option is selected.</li> <li>- Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected and in the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Mol% C3H8	<p>If the following conditions are met:            In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</p> <ul style="list-style-type: none"> <li>- In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter, the <b>Propane C3H8</b> option is selected.</li> <li>- Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected and in the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% CH4	<p>If the following conditions are met:            In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</p> <ul style="list-style-type: none"> <li>- In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter, the <b>Methane CH4</b> option is selected.</li> <li>- Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	100 %
Mol% Cl2	<p>If all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected.</li> <li>▪ In the <b>Gas mixture</b> parameter, the <b>Chlorine Cl2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% CO	<p>If the following conditions are met:            In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</p> <ul style="list-style-type: none"> <li>- In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter, the <b>Carbon monoxide CO</b> option is selected.</li> <li>- Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected and in the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Mol% CO2	<p>If the following conditions are met:            In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</p> <ul style="list-style-type: none"> <li>- In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter, the <b>Carbon dioxide CO2</b> option is selected.</li> <li>- Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% H2	<p>If the following conditions are met:            In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</p> <ul style="list-style-type: none"> <li>- In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter the <b>Hydrogen H2</b> option is selected.</li> <li>- Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected and in the <b>Density calculation</b> parameter, the <b>AGA Nx19</b> option is <b>not</b> selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% H2O	<p>If all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% H2S	<p>If the following conditions are met:            In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</p> <ul style="list-style-type: none"> <li>- In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter, the <b>Hydrogen sulfide H2S</b> option is selected.</li> <li>- Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected and in the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Mol% HCl	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected.</li> <li>▪ In the <b>Gas mixture</b> parameter, the <b>Hydrogen chloride HCl</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% He	If the following conditions are met: In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected. <ul style="list-style-type: none"> <li>– In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter, the <b>Helium He</b> option is selected.</li> <li>– Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected and in the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% i-C4H10	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% i-C5H12	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% Kr	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected.</li> <li>▪ In the <b>Gas mixture</b> parameter, the <b>Krypton Kr</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Mol% N2	<p>If the following conditions are met:</p> <p>In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</p> <ul style="list-style-type: none"> <li>- In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter the <b>Nitrogen N2</b> option is selected.</li> <li>- Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected and in the <b>Density calculation</b> parameter, the <b>AGA Nx19</b> option or the <b>ISO 12213- 2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% n-C10H22	<p>If all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213- 2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% n-C4H10	<p>If the following conditions are met:</p> <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected. <ul style="list-style-type: none"> <li>- In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter, the <b>Butane C4H10</b> option is selected.</li> <li>- Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected and in the <b>Density calculation</b> parameter, the <b>ISO 12213- 2</b> option is selected.</li> </ul> </li> <li>▪ Or in the <b>Select medium</b> parameter, the <b>Liquid</b> option is selected and in the <b>Select liquid type</b> parameter, the <b>LPG</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% n-C5H12	<p>If all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213- 2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %



Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Mol% n-C <sub>6</sub> H <sub>14</sub>	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% n-C <sub>6</sub> H <sub>14</sub>	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% n-C <sub>7</sub> H <sub>16</sub>	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% n-C <sub>8</sub> H <sub>18</sub>	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% n-C <sub>9</sub> H <sub>20</sub>	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected.</li> <li>▪ In the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Mol% Ne	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected.</li> <li>▪ In the <b>Gas mixture</b> parameter, the <b>Neon Ne</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% NH3	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected.</li> <li>▪ In the <b>Gas mixture</b> parameter, the <b>Ammonia NH3</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% O2	If the following conditions are met: <p>In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</p> <ul style="list-style-type: none"> <li>- In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected and in the <b>Gas mixture</b> parameter, the <b>Oxygen O2</b> option is selected.</li> <li>- Or in the <b>Select gas type</b> parameter, the <b>Natural gas</b> option is selected and in the <b>Density calculation</b> parameter, the <b>ISO 12213-2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% SO2	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected.</li> <li>▪ In the <b>Gas mixture</b> parameter, the <b>Sulfur dioxide SO2</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Mol% Xe	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected.</li> <li>▪ In the <b>Gas mixture</b> parameter, the <b>Xenon Xe</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Mol% other gas	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Gas mixture</b> option is selected.</li> <li>▪ In the <b>Gas mixture</b> parameter, the <b>Others</b> option is selected.</li> </ul>	Enter amount of substance for the gas mixture.	0 to 100 %	0 %
Relative humidity	If all of the following conditions are met: <ul style="list-style-type: none"> <li>▪ In the <b>Select medium</b> parameter, the <b>Gas</b> option is selected.</li> <li>▪ In the <b>Select gas type</b> parameter, the <b>Air</b> option is selected.</li> </ul>	Enter humidity content of air in %.	0 to 100 %	0 %

### 10.6.2 Performing external compensation





The **External compensation** submenu contains parameters which can be used to enter external or fixed values. These values are used for internal calculations.





#### Navigation

"Expert" menu → Sensor → External compensation

▶ External compensation

## Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
External value	For the following order code: "Sensor version", option "Mass flow"	Assign variable from external device to process variable.  For detailed information on the calculation of the measured variables with steam: (→  172)  For detailed information on setting the parameter in steam applications, see the Special Documentation for the <b>Wet Steam Detection and Wet Steam Measurement</b> (→  195) application package.	<ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ Pressure</li> <li>▪ Relative pressure</li> <li>▪ Density</li> <li>▪ Temperature</li> <li>▪ 2nd temperature delta heat</li> </ul>	Off
Atmospheric pressure	If the <b>Relative pressure</b> option is selected in the <b>External value</b> parameter.	Enter atmospheric pressure value to be used for pressure correction. <i>Dependency</i> The unit is taken from the <b>Pressure unit</b> parameter	0 to 250 bar	1.01325 bar
Delta heat calculation	If the <b>Delta heat calculation</b> parameter is visible.	Calculates the transferred heat of a heat exchanger (= delta heat).	<ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ Device on cold side</li> <li>▪ Device on warm side</li> </ul>	Device on warm side
Fixed density	For the following order code: "Sensor version", option "Volume flow"	Enter fixed value for medium density. <i>Dependency</i> The unit is taken from the <b>Density unit</b> parameter	0.01 to 15 000 kg/m <sup>3</sup>	1 000 kg/m <sup>3</sup>
Fixed temperature	–	Enter a fixed value for process temperature. <i>Dependency</i> The unit is taken from the <b>Temperature unit</b> parameter	–200 to 450 °C	20 °C
2nd temperature delta heat	If the <b>2nd temperature delta heat</b> parameter is visible.	Enter 2nd temperature value to calculate the delta heat. <i>Dependency</i> The unit is taken from the <b>Temperature unit</b> parameter	–200 to 450 °C	20 °C

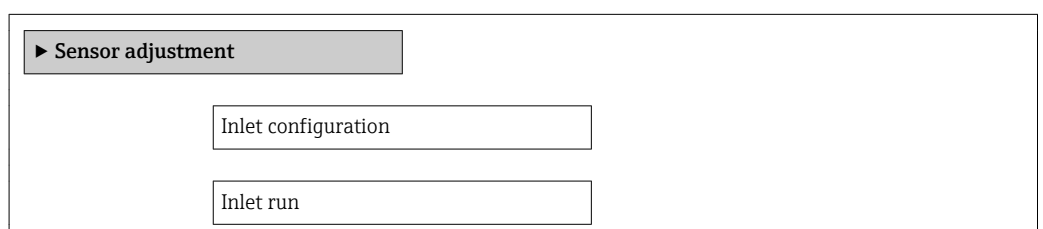
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Fixed process pressure	<ul style="list-style-type: none"> <li>Order code for "Sensor version", option "Mass flow (integrated temperature measurement)"</li> <li>In the <b>External value</b> parameter (→ 100), the <b>Pressure</b> option is not selected.</li> </ul>	<p>Enter fixed value for process pressure.</p> <p><i>Dependency</i> The unit is taken from the <b>Pressure unit</b> parameter</p> <p> For detailed information on the calculation of the measured variables with steam: (→ 172)</p> <p> For detailed information on setting the parameter in steam applications, see the Special Documentation for the <b>Wet Steam Detection</b> and <b>Wet Steam Measurement</b> (→ 195) application package.</p>	0 to 250 bar abs.	0 bar abs.
Steam quality	<p>For the following order code: "Application package", option "Wet steam detection/ measurement"</p> <p>If the <b>Steam</b> option is selected in the <b>Select medium</b> parameter.</p>	<p>Select compensation mode for steam quality.</p> <p> For detailed information on setting the parameter in steam applications, see the Special Documentation for the <b>Wet Steam Detection</b> and <b>Wet Steam Measurement</b> (→ 195) application package.</p>	<ul style="list-style-type: none"> <li>Fixed value</li> <li>Calculated value</li> </ul>	Fixed value
Steam quality value	<ul style="list-style-type: none"> <li>If the <b>Steam</b> option is selected in the <b>Select medium</b> parameter.</li> <li>If the <b>Fixed value</b> option is selected in the <b>Steam quality</b> parameter.</li> </ul>	<p>Enter fixed value for steam quality.</p> <p> For detailed information on setting the parameter in steam applications, see the Special Documentation for the <b>Wet Steam Detection</b> and <b>Wet Steam Measurement</b> (→ 195) application package.</p>	0 to 100 %	100 %

### 10.6.3 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



<input type="text" value="Mating pipe diameter"/>
<input type="text" value="Installation factor"/>

### Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Inlet configuration	Select inlet configuration. <i>Note</i> The available option is only valid for Prowirl F, DN15 to 150 (½" to 6").	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Single elbow</li> <li>■ Double elbow</li> <li>■ Double elbow 3D</li> <li>■ Reduction</li> </ul>	Off
Inlet run	Define length of the straight inlet run.	0 to 20 m	0 m
Mating pipe diameter	Enter actual value of the mating pipe to activate the diameter mismatch correction. <i>Note</i> The unit displayed depends on the <b>Length unit</b> parameter.	0 to 1 m (0 to 3 ft)	Country-specific: <ul style="list-style-type: none"> <li>■ 0 m</li> <li>■ 0 ft</li> </ul>
Installation factor	Enter factor to adjust for installation conditions.	Positive floating-point number	1.0

### 10.6.4 Configuring the pulse/frequency/switch output

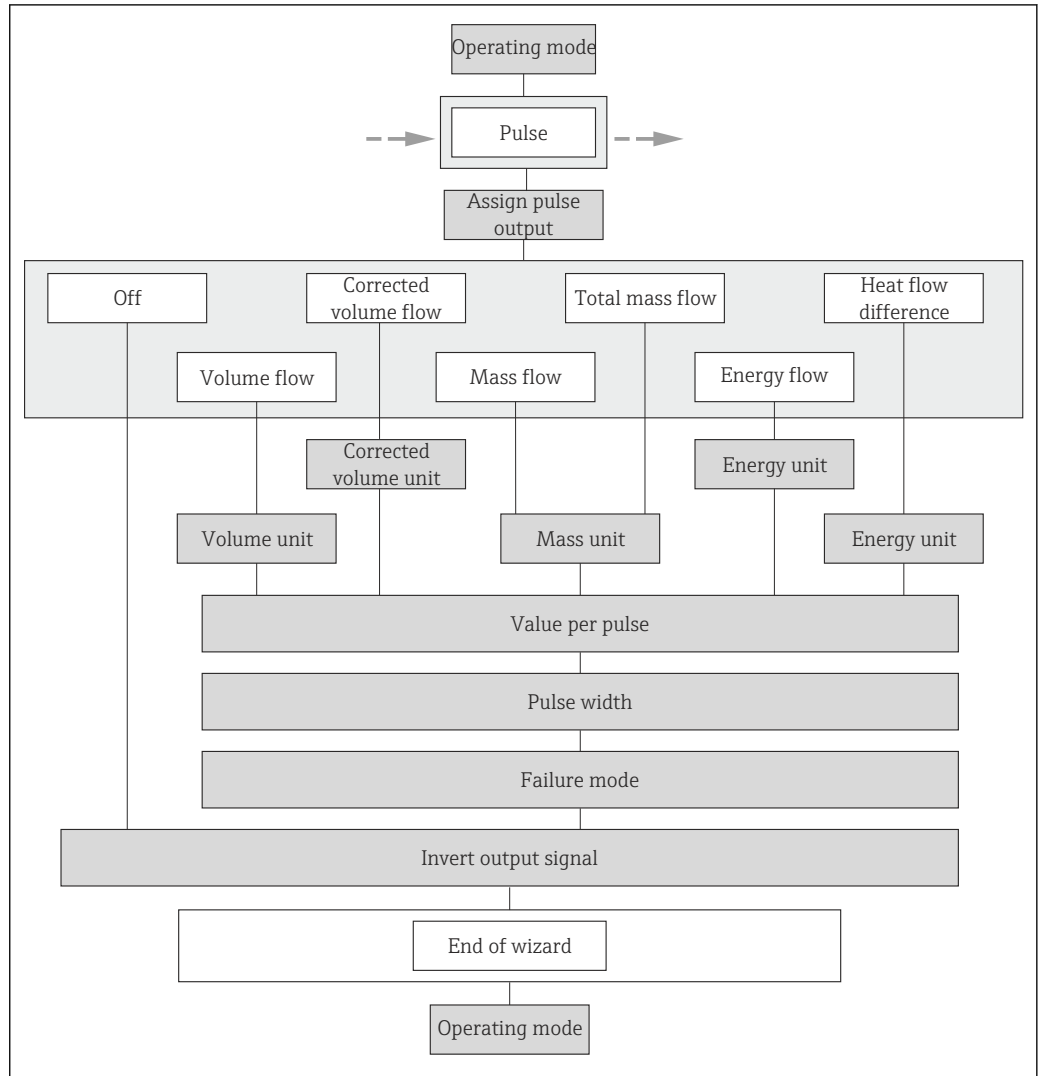
The **Pulse/frequency/switch output 1** submenu guides you systematically through all the parameters that can be set for configuring the selected output type.

#### Configuring the pulse output

##### Navigation

"Setup" menu → Advanced setup → Pulse/frequency/switch output 1

Structure of the wizard for the pulse output



A0020792-EN

24 "Pulse/frequency/switch output" wizard in the "Setup" menu: "Pulse" operating mode

Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Operating mode	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> <li>■ Pulse</li> <li>■ Frequency</li> <li>■ Switch</li> </ul>	Pulse
Assign pulse output	Select process variable for pulse output.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> </ul>	Volume flow
Mass unit	Select mass unit. <i>Result</i> The selected unit is taken from: <b>Mass flow unit</b> parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>■ kg</li> <li>■ lb</li> </ul>

Parameter	Description	Selection / User entry	Factory setting
Volume unit	Select volume unit. <b>Result</b> The selected unit is taken from: <b>Volume flow unit</b> parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ l</li> <li>▪ gal (us)</li> </ul>
Corrected volume unit	Select corrected volume unit. <b>Result</b> The selected unit is taken from: <b>Corrected volume flow unit</b> parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ NI</li> <li>▪ Sft<sup>3</sup></li> </ul>
Energy unit	Select energy unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>▪ kWh</li> <li>▪ Btu</li> </ul>
Value per pulse	Enter measured value at which a pulse is output.	2.0E-38 to 3.4E+38 m <sup>3</sup>	1 m <sup>3</sup>
Pulse width	Define time width of the output pulse.	5 to 2 000 ms	100 ms
Failure mode	Define output behavior in alarm condition.	<ul style="list-style-type: none"> <li>▪ Actual value</li> <li>▪ No pulses</li> </ul>	No pulses
Invert output signal	Invert the output signal.	<ul style="list-style-type: none"> <li>▪ No</li> <li>▪ Yes</li> </ul>	No

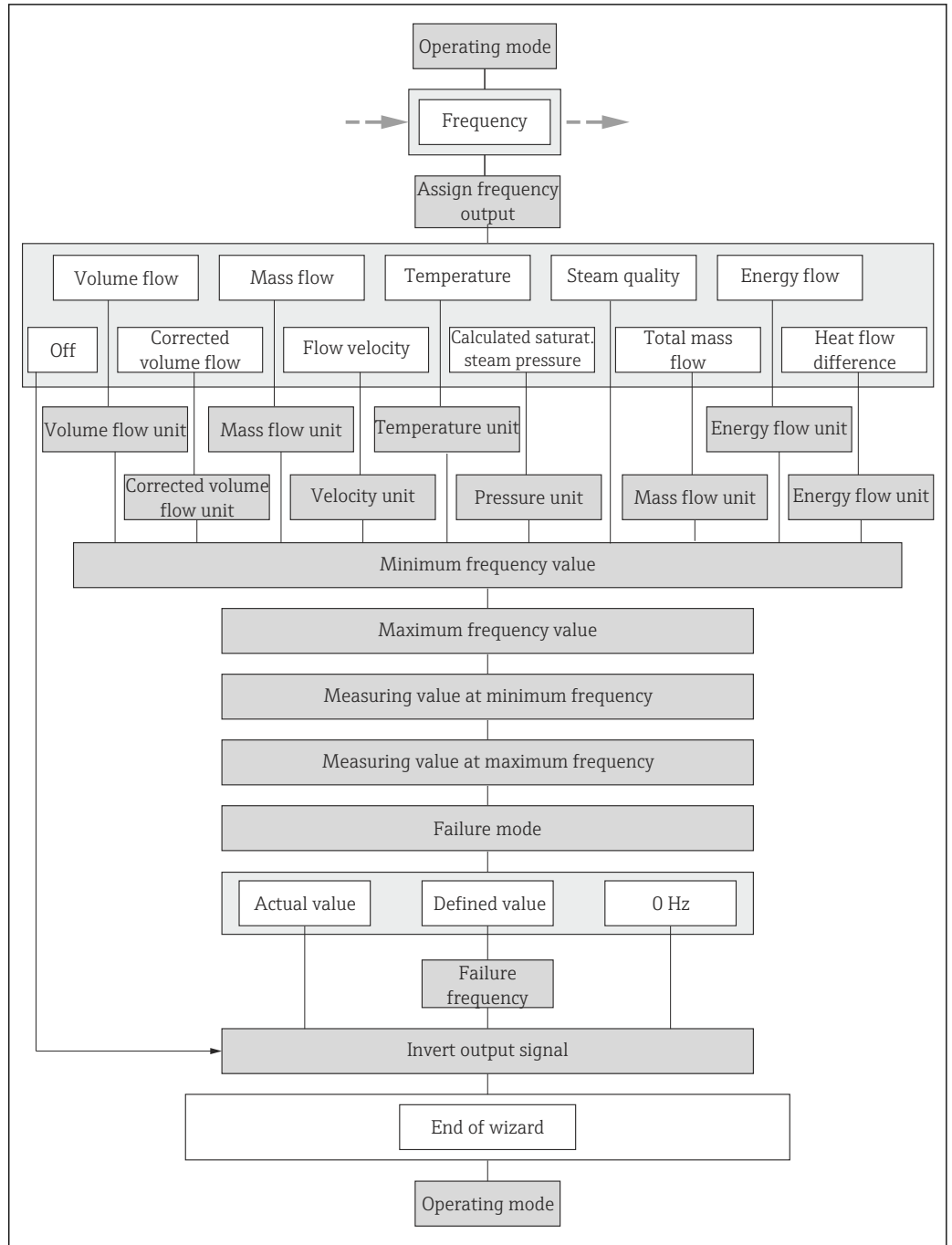
### Configuring the frequency output

#### Navigation

"Setup" menu → Advanced setup → Pulse/frequency/switch output 1



Structure of the wizard for the frequency output



A0020789-EN

25 "Pulse/frequency/switch output" wizard in the "Setup" menu: "Frequency" operating mode

## Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Operating mode	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> <li>■ Pulse</li> <li>■ Frequency</li> <li>■ Switch</li> </ul>	Pulse
Assign frequency output	Select process variable for frequency output.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Mass flow</li> <li>■ Flow velocity</li> <li>■ Temperature</li> <li>■ Calculated saturated steam pressure</li> <li>■ Steam quality</li> <li>■ Total mass flow</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> </ul>	Off
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>
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>
Corrected volume flow unit	Select corrected 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>■ NI/h</li> <li>■ Sft<sup>3</sup>/h</li> </ul>
Energy flow unit	Select energy flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>■ Outputs</li> <li>■ Low flow cut off</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>■ kW</li> <li>■ Btu/h</li> </ul>
Pressure unit	Select process pressure unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>■ bar</li> <li>■ psi</li> </ul>
Velocity unit	Select velocity unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>■ m/s</li> <li>■ ft/s</li> </ul>
Temperature unit	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>■ Output</li> <li>■ Reference temperature</li> <li>■ Simulation process variable</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>■ °C (Celsius)</li> <li>■ °F (Fahrenheit)</li> </ul>
Minimum frequency value	Enter minimum frequency.	0.0 to 1 000.0 Hz	0.0 Hz
Maximum frequency value	Enter maximum frequency.	0.0 to 1 000.0 Hz	1 000.0 Hz
Measuring value at minimum frequency	Enter measured value for minimum frequency.	Signed floating-point number	0

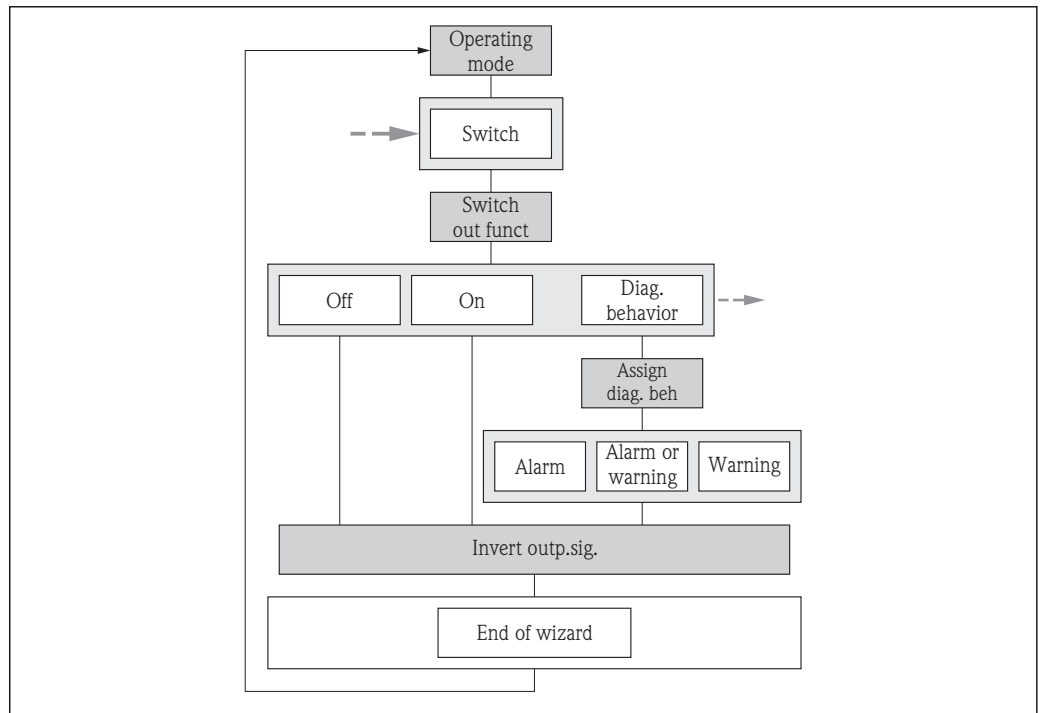
Parameter	Description	Selection / User entry	Factory setting
Measuring value at maximum frequency	Enter measured value for maximum frequency.	Signed floating-point number	0
Failure mode	Define output behavior in alarm condition.	<ul style="list-style-type: none"> <li>■ Actual value</li> <li>■ Defined value</li> <li>■ 0 Hz</li> </ul>	0 Hz
Failure frequency	Enter frequency output value in alarm condition.	0.0 to 1250.0 Hz	0.0 Hz
Invert output signal	Invert the output signal.	<ul style="list-style-type: none"> <li>■ No</li> <li>■ Yes</li> </ul>	No

### Configuring the switch output

#### Navigation

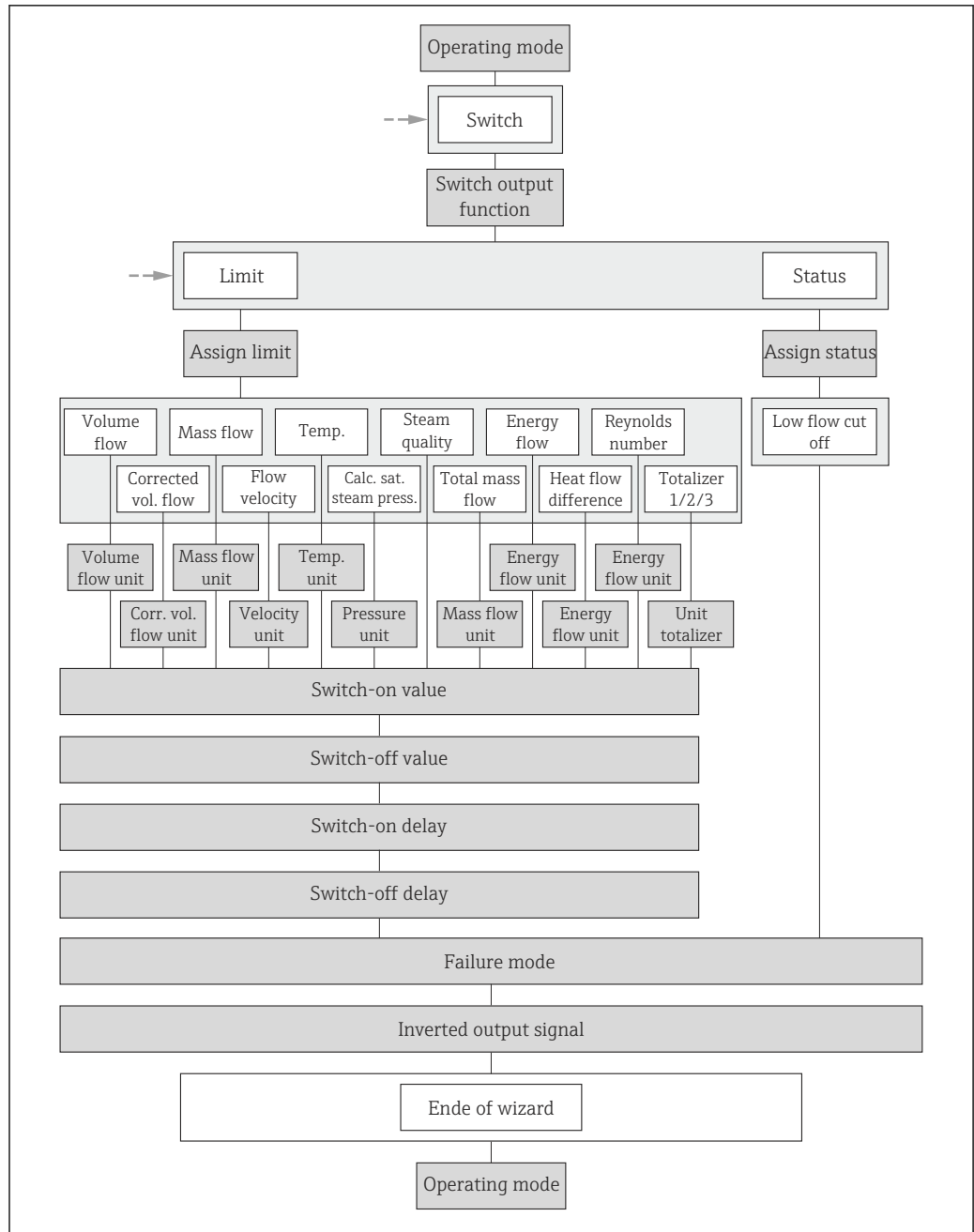
"Setup" menu → Advanced setup → Pulse/frequency/switch output 1

#### Structure of the wizard for the switch output



A0017439-EN

26 "Pulse/frequency/switch output" wizard in the "Setup" menu: "Switch" operating mode (Part 1)



A0020794-EN

27 "Pulse/frequency/switch output" wizard in the "Setup" menu: "Switch" operating mode (Part 2)

**Parameter overview with brief description**

Parameter	Description	Selection / User entry	Factory setting
Operating mode	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> <li>■ Pulse</li> <li>■ Frequency</li> <li>■ Switch</li> </ul>	Pulse
Switch output function	Select function for switch output.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> <li>■ Diagnostic behavior</li> <li>■ Limit</li> <li>■ Status</li> </ul>	Off
Assign diagnostic behavior	Select diagnostic behavior for switch output.	<ul style="list-style-type: none"> <li>■ Alarm</li> <li>■ Alarm or warning</li> <li>■ Warning</li> </ul>	Alarm

Parameter	Description	Selection / User entry	Factory setting
Assign limit	Select process variable for limit function.	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Mass flow</li> <li>■ Flow velocity</li> <li>■ Temperature</li> <li>■ Calculated saturated steam pressure</li> <li>■ Steam quality</li> <li>■ Total mass flow</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> <li>■ Reynolds number</li> <li>■ Totalizer 1</li> <li>■ Totalizer 2</li> <li>■ Totalizer 3</li> </ul>	Volume flow
Assign flow direction check	Select process variable for flow direction monitoring.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul>	Volume flow
Assign status	Select device status for switch output.	<ul style="list-style-type: none"> <li>■ Low flow cut off</li> <li>■ Digital output 2</li> </ul>	Low flow cut off
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>
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>
Corrected volume flow unit	Select corrected 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>■ NI/h</li> <li>■ Sft<sup>3</sup>/h</li> </ul>
Velocity unit	Select velocity unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>■ m/s</li> <li>■ ft/s</li> </ul>
Temperature unit	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>■ Output</li> <li>■ Reference temperature</li> <li>■ Simulation process variable</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>■ °C (Celsius)</li> <li>■ °F (Fahrenheit)</li> </ul>
Pressure unit	Select process pressure unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>■ bar</li> <li>■ psi</li> </ul>
Energy flow unit	Select energy flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> <li>■ Outputs</li> <li>■ Low flow cut off</li> </ul>	Unit choose list	Country-specific: <ul style="list-style-type: none"> <li>■ kW</li> <li>■ Btu/h</li> </ul>
Unit totalizer	Select process variable totalizer unit.	Unit choose list	m <sup>3</sup>

Parameter	Description	Selection / User entry	Factory setting
Switch-on value	Enter measured value for the switch-on point.	Signed floating-point number	0 m <sup>3</sup> /h
Switch-off value	Enter measured value for the switch-off point.	Signed floating-point number	0 m <sup>3</sup> /h
Switch-on delay	Define delay for the switch-on of status output.	0.0 to 100.0 s	0.0 s
Switch-off delay	Define delay for the switch-off of status output.	0.0 to 100.0 s	0.0 s
Failure mode	Define output behavior in alarm condition.	<ul style="list-style-type: none"> <li>▪ Actual status</li> <li>▪ Open</li> <li>▪ Closed</li> </ul>	Open
Invert output signal	Invert the output signal.	<ul style="list-style-type: none"> <li>▪ No</li> <li>▪ Yes</li> </ul>	No

### 10.6.5 Configuring the totalizer

In the **"Totalizer 1 to 3"** submenu the individual totalizers can be configured.

#### Navigation

"Setup" menu → Advanced setup → Totalizer 1 to 3

▶ Totalizer 1 to 3

#### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable	–	Assignment of a process variable to the totalizer.	<ul style="list-style-type: none"> <li>▪ Volume flow</li> <li>▪ Mass flow</li> <li>▪ Corrected volume flow</li> <li>▪ Total mass flow</li> <li>▪ Condensate mass flow</li> <li>▪ Energy flow</li> <li>▪ Heat flow difference</li> </ul>	Volume flow
Unit totalizer	–		Unit choose list	m <sup>3</sup>

Parameter	Prerequisite	Description	Selection	Factory setting
Control Totalizer 1 to 3	In the <b>Assign process variable</b> parameter one of the following options is selected: <ul style="list-style-type: none"> <li>▪ Volume flow</li> <li>▪ Mass flow</li> <li>▪ Corrected volume flow</li> <li>▪ Total mass flow</li> <li>▪ Condensate mass flow</li> <li>▪ Energy flow</li> <li>▪ Heat flow difference</li> </ul>	Control totalizer value.	<ul style="list-style-type: none"> <li>▪ Totalize</li> <li>▪ Reset + hold</li> <li>▪ Preset + hold</li> </ul>	Totalize
Totalizer operation mode	–		<ul style="list-style-type: none"> <li>▪ Net flow total</li> <li>▪ Forward flow total</li> <li>▪ Reverse flow total</li> <li>▪ Last valid value</li> </ul>	Net flow total
Failure mode	–		<ul style="list-style-type: none"> <li>▪ Stop</li> <li>▪ Actual value</li> <li>▪ Last valid value</li> </ul>	Actual value

## 10.6.6 Carrying out additional display configurations

In the **"Display"** submenu you can set all the parameters involved in the configuration of the local display.

### Navigation

"Setup" menu → Advanced setup → Display


► Display

- Format display
- Value 1 display
- 0% bargraph value 1
- 100% bargraph value 1
- Decimal places 1
- Value 2 display
- Decimal places 2
- Value 3 display
- 0% bargraph value 3
- 100% bargraph value 3
- Decimal places 3
- Value 4 display
- Decimal places 4
- Language
- Display interval
- Display damping
- Header
- Header text
- Separator
- Backlight



## Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Format display	Select how measured values are shown on the display.	<ul style="list-style-type: none"> <li>■ 1 value, max. size</li> <li>■ 1 bargraph + 1 value</li> <li>■ 2 values</li> <li>■ 1 value large + 2 values</li> <li>■ 4 values</li> </ul>	1 value, max. size
Value 1 display	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Mass flow</li> <li>■ Flow velocity</li> <li>■ Temperature</li> <li>■ Calculated saturated steam pressure</li> <li>■ Steam quality</li> <li>■ Total mass flow</li> <li>■ Condensate mass flow</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> <li>■ Reynolds number</li> <li>■ Density</li> <li>■ Pressure</li> <li>■ Specific volume</li> <li>■ Degrees of superheat</li> <li>■ Totalizer 1</li> <li>■ Totalizer 2</li> <li>■ Totalizer 3</li> </ul>	Volume flow
0% bargraph value 1	Enter 0% value for bar graph display.	Signed floating-point number	0 m <sup>3</sup> /h
100% bargraph value 1	Enter 100% value for bar graph display.	Signed floating-point number	1 m <sup>3</sup> /h
Decimal places 1	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> <li>■ x</li> <li>■ x.x</li> <li>■ x.xx</li> <li>■ x.xxx</li> <li>■ x.xxxx</li> </ul>	x.xx
Value 2 display	Select the measured value that is shown on the local display.	Picklist (see 1st display value)	None
Decimal places 2	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> <li>■ x</li> <li>■ x.x</li> <li>■ x.xx</li> <li>■ x.xxx</li> <li>■ x.xxxx</li> </ul>	x.xx
Value 3 display	Select the measured value that is shown on the local display.	Picklist (see 1st display value)	None
0% bargraph value 3	Enter 0% value for bar graph display.	Signed floating-point number	0
100% bargraph value 3	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 3	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> <li>■ x</li> <li>■ x.x</li> <li>■ x.xx</li> <li>■ x.xxx</li> <li>■ x.xxxx</li> </ul>	x.xx
Value 4 display	Select the measured value that is shown on the local display.	Picklist (see 1st display value)	None
Decimal places 4	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> <li>■ x</li> <li>■ x.x</li> <li>■ x.xx</li> <li>■ x.xxx</li> <li>■ x.xxxx</li> </ul>	x.xx

Parameter	Description	Selection / User entry	Factory setting
Language	Set display language.	<ul style="list-style-type: none"> <li>▪ English</li> <li>▪ Deutsch</li> <li>▪ Français</li> <li>▪ Español</li> <li>▪ Italiano</li> <li>▪ Nederlands</li> <li>▪ Portuguesa</li> <li>▪ Polski</li> <li>▪ русский язык (Russian)</li> <li>▪ Svenska</li> <li>▪ Türkçe</li> <li>▪ 中文 (Chinese)</li> <li>▪ 日本語 (Japanese)</li> <li>▪ 한국어 (Korean)</li> <li>▪ العربية (Arabic)</li> <li>▪ Bahasa Indonesia</li> <li>▪ ภาษาไทย (Thai)</li> <li>▪ tiếng Việt (Vietnamese)</li> <li>▪ čeština (Czech)</li> </ul>	English (alternatively, the ordered language is preset in the device)
Display interval	Set time measured values are shown on display if display alternates between values.	1 to 10 s	5 s
Display damping	Set display reaction time to fluctuations in the measured value.	0.0 to 999.9 s	5.0 s
Header	Select header contents on local display.	<ul style="list-style-type: none"> <li>▪ Device tag</li> <li>▪ Free text</li> </ul>	Device tag
Header text	Enter display header text.		-----
Separator	Select decimal separator for displaying numerical values.	<ul style="list-style-type: none"> <li>▪ .</li> <li>▪ ,</li> </ul>	.
Backlight	Switch the local display backlight on and off.  Only for device version with onsite display SD03 (touch control)	<ul style="list-style-type: none"> <li>▪ Disable</li> <li>▪ Enable</li> </ul>	Disable

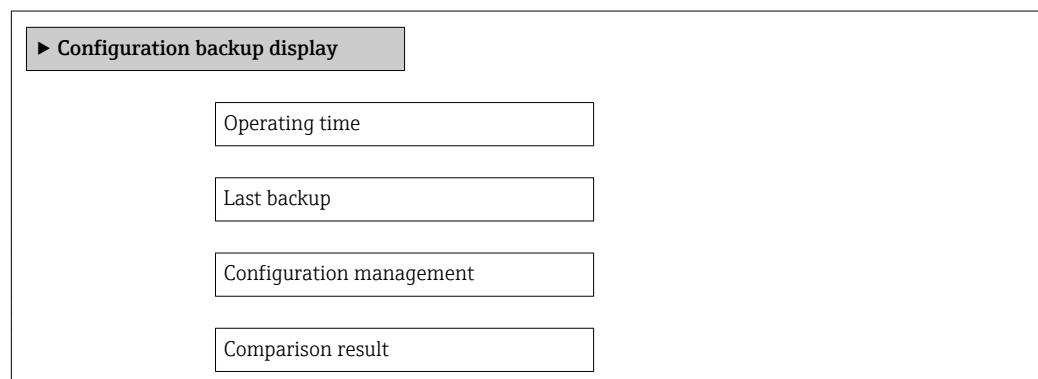
## 10.7 Configuration management

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

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

### Navigation

"Setup" menu → Advanced setup → Configuration backup display



### Parameter overview with brief description

Parameter	Description	User interface / Selection	Factory setting
Operating time	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m), seconds (s)	–
Last backup	Indicates when the last data backup was saved to the display module.	Days (d), hours (h), minutes (m), seconds (s)	–
Configuration management	Select action for managing the device data in the display module.	<ul style="list-style-type: none"> <li>■ Cancel</li> <li>■ Execute backup</li> <li>■ Restore</li> <li>■ Duplicate</li> <li>■ Compare</li> <li>■ Clear backup data</li> </ul>	Cancel
Comparison result	Comparison between present device data and display backup.	<ul style="list-style-type: none"> <li>■ Settings identical</li> <li>■ Settings not identical</li> <li>■ No backup available</li> <li>■ Backup settings corrupt</li> <li>■ Check not done</li> <li>■ Dataset incompatible</li> </ul>	Check not done

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

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



#### *Integrated HistoROM*

A HistoROM is a "non-volatile" device memory in the form of an EEPROM.



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

## 10.8 Simulation

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


#### Navigation

"Diagnostics" menu → Simulation

▶ 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>▪ Volume flow</li> <li>▪ Corrected volume flow</li> <li>▪ Mass flow</li> <li>▪ Flow velocity</li> <li>▪ Temperature</li> <li>▪ Calculated saturated steam pressure</li> <li>▪ Steam quality</li> <li>▪ Total mass flow</li> <li>▪ Condensate mass flow</li> <li>▪ Energy flow</li> <li>▪ Heat flow difference</li> <li>▪ Reynolds number</li> </ul>	Off
Value process variable	A process variable is selected in the <b>Assign simulation process variable</b> parameter.	Enter the simulation value for the selected process variable.	Signed floating-point number	0
Frequency simulation	–	Switch simulation of the frequency output on and off.	<ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ On</li> </ul>	Off
Frequency value	The <b>On</b> option is selected in the <b>Frequency output simulation</b> parameter.	Enter the frequency value for simulation.	0.0 to 1 250.0 Hz	0.0 Hz

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Pulse simulation	The <b>Down-count. val.</b> option is selected in the <b>Simulation pulse output</b> parameter.	Switch simulation of the pulse output on and off.  If the <b>Fixed value</b> option is selected, the <b>Pulse width</b> parameter defines the pulse width of the pulses output.	<ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ Fixed value</li> <li>▪ Down-counting value</li> </ul>	Off
Pulse value	The <b>Down-count. val.</b> option is selected in the <b>Simulation pulse output</b> parameter.	Enter the number of pulses for simulation.	0 to 65535	0
Switch output simulation	–	Switch simulation of switch output on and off.	<ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ On</li> </ul>	Off
Switch status	The <b>On</b> option is selected in the <b>Switch output simulation</b> parameter.	Select the status of the status output for the simulation.	<ul style="list-style-type: none"> <li>▪ Open</li> <li>▪ Closed</li> </ul>	Open
Simulation device alarm	–	Switch the device alarm on and off.	<ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ On</li> </ul>	Off
Diagnostic event category	–	Select the category of the diagnostic event.	<ul style="list-style-type: none"> <li>▪ Sensor</li> <li>▪ Electronics</li> <li>▪ Configuration</li> <li>▪ Process</li> </ul>	Process
Simulation diagnostic event	–	Switch simulation of the diagnostic event on and off. For the simulation, you can choose from the diagnostic events of the category selected in the <b>Diagnostic event category</b> parameter.	<ul style="list-style-type: none"> <li>▪ Off</li> <li>▪ Picklist Diagnostic events (depends on the selected category)</li> </ul>	Off

## 10.9 Protecting settings from unauthorized access

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

- Write protection via access code (→  117)
- Write protection via write protection switch (→  118)
- Write protection via keypad lock (→  58)

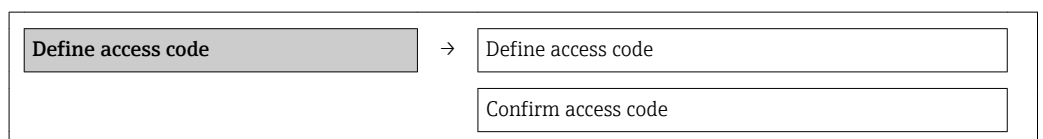
### 10.9.1 Write protection via access code

With the customer-specific access code, the parameters for the measuring device configuration are write-protected and their values can no longer be changed via local operation.

#### Navigation


"Setup" menu → Advanced setup → Administration → Define access code

*Structure of the submenu*





#### Defining the access code via local display

1. Navigate to the **Enter access code** parameter.

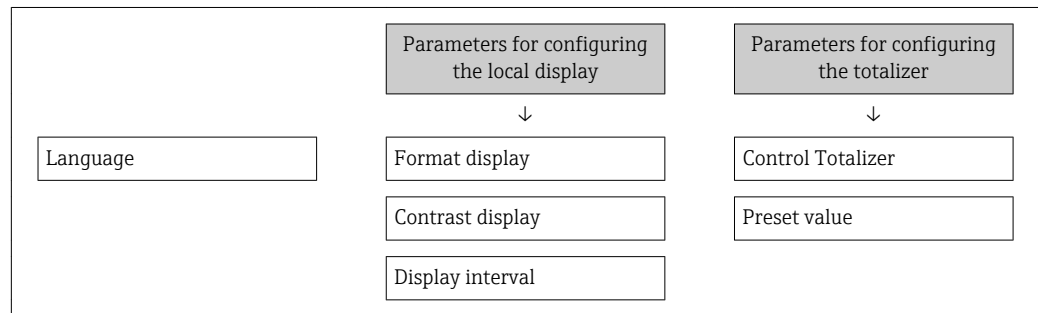
2. Define a max. 4-digit numeric code as an access code.
3. Enter the access code again to confirm the code.
  - ↳ The -symbol appears in front of all write-protected parameters.

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

-  If write access is activated via access code, it can be also be deactivated only via the access code (→  58).
- The user role with which the user is currently logged on via the local display is indicated by the **Access status display** parameter. Navigation path: "Operation" menu → Access status display.

### Parameters which can always be modified via the local display

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

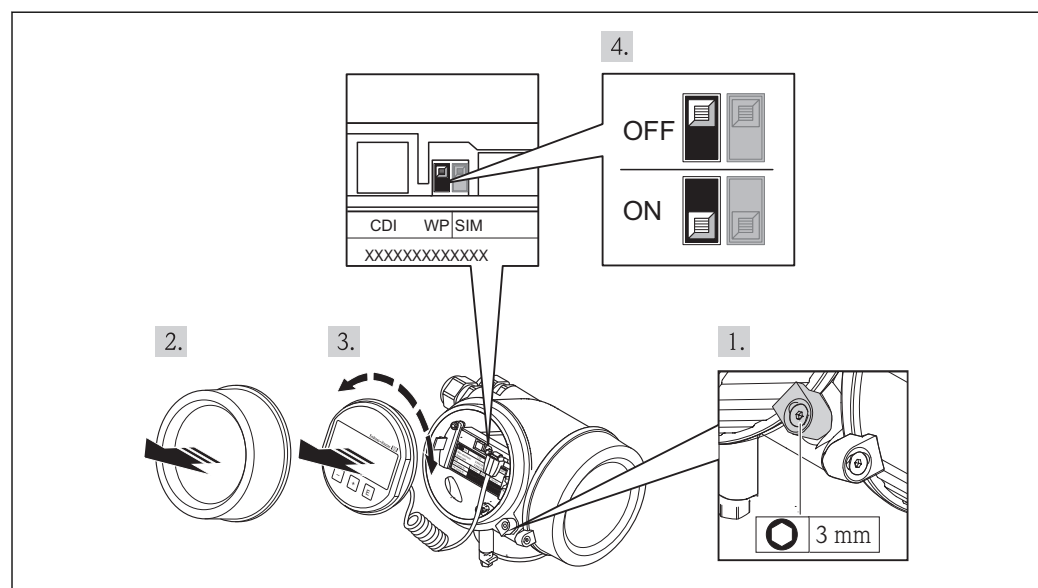


### 10.9.2 Write protection via write protection switch

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

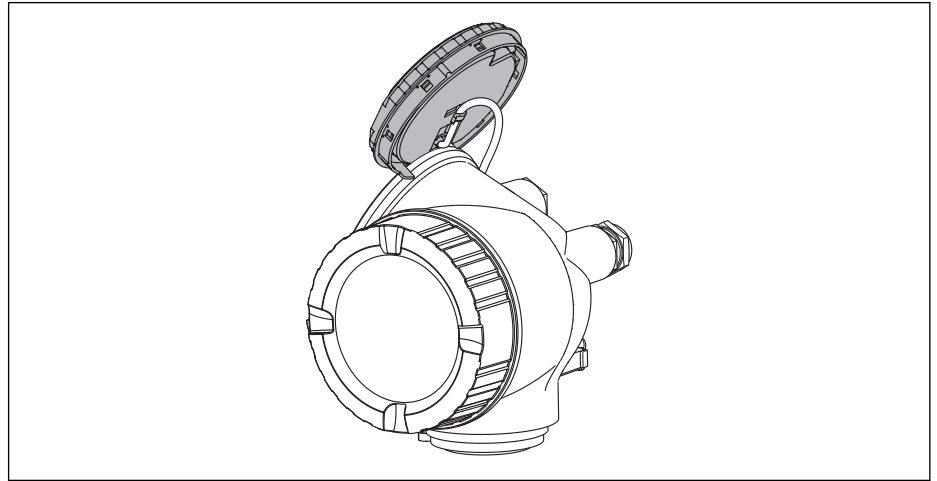
The parameter values are now read only and cannot be edited any more (exception **"Contrast display" parameter**):

- Via local display
- Via PROFIBUS PA protocol




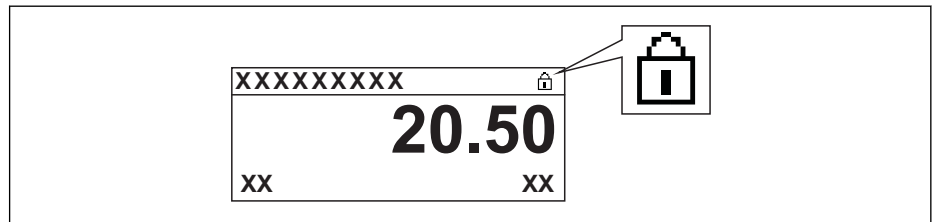
A0013768

1. Loosen the securing clamp.
2. Unscrew the electronics compartment cover.
3. Pull out the display module with a gentle rotational movement. To make it easier to access the lock switch, attach the display module to the edge of the electronics compartment.
  - ↳ Display module is attached to the edge of the electronics compartment.




A0013909

4. Setting the write protection switch (WP) on the main electronics module to the ON position enables the hardware write protection. Setting the write protection switch (WP) on the main electronics module to the OFF position (factory setting) disables the hardware write protection.
  - ↳ If hardware write protection is enabled, the **Hardware locked** option is displayed in the **Locking status** parameter (→ 120). In addition, on the local display the -symbol appears in front of the parameters in the header of the operational display and in the navigation view.



A0015870

If hardware write protection is disabled, no option is displayed in the **Locking status** parameter (→ 120). On the local display, the -symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

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

## 11 Operation



### 11.1 Reading device locking status

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


#### Navigation



"Operation" menu → Locking status

*Function scope of "Locking status" parameter*



Options	Description
None	The access status displayed in " <b>Access status display</b> " parameter applies (→  58). Only appears on local display.
Hardware locked	The DIP switch for hardware locking is activated on the main electronics module. This prevents write access to the parameters (→  118).
Temporarily locked	Due to internal processing in the device (e.g. up-/downloading of data, reset), write access to the parameters is blocked for a short time. Once the internal processing has been completed, the parameters can be changed once again.

### 11.2 Adjusting the operating language

Information (→  72)

 For information on the operating languages supported by the measuring device (→  193)

### 11.3 Configuring the display

- Basic settings for local display (→  81)
- Advanced settings for local display (→  112)

### 11.4 Reading measured values

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

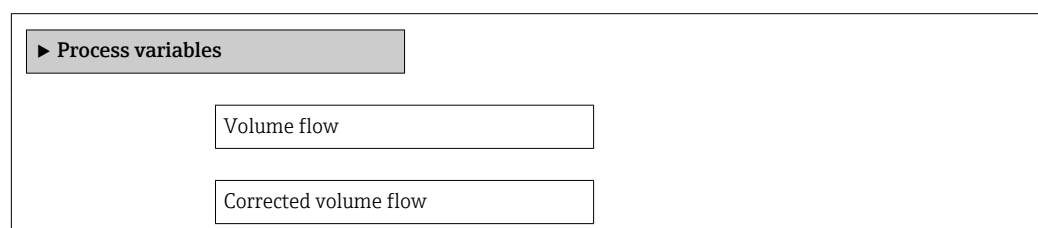
"Diagnostics" menu → Measured values

#### 11.4.1 Process variables

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

#### Navigation

"Diagnostics" menu → Measured values → Process variables





Mass flow
Flow velocity
Temperature
Calculated saturated steam pressure
Steam quality
Total mass flow
Condensate mass flow
Energy flow
Heat flow difference
Reynolds number
Density
Specific volume
Pressure
Compressibility factor
Degrees of superheat

**Parameter overview with brief description**

Parameter	Prerequisite	Description	User interface	Factory setting
Volume flow	–	Displays the volume flow currently measured. <i>Dependency</i> The unit is taken from the <b>Volume flow unit</b> parameter	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	Signed floating-point number	
Mass flow	–	Displays the mass flow currently calculated. <i>Dependency</i> The unit is taken from the <b>Mass flow unit</b> parameter	Signed floating-point number	

Parameter	Prerequisite	Description	User interface	Factory setting
Flow velocity	–	Displays the flow velocity currently calculated. <i>Dependency</i> The unit is taken from the <b>Velocity unit</b> parameter	Signed floating-point number	
Temperature	For the following order code: "Sensor version", option "Mass flow"	Displays the temperature currently measured. <i>Dependency</i> The unit is taken from the <b>Temperature unit</b> parameter	Signed floating-point number	
Calculated saturated steam pressure	In the <b>Select medium</b> parameter, the <b>Steam</b> option must be selected.	Displays the saturated steam pressure currently calculated. <i>Dependency</i> The unit is taken from the <b>Pressure unit</b> parameter	Signed floating-point number	
Steam quality	In the <b>Select medium</b> parameter, the <b>Steam</b> option must be selected.	Displays the steam quality currently calculated.	Signed floating-point number	
Total mass flow	For the following order code: "Application package ", option EU "Wet steam measurement" In the <b>Select medium</b> parameter, the <b>Steam</b> option must be selected.	Displays the total mass flow currently calculated. <i>Dependency</i> The unit is taken from the <b>Mass flow unit</b> parameter	Signed floating-point number	
Condensate mass flow	For the following order code: "Application package ", option EU "Wet steam measurement" In the <b>Select medium</b> parameter, the <b>Steam</b> option must be selected.	Displays the condensate mass flow currently calculated. <i>Dependency</i> The unit is taken from the <b>Mass flow unit</b> parameter	Signed floating-point number	
Energy flow	For the following order code: "Sensor version", option "Mass flow"	Displays the calculated energy flow. <i>Dependency</i> The unit is taken from the <b>Energy flow unit</b> parameter	Signed floating-point number	
Heat flow difference	For the following order code: "Sensor version", option "Mass flow"	Displays the heat flow difference currently calculated. <i>Dependency</i> The unit is taken from the <b>Energy flow unit</b> parameter	Signed floating-point number	
Reynolds number	For the following order code: "Sensor version", option "Mass flow"	Displays the Reynolds number currently calculated.	Signed floating-point number	
Density	For the following order code: "Sensor version", option "Mass flow"	Displays the density currently measured. <i>Dependency</i> The unit is taken from the <b>Density unit</b> parameter	Positive floating-point number	
Specific volume	For the following order code: "Sensor version", option "Mass flow"		Positive floating-point number	0 m <sup>3</sup> /kg
Pressure	For the following order code: "Sensor version", option "Mass flow"	Displays the pressure currently measured. <i>Dependency</i> The unit is taken from the <b>Pressure unit</b> parameter	0 to 250 bar	

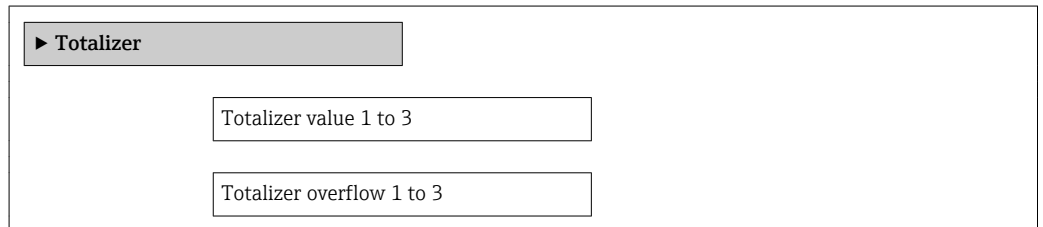
Parameter	Prerequisite	Description	User interface	Factory setting
Compressibility factor	For the following order code: "Sensor version", option "Mass flow"  In the <b>Select medium</b> parameter, the <b>Gas</b> option or the <b>Steam</b> option must be selected.	Displays the compression factor currently measured.	0 to 2	
Degrees of superheat	In the <b>Select medium</b> parameter, the <b>Steam</b> option is selected.		0 to 500 K	0 K

### 11.4.2 Totalizer

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

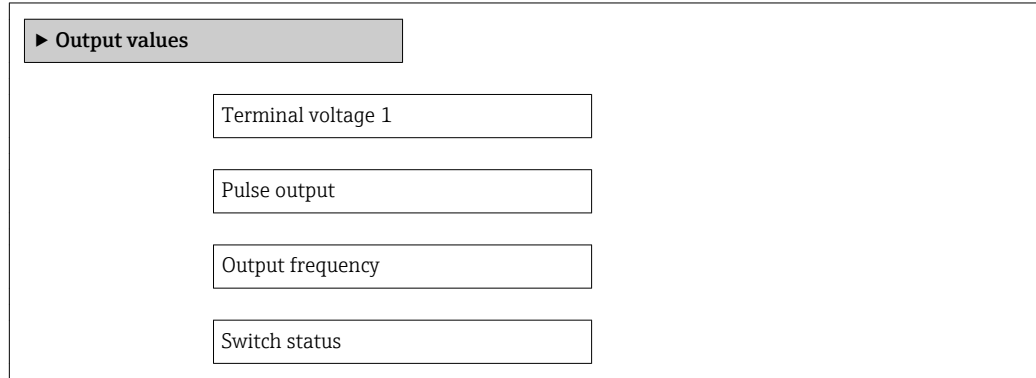
Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign process variable	–	Assignment of a process variable to the totalizer.	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Total mass flow</li> <li>■ Condensate mass flow</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> </ul>	Volume flow
Totalizer value #	In the <b>Assign process variable</b> parameter one of the following options is selected: <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Total mass flow</li> <li>■ Condensate mass flow</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> </ul>	Displays the current totalizer counter value.	Signed floating-point number	0 m <sup>3</sup>
Totalizer status #	–	Displays the current totalizer status.	<ul style="list-style-type: none"> <li>■ Good</li> <li>■ Uncertain</li> <li>■ Bad</li> </ul>	Good
Totalizer status (Hex) #	–	Displays the current status value (hex) of the totalizer.	0 to 255	128

### 11.4.3 Output values

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

#### Navigation

"Diagnostics" menu → Measured values → Output values



#### Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Terminal voltage 1	Displays the current terminal voltage that is applied at the current output.	0.0 to 50.0 V	0 V
Pulse output	Displays the value currently measured for the pulse output.	Positive floating-point number	0 Hz
Output frequency	Displays the value currently measured for the frequency output.	0.0 to 1 250.0 Hz	0.0 Hz
Switch status	Displays the current switch output status.	<ul style="list-style-type: none"> <li>▪ Open</li> <li>▪ Closed</li> </ul>	Open

## 11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu(→ 74)
- Advanced settings using the **Advanced setup** submenu (→ 85)

## 11.6 Performing a totalizer reset

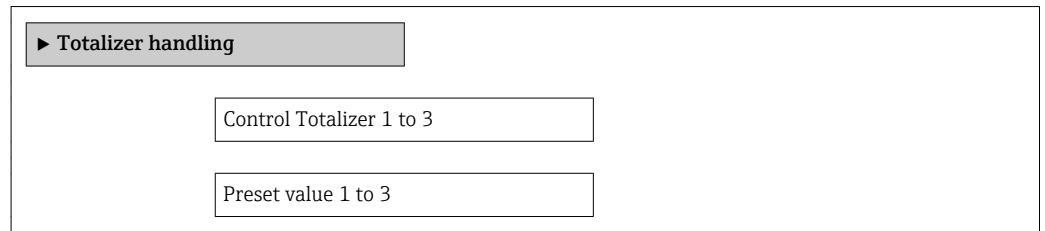
In the **Operation** submenu the totalizers are reset:  
Control Totalizer

*Function scope of "Control Totalizer " parameter*

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

**Navigation**

"Operation" menu → Operation



**Parameter overview with brief description**

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Control Totalizer #	In the <b>Assign process variable</b> parameter one of the following options is selected: <ul style="list-style-type: none"> <li>▪ Volume flow</li> <li>▪ Mass flow</li> <li>▪ Corrected volume flow</li> <li>▪ Total mass flow</li> <li>▪ Condensate mass flow</li> <li>▪ Energy flow</li> <li>▪ Heat flow difference</li> </ul>	Control totalizer value.	<ul style="list-style-type: none"> <li>▪ Totalize</li> <li>▪ Reset + hold</li> <li>▪ Preset + hold</li> </ul>	Totalize
Preset value #	In the <b>Assign process variable</b> parameter one of the following options is selected: <ul style="list-style-type: none"> <li>▪ Volume flow</li> <li>▪ Mass flow</li> <li>▪ Corrected volume flow</li> <li>▪ Total mass flow</li> <li>▪ Condensate mass flow</li> <li>▪ Energy flow</li> <li>▪ Heat flow difference</li> </ul>	Specify start value for totalizer.	Signed floating-point number	0 m <sup>3</sup>

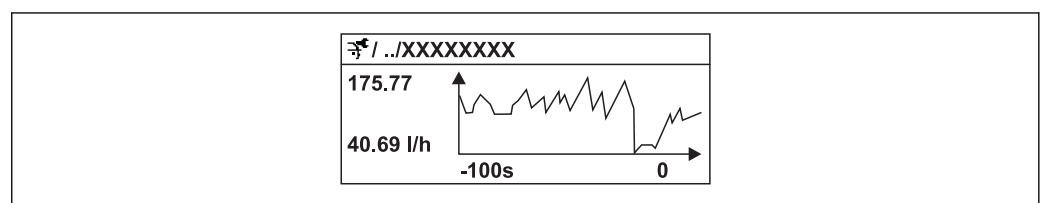
**11.7 Showing data logging**


In the device, the extended function of the HistoROM must be enabled (order option) so that the **"Data logging" submenu** appears. This contains all the parameters for the measured value history.

 The data logging history is also available via the FieldCare plant asset management tool (→  61).

**Function scope**

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



 28 Chart of a measured value trend

A0016222

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

### Navigation

"Diagnostics" menu → Data logging

### "Data logging" submenu

► Data logging

Assign channel 1

Assign channel 2

Assign channel 3

Assign channel 4

Logging interval

Clear logging data

► Display channel 1

► Display channel 2

► Display channel 3

► Display channel 4

## Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Assign channel 1 to 4	Assign process variable to logging channel.	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Mass flow</li> <li>■ Flow velocity</li> <li>■ Temperature</li> <li>■ Calculated saturated steam pressure</li> <li>■ Steam quality</li> <li>■ Total mass flow</li> <li>■ Condensate mass flow</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> <li>■ Reynolds number</li> <li>■ Current output 1</li> <li>■ Current output 2</li> <li>■ Density</li> <li>■ Vortex frequency</li> <li>■ Electronic temperature</li> </ul>	Off
Logging interval	Define the logging interval for data logging. This value defines the time interval between the individual data points in the memory.	1.0 to 3 600.0 s	10.0 s
Clear logging data	Clear the entire logging data.	<ul style="list-style-type: none"> <li>■ Cancel</li> <li>■ Clear data</li> </ul>	Cancel

## 12 Diagnostics and troubleshooting

### 12.1 General troubleshooting

*For local display*





Problem	Possible causes	Remedy
Local display dark and no output signals	Supply voltage does not match that specified on the nameplate.	Apply the correct supply voltage .
Local display dark and no output signals	Supply voltage has incorrect polarity.	Reverse polarity of supply voltage.
Local display dark and no output signals	No contact between connecting cables and terminals.	Check the connection of the cables and correct if necessary.
Local display dark and no output signals	Terminals are not plugged into the I/O electronics module correctly.	Check terminals.
Local display dark and no output signals	I/O electronics module is defective.	Order spare part (→ ☰ 164).
Local display is dark, but signal output is within the valid range	Display is set too bright or too dark.	<ul style="list-style-type: none"> <li>▪ Set the display brighter by simultaneously pressing ☐ + ☐.</li> <li>▪ Set the display darker by simultaneously pressing ☐ + ☐.</li> </ul>
Local display is dark, but signal output is within the valid range	The cable of the display module is not plugged in correctly.	Insert the plug correctly into the main electronics module and display module.
Local display is dark, but signal output is within the valid range	Display module is defective.	Order spare part (→ ☰ 164).
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures (→ ☰ 137)
Text on local display appears in a foreign language and cannot be understood.	Incorrect operating language is configured.	<ol style="list-style-type: none"> <li>1. Press ☐ + ☐ for 2 s ("home position").</li> <li>2. Press ☐.</li> <li>3. Set the desired language in the <b>Language</b> parameter.</li> </ol>
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	<ul style="list-style-type: none"> <li>▪ Check the cable and the connector between the main electronics module and display module.</li> <li>▪ Order spare part (→ ☰ 164).</li> </ul>

*For output signals*

Problem	Possible causes	Remedy
Signal output outside the valid range	Main electronics module is defective.	Order spare part (→ ☰ 164).
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Configuration error	Check and correct parameter configuration.
Device measures incorrectly.	Configuration error or device is operated outside the application.	<ol style="list-style-type: none"> <li>1. Check and correct parameter configuration.</li> <li>2. Observe limit values specified in the "Technical Data".</li> </ol>



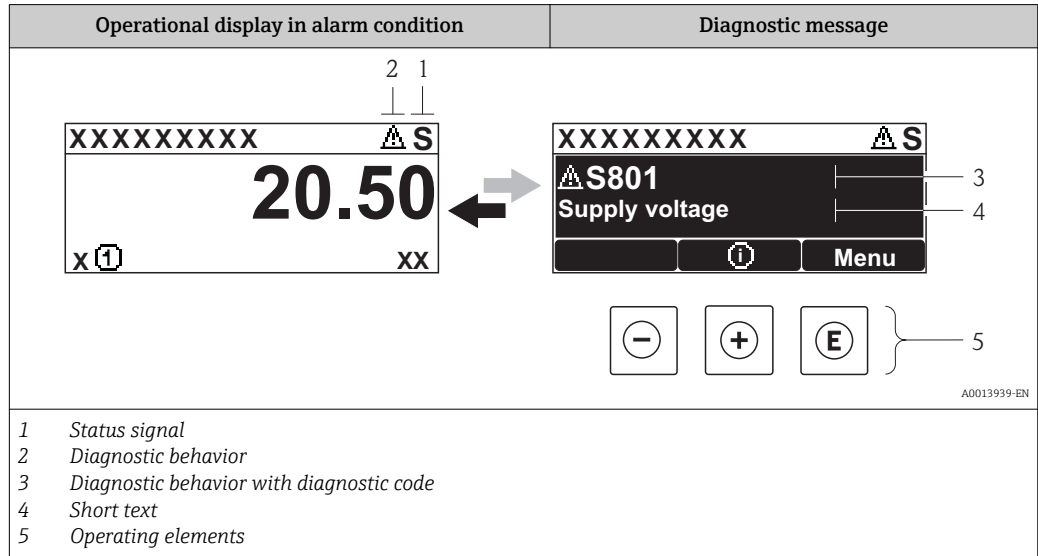
*For access*

Problem	Possible causes	Remedy
No write access to parameters	Hardware write protection enabled	Set the write protection switch on the main electronics module to the OFF position (→  118).
No write access to parameters	Current user role has limited access authorization	1. Check user role (→  58). 2. Enter correct customer-specific access code (→  58).
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

## 12.2 Diagnostic information on local display

### 12.2.1 Diagnostic message

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



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

- i** Other diagnostic events that have occurred can be called up in the **Diagnostics** menu:
  - Via parameters (→ 157)
  - Via submenus (→ 157)



#### 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).

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

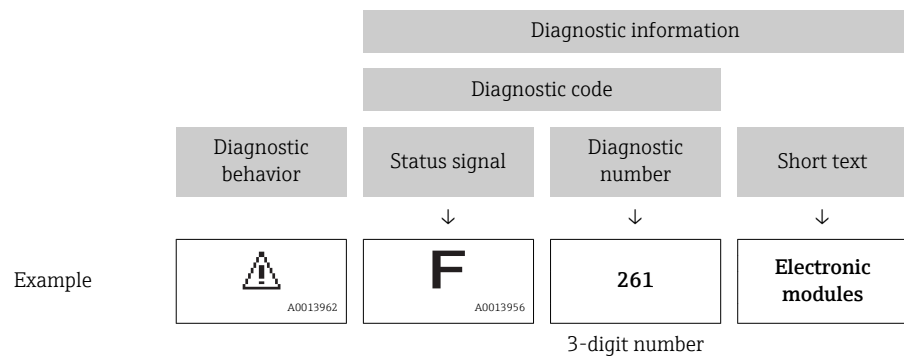
Symbol	Meaning
<b>F</b> <small>A0013956</small>	<b>Failure</b> A device error has occurred. The measured value is no longer valid.
<b>C</b> <small>A0013959</small>	<b>Function check</b> The device is in service mode (e.g. during a simulation).
<b>S</b> <small>A0013958</small>	<b>Out of specification</b> The device is operated: Outside its technical specification limits (e.g. outside the process temperature range)
<b>M</b> <small>A0013957</small>	<b>Maintenance required</b> Maintenance is required. The measured value remains valid.

### Diagnostic behavior



Symbol	Meaning
 <small>A0013961</small>	<b>Alarm</b> <ul style="list-style-type: none"> <li>▪ Measurement is interrupted.</li> <li>▪ Signal outputs and totalizers assume the defined alarm condition.</li> <li>▪ A diagnostic message is generated.</li> <li>▪ For local display with touch control: the background lighting changes to red.</li> </ul>
 <small>A0013962</small>	<b>Warning</b> Measurement is resumed. The signal outputs and totalizers are not affected. A diagnostic message is generated.

### Diagnostic information

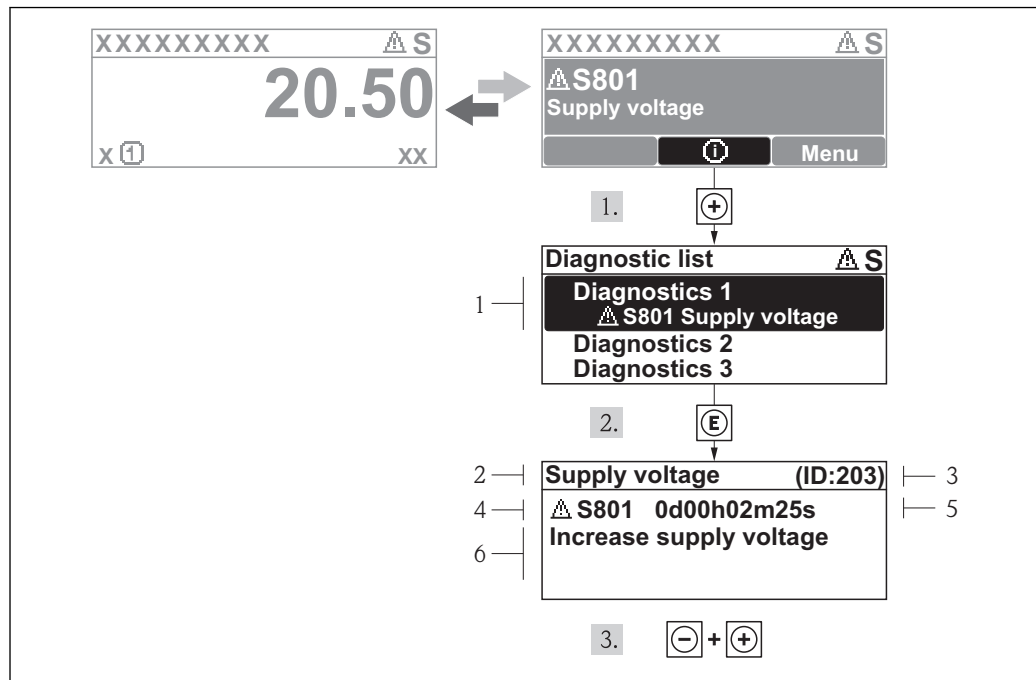
The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.



### Operating elements

Key	Meaning
 <small>A0013970</small>	<b>Plus key</b> <i>In a menu, submenu</i> Opens the message about the remedial measures.
 <small>A0013952</small>	<b>Enter key</b> <i>In a menu, submenu</i> Opens the operating menu.

## 12.2.2 Calling up remedial measures



29 Message for remedial measures

- 1 Diagnostic information
- 2 Short text
- 3 Service ID
- 4 Diagnostic behavior with diagnostic code
- 5 Operation time of occurrence
- 6 Remedial measures

The user is in the diagnostic message.

1. Press  $\oplus$  ( $\text{ⓘ}$  symbol).  
↳ The **Diagnostic list** submenu opens.
2. Select the desired diagnostic event with  $\oplus$  or  $\ominus$  and press  $\text{⏎}$ .  
↳ The message for the remedial measures for the selected diagnostic event opens.
3. Press  $\ominus + \oplus$  simultaneously.  
↳ The message for the remedial measures closes.

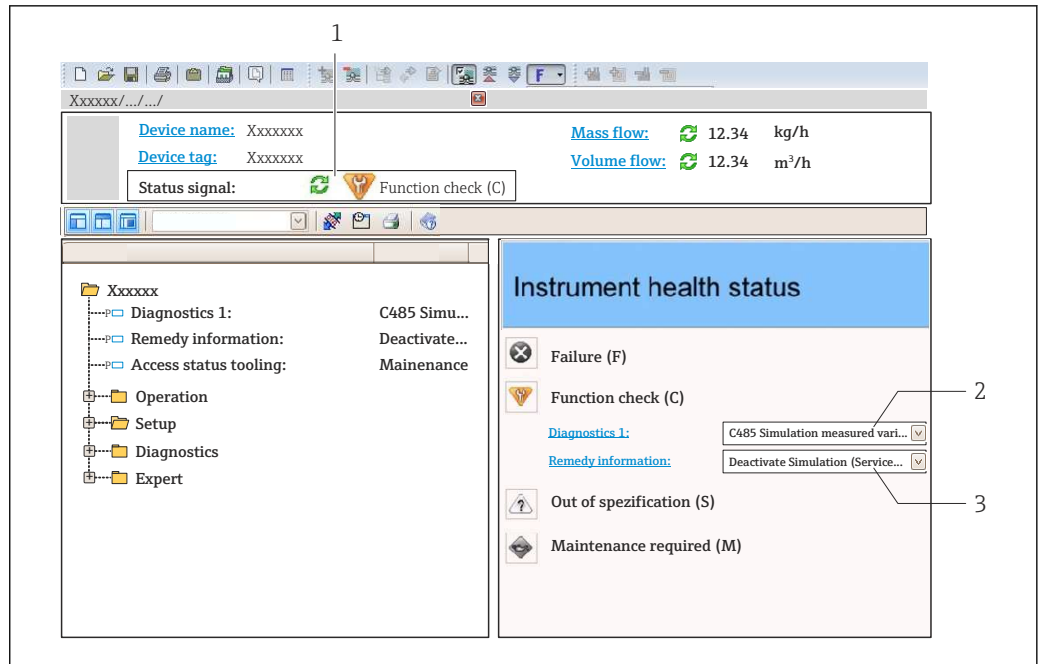
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or the **Previous diagnostics** parameter.

1. Press  $\text{⏎}$ .  
↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press  $\ominus + \oplus$  simultaneously.  
↳ The message for the remedial measures closes.

## 12.3 Diagnostic information in 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.

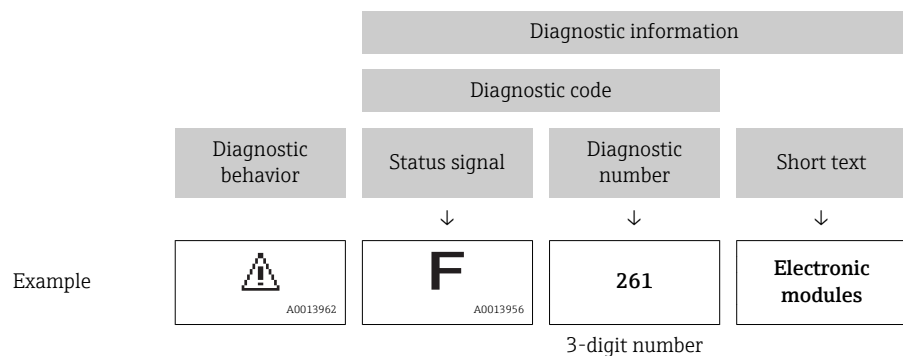


- 1 Status area with status signal (→ 130)
- 2 Diagnostic information (→ 131)
- 3 Remedial measures with Service ID

- i** Furthermore, diagnostic events that have occurred can be viewed in the **Diagnostics** menu:
  - Via parameters (→ 157)
  - Via submenu (→ 157)

### Diagnostic information

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



### 12.3.2 Calling up remedy information

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

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

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

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

## 12.4 Adapting the diagnostic information

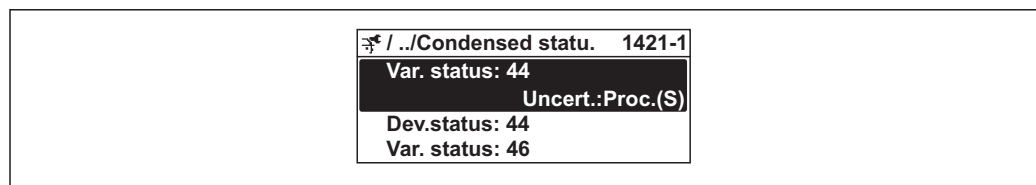
### 12.4.1 Adapting the measured value and device status

#### Measured value status

Each diagnostic number is assigned a specific measured value status at the factory. The user can change this assignment for specific diagnostic numbers via the **Var. status xx** parameter.

#### Navigation path

"Expert" menu → System → Diagnostic handling → Condensed status → Assign behavior of measured value status xx



A0019175-EN

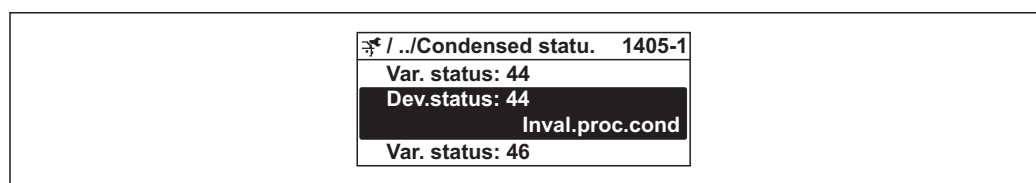
Quality	Substatus	Status (hex)	Event category	Event class
GOOD	None	0x80	-	-
GOOD	Maintenance required	0xA4	M	Warning
GOOD	Maintenance demanded	0xA8	M	Warning
GOOD	Function check	0xBC	-	-
BAD	Maintenance alarm	0x24	F	Alarm
BAD	Process related, no maintenance	0x28	F	Alarm
BAD	Function check	0x3C	C	Warning
UNCERTAIN	Maintenance demanded	0x68	M	Warning
UNCERTAIN	Process related, no maintenance	0x78	S	Warning

#### Device status

Each diagnostic number is assigned a specific device status at the factory. The user can change this assignment for specific diagnostic numbers via the **Dev. status xx** parameter.

#### Navigation path

"Expert" menu → System → Diagnostic handling → Condensed status → Assign behavior of device status xx



A0019186-EN

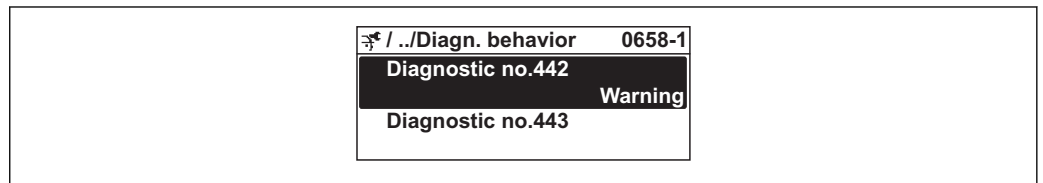
Mnemonic	Octet	Bit
Maintenance required	2	5
Maintenance alarm	3	0
Maintenance demanded	3	1
Function check	3	2
Invalid process conditions	3	3

### 12.4.2 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 certain diagnostic information in the **Diagnostic behavior** submenu .

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

"Expert" menu → System → Diagnostic handling → Diagnostic behavior



A0019179-EN

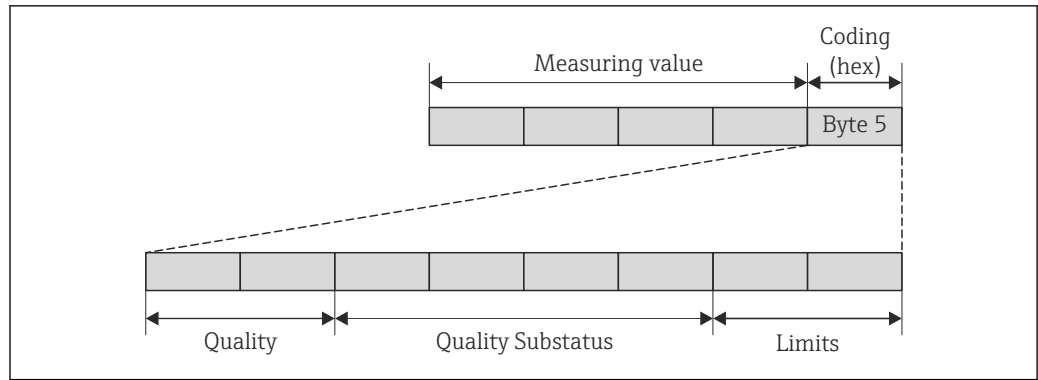
### Available diagnostic behaviors

The following diagnostic behaviors can be assigned:

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

### Displaying the measured value status

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



A0021271-EN

30 Structure of the coding byte

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

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

When the diagnostic behavior is assigned, this also changes the measured value status and device status for the diagnostic information. The measured value status and device status depend on the choice of diagnostic behavior and the group in which the diagnostic information is located. The measured value status and device status are firmly assigned to the particular diagnostic behavior and cannot be changed individually.

The diagnostic information is grouped as follows:

- Diagnostic information pertaining to the sensor: diagnostic number 000 to 199  
(→ 136)
- Diagnostic information pertaining to the electronics: diagnostic number 200 to 399  
(→ 137)
- Diagnostic information pertaining to the configuration: diagnostic number 400 to 599  
(→ 137)
- Diagnostic information pertaining to the process: diagnostic number 800 to 999  
(→ 137)

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

*Diagnostic information pertaining to the sensor (diagnostic no.: 000 to 199)*

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



*Diagnostic information pertaining to the electronics (diagnostic no.: 200 to 399)*

Diagnostic behavior (configurable)	Measured value status (fixed assignment)				Device diagnostics (fixed assignment)
	Quality	Quality Substatus	Coding (hex)	Category (NE107)	
Alarm	BAD	Maintenance alarm	0x24 to 0x27	F (Failure)	Maintenance alarm
Warning					
Logbook entry only	GOOD	ok	0x80 to 0x8E	-	-
Off					




*Diagnostic information pertaining to the configuration (diagnostic no.: 400 to 599)*

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

*Diagnostic information pertaining to the process (diagnostic no.: 800 to 999)*

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

## 12.5 Overview of diagnostic information

-  The amount of diagnostic information and the number of measured variables affected increase if the measuring device has one or more application packages.
-  In the case of some items of diagnostic information, the diagnostic behavior can be changed. Adapt the diagnostic information (→  134)

- i** Operating conditions for displaying the following diagnostics information:
- Diagnostics information 871: The process temperature is less than 2K from the saturated steam line.
  - Diagnostics information 872: The measured steam quality has dropped below the configured limit value for the steam quality (limit value: "Expert" menu → System → Diagnostic handling → Diagnostic limits → Steam quality limit).
  - Diagnostics information 873: The process temperature is  $\leq 0$  °C.
  - Diagnostics information 874: Wet steam detection/measurement is outside the specified limits for the following process parameters: pressure, temperature, velocity.
  - Diagnostics information 972: The degree of superheat has exceeded the configured limit value (limit value: "Expert" menu → System → Diagnostic handling → Diagnostic limits → Degrees of superheat limit).

### 12.5.1 Diagnostics for the sensor

**Diagnostic no. 004**      **Message: F004 Sensor defective**

Measured value status		Measured variables concerned
Quality:	BAD	
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
Remedial measures		
<ul style="list-style-type: none"> <li>▪ Check plug connections.</li> <li>▪ Change pre-amplifier.</li> <li>▪ Change DSC sensor.</li> </ul>		

**Diagnostic no. 022**      **Message: \*022 Temperature sensor defective**

Measured value status		Measured variables concerned
Quality:	BAD	
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Alarm (factory setting)		
Remedial measures		
<ul style="list-style-type: none"> <li>▪ Check plug connections.</li> <li>▪ Change pre-amplifier.</li> <li>▪ Change DSC sensor.</li> </ul>		

**Diagnostic no. 046**      **Message: S046 Sensor limit exceeded**

Measured value status		Measured variables concerned
Quality:	GOOD	
Quality Substatus:	Maintenance demanded	

Coding (hex):	0xA8	<ul style="list-style-type: none"> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Volume flow</li> </ul>
Category (NE107):	S (Out of specification)	
Diagnostic behavior:	Warning	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check plug connections.</li> <li>■ Change pre-amplifier.</li> <li>■ Change DSC sensor.</li> </ul>		

**Diagnostic no. 062**

**Message: F062 Sensor connection**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check plug connections.</li> <li>■ Change pre-amplifier.</li> <li>■ Change DSC sensor.</li> </ul>		

**Diagnostic no. 082**

**Message: F082 Data storage**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Change main electronics module.</li> <li>■ Change sensor.</li> </ul>		

**Diagnostic no. 083**

**Message: F083 Memory content**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Change main electronics module.</li> <li>■ Change sensor.</li> </ul>		

<ul style="list-style-type: none"> <li>▪ Restart the device.</li> <li>▪ Restore data.</li> <li>▪ Change sensor.</li> </ul>	
--	--

## Diagnostic no. 114

Message: F114 Sensor leaky

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>▪ Calculated saturated steam pressure</li> <li>▪ Energy flow</li> <li>▪ Flow velocity</li> <li>▪ Heat flow difference</li> <li>▪ Low flow cut off</li> <li>▪ Mass flow</li> <li>▪ Total mass flow</li> <li>▪ Status value pulse/freq./switch output</li> <li>▪ Corrected volume flow</li> <li>▪ Steam quality</li> <li>▪ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
Change DSC sensor		

## Diagnostic no. 122

Message: \*122 Temperature sensor defective

Measured value status		Measured variables concerned
Quality:	GOOD	<ul style="list-style-type: none"> <li>▪ Calculated saturated steam pressure</li> <li>▪ Energy flow</li> <li>▪ Heat flow difference</li> <li>▪ Mass flow</li> <li>▪ Total mass flow</li> <li>▪ Corrected volume flow</li> <li>▪ Steam quality</li> <li>▪ Temperature</li> </ul>
Quality Substatus:	Maintenance demanded	
Coding (hex):	0xA8	
Category (NE107):	M (Maintenance)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>▪ Check plug connections.</li> <li>▪ Change pre-amplifier.</li> <li>▪ Change DSC sensor.</li> </ul>		

## 12.5.2 Diagnostics for the electronics

## Diagnostic no. 242

Message: F242 Software incompatible

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>▪ Calculated saturated steam pressure</li> <li>▪ Energy flow</li> <li>▪ Flow velocity</li> <li>▪ Heat flow difference</li> <li>▪ Low flow cut off</li> <li>▪ Mass flow</li> <li>▪ Total mass flow</li> <li>▪ Status value pulse/freq./switch output</li> <li>▪ Corrected volume flow</li> <li>▪ Steam quality</li> <li>▪ Temperature</li> <li>▪ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>▪ Check software.</li> <li>▪ Flash or change main electronic module.</li> </ul>		

**Diagnostic no. 252 Message: F252 Modules incompatible**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
Remedial measures		
<ul style="list-style-type: none"> <li>■ Check electronic modules.</li> <li>■ Change I/O or main electronic module.</li> </ul>		

**Diagnostic no. 261 Message: F261 electronic modules**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
Remedial measures		
<ul style="list-style-type: none"> <li>■ Restart the device.</li> <li>■ Check electronic modules.</li> <li>■ Change I/O or main electronic module.</li> </ul>		

**Diagnostic no. 262 Message: F262 Module connection**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
Remedial measures		
<ul style="list-style-type: none"> <li>■ Check module connections.</li> <li>■ Change electronics modules.</li> </ul>		

**Diagnostic no. 270 Message: F270 Main electronic failure**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	

Coding (hex):	0x24	<ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
Change main electronics module.		

## Diagnostic no. 271

## Message: F271 Main electronic failure

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Restart the device.</li> <li>■ Change main electronics module.</li> </ul>		

## Diagnostic no. 272

## Message: F272 Main electronic failure

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Restart the device.</li> <li>■ Contact service.</li> </ul>		

## Diagnostic no. 273

## Message: F273 Main electronic failure

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Emergency operation via display.</li> <li>■ Change main electronics.</li> </ul>		

Diagnostic no. 275

Message: F275 I/O module failure

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:		
Alarm		
<b>Remedial measures</b>		
Change I/O module.		

Diagnostic no. 276

Message: F276 I/O module failure

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:		
Alarm		
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Restart the device.</li> <li>■ Change I/O module.</li> </ul>		

Diagnostic no. 277

Message: F277 electronics defective

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:		
Alarm		
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Change pre-amplifier.</li> <li>■ Change main electronics module.</li> </ul>		

Diagnostic no. 282

Message: F282 Data storage

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	

Category (NE107):	F (Failure)	<ul style="list-style-type: none"> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Restart the device.</li> <li>■ Contact service.</li> </ul>		

## Diagnostic no. 283

## Message: F283 Memory content

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Transfer data or reset device.</li> <li>■ Contact service.</li> </ul>		

## Diagnostic no. 302

## Message: C302 Device verification active

Measured value status		Measured variables concerned
Quality:	GOOD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Function check	
Coding (hex):	0x3C	
Category (NE107):	C (Check)	
Diagnostic behavior:	Warning	
<b>Remedial measures</b>		
Device verification active, please wait.		

## Diagnostic no. 311

## Message: F311 Electronic failure

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Transfer data or reset device.</li> <li>■ Contact service.</li> </ul>		



**Diagnostic no. 311**      **Message: M311 Electronic failure**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	M (Maintenance)	
Diagnostic behavior:	Warning	
<b>Remedial measures</b>		
Maintenance required! <ul style="list-style-type: none"> <li>■ Do <b>not</b> reset device.</li> <li>■ Contact service.</li> </ul>		

**Diagnostic no. 350**      **Message: \*350 Pre-amplifier defective**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Alarm (factory setting)		
<b>Remedial measures</b>		
Change pre-amplifier.		

**Diagnostic no. 351**      **Message: F351 Pre-amplifier defective**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
Change pre-amplifier.		


**Diagnostic no. 370**      **Message: F370 Pre-amplifier defective**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	

Coding (hex):	0x24	<ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check plug connections.</li> <li>■ Check cable connection of remote version.</li> <li>■ Change pre-amplifier or main electronic module.</li> </ul>		

Diagnostic no. 371

Message: \*371 Temperature sensor defective

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	M (Maintenance)	
<b>Diagnostic behavior</b> , configurable (->  135)		
Warning (factory setting)		
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check plug connections.</li> <li>■ Change pre-amplifier.</li> <li>■ Change DSC sensor.</li> </ul>		

### 12.5.3 Diagnostics for the configuration

Diagnostic no. 410

Message: F410 Data transfer

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check connection.</li> <li>■ Retry data transfer.</li> </ul>		

Diagnostic no. 411

Message: C411 Up-/download active

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> </ul>
Quality Substatus:	Function check	
Coding (hex):	0x3C	
Category (NE107):	C (Check)	
Diagnostic behavior:	Warning	

<b>Remedial measures</b>	<ul style="list-style-type: none"> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Up-/download active: Wait until the up-/download is complete.	

**Diagnostic no. 411 Message: C411 Up-/download active**

Measured value status		Measured variables concerned
Quality:	GOOD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Function check	
Coding (hex):	0x3C	
Category (NE107):	C (Check)	
<b>Remedial measures</b>		
Up-/download active: Wait until the up-/download is complete.		
Diagnostic behavior:	Warning	

**Diagnostic no. 437 Message: F437 Configuration incompatible**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Restart the device.</li> <li>■ Contact service.</li> </ul>		
Diagnostic behavior:	Alarm	

**Diagnostic no. 438 Message: M438 Dataset**

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Maintenance demanded	
Coding (hex):	0x68	
Category (NE107):	M (Maintenance)	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check data set file.</li> <li>■ Check device configuration.</li> <li>■ Up- and download new configuration.</li> </ul>		
Diagnostic behavior:	Warning	

**Diagnostic no. 453 Message: C453 Flow override**

Measured value status	Measured variables concerned
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Quality:	GOOD	<ul style="list-style-type: none"> <li>▪ Calculated saturated steam pressure</li> <li>▪ Energy flow</li> <li>▪ Flow velocity</li> <li>▪ Heat flow difference</li> <li>▪ Low flow cut off</li> <li>▪ Mass flow</li> <li>▪ Total mass flow</li> <li>▪ Status value pulse/freq./switch output</li> <li>▪ Corrected volume flow</li> <li>▪ Steam quality</li> <li>▪ Temperature</li> <li>▪ Volume flow</li> </ul>
Quality Substatus:	Function check	
Coding (hex):	0xBC	
Category (NE107):	C (Check)	
Diagnostic behavior:	Warning	
<b>Remedial measures</b>		
Deactivate flow override.		

## Diagnostic no. 482

## Message: F482 Block in OOS

Measured value status		Measured variables concerned
Quality:	BAD	-
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
Set block in AUTO mode.		

## Diagnostic no. 484

## Message: C484 Simulation failsafe mode

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>▪ Calculated saturated steam pressure</li> <li>▪ Energy flow</li> <li>▪ Flow velocity</li> <li>▪ Heat flow difference</li> <li>▪ Low flow cut off</li> <li>▪ Mass flow</li> <li>▪ Total mass flow</li> <li>▪ Status value pulse/freq./switch output</li> <li>▪ Corrected volume flow</li> <li>▪ Steam quality</li> <li>▪ Temperature</li> <li>▪ Volume flow</li> </ul>
Quality Substatus:	Function check	
Coding (hex):	0x3C	
Category (NE107):	C (Check)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
Deactivate simulation.		

## Diagnostic no. 485

## Message: C485 Simulation process variable

Measured value status		Measured variables concerned
Quality:	GOOD	<ul style="list-style-type: none"> <li>▪ Calculated saturated steam pressure</li> <li>▪ Energy flow</li> <li>▪ Flow velocity</li> <li>▪ Heat flow difference</li> <li>▪ Low flow cut off</li> <li>▪ Mass flow</li> <li>▪ Total mass flow</li> <li>▪ Status value pulse/freq./switch output</li> <li>▪ Corrected volume flow</li> <li>▪ Steam quality</li> <li>▪ Temperature</li> <li>▪ Volume flow</li> </ul>
Quality Substatus:	Function check	
Coding (hex):	0xBC	
Category (NE107):	C (Check)	
Diagnostic behavior:	Warning	
<b>Remedial measures</b>		
Deactivate simulation.		

**Diagnostic no. 492**      **Message: C492 Simulation frequency output**

Measured value status		Measured variables concerned
Quality:	GOOD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Function check	
Coding (hex):	0x80	
Category (NE107):	C (Check)	
Diagnostic behavior:	Warning	
<b>Remedial measures</b>		
Switch off frequency output simulation.		

**Diagnostic no. 493**      **Message: C493 Simulation pulse output**

Measured value status		Measured variables concerned
Quality:	GOOD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Function check	
Coding (hex):	0x80	
Category (NE107):	C (Check)	
Diagnostic behavior:	Warning	
<b>Remedial measures</b>		
Switch off pulse output simulation.		

**Diagnostic no. 494**      **Message: C494 Switch output simulation**

Measured value status		Measured variables concerned
Quality:	GOOD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Function check	
Coding (hex):	0xBC	
Category (NE107):	C (Check)	
Diagnostic behavior:	Warning	
<b>Remedial measures</b>		
Switch off switch output simulation.		

**Diagnostic no. 495**      **Message: C495 Simulation block output**

Measured value status		Measured variables concerned
Quality:	GOOD	-
Quality Substatus:	Function check	
Coding (hex):	0xBC	
Category (NE107):	C (Check)	
Diagnostic behavior:	Warning	
<b>Remedial measures</b>		

Deactivate simulation.	
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**Diagnostic no. 495 Message: C495 Simulation diagnostic event**

Measured value status		Measured variables concerned
Quality:	GOOD	-
Quality Substatus:	Function check	
Coding (hex):	0xBC	
Category (NE107):	C (Check)	
Diagnostic behavior: Warning		
Remedial measures		
Deactivate simulation.		

**Diagnostic no. 538 Message: S538 Computer configuration incorrect**

Measured value status		Measured variables concerned
Quality:	GOOD	<ul style="list-style-type: none"> <li>▪ Calculated saturated steam pressure</li> <li>▪ Energy flow</li> <li>▪ Heat flow difference</li> <li>▪ Low flow cut off</li> <li>▪ Mass flow</li> <li>▪ Total mass flow</li> <li>▪ Status value pulse/freq./switch output</li> <li>▪ Corrected volume flow</li> <li>▪ Steam quality</li> </ul>
Quality Substatus:	Function check	
Coding (hex):	0xBC	
Category (NE107):	S (Out of specification)	
Diagnostic behavior: Warning		
Remedial measures		
Check input value (pressure, temperature).		

**Diagnostic no. 539 Message: S539 Computer configuration incorrect**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>▪ Calculated saturated steam pressure</li> <li>▪ Energy flow</li> <li>▪ Heat flow difference</li> <li>▪ Low flow cut off</li> <li>▪ Mass flow</li> <li>▪ Total mass flow</li> <li>▪ Status value pulse/freq./switch output</li> <li>▪ Corrected volume flow</li> <li>▪ Steam quality</li> </ul>
Quality Substatus:	Function check	
Coding (hex):	0x3C	
Category (NE107):	S (Out of specification)	
Warning		
Diagnostic behavior:	Alarm	
Remedial measures		
<ul style="list-style-type: none"> <li>▪ Check input value (pressure, temperature).</li> <li>▪ Check allowed values of the medium properties.</li> </ul>		

**Diagnostic no. 570 Message: F570 Inverted delta heat**

Measured value status		Measured variables concerned
Quality:	BAD	Heat flow difference
Quality Substatus:	Function check	
Coding (hex):	0x3C	

Category (NE107):	F (Failure)
Diagnostic behavior:	Alarm
<b>Remedial measures</b>	
Check configuration of mounting location (parameter Installation direction).	

### 12.5.4 Diagnostics for the process

Diagnostic no. 801      Message: Supply voltage too low

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
Diagnostic behavior:	Warning	
<b>Remedial measures</b>		
Increase voltage.		

Diagnostic no. 825      Message: F825 Operating temperature

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x28	
Category (NE107):	F (Failure)	
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check ambient temperature.</li> <li>■ Check process temperature.</li> </ul>		

Diagnostic no. 828      Message: \*828 Ambient temperature too low

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
Increase ambient temperature of pre-amplifier.		

**Diagnostic no. 829**      **Message: \*829 Ambient temperature too high**

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
Reduce ambient temperature of pre-amplifier.		

**Diagnostic no. 832**      **Message: \*832 Ambient temperature too high**

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
Reduce ambient temperature.		

**Diagnostic no. 833**      **Message: \*833 Ambient temperature too low**

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
Increase ambient temperature.		

**Diagnostic no. 834**      **Message: \*834 Process temperature too high**

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		



Warning (factory setting)	<ul style="list-style-type: none"> <li>■ Steam quality</li> <li>■ Volume flow</li> </ul>
<b>Remedial measures</b>	
Reduce process temperature.	

**Diagnostic no. 835**      **Message: \*835 Process temperature too low**

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
Increase process temperature.		

**Diagnostic no. 841**      **Message: \*841 Flow velocity too high**

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
Reduce flow velocity.		

**Diagnostic no. 842**      **Message: S842 Process limit**

Measured value status		Measured variables concerned
Quality:	GOOD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	ok	
Coding (hex):	0x80	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> : Warning		
<b>Remedial measures</b>		
Low flow cut off active: Check settings for low flow cut off.		

**Diagnostic no. 844**      **Message: \*844 Sensor range exceeded**

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> </ul>

Quality Substatus:	Process related, no maintenance	<ul style="list-style-type: none"> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Volume flow</li> </ul>
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
Reduce flow velocity.		

## Diagnostic no. 862

## Message: S862 Partly filled pipe

Measured value status		Measured variables concerned
Quality:	GOOD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	ok	
Coding (hex):	0x80	
Category (NE107):	S (Out of specification)	
Diagnostic behavior: Warning		
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check for gas in process.</li> <li>■ Check detection limits.</li> </ul>		

## Diagnostic no. 870

## Message: \*870 Measuring inaccuracy increased

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check process.</li> <li>■ Increase flow volume.</li> </ul>		

## Diagnostic no. 871

## Message: \*871 Near steam saturation limit

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
Check process conditions.		

**Diagnostic no. 872**      **Message: \*872 Wet steam detected**

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Energy flow</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check process.</li> <li>■ Check plant.</li> </ul>		

**Diagnostic no. 873**      **Message: \*873 No steam detected**

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
Check process (water in piping).		

**Diagnostic no. 874**      **Message: S874 Wet steam detection uncertain**

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> : Warning		
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check pressure, temperature..</li> <li>■ Check flow velocity.</li> <li>■ Check for flow fluctuation.</li> </ul>		

**Diagnostic no. 882**      **Message: F882 Input signal**

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> </ul>
Quality Substatus:	Maintenance alarm, more diagnosis available	
Coding (hex):	0x24	

Category (NE107):	F (Failure)	<ul style="list-style-type: none"> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul>
Diagnostic behavior:	Alarm	
<b>Remedial measures</b>		
<ul style="list-style-type: none"> <li>■ Check input configuration.</li> <li>■ Check pressure sensor or process conditions.</li> </ul>		

## Diagnostic no. 945

Message: \*945 Sensor range exceeded

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Warning (factory setting)		
<b>Remedial measures</b>		
Check immediately process conditions (pressure-temperature rating).		

## Diagnostic no. 946

Message: S946 Vibration detected

Measured value status		Measured variables concerned
Quality:	UNCERTAIN	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x78	
Category (NE107):	S (Out of specification)	
Diagnostic behavior:	Warning	
<b>Remedial measures</b>		
Check installation.		




## Diagnostic no. 947

Message: \*947 Vibration exceeded

Measured value status		Measured variables concerned
Quality:	BAD	<ul style="list-style-type: none"> <li>■ Calculated saturated steam pressure</li> <li>■ Energy flow</li> <li>■ Flow velocity</li> <li>■ Heat flow difference</li> <li>■ Low flow cut off</li> <li>■ Mass flow</li> <li>■ Total mass flow</li> <li>■ Status value pulse/freq./switch output</li> <li>■ Corrected volume flow</li> <li>■ Steam quality</li> <li>■ Volume flow</li> </ul>
Quality Substatus:	Process related, no maintenance	
Coding (hex):	0x28	
Category (NE107):	S (Out of specification)	
<b>Diagnostic behavior</b> , configurable (→ ⓘ 135)		
Alarm (factory setting)		
<b>Remedial measures</b>		
Check installation.		

## 12.6 Pending diagnostic events

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

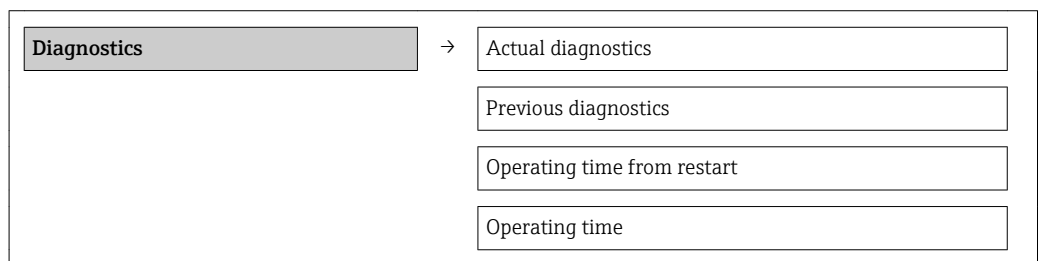
-  To call up the measures to rectify a diagnostic event:
  - Via local display (→  132)
  - Via "FieldCare" operating tool (→  133)

-  Other pending diagnostic events can be displayed in the **Diagnostic list** submenu(→  157)


### Navigation

"Diagnostics" menu

### Structure of the submenu



### Parameter overview with brief description

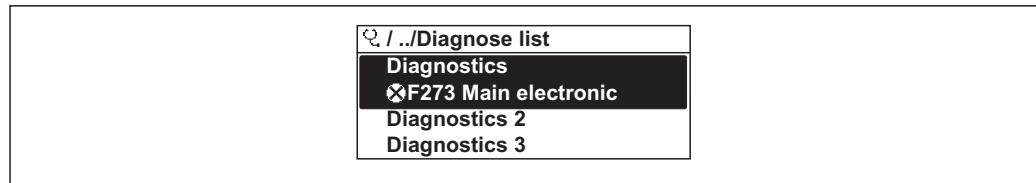
Parameter	Prerequisite	Description	User interface	Factory setting
Actual diagnostics	1 diagnostic event has occurred.	Displays the current diagnostic event along with the diagnostic information.  If two or more messages occur simultaneously, the message with the highest priority is shown on the display.	Symbol for diagnostic behavior, diagnostic code and short message.	-
Previous diagnostics	2 diagnostic events have already occurred.	Displays the diagnostic event that occurred prior to the current diagnostic event along with the 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), seconds (s)	-
Operating time	-	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m), seconds (s)	-

## 12.7 Diagnostic list

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

### Navigation path

**Diagnostics** menu → **Diagnostic list** submenu



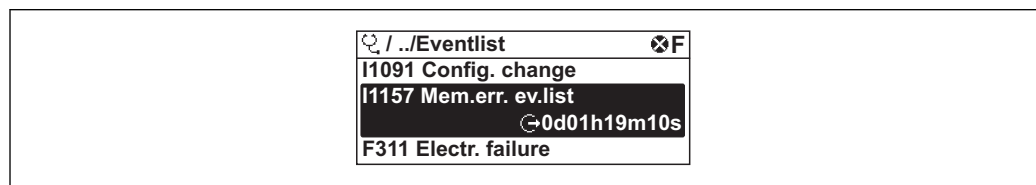
A0014006-EN

31 Illustrated using the example of the local display

- i** To call up the measures to rectify a diagnostic event:
- Via local display (→ 132)
  - Via "FieldCare" operating tool (→ 133)

## 12.8 Event logbook

### 12.8.1 Event history



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32 Illustrated using the example of the local display

- i** To call up the measures to rectify a diagnostic event:
- Via local display (→ 132)
  - Via "FieldCare" operating tool (→ 133)
- i** For filtering the displayed event messages (→ 158)

### 12.8.2 Filtering the event logbook

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

#### Navigation path

"Diagnostics" menu → Event logbook → Filter options

#### Filter categories

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

### 12.8.3 Overview of information events

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

Info number	Info name
I1000	----- (Device ok)
I1079	Sensor changed

Info number	Info name
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed
I1092	Trend data deleted
I1110	Write protection switch changed
I1137	Electronic changed
I1151	History reset
I1154	Reset terminal voltage min/max
I1155	Reset electronic temperature
I1156	Memory error trend
I1157	Memory error event list
I1185	Display backup done
I1186	Restore via display done
I1187	Settings downloaded with display
I1188	Display data cleared
I1189	Backup compared
I1227	Sensor emergency mode activated
I1228	Sensor emergency mode failed
I1256	Display: access status changed
I1264	Safety sequence aborted
I1335	Firmware changed
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1444	Device verification passed
I1445	Device verification failed
I1459	Failed: I/O module verification
I1461	Failed: Sensor verification
I1512	Download started
I1513	Download finished
I1514	Upload started
I1515	Upload finished
I1552	Failed: Main electronic verification
I1553	Failed: Pre-amplifier verification

## 12.9 Resetting the measuring device

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

### Navigation

"Setup" menu → Advanced setup → Administration → Device reset

▶ Administration

▶ Define access code

Define access code

Confirm access code

Device reset

### Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Device reset	Restart or reset device manually.	<ul style="list-style-type: none"> <li>■ Cancel</li> <li>■ To fieldbus defaults <sup>1)</sup></li> <li>■ To factory defaults</li> <li>■ To delivery settings</li> <li>■ Restart device</li> </ul>	Cancel

1) Visibility depends on communication

#### 12.9.1 Function scope of "Device reset" parameter

Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting.
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.
History reset	Every parameter is reset to its factory setting.

### 12.10 Device information

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

#### Navigation

"Diagnostics" menu → Device information

▶ Device information

Device tag

Serial number

Firmware version

Device name





Order code
Extended order code 1
Extended order code 2
Extended order code 3
ENP version


### Parameter overview with brief description


Parameter	Description	User interface	Factory setting
Device tag	Enter the name for the measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /)	Prowirl 200 PA
Serial number	Displays the serial number of the measuring device.	Max. 11-digit character string comprising letters and numbers.	79AFF16000
Firmware version	Displays the device firmware version installed.	Character string with the following format: xx.yy.zz	01.01
Device name	Displays the name of the transmitter.	Character string composed of letters, numbers and certain punctuation marks.	Prowirl 200 PA
Order code	Displays the device order code.	Character string composed of letters, numbers and certain punctuation marks	-
Extended order code 1	Displays the 1st part of the extended order code.	Character string	-
Extended order code 2	Displays the 2nd part of the extended order code.	Character string	-
Extended order code 3	Displays the 3rd part of the extended order code.	Character string	-
ENP version	Displays the version of the electronic nameplate.	Character string in the format xx.yy.zz	2.02.00
PROFIBUS ident number		0 to 65 535	5 476
Status PROFIBUS Master Config		<ul style="list-style-type: none"> <li>■ Active</li> <li>■ Not active</li> </ul>	Not active

## 12.11 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
10.2014	01.01.00	Option 73	<ul style="list-style-type: none"> <li>▪ No need to restart device after parameter download</li> <li>▪ Additional process variables:               <ul style="list-style-type: none"> <li>- Pressure</li> <li>- Degree of overheating</li> <li>- Specific volume</li> </ul> </li> <li>▪ Process variables interconnectable with onsite display and data logger (trend)</li> <li>▪ Additional AI channels:               <ul style="list-style-type: none"> <li>- Pressure</li> <li>- Degree of overheating</li> <li>- Specific volume</li> <li>- Density</li> <li>- Reynolds number</li> </ul> </li> <li>▪ Verification progress is displayed (0-100%)</li> <li>▪ New Wet Steam Measurement application package</li> <li>▪ Operation in steam simplified</li> <li>▪ More robust signal processing in event of low flow rates in wet steam</li> </ul>	Operating Instructions	BA01223D/06/EN/01.14
10.2013	01.00.00	Option 77	Original firmware	Operating Instructions	BA01223D/06/EN/01.13

 Flashing the firmware to the current version or to the previous version is possible via the service interface (CDI) (→  191).

 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 Internet site: [www.endress.com](http://www.endress.com) → Download
- Specify the following details:
  - Text search: Manufacturer's information
  - Search range: 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

##### NOTICE

**The use of unsuitable equipment or cleaning liquids can damage the transducer.**

- ▶ Do not use pigs to clean the pipe.

#### 13.1.3 Replacing seals

##### Replacing sensor seals

##### NOTICE

**Under normal circumstances, wetted seals must not be replaced.**

Replacement is necessary only in special circumstances, for example if aggressive or corrosive fluids are incompatible with the seal material.

- ▶ The time span between the individual replacement procedures depends on the fluid properties.
- ▶ Only Endress+Hauser sensor seals may be used: replacement seals

##### Replacing housing seals

The housing seals must be clean and undamaged when inserted into their grooves. Dry, clean or replace the seals if necessary.


##### NOTICE


**When the measuring device is used in a dusty atmosphere:**

- ▶ only use the associated Endress+Hauser housing seals.

### 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.

 For a list of some of the measuring and test equipment, refer to the "Accessories" chapter of the "Technical Information" document for the device.

### 13.3 Endress+Hauser services

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

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

# 14 Repair

## 14.1 General notes

### 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 correspondingly trained customers.
- Certified devices can be converted into other certified devices by Endress+Hauser Service or at the factory only.

### Notes for repair and conversion

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

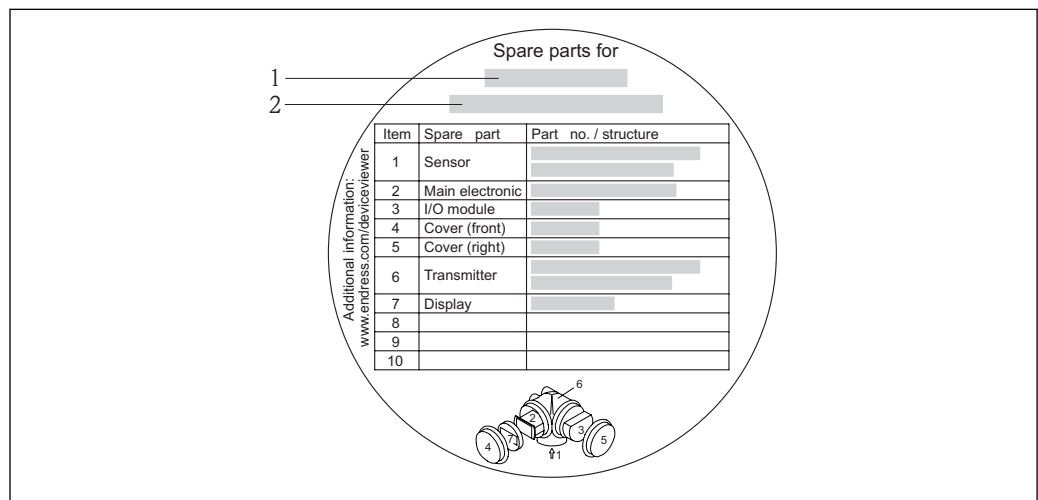
- Use only original Endress+Hauser spare parts.
- Carry out the repair according to the Installation Instructions.
- Observe the applicable standards, federal/national regulations, Ex documentation (XA) and certificates.
- Document every repair and each conversion and enter them into the W@M life cycle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

## 14.2 Spare parts

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

The spare part overview sign contains the following information:



- A list of the most important spare parts for the measuring device, including their ordering information.
- The URL for the W@M Device Viewer ([www.endress.com/deviceviewer](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.



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33 Example for "Spare part overview sign" in connection compartment cover

- 1 Measuring device name
- 2 Measuring device serial number

-  Measuring device serial number:
- Is located on the device nameplate and the spare part overview sign.
  - Can be read out via the **Serial number** parameter in the **Device information** submenu (→  160).

### 14.3 Endress+Hauser services

-  Contact your Endress+Hauser Sales Center for information on services and spare parts.

### 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.
2. **WARNING!** Danger to persons from process conditions. Beware of hazardous process conditions such as pressure in the measuring device, high temperatures or aggressive fluids.

Carry out the mounting and connection steps from the chapters "Mounting the measuring device" and "Connecting the measuring device" in the logically reverse sequence. 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 transmitter


Accessories	Description
Prowirl 200 transmitter	<p>Transmitter for replacement or for stock. Use the order code to define the following specifications:</p> <ul style="list-style-type: none"> <li>▪ Approvals</li> <li>▪ Output</li> <li>▪ Display / operation</li> <li>▪ Housing</li> <li>▪ Software</li> </ul> <p> For details, see Installation Instructions EA01056D</p>
Remote display FHX50	<p>FHX50 housing to accommodate a display module (→  192).</p> <ul style="list-style-type: none"> <li>▪ FHX50 housing suitable for: <ul style="list-style-type: none"> <li>– SD02 display module (push buttons)</li> <li>– SD03 display module (touch control)</li> </ul> </li> <li>▪ Housing material: <ul style="list-style-type: none"> <li>– Plastic PBT</li> <li>– 316L</li> </ul> </li> <li>▪ Length of connecting cable: up to max. 60 m (196 ft) (cable lengths available for order: 5 m (16 ft), 10 m (32 ft), 20 m (65 ft), 30 m (98 ft))</li> </ul> <p>The measuring device can be ordered with the FHX50 housing and a display module. The following options must be selected in the separate order codes:</p> <ul style="list-style-type: none"> <li>▪ Order code for measuring device, feature 030: Option L or M "Prepared for FHX50 display"</li> <li>▪ Order code for FHX50 housing, feature 050 (device version): Option A "Prepared for FHX50 display"</li> <li>▪ Order code for FHX50 housing, depends on the desired display module in feature 020 (display, operation): <ul style="list-style-type: none"> <li>– Option C: for an SD02 display module (push buttons)</li> <li>– Option E: for an SD03 display module (touch control)</li> </ul> </li> </ul> <p>The FHX50 housing can also be ordered as a retrofit kit. The measuring device display module is used in the FHX50 housing. The following options must be selected in the order code for the FHX50 housing:</p> <ul style="list-style-type: none"> <li>▪ Feature 050 (measuring device version): option B "Not prepared for FHX50 display"</li> <li>▪ Feature 020 (display, operation): option A "None, existing displayed used"</li> </ul> <p> For details, see Special Documentation SD01007F</p>
Overvoltage protection for 2-wire devices	<p>Ideally, the overvoltage protection module should be ordered directly with the device. See product structure, characteristic 610 "Accessory mounted", option NA "Overvoltage protection". Separate order necessary only if retrofitting.</p> <ul style="list-style-type: none"> <li>▪ OVP10: For 1-channel devices (characteristic 020, option A):</li> <li>▪ OVP20: For 2-channel devices (characteristic 020, options B, C, E or G)</li> </ul> <p> For details, see Special Documentation SD01090F.</p>
Weather protection cover	<p>Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight or extreme cold in winter.</p> <p> For details, see Special Documentation SD00333F</p>

Connecting cable for remote version	<ul style="list-style-type: none"> <li>▪ Connecting cable available in various lengths:                             <ul style="list-style-type: none"> <li>- 5 m (16 ft)</li> <li>- 10 m (32 ft)</li> <li>- 20 m (65 ft)</li> <li>- 30 m (98 ft)</li> </ul> </li> <li>▪ Reinforced cables available on request.</li> </ul> <p> Standard length: 5 m (16 ft) Is always supplied if no other cable length has been ordered.</p>
Post mounting kit	<p>Post mounting kit for transmitter.</p> <p> The post mounting kit can only be ordered together with a transmitter.</p>


### 15.1.2 For the sensor



Accessories	Description
Flow conditioner	Is used to shorten the necessary inlet run.

## 15.2 Service-specific accessories

Accessories	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> <li>▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections.</li> <li>▪ Graphic illustration of the calculation results</li> </ul> <p>Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.</p> <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>▪ On CD-ROM for local PC installation.</li> </ul>
W@M	<p>Life cycle management for your plant</p> <p>W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle.</p> <p>The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records.</p> <p>W@M is available:</p> <ul style="list-style-type: none"> <li>▪ Via the Internet: <a href="http://www.endress.com/lifecyclemanagement">www.endress.com/lifecyclemanagement</a></li> <li>▪ On CD-ROM for local PC installation.</li> </ul>
FieldCare	<p>FDT-based plant asset management tool from Endress+Hauser.</p> <p>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>

## 15.3 System components

Accessories	Description
Memograph M graphic display recorder	<p>The Memograph M graphic display recorder provides information on all 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>

Cerabar M	<p>The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.</p> <p> For details, see "Technical Information" TI00426P, TI00436P and Operating Instructions BA00200P, BA00382P</p>
Cerabar S	<p>The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.</p> <p> For details, see "Technical Information" TI00383P and Operating Instructions BA00271P</p>




## 16 Technical data

### 16.1 Application

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 adequately resistant.

### 16.2 Function and system design

Measuring principle	Vortex meters work on the principle of the <i>Karman vortex street</i> .
Measuring system	<p>The device consists of a transmitter and a sensor.</p> <p>Two device versions are available:</p> <ul style="list-style-type: none"> <li>■ Compact version - the transmitter and sensor form a mechanical unit.</li> <li>■ Remote version – the transmitter and sensor are mounted separately from one another.</li> </ul> <p>For information on the structure of the device (→  11)</p>

### 16.3 Input

Measured variable	<p><b>Direct measured variables</b></p> <p>Order code for "Sensor version":</p> <ul style="list-style-type: none"> <li>■ Option 4 "Volume flow, Alloy 718" and</li> <li>■ Option 5 "Volume flow, titanium": Volume flow</li> </ul> <p>Order code for "Sensor version":</p> <p>Option 6 "Mass flow, Alloy 718":</p> <ul style="list-style-type: none"> <li>– Volume flow</li> <li>– Temperature</li> </ul> <p><b>Calculated measured variables</b></p> <p>Order code for "Sensor version":</p> <ul style="list-style-type: none"> <li>■ Option 4 "Volume flow, Alloy 718" and</li> <li>■ Option 5 "Volume flow, titanium":             <ul style="list-style-type: none"> <li>– In the case of constant process conditions: Mass flow<sup>1)</sup> or Corrected volume flow</li> <li>– The totalized values for Volume flow, Mass flow, or Corrected volume flow</li> </ul> </li> </ul> <p>Order code for "Sensor version":</p> <p>Option 6 "Mass flow, Alloy 718":</p> <ul style="list-style-type: none"> <li>– Corrected volume flow</li> <li>– Mass flow</li> <li>– Calculated saturated steam pressure</li> <li>– Energy flow</li> </ul>
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1) A fixed density must be entered for calculating the mass flow (Setup menu → Advanced setup submenu → External compensation submenu → Fixed density parameter).

- Heat flow difference
- Specific volume
- Degrees of superheat

### Calculation of the measured variables

The meter electronics system of the Prowirl 200 unit with the order code "Sensor version", option 3 "Mass flow, Alloy 718" has a flow computer. This computer can calculate the following secondary measured variables directly from the primary measured variables recorded using the pressure value (entered or external) and/or temperature value (measured or entered).

### Mass flow and corrected volume flow

Medium	Fluid	Standards	Explanation	
Steam <sup>1)</sup>	–	IAPWS-IF97/ ASME	If the device features integrated temperature measurement and in the event of a fixed process pressure, or if the pressure is read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus	
Gas	Single gas	NEL40	In the event of a fixed process pressure, or if the pressure is read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus	
	Gas mixture	NEL40		
	Air	NEL40		
	Natural gas		ISO 12213-2	Contains AGA8-DC92 In the event of a fixed process pressure, or if the pressure is read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus
			AGA NX-19	In the event of a fixed process pressure, or if the pressure is read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus
			ISO 12213-3	Contains SGERG-88, AGA8 Gross Method 1 In the event of a fixed process pressure, or if the pressure is read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus
Other gases	Linear equation	Ideal gases In the event of a fixed process pressure, or if the pressure is read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus		
Liquids	Water	IAPWS-IF97/ ASME		
	Liquefied gas	Tables	Propane and butane mixture	
	Other liquid	Linear equation	Ideal liquids	

- 1) The Prowirl 200 is able to calculate the volume flow, and other measured variables derived from the volume flow, across all steam types with full compensation using the pressure and temperature. For information on setting the device behavior, see the "Perform external compensation" section (→ 99)

### Mass flow calculation

Volume flow × operating density

- Operating density for saturated steam, water and other liquids: depends on the temperature
- Operating density for superheated steam and all other gases: depends on the temperature and process pressure

### Corrected volume flow calculation

(Volume flow × operating density)/reference density

- Operating density for water and other liquids: depends on the temperature
- Operating density for all other gases: depends on the temperature and process pressure

*Energy flow*

Medium	Fluid	Standards	Explanation	Heat/energy option
Steam <sup>1)</sup>	–	IAPWS-IF97/ASME	In the event of a fixed process pressure, or if the pressure is read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus	Heat Gross calorific value <sup>2)</sup> in relation to mass Net calorific value <sup>3)</sup> in relation to mass Gross calorific value <sup>2)</sup> in relation to corrected volume Net calorific value <sup>3)</sup> in relation to corrected volume
Gas	Single gas	ISO 6976	Contains GPA 2172 In the event of a fixed process pressure, or if the pressure is read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus	
	Gas mixture	ISO 6976	Contains GPA 2172 In the event of a fixed process pressure, or if the pressure is read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus	
	Air	NEL40	In the event of a fixed process pressure, or if the pressure is read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus	
	Natural gas	ISO 6976	Contains GPA 2172 In the event of a fixed process pressure, or if the pressure is read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus	
AGA 5				
Liquids	Water	IAPWS-IF97/ASME		
	Liquefied gas	ISO 6976	Contains GPA 2172	
	Other liquid	Linear equation		

- 1) The Prowirl 200 is able to calculate the volume flow, and other measured variables derived from the volume flow, across all steam types with full compensation using the pressure and temperature. For information on setting the device behavior, see the "Perform external compensation" section (→ ☰ 99)
- 2) Gross calorific value: combustion energy + condensation energy of the flue gas (gross calorific value > net calorific value)
- 3) Net calorific value: only combustion energy




*Mass flow and energy flow calculation*

**NOTICE**

**The process pressure (p) in the process pipe is required to calculate the process variables and the limit values of the measuring range.**

- ▶ In the case of the PROFIBUS PA device, the process pressure can be transmitted from the Profibus master to the measuring device via the AO Block or entered as a fixed value in the **External compensation** submenu (→ ☰ 99) .

Steam is calculated based on the following factors:

- The measuring device calculates the density with full compensation using the pressure and temperature measured variables.
- Assuming superheated steam conditions the measuring device calculates until the saturation point is reached. The diagnostic behavior of the diagnostic message **△S871 Near steam saturation limit** is set to **Off** (ex works) as standard (→  137). This diagnostic behavior can optionally be redefined as an alarm or a warning (→  135). At 2 K above saturation, the diagnostic message **△S871 Near steam saturation limit** is then triggered.
- The smaller of the following two pressure values is always used to calculate the density:
  - The measured pressure which is either entered as Fixed process pressure (→  80) ≠ 0 bar abs. or as an external pressure value read in via the current input/HART/PROFIBUS PA/FOUNDATION Fieldbus
  - The saturated steam pressure which is determined from the saturated steam line (IAPWS-IF97/ASME)
- If the fixed process pressure = 0 bar abs. the measuring device only calculates on the saturated steam curve using temperature compensation.

 For detailed information on performing external compensation: (→  99)

*Calculated value*

The unit calculates the mass flow, heat flow, energy flow, density and specific enthalpy from the measured volume flow and the measured temperature and/or the pressure based on international standard IAPWS-IF97/ASME.

Formulae for calculation:

- Mass flow:  $m = q \cdot \rho (T, p)$
- Heat quantity:  $E = q \cdot \rho (T, p) \cdot h_D (T, p)$

$m$  = Mass flow

$E$  = Heat quantity

$q$  = Volume flow (measured)

$h_D$  = Specific enthalpy

$T$  = Process temperature (measured)

$p$  = Process pressure

$\rho$  = Density<sup>2)</sup>

*Pre-programmed gases*

*The following gases are pre-programmed in the flow computer:*

Hydrogen <sup>1)</sup>	Helium 4	Neon	Argon
Krypton	Xenon	Nitrogen	Oxygen
Chlorine	Ammonia	Carbon monoxide <sup>1)</sup>	Carbon dioxide
Sulfur dioxide	Hydrogen sulfide <sup>1)</sup>	Hydrogen chloride	Methane <sup>1)</sup>
Ethane <sup>1)</sup>	Propane <sup>1)</sup>	Butane <sup>1)</sup>	Ethylene (ethene) <sup>1)</sup>
Vinyl chloride	Mixtures of up to 8 components of these gases <sup>1)</sup>		

1) The energy flow is calculated as per ISO 6976 (contains GPA 2172) or AGA5 - in relation to the net calorific value or gross calorific value .


2) From steam data as per IAPWS-IF97 (ASME), for the measured temperature and the specified pressure

*Energy flow calculation*

Volume flow × operating density × specific enthalpy

- Operating density for saturated steam and water: depends on the temperature
- Operating density for superheated steam, natural gas ISO 6976 (contains GPA 2172), natural gas AGA5: depends on the temperature and pressure

*Heat flow difference*

- Between saturated steam upstream from a heat exchanger and condensate downstream from the heat exchanger (second temperature read in via current input/HART/PROFIBUS PA/FOUNDATION Fieldbus) in accordance with IAPWS-IF97/ASME (→  25).
- Between warm water and cold water (second temperature read in via current input/HART/PROFIBUS PA/FOUNDATION Fieldbus) in accordance with IAPWS-IF97/ASME.

*Vapor pressure and steam temperature*

The measuring device can perform the following in saturated steam measurements between the feed line and return line of any heating liquid (second temperature read in via current input/HART/PROFIBUS PA/FOUNDATION Fieldbus and Cp value entered):

- Calculate the saturation pressure of the steam from the measured temperature and output the value in accordance with IAPWS-IF97/ASME.
- Calculate the saturation temperature of the steam from the specified pressure and output the value in accordance with IAPWS-IF97/ASME.

Measuring range

The measuring range depends on the fluid and nominal diameter.

**Lower range value**

Depends on the density and the Reynolds number ( $Re_{min} = 5\,000$ ,  $Re_{linear} = 20\,000$ ). The Reynolds number is dimensionless and indicates the ratio of the inertia force of a fluid to its viscous force. It is used to characterize the flow. The Reynolds number is calculated as follows:

$$Re = \frac{4 \cdot Q \text{ [m}^3\text{/s]} \cdot \rho \text{ [kg/m}^3\text{]}}{\pi \cdot di \text{ [m]} \cdot \mu \text{ [Pa}\cdot\text{s]}} \qquad Re = \frac{4 \cdot Q \text{ [ft}^3\text{/s]} \cdot \rho \text{ [lb/ft}^3\text{]}}{\pi \cdot di \text{ [ft]} \cdot \mu \text{ [0.001 cP]}}$$

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*Re = Reynolds number; Q = flow; di = internal diameter; μ = dynamic viscosity, ρ = density*

$$\begin{aligned} \text{DN 15...150} &\rightarrow v_{min.} = \frac{6}{\sqrt{\rho \text{ [kg/m}^3\text{]}}} \text{ [m/s]} \\ \text{DN } \frac{1}{2}\text{...6"} &\rightarrow v_{min.} = \frac{4.92}{\sqrt{\rho \text{ [lb/ft}^3\text{]}}} \text{ [ft/s]} \end{aligned}$$

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**Upper range value**

**Liquids:**



The upper range value must be calculated as follows:

$v_{max} = 9 \text{ m/s (30 ft/s)}$  and  $v_{max} = 350/\sqrt{\rho} \text{ m/s (130/\sqrt{\rho} ft/s)}$

► Use the lower value.

*Gas/steam:*

Nominal diameter	$v_{max}$
Standard device: DN 15 (½")	46 m/s (151 ft/s) and $350/\sqrt{\rho} \text{ m/s (130/\sqrt{\rho} ft/s)}$ (Use the lower value.)
Standard device: DN 25 (1"), DN 40 (1½")	75 m/s (246 ft/s) and $350/\sqrt{\rho} \text{ m/s (130/\sqrt{\rho} ft/s)}$ (Use the lower value.)
Standard device: DN 50 to 150 (2 to 8")	120 m/s (394 ft/s) and $350/\sqrt{\rho} \text{ m/s (130/\sqrt{\rho} ft/s)}$ (Use the lower value.) Calibrated range: up to 75 m/s (246 ft/s)

 For information about the Applicator (→  167)

Operable flow range




Up to 45: 1 (ratio between lower and upper range value)

Input signal

**External measured values**

To increase the accuracy of certain measured variables or to calculate the corrected volume flow, the automation system can continuously write different measured values to the measuring device:

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

-  Various pressure transmitters can be ordered from Endress+Hauser: see "Accessories" section (→  167)
- Please comply with the special mounting instructions when using pressure transmitters (→  25)

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

- Energy flow
- Mass flow
- Corrected volume flow

*Fieldbus*

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

## 16.4 Output

Output signal

**Pulse/frequency/switch output**

<b>Function</b>	Can be set to pulse, frequency or switch output
<b>Version</b>	Passive, open collector
<b>Maximum input values</b>	<ul style="list-style-type: none"> <li>▪ DC 35 V</li> <li>▪ 50 mA</li> </ul>
<b>Voltage drop</b>	<ul style="list-style-type: none"> <li>▪ For ≤2 mA: 2 V</li> <li>▪ For 10 mA: 8 V</li> </ul>
<b>Residual current</b>	≤0.05 mA
<b>Pulse output</b>	
<b>Pulse width</b>	Adjustable: 5 to 2 000 ms
<b>Maximum pulse rate</b>	100 Impulse/s
<b>Pulse value</b>	Adjustable
<b>Assignable measured variables</b>	<ul style="list-style-type: none"> <li>▪ Total volume flow</li> <li>▪ Total corrected volume flow</li> <li>▪ Total mass flow</li> <li>▪ Total energy flow</li> <li>▪ Total heat flow difference</li> </ul>
<b>Frequency output</b>	
<b>Output frequency</b>	Adjustable: 0 to 1 000 Hz
<b>Damping</b>	Adjustable: 0 to 999 s
<b>Pulse/pause ratio</b>	1:1



<b>Assignable measured variables</b>	<ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Mass flow</li> <li>■ Flow velocity</li> <li>■ Temperature</li> <li>■ Calculated saturated steam pressure</li> <li>■ Steam quality</li> <li>■ Total mass flow</li> <li>■ Energy flow</li> <li>■ Heat flow difference</li> </ul>
<b>Switch output</b>	
<b>Switching behavior</b>	Binary, conductive or non-conductive
<b>Switching delay</b>	Adjustable: 0 to 100 s
<b>Number of switching cycles</b>	Unlimited
<b>Assignable functions</b>	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> <li>■ Diagnostic behavior</li> <li>■ Limit value                             <ul style="list-style-type: none"> <li>- Volume flow</li> <li>- Corrected volume flow</li> <li>- Mass flow</li> <li>- Flow velocity</li> <li>- Temperature</li> <li>- Calculated saturated steam pressure</li> <li>- Steam quality</li> <li>- Total mass flow</li> <li>- Energy flow</li> <li>- Heat flow difference</li> <li>- Reynolds number</li> <li>- Totalizer 1-3</li> </ul> </li> <li>■ Status</li> <li>■ Status of low flow cut off</li> </ul>

**PROFIBUS PA**

<b>Signal encoding</b>	Manchester Bus Powered (MBP)
<b>Data transfer</b>	31.25 KBit/s, Voltage mode

Signal on alarm

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

**Pulse/frequency/switch output**

<b>Pulse output</b>	
<b>Failure mode</b>	No pulses
<b>Frequency output</b>	
<b>Failure mode</b>	Choose from: <ul style="list-style-type: none"> <li>■ Actual value</li> <li>■ Defined value: 0 to 1 250 Hz</li> <li>■ 0 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>

**PROFIBUS PA**

<b>Status and alarm messages</b>	Diagnostics in accordance with PROFIBUS PA Profile 3.02
<b>Error current FDE (Fault Disconnection Electronic)</b>	0 mA

**Local display**

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

 Status signal as per NAMUR recommendation NE 107

**Operating tool**

- Via digital communication:  
PROFIBUS PA
- Via service interface

<b>Plain text display</b>	With information on cause and remedial measures
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Low flow cut off                      The switch points for low flow cut off are user-selectable.

Galvanic isolation                    All outputs are galvanically isolated from one another.

Protocol-specific data

**PROFIBUS PA**

<b>Manufacturer ID</b>	0x11
<b>Ident number</b>	0x1564
<b>Profile version</b>	3.02
<b>Device description files (GSD, DTM, DD)</b>	Information and files under: <ul style="list-style-type: none"> <li>■ <a href="http://www.endress.com">www.endress.com</a></li> <li>■ <a href="http://www.profibus.org">www.profibus.org</a></li> </ul>
<b>Output values</b> (from measuring device to automation system)	<p><b>Analog input 1 to 4</b></p> <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>■ Pressure</li> <li>■ Specific volume</li> <li>■ Degree of overheating</li> </ul> <p><b>Digital input 1 to 2</b></p> <ul style="list-style-type: none"> <li>■ Status</li> <li>■ Low flow cut off</li> <li>■ Switch output</li> </ul> <p><b>Totalizer 1 to 3</b></p> <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> </ul>

<b>Input values</b> (from automation system to measuring device)	<b>Analog output</b> External pressure, gage pressure, density, temperature or second temperature (for delta heat measurement)  <b>Digital output 1 to 3 (fixed assignment)</b> <ul style="list-style-type: none"> <li>▪ Digital output 1: switch positive zero return on/off</li> <li>▪ Digital output 2: switch switch output on/off</li> <li>▪ Digital output 3: Start verification</li> </ul> <b>Totalizer 1 to 3</b> <ul style="list-style-type: none"> <li>▪ Totalize</li> <li>▪ Reset and hold</li> <li>▪ Preset and hold</li> </ul>
<b>Supported functions</b>	<ul style="list-style-type: none"> <li>▪ Identification &amp; Maintenance Simplest device identification on the part of the control system and nameplate</li> <li>▪ PROFIBUS upload/download Reading and writing parameters is up to ten times faster with PROFIBUS upload/download</li> <li>▪ Condensed status Simplest and self-explanatory diagnostic information by categorizing diagnostic messages that occur</li> </ul>
<b>Configuration of the device address</b>	<ul style="list-style-type: none"> <li>▪ DIP switches on the I/O electronics module</li> <li>▪ Local display</li> <li>▪ Via operating tools (e.g. FieldCare)</li> </ul>

## 16.5 Power supply

Terminal assignment (→  33)

Pin assignment, device plug (→  34)

Supply voltage

### Transmitter

An external power supply is required for each output. The following supply voltage values apply for PROFIBUS PA and the pulse/frequency/switch output:

*Supply voltage for a compact version without a local display <sup>1)</sup>*

Order code for "Output"	Minimum terminal voltage <sup>2)</sup>	Maximum terminal voltage
Option <b>G</b> : PROFIBUS PA, pulse/frequency/switch output	≥DC 9 V	DC 32 V

1) In event of external supply voltage of the PROFIBUS DP/PA coupler

2) The minimum terminal voltage increases if local operation is used: see the following table

### *Increase in minimum terminal voltage*

Local operation	Increase in minimum terminal voltage
Order code for "Display; Operation", option <b>C</b> : Local operation SDO2	+ DC 1 V
Order code for "Display; Operation", option <b>E</b> : Local operation SDO3 with lighting (backlighting <b>not used</b> )	+ DC 1 V
Order code for "Display; Operation", option <b>E</b> : Local operation SDO3 with lighting (backlighting <b>used</b> )	+ DC 3 V

Power consumption

**Transmitter**

Order code for "Output"	Maximum power consumption
Option G: PROFIBUS PA, pulse/frequency/switch output	<ul style="list-style-type: none"> <li>▪ Operation with output 1: 512 mW</li> <li>▪ Operation with output 1 and 2: 2.512 mW</li> </ul>

Current consumption


**PROFIBUS PA**

15 mA

Power supply failure

- Totalizers stop at the last value measured.
- Configuration is retained in the device memory (HistoROM).
- Error messages (incl. total operated hours) are stored.

Electrical connection


(→  36)

Potential equalization

**Requirements**

Please consider the following to ensure correct measurement:

- Same electrical potential for the fluid and sensor
- Remote version: same electrical potential for the sensor and transmitter
- Company-internal grounding concepts
- Pipe material and grounding

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

Terminals

- For device version without integrated overvoltage protection: plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm<sup>2</sup> (20 to 14 AWG)
- For device version with integrated overvoltage protection: screw terminals for wire cross-sections 0.2 to 2.5 mm<sup>2</sup> (24 to 14 AWG)

Cable entries


- Cable gland: M20 × 1.5 with cable  $\phi$ 6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
  - NPT 1/2"
  - G 1/2"

Cable specification



(→  30)

Overvoltage protection

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



<b>Input voltage range</b>	Values correspond to supply voltage specifications (→  35) <sup>1)</sup>
<b>Resistance per channel</b>	2 · 0.5 $\Omega$ max
<b>DC sparkover voltage</b>	400 to 700 V
<b>Trip surge voltage</b>	<800 V
<b>Capacitance at 1 MHz</b>	<1.5 pF
<b>Nominal discharge current (8/20 <math>\mu</math>s)</b>	10 kA
<b>Temperature range</b>	–40 to +85 °C (–40 to +185 °F)

1) The voltage is reduced by the amount of the internal resistance  $I_{min} \cdot R_i$

-  Depending on the temperature class, restrictions apply to the ambient temperature for device versions with overvoltage protection .
-  For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.

## 16.6 Performance characteristics

Reference operating conditions

- Error limits following ISO/DIN 11631
  - +20 to +30 °C (+68 to +86 °F)
  - 2 to 4 bar (29 to 58 psi)
  - Calibration system traceable to national standards
  - Calibration with the process connection corresponding to the particular standard
-  To obtain measured errors, use the *Applicator* sizing tool (→  195)

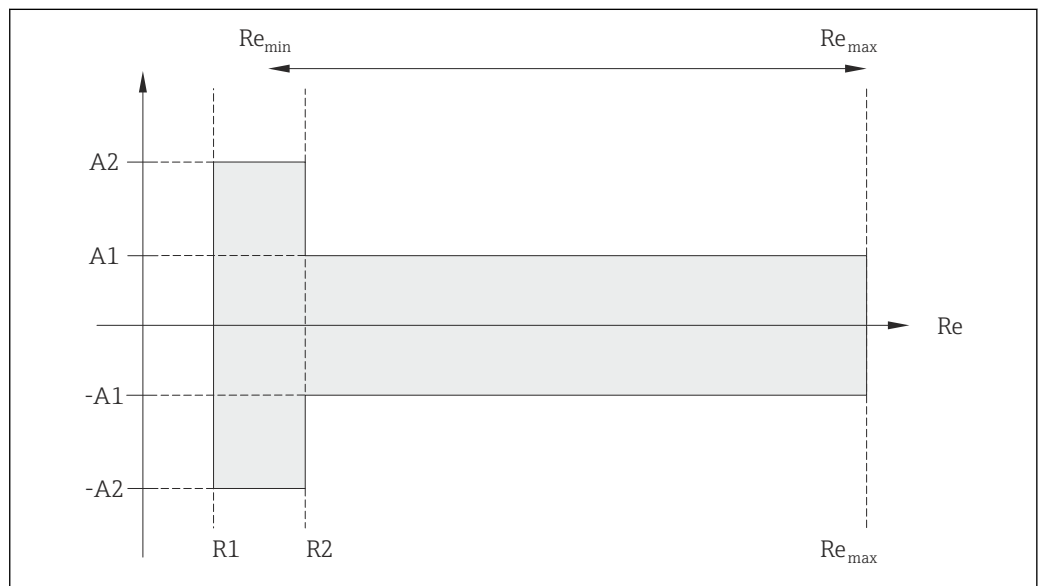
Maximum measured error

### Base accuracy

o.r. = of reading, Re = Reynolds number

### Volume flow

The measured error for the volume flow is as follows depending on the Reynolds number and the compressibility of the medium under measurement:



Deviation of volume flow value (absolute) from the reading			
Medium type		Incompressible	Compressible <sup>1)</sup>
Re range	Measured value deviation	Standard	Standard
R1 to R2	A2	< 10 %	< 10 %
R2 to Re <sub>max</sub>	A1	< 0.75 %	< 1.0 %

1) Accuracy specifications valid up to 75 m/s (246 ft/s)

Reynolds numbers	Incompressible	Compressible
	Standard	Standard
R1	5 000	
R2	20 000	


**Temperature**

- Saturated steam and liquids at room temperature if  $T > 100\text{ °C}$  (212 °F) applies: < 1 °C (1.8 °F)
- Gas: < 1 % o.r. [K]

Rise time 50 % (stirred under water, following IEC 60751): 8 s

**Mass flow (saturated steam)**

- Flow velocities 20 to 50 m/s (66 to 164 ft/s),  $T > 150\text{ °C}$  (302 °F) or (423 K)
  - Re > 20 000: < 1.7 % o.r.
  - Re between 5 000 to 20 000: < 10 % o.r.
- Flow velocities 10 to 70 m/s (33 to 210 ft/s),  $T > 140\text{ °C}$  (284 °F) or (413 K)
  - Re > 20 000: < 2 % o.r.
  - Re between 5 000 to 20 000: < 10 % o.r.

 The use of a Cerabar S is required for the measured errors listed in the following section. The measured error used to calculate the error in the measured pressure is 0.15%.

**Mass flow of superheated steam and gas (single gas, gas mixture, air: NEL40; natural gas: ISO 12213-2 contains AGA8-DC92, AGA NX-19, ISO 12213-3 contains SGERG-88 and AGA8 Gross Method 1)**

- Re > 20 000 and process pressure < 40 bar abs. (580 psi abs.): 1.7 % o.r.
- Re between 5 000 to 20 000 and process pressure < 40 bar abs. (580 psi abs.): 10 % o.r.
- Re > 20 000 and process pressure < 120 bar abs. (1 740 psi abs.): 2.6 % o.r.
- Re between 5 000 to 20 000 and process pressure < 120 bar abs. (1 740 psi abs.): 10 % o.r.

abs. = absolute

**Mass flow (water)**

- Re 20 000: < 0.85 % o.r.
- Re between 5 000 to 20 000: < 10 % o.r.

**Mass flow (user-defined liquids)**

To specify the system accuracy, Endress+Hauser requires information about the type of liquid and its operating temperature or information in table form about the dependency between the liquid density and the temperature.

*Example*

- Acetone is to be measured at fluid temperatures between +70 to +90 °C (+158 to +194 °F).
- For this purpose the **Reference temperature** parameter (7703) (here 80 °C (176 °F)), **Reference density** parameter (7700) (here 720.00 kg/m<sup>3</sup>) and **Linear expansion coefficient** parameter (7621) (here 18.0298 × 10<sup>-4</sup> 1/°C) must be entered in the transmitter.
- The overall system uncertainty, which is smaller than 0.9 % for the example above, is comprised of the following uncertainties of measurement: uncertainty of volume flow measurement, uncertainty of temperature measurement, uncertainty of the density-temperature correlation used (incl. the resulting uncertainty of density).

**Mass flow (other media)**

Depends on the selected fluid and the pressure value, which is specified in the parameters. Individual error analysis must be performed.

**Diameter mismatch correction**

Prowirl 200 can correct shifts in the calibration factor which are caused, for example, by diameter mismatch between the device flange (e.g. ASME B16.5/Sch. 80, DN 50 (2")) and the mating pipe (e.g. ASME B16.5/Sch. 40, DN 50 (2")). Only apply diameter mismatch correction within the following limit values (listed below) for which test measurements have also been performed.

**Flange connection:**

- DN 15 (½"): ±20 % of the internal diameter
- DN 25 (1"): ±15 % of the internal diameter
- DN 40 (1½"): ±12 % of the internal diameter
- DN ≥ 50 (2"): ±10 % of the internal diameter

If the standard internal diameter of the ordered process connection differs from the internal diameter of the mating pipe, an additional measuring uncertainty of approx. 2 % o.r. must be expected.

**Example**

Influence of the diameter mismatch without using the correction function:

- Mating pipe DN 100 (4"), schedule 80
- Device flange DN 100 (4"), schedule 40
- This installation position results in a diameter mismatch of 5 mm (0.2 in). If the correction function is not used, an additional measuring uncertainty of approx. 2 % o.r. must be expected.

**Accuracy of outputs**

o.r. = of reading

*Current output*

<b>Accuracy</b>	±10 µA
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*Pulse/frequency output*

<b>Accuracy</b>	Max. ±100 ppm o.r.
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Repeatability	o.r. = of reading ±0.2 % o.r.
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Response time	If all the configurable functions for filter times (flow damping, display damping, current output time constant, frequency output time constant, status output time constant) are set to 0, in the event of vortex frequencies of 10 Hz and higher a response time of max( $T_v$ , 100 ms) can be expected.  In the event of measuring frequencies < 10 Hz, the response time is > 100 ms and can be up to 10 s. $T_v$ is the average vortex period duration of the flowing fluid.
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Influence of ambient temperature	o.r. = of reading
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**Pulse/frequency output**

<b>Temperature coefficient</b>	Max. ±100 ppm o.r.
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## 16.7 Installation


"Mounting requirements" (→  19)

## 16.8 Environment

Ambient temperature range (→  22)

### 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 All components apart from the display modules:  
-50 to +80 °C (-58 to +176 °F)  
Display modules:  
-40 to +80 °C (-40 to +176 °F)

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

Degree of protection

### Transmitter

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

### Sensor

IP66/67, type 4X enclosure

### Device plug

IP67, only in screwed situation

Vibration resistance

- For compact/remote version made of coated aluminum and remote version made of stainless steel:  
Acceleration up to 2g (if gain set to factory setting), 10 to 500 Hz, following IEC 60068-2-6
- For the compact version made of stainless steel:  
Acceleration up to 1g (if gain set to factory setting), 10 to 500 Hz, following IEC 60068-2-6



Electromagnetic compatibility (EMC)

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


 For details refer to the Declaration of Conformity.



## 16.9 Process

Medium temperature range	<p><b>DSC sensor</b> <sup>3)</sup></p> <p>Order code for "Sensor version":</p> <ul style="list-style-type: none"> <li>■ Option 5 "Volume flow, titanium": -50 to +400 °C (-58 to +752 °F), for PN 250/Class 900 to 1 500 and butt-weld version</li> <li>■ Option 4 "Volume flow, Alloy 718": -200 to +400 °C (-328 to +752 °F), PN 63 to 160/Class 600</li> <li>■ Option 6 "Mass flow, Alloy 718": -200 to +400 °C (-328 to +752 °F), PN 63 to 160/Class 600</li> </ul> <p><b>DSC sensor</b> <sup>3)</sup></p> <p>Order code for "Sensor option":</p> <p>Option CD "Harsh environment, DSC sensor components, Alloy C22": -200 to +400 °C (-328 to +752 °F), DSC sensor Alloy C22</p> <p><b>DSC sensor</b> <sup>3)</sup></p> <p>Special version for very high fluid temperatures (on request):</p> <ul style="list-style-type: none"> <li>■ -200 to +440 °C (-328 to +824 °F), Ex version</li> <li>■</li> </ul> <p><b>Seals</b></p> <p><i>High-pressure version</i></p> <ul style="list-style-type: none"> <li>■ -200 to +400 °C (-328 to +752 °F) for graphite (standard)</li> <li>■ -15 to +175 °C (+5 to +347 °F) for Viton</li> <li>■ -20 to +275 °C (-4 to +527 °F) for Kalrez</li> <li>■ -200 to +260 °C (-328 to +500 °F) for Gylon</li> </ul> <p><i>Ultra-high pressure version</i></p> <p>-200 to +400 °C (-328 to +752 °F) for graphite (standard)</p>
Pressure-temperature ratings	<p> An overview of the pressure-temperature ratings for the process connections is provided in the "Technical Information" document</p>
Pressure loss	For a precise calculation, use the Applicator(→  167).

## 16.10 Mechanical construction

Design, dimensions	<p> For the dimensions and installation lengths of the device, see the "Technical Information" document, "Mechanical construction" section</p>
Weight	<p><b>Compact version</b></p> <p>Weight data:</p> <ul style="list-style-type: none"> <li>■ Including the transmitter: <ul style="list-style-type: none"> <li>– Order code for "Housing", option C: 1.8 kg (4.0 lb)</li> <li>– Order code for "Housing", option B: 4.5 kg (9.9 lb)</li> </ul> </li> <li>■ Excluding packaging material</li> </ul> <p><i>Weight in SI units</i></p> <p>All values (weight) refer to devices with EN (DIN), PN 250 flanges. Weight information in [kg].</p>

3) Capacitance sensor

DN [mm]	Weight [kg]	
	Order code for "Housing", option C Aluminum, AlSi10Mg, coated	Order code for "Housing", option B Stainless steel, 1.4404 (316L)
15	15.1	17.8
25	16.1	18.8
40	21.1	23.8
50	23.1	2..8
80	41.1	43.8
100	64.1	66.8
150	152.1	154.8

*Weight in US units*

All values (weight) refer to devices with ASME B16.5, Class 1500/Sch. 80 flanges. Weight information in [lbs].

DN [in]	Weight [lbs]	
	Order code for "Housing", option C Aluminum, AlSi10Mg, coated	Order code for "Housing", option B Stainless steel, 1.4404 (316L)
½	29.0	34.9
1	37.8	43.7
1½	44.4	50.3
2	66.5	72.4
3	108.3	114.3
4	156.8	162.8
6	381.7	387.7

**Transmitter remote version**

*Wall-mount housing*

Depends on the material of the wall-mount housing:

- Aluminum, AlSi10Mg, coated: 2.4 kg (5.2 lb)
- Stainless steel, 1.4404 (316L): 6.0 kg (13.2 lb)

**Sensor remote version**

Weight data:

- Including the connection housing:
  - Aluminum, AlSi10Mg, coated: 0.8 kg (1.8 lb)
  - Stainless cast steel, 1.4408 (CF3M): 2.0 kg (4.4 lb)
- Excluding the connecting cable
- Excluding packaging material

*Weight in SI units*

All values (weight) refer to devices with EN (DIN), PN 250 flanges. Weight information in [kg].

DN [mm]	Weight [kg]	
	Connection housing Aluminum, AlSi10Mg, coated	Connection housing Stainless cast steel, 1.4408 (CF3M)
15	14.1	15.3
25	15.1	16.3
40	20.1	21.3
50	22.1	23.3
80	40.1	41.3
100	63.1	64.3
150	151.1	152.3

*Weight in US units*

All values (weight) refer to devices with ASME B16.5, Class 1500/Sch. 80 flanges. Weight information in [lbs].

DN [in]	Weight [lbs]	
	Connection housing Aluminum, AlSi10Mg, coated	Connection housing Stainless cast steel, 1.4408 (CF3M)
½	26.6	29.4
1	35.4	38.2
1½	42.0	44.8
2	64.1	66.8
3	105.9	108.7
4	154.5	157.2
6	379.3	382.1

**Accessories***Flow conditioner**Weight in SI units*

DN <sup>1)</sup> [mm]	Pressure rating	Weight [kg]
15	PN 63	0.05
25	PN 63	0.2
40	PN 63	0.4
50	PN 63	0.6
80	PN 63	1.4
100	PN 63	2.4
150	PN 63	7.8

1) EN (DIN)

DN <sup>1)</sup> [mm]	Pressure rating	Weight [kg]
15	40K	0.06
25	40K	0.1
40	40K	0.3
50	40K	0.5
80	40K	1.3
100	40K	2.1
150	40K	6.2

1) JIS

Materials

**Transmitter housing**

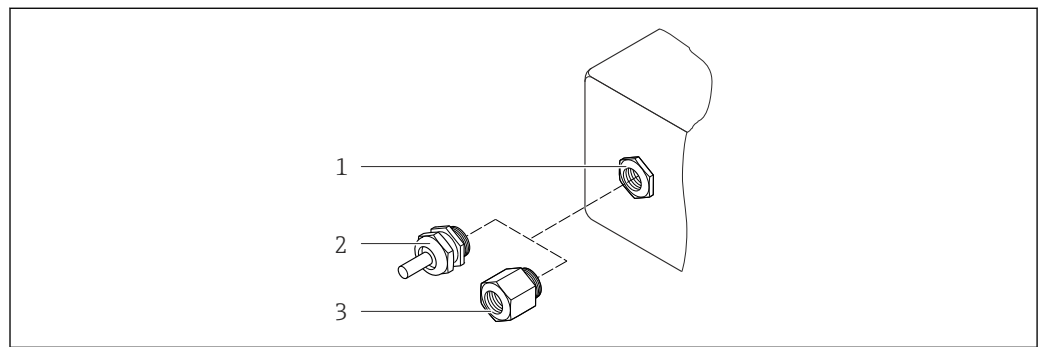
**Compact version**

- Order code for "Housing", option **C** "Compact, aluminum coated":  
Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **B** "Compact, stainless":  
For maximum corrosion resistance: stainless steel 1.4404 (316L)

**Remote version**

- Order code for "Housing", option **J** "Remote, aluminum coated":  
Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **K** "Remote, stainless":  
For maximum corrosion resistance: stainless steel 1.4404 (316L)

**Cable entries/cable glands**



34 Possible cable entries/cable glands

- 1 Cable entry in transmitter housing, wall-mount housing or connection housing with internal thread M20 x 1.5
- 2 Cable gland M20 x 1.5
- 3 Adapter for cable entry with internal thread G 1/2" or NPT 1/2"

Order code for "Housing", option B "Compact, stainless", option K "Remote, stainless"

Cable entry/cable gland	Type of protection	Material
Cable gland M20 × 1.5	<ul style="list-style-type: none"> <li>■ Non-Ex</li> <li>■ Ex ia</li> <li>■ Ex ic</li> <li>■ Ex nA</li> <li>■ Ex tb</li> </ul>	Stainless steel ,1.4404
Adapter for cable entry with internal thread G ½"	For non-Ex and Ex (except for CSA Ex d/XP)	Stainless steel, 1.4404 (316L)
Adapter for cable entry with internal thread NPT ½"	For non-Ex and Ex	

Order code for "Housing": option C "Compact, aluminum coated", option J "Remote, aluminum coated"

Cable entry/cable gland	Type of protection	Material
Cable gland M20 × 1.5	<ul style="list-style-type: none"> <li>■ Non-Ex</li> <li>■ Ex ia</li> <li>■ Ex ic</li> </ul>	Plastic
	Adapter for cable entry with internal thread G ½"	Nickel-plated brass
Adapter for cable entry with internal thread NPT ½"	For non-Ex and Ex (except for CSA Ex d/XP)	Nickel-plated brass
Thread NPT ½" via adapter	For non-Ex and Ex	

### Connecting cable for remote version

- Standard cable: PVC cable with copper shield
- Reinforced cable: PVC cable with copper shield and additional steel wire braided jacket

### Sensor connection housing

- Coated aluminum AlSi10Mg
- Stainless cast steel, 1.4408 (CF3M), in compliance with NACE MR0175-2003 and MR0103-2003

### Measuring tubes

#### Pressure ratings up to PN 160, Class 600, and JIS 40K:

Stainless cast steel, 1.4408 (CF3M), in compliance with AD2000 (for AD2000 the temperature range is limited to -10 to +400 °C (+14 to +752 °F)) and in compliance with NACE MR0175-2003 and MR0103-2003

#### Pressure ratings PN 250, Class 900 to 1500 and butt-weld version:

Stainless steel, 1.4571 similar to 316Ti, NACE available on request

### DSC sensor

#### Pressure ratings up to PN 63/100/160, Class 600, and JIS 40K:

Parts in contact with medium (marked as "wet" on the DSC sensor flange): UNS N07718 similar to Alloy 718/2.4668, in compliance with NACE MR0175-2003 and MR0103-2003

Parts not in contact with medium:

- Stainless steel 1.4301 (304)
- Order code for "Sensor option", option CD "Harsh environment, DSC sensor, sensor components Alloy C22":  
Alloy C22 sensor: UNS N06022 similar to Alloy C22/2.4602, in compliance with NACE MR0175-2003 and MR0103-2003

**Pressure ratings up to PN 250, Class 900/1500:**

- Parts in contact with medium (marked as "wet" on the DSC sensor flange):  
Titanium Gr. 5 similar to 3.7165
- Parts not in contact with medium:  
Stainless steel 1.4301 (304)

**Process connections**

**Pressure ratings up to PN 63/100/160, Class 600, and JIS 40K:**



Stainless cast steel, multiple certifications, 1.4408 (CF3M)

**Pressure ratings up to PN 250:**

Stainless steel, 1.4571 similar to F316 Ti

**Pressure ratings Class 900/1500:**

Stainless steel, F316/F316L similar to 1.4404

 List of all available process connections (→  191)

**Seals**

*High-pressure version*

- Graphite (standard)  
Pressure rating PN 63 to 160, Class 600, JIS 40K: Sigraflex Hochdruck™ with smooth sheet metal insert made of stainless steel, 316/316L (BAM-certified for oxygen applications, "high quality in terms of TA Luft (German Clean Air Act)")
- FPM (Viton)
- Kalrez 6375
- Gylon 3504 (BAM-certified for oxygen applications, "high quality in terms of TA Luft (German Clean Air Act)")

*Ultra-high pressure version*

Graphite (standard)

Pressure rating PN 250, Class 900 to 1500: Grafoil with perforated metal insert made of stainless steel, 1.4404 (316/316L)

**Housing support**

Stainless steel, 1.4408 (CF3M)

**Accessories**

*Weather protection cover*

Stainless steel 1.4404 (316L)

*Flow conditioner*

Stainless steel, multiple certifications, 1.4404 (316, 316L), in compliance with NACE MR0175-2003 and MR0103-2003

## Process connections

- EN 1092-1 (DIN 2501)
- ASME B16.5
- JIS B2220

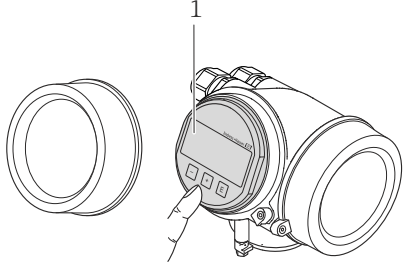
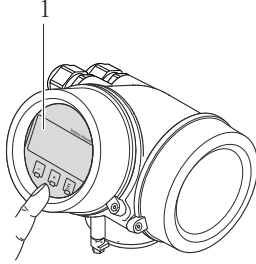


For information on the materials of the process connections

## 16.11 Operability

## Local operation







## Via display module

Order code for "Display; Operation", option C "SD02"	Order code for "Display; Operation", option E "SD03"
	
1 Operation with pushbuttons	1 Operation with touch control

### Display elements

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

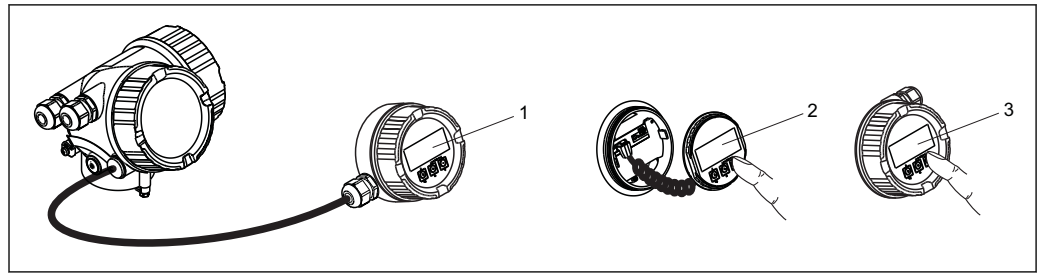
### Operating elements

- With order code for "Display; operation", option C:  
Local operation with 3 push buttons: , , 
- With order code for "Display; operation", option E:  
External operation via touch control; 3 optical keys: , , 
- Operating elements also accessible in various hazardous areas

### Additional functionality

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

**Via remote display and operating module FHX50**



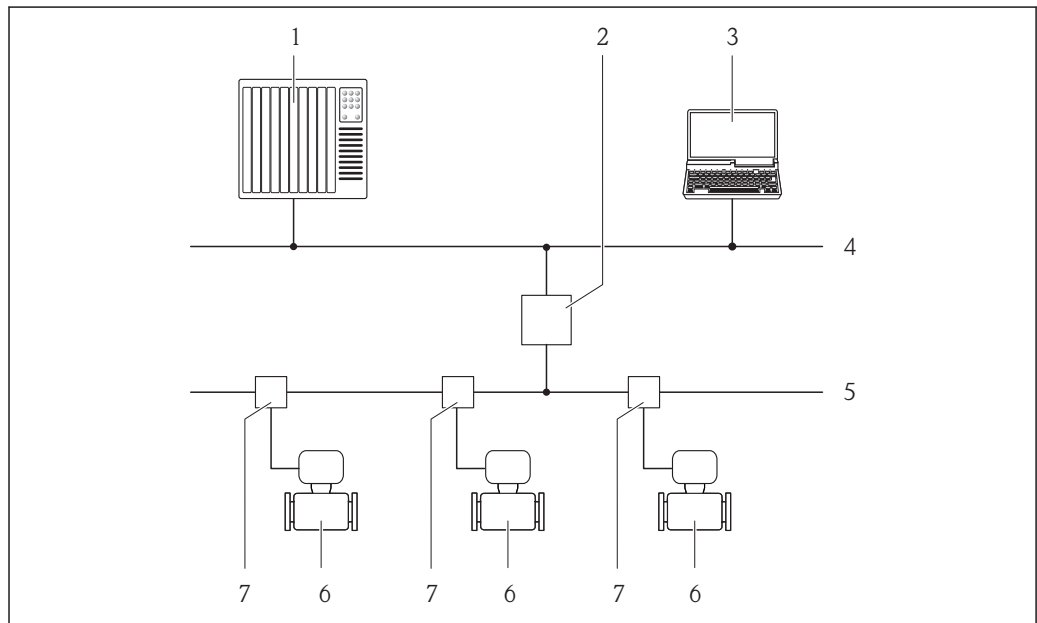
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35 Operating options via FHX50

- 1 Housing of remote display and operating module FHX50
- 2 SD02 display and operating module, push buttons: cover must be opened for operation
- 3 SD03 display and operating module, optical buttons: operation possible through cover glass

Remote operation

**Via PROFIBUS PA network**

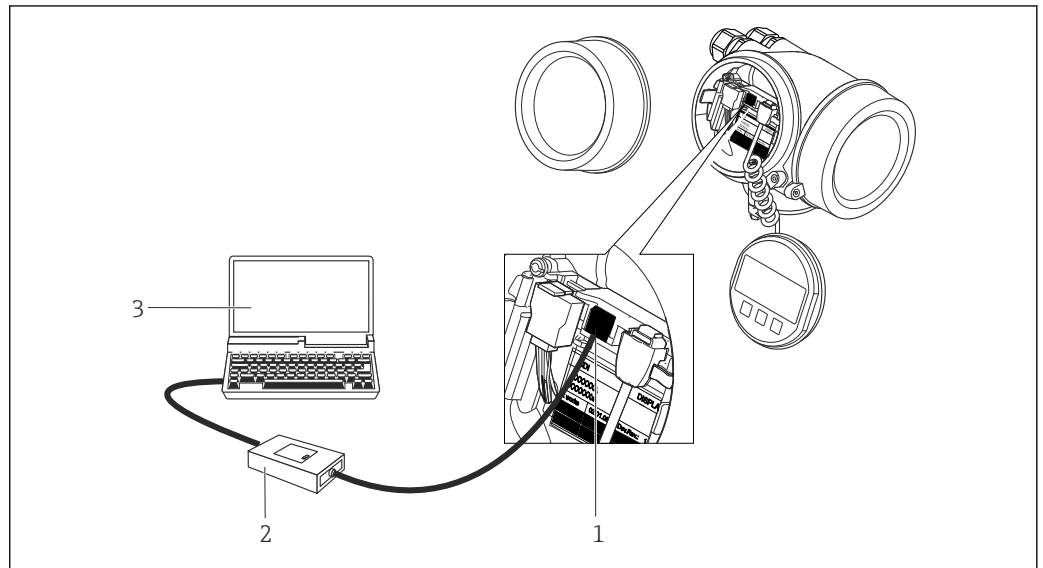


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- 1 Automation system
- 2 Segment coupler PROFIBUS DP/PA
- 3 Computer with PROFIBUS network card
- 4 PROFIBUS DP network
- 5 PROFIBUS PA network
- 6 Measuring device
- 7 T-box



## Service interface

**Service interface (CDI)**

- 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"

## Languages

Can be operated in the following languages:

- Via local display:  
English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Swedish, Turkish, Chinese, Japanese, Korean, Bahasa (Indonesian), Vietnamese, Czech
- Via "FieldCare" operating tool:  
English, German, French, Spanish, Italian, Chinese, Japanese

**16.12 Certificates and approvals**

## CE mark

The measuring system is in conformity with the statutory requirements of the applicable EC Directives. These are listed in the corresponding EC 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.

## Certification PROFIBUS

**PROFIBUS interface**

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



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

Pressure Equipment Directive	<ul style="list-style-type: none"> <li>■ With the PED/G1/x (x = category) marking on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements" specified in Annex I of the Pressure Equipment Directive 97/23/EC.</li> <li>■ Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Art.3 Section 3 of the Pressure Equipment Directive 97/23/EC. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive.</li> </ul>
Experience	The Prowirl 200 measuring system is the official successor to Prowirl 72 and Prowirl 73.
Other standards and guidelines	<ul style="list-style-type: none"> <li>■ EN 60529 Degrees of protection provided by enclosures (IP code)</li> <li>■ DIN ISO 13359 Measurement of conductive liquid flow in closed conduits - Flanged-type electromagnetic flowmeters - Overall length</li> <li>■ EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use</li> <li>■ IEC/EN 61326 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).</li> <li>■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment</li> <li>■ NAMUR NE 32 Data retention in the event of a power failure in field and control instruments with microprocessors</li> <li>■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.</li> <li>■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics</li> <li>■ NAMUR NE 105 Specifications for integrating fieldbus devices in engineering tools for field devices</li> <li>■ NAMUR NE 107 Self-monitoring and diagnosis of field devices</li> <li>■ NAMUR NE 131 Requirements for field devices for standard applications</li> <li>■ ASME BPVC Section VIII, Division 1 Rules for Construction of Pressure Vessels</li> </ul>


## 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 from Endress+Hauser either directly with the device or subsequently. 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 on the device (→  195)

## 16.14 Accessories

 Overview of accessories available for order (→  166)

## 16.15 Documentation

-  For an overview of the scope of the associated Technical Documentation, refer to the following:
- The CD-ROM provided for the device (depending on the device version, the CD-ROM might not be part of the delivery!)
  - 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

Measuring device	Documentation code
Prowirl R 200	KA01138D

#### Technical Information

Measuring device	Documentation code
Prowirl O 200	TI01085D

### Supplementary device-dependent documentation

#### Safety Instructions



Contents	Documentation code
ATEX/IECEX Ex d, Ex tb	XA01148D
ATEX/IECEX Ex ia, Ex tb	XA01151D
ATEX/IECEX Ex ic, Ex nA	XA01152D
<sup>c</sup> CSA <sub>US</sub> XP	XA01153D
<sup>c</sup> CSA <sub>US</sub> IS	XA01154D
NEPSI Ex d	XA01238D
NEPSI Ex i	XA01239D
NEPSI Ex ic, Ex nA	XA01240D
INMETRO Ex d	XA01250D
INMETRO Ex i	XA01042D
INMETRO Ex nA	XA01043D

#### Special Documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01163D
Heartbeat Technology	SD01204D

Contents	Documentation code
Natural gas	SD01194D
Air + Industrial Gases (Single Gas + Gas Mixtures)	SD01195D





### Installation Instructions

Contents	Documentation code
Installation Instructions for spare part sets	 <a href="#">Overview of accessories available for order (→  166)</a>

## 17 Appendix


### 17.1 Overview of the operating menu

The following tables provide an overview of the entire operating menu structure with menus and parameters. The page reference indicates where a description of the parameter can be found in the manual.

Language	(→ 114)
 Operation	(→ 197)
 Setup	(→ 198)
 Diagnostics	(→ 206)
 Expert	(→ 210)

























#### 17.1.1 "Operation" menu

Navigation  Operation

 Operation	(→ 120)
Access status display	
Locking status	
▶ Display	(→ 81)
Format display	(→ 83)
Contrast display	
Backlight	(→ 114)
Display interval	(→ 114)
▶ Totalizer handling	(→ 124)
Control Totalizer 1 to 3	(→ 125)
Preset value 1 to 3	(→ 125)

## 17.1.2 "Setup" menu


























Navigation  Setup

 Setup	(→  74)
Device tag	(→  75)
▶ Medium selection	(→  79)
Select medium	(→  79)
Select gas type	(→  79)
Select liquid type	(→  80)
Fixed process pressure	(→  80)
Enthalpy calculation	(→  80)
Density calculation	(→  80)
Enthalpy type	(→  80)
▶ System units	(→  75)
Volume flow unit	(→  76)
Volume unit	(→  76)
Mass flow unit	(→  76)
Mass unit	(→  76)
Corrected volume flow unit	(→  76)
Corrected volume unit	(→  76)
Pressure unit	(→  77)
Temperature unit	(→  77)
Energy flow unit	(→  77)
Energy unit	(→  77)
Calorific value unit	(→  77)
Calorific value unit	(→  77)

























Velocity unit	(→ 77)
Density unit	(→ 77)
Specific volume unit	
Dynamic viscosity unit	(→ 78)
Length unit	(→ 78)
<b>► Communication</b>	(→ 83)
Device address	(→ 84)
<b>► Analog inputs</b>	(→ 81)
<b>► Analog input 1 to 4</b>	
Channel	(→ 81)
PV filter time	(→ 81)
Fail safe type	(→ 81)
Fail safe value	(→ 81)
<b>► Display</b>	(→ 81)
Format display	(→ 83)
Value 1 display	(→ 83)
0% bargraph value 1	(→ 83)
100% bargraph value 1	(→ 83)
Value 2 display	(→ 83)
Value 3 display	(→ 83)
0% bargraph value 3	(→ 83)
100% bargraph value 3	(→ 83)
Value 4 display	(→ 83)
<b>► Low flow cut off</b>	(→ 84)
Assign process variable	(→ 84)

























On value low flow cutoff	(→ 84)
Off value low flow cutoff	(→ 84)
► <b>Advanced setup</b>	(→ 85)
Enter access code	
► <b>Medium properties</b>	(→ 86)
Enthalpy type	(→ 87)
Calorific value type	(→ 87)
Reference combustion temperature	(→ 87)
Reference density	(→ 87)
Reference gross calorific value	(→ 87)
Reference pressure	(→ 87)
Reference temperature	(→ 87)
Reference Z-factor	(→ 88)
Linear expansion coefficient	(→ 88)
Relative density	(→ 88)
Specific heat capacity	(→ 88)
Calorific value	(→ 88)
Z-factor	(→ 88)
Dynamic viscosity	(→ 89)
Dynamic viscosity	(→ 89)
► <b>Gas composition</b>	(→ 89)
Gas type	(→ 91)
Gas mixture	(→ 91)
Mol% Ar	(→ 92)
Mol% C <sub>2</sub> H <sub>3</sub> Cl	(→ 92)


















Mol% C2H4	(→  92)
Mol% C2H6	(→  92)
Mol% C3H8	(→  93)
Mol% CH4	(→  93)
Mol% Cl2	(→  93)
Mol% CO	(→  93)
Mol% CO2	(→  94)
Mol% H2	(→  94)
Mol% H2O	(→  94)
Mol% H2S	(→  94)
Mol% HCl	(→  95)
Mol% He	(→  95)
Mol% i-C4H10	(→  95)
Mol% i-C5H12	(→  95)
Mol% Kr	(→  95)
Mol% N2	(→  96)
Mol% n-C10H22	(→  96)
Mol% n-C4H10	(→  96)
Mol% n-C5H12	(→  96)
Mol% n-C6H14	(→  97)
Mol% n-C7H16	(→  97)
Mol% n-C8H18	(→  97)
Mol% n-C9H20	(→  97)
Mol% Ne	(→  98)
Mol% NH3	(→  98)

Mol% O <sub>2</sub>	(→ 98)
Mol% SO <sub>2</sub>	(→ 98)
Mol% Xe	(→ 98)
Mol% other gas	(→ 99)
Relative humidity	(→ 99)
<b>► External compensation</b>	(→ 99)
External value	(→ 100)
Atmospheric pressure	(→ 100)
Delta heat calculation	(→ 100)
Fixed density	(→ 100)
Fixed temperature	(→ 100)
2nd temperature delta heat	(→ 100)
Fixed process pressure	(→ 101)
Steam quality	(→ 101)
Steam quality value	(→ 101)
<b>► Sensor adjustment</b>	(→ 101)
Inlet configuration	(→ 102)
Inlet run	(→ 102)
Mating pipe diameter	(→ 102)
Installation factor	(→ 102)
<b>► Pulse/frequency/switch output</b>	(→ 102)
Operating mode	(→ 103)
Assign pulse output	(→ 103)
Assign frequency output	(→ 106)
Switch output function	(→ 108)

Assign diagnostic behavior	(→  108)
Assign limit	(→  109)
Assign flow direction check	(→  109)
Assign status	(→  109)
Mass flow unit	(→  106)
Mass unit	(→  103)
Volume flow unit	(→  106)
Volume unit	(→  104)
Corrected volume flow unit	(→  106)
Corrected volume unit	(→  104)
Energy flow unit	(→  106)
Energy unit	(→  104)
Pressure unit	(→  106)
Velocity unit	(→  106)
Unit totalizer	(→  110)
Unit totalizer	(→  110)
Unit totalizer	(→  110)
Temperature unit	(→  106)
Value per pulse	(→  104)
Pulse width	(→  104)
Failure mode	(→  104)
Minimum frequency value	(→  106)
Maximum frequency value	(→  106)
Measuring value at minimum frequency	(→  106)

Measuring value at maximum frequency	(→  107)
Failure mode	(→  107)
Failure frequency	(→  107)
Switch-on value	(→  110)
Switch-off value	(→  110)
Switch-on delay	(→  110)
Switch-off delay	(→  110)
Failure mode	(→  110)
Invert output signal	(→  104)
<b>► Totalizer 1 to 3</b>	(→  110)
Assign process variable	(→  110)
Unit totalizer	(→  110)
Control Totalizer 1 to 3	(→  111)
Totalizer operation mode	(→  111)
Failure mode	(→  111)
<b>► Display</b>	(→  81)
Format display	(→  83)
Value 1 display	(→  83)
0% bargraph value 1	(→  83)
100% bargraph value 1	(→  83)
Decimal places 1	(→  113)
Value 2 display	(→  83)
Decimal places 2	(→  113)
Value 3 display	(→  83)

0% bargraph value 3	(→  83)
100% bargraph value 3	(→  83)
Decimal places 3	(→  113)
Value 4 display	(→  83)
Decimal places 4	(→  113)
Language	(→  114)
Display interval	(→  114)
Display damping	(→  114)
Header	(→  114)
Header text	(→  114)
Separator	(→  114)
Backlight	(→  114)
<b>▶ Heartbeat setup</b>	
<b>▶ Heartbeat base settings</b>	
Plant operator	
Location	
<b>▶ Configuration backup display</b>	(→  114)
Operating time	(→  115)
Last backup	(→  115)



















Configuration management	(→ 📄 115)
Comparison result	(→ 📄 115)
▶ Administration	(→ 📄 159)
▶ Define access code	(→ 📄 117)
Define access code	
Confirm access code	
Device reset	(→ 📄 160)

### 17.1.3 "Diagnostics" menu

Navigation  Diagnostics

🔍 Diagnostics	(→ 📄 157)
Actual diagnostics	(→ 📄 157)
Previous diagnostics	(→ 📄 157)
Operating time from restart	(→ 📄 157)
Operating time	(→ 📄 157)
▶ Diagnostic list	
Diagnostics 1	
Diagnostics 2	
Diagnostics 3	
Diagnostics 4	
Diagnostics 5	
▶ Event logbook	
Filter options	
▶ Event list	

<b>► Device information</b>		(→ ⓘ 160)
Device tag		(→ ⓘ 161)
Serial number		(→ ⓘ 161)
Firmware version		(→ ⓘ 161)
Device name		(→ ⓘ 161)
Order code		(→ ⓘ 161)
Extended order code 1		(→ ⓘ 161)
Extended order code 2		(→ ⓘ 161)
Extended order code 3		(→ ⓘ 161)
ENP version		(→ ⓘ 161)
<b>► Measured values</b>		
<b>► Process variables</b>		(→ ⓘ 120)
Volume flow		(→ ⓘ 121)
Corrected volume flow		(→ ⓘ 121)
Mass flow		(→ ⓘ 121)
Flow velocity		(→ ⓘ 122)
Temperature		(→ ⓘ 122)
Calculated saturated steam pressure		(→ ⓘ 122)
Steam quality		(→ ⓘ 122)
Total mass flow		(→ ⓘ 122)
Condensate mass flow		(→ ⓘ 122)
Energy flow		(→ ⓘ 122)
Heat flow difference		(→ ⓘ 122)
Reynolds number		(→ ⓘ 122)
Density		(→ ⓘ 122)

Specific volume	(→  122)
Pressure	(→  122)
Compressibility factor	(→  123)
Degrees of superheat	(→  123)
<b>► Totalizer 1 to 3</b>	(→  110)
Assign process variable	(→  110)
Totalizer value 1 to 3	(→  123)
Totalizer status 1 to 3	(→  123)
Totalizer status (Hex) 1 to 3	(→  123)
<b>► Output values</b>	(→  124)
Terminal voltage 1	(→  124)
Pulse output	(→  124)
Output frequency	(→  124)
Switch status	(→  124)
<b>► Data logging</b>	(→  125)
Assign channel 1	(→  127)
Assign channel 2	
Assign channel 3	
Assign channel 4	
Logging interval	(→  127)
Clear logging data	(→  127)
<b>► Display channel 1</b>	
<b>► Display channel 2</b>	
<b>► Display channel 3</b>	
<b>► Display channel 4</b>	



<b>▶ Analog inputs</b>	(→ ⓘ 81)
<b>▶ Analog input 1 to 4</b>	
Channel	(→ ⓘ 81)
Out value	
Out status	
Out status	
<b>▶ Heartbeat</b>	
<b>▶ Performing verification</b>	
Year	
Month	
Day	
Hour	
AM/PM	
Minute	
Verification mode	
External device information	
Start verification	
Measured values	
Overall result	
<b>▶ Verification results</b>	
Date/time	
Verification ID	
Operating time	
Overall result	
Sensor	

Pre-amplifier module	
Main electronic module	
I/O module	
<b>► Simulation</b>	(→ 📖 115)
Assign simulation process variable	(→ 📖 116)
Value process variable	(→ 📖 116)
Frequency simulation	(→ 📖 116)
Frequency value	(→ 📖 116)
Pulse simulation	(→ 📖 117)
Pulse value	(→ 📖 117)
Switch output simulation	(→ 📖 117)
Switch status	(→ 📖 117)
Simulation device alarm	(→ 📖 117)
Diagnostic event category	(→ 📖 117)
Simulation diagnostic event	(→ 📖 117)

### 17.1.4 "Expert" menu

The following tables provide an overview of the **Expert** menu with its submenus and parameters. The direct access code to the parameter is given in brackets. The page reference indicates where a description of the parameter can be found in the manual.

Navigation  Expert















<b>🔑 Expert</b>	
Direct access (0106)	
Locking status (0004)	
Access status display (0091)	
Enter access code (0092)	
<b>► System</b>	(→ 📖 211)

▶ Sensor	(→ 214)
▶ Output	(→ 220)
▶ Communication	(→ 221)
▶ Analog inputs	(→ 223)
▶ Discrete inputs	(→ 223)
▶ Analog outputs	(→ 224)
▶ Discrete outputs	(→ 224)
▶ Application	(→ 225)
▶ Diagnostics	(→ 225)

**"System" submenu**

Navigation  Expert → System

▶ System	
▶ Display	(→ 81)
Language (0104)	(→ 114)
Format display (0098)	(→ 83)
Value 1 display (0107)	(→ 83)
0% bargraph value 1 (0123)	(→ 83)
100% bargraph value 1 (0125)	(→ 83)
Decimal places 1 (0095)	(→ 113)
Value 2 display (0108)	(→ 83)
Decimal places 2 (0117)	(→ 113)
Value 3 display (0110)	(→ 83)
0% bargraph value 3 (0124)	(→ 83)
100% bargraph value 3 (0126)	(→ 83)

Decimal places 3 (0118)	(→  113)
Value 4 display (0109)	(→  83)
Decimal places 4 (0119)	(→  113)
Display interval (0096)	(→  114)
Display damping (0094)	(→  114)
Header (0097)	(→  114)
Header text (0112)	(→  114)
Separator (0101)	(→  114)
Contrast display (0105)	
Backlight (0111)	(→  114)
Access status display (0091)	
<b>► Configuration backup display</b>	(→  114)
Operating time (0652)	(→  115)
Last backup (0102)	(→  115)
Configuration management (0100)	(→  115)
Comparison result (0103)	(→  115)
<b>► Diagnostic handling</b>	
Alarm delay (0651)	
<b>► Diagnostic behavior</b>	
Assign behavior of diagnostic no. 022 (0751)	
Assign behavior of diagnostic no. 122 (0752)	
Assign behavior of diagnostic no. 350 (0756)	
Assign behavior of diagnostic no. 371 (0757)	

Assign behavior of diagnostic no. 442  
(0658)

Assign behavior of diagnostic no. 443  
(0659)

Assign behavior of diagnostic no. 828  
(0755)

Assign behavior of diagnostic no. 829  
(0754)

Assign behavior of diagnostic no. 832  
(0675)

Assign behavior of diagnostic no. 833  
(0676)

Assign behavior of diagnostic no. 834  
(0677)

Assign behavior of diagnostic no. 835  
(0678)

Assign behavior of diagnostic no. 841  
(0729)

Assign behavior of diagnostic no. 844  
(0747)

Assign behavior of diagnostic no. 870  
(0726)

Assign behavior of diagnostic no. 871  
(0748)

Assign behavior of diagnostic no. 872  
(0746)

Assign behavior of diagnostic no. 873  
(0749)

Assign behavior of diagnostic no. 874  
(0772)























Assign behavior of diagnostic no. 945  
(0750)




















Assign behavior of diagnostic no. 947 (0753)	
Assign behavior of diagnostic no. 972 (0758)	
<b>► Diagnostic limits</b>	
Reynolds number limit (7646)	
Steam quality limit (7717)	
Degrees of superheat limit (7737)	
<b>► Administration</b>	(→ 📄 159)
<b>► Define access code</b>	(→ 📄 117)
Define access code	
Confirm access code	
Device reset (0000)	(→ 📄 160)
Activate SW option (0029)	
Software option overview (0015)	
Activate sensor emergency mode (7712)	

**"Sensor" submenu**























Navigation  Expert → Sensor


























<b>► Sensor</b>	
<b>► Measured values</b>	
<b>► Process variables</b>	(→ 📄 120)
Volume flow (1838)	(→ 📄 121)
Corrected volume flow (1850)	(→ 📄 121)
Mass flow (1847)	(→ 📄 121)
Flow velocity (1865)	(→ 📄 122)

























Temperature (1851)	(→  122)
Calculated saturated steam pressure (1852)	(→  122)
Steam quality (1853)	(→  122)
Total mass flow (1854)	(→  122)
Condensate mass flow (1857)	(→  122)
Energy flow (1872)	(→  122)
Heat flow difference (1863)	(→  122)
Reynolds number (1864)	(→  122)
Density (7607)	(→  122)
Specific volume (7739)	(→  122)
Pressure (7696)	(→  122)
Saturation temperature (7709)	
Degrees of superheat (7738)	(→  123)
Compressibility factor (7729)	(→  123)
Vortex frequency (7722)	
<b>► Totalizer</b>	(→  110)
Totalizer value 1 to 3 (3827-1 to 3)	(→  123)
Totalizer status (Hex) 1 to 3 (3825-1 to 3)	(→  123)
Totalizer status 1 to 3 (3826-1 to 3)	(→  123)
<b>► Output values</b>	(→  124)
Terminal voltage 1 (0662)	(→  124)
Pulse output (0456)	(→  124)
Output frequency (0471)	(→  124)
Switch status (0461)	(→  124)



<b>► System units</b>	(→  75)
Volume flow unit (0553)	(→  76)
Volume unit (0563)	(→  76)
Mass flow unit (0554)	(→  76)
Mass unit (0574)	(→  76)
Corrected volume flow unit (0558)	(→  76)
Corrected volume unit (0575)	(→  76)
Pressure unit (0564)	(→  77)
Temperature unit (0557)	(→  77)
Energy flow unit (0565)	(→  77)
Energy unit (0559)	(→  77)
Calorific value unit (0552)	(→  77)
Calorific value unit (0606)	(→  77)
Velocity unit (0566)	(→  77)
Density unit (0555)	(→  77)
Specific volume unit (0610)	
Dynamic viscosity unit (0577)	(→  78)
Specific heat capacity unit (0604)	
Length unit (0551)	(→  78)
Date/time format (2812)	
<b>► Process parameters</b>	
Flow override (1839)	
Flow damping (1802)	
<b>► Low flow cut off</b>	(→  84)
Assign process variable (1837)	(→  84)




























On value low flow cutoff (1805)	(→  84)
Off value low flow cutoff (1804)	(→  84)
<b>► Measurement mode</b>	
Select medium (7653)	(→  79)
Select gas type (7635)	(→  79)
Select liquid type (7636)	(→  80)
Density calculation (7608)	(→  80)
Enthalpy calculation (7619)	(→  80)
<b>► Medium properties</b>	(→  86)
Enthalpy type (7620)	(→  87)
Calorific value type (7698)	(→  87)
Reference combustion temperature (7699)	(→  87)
Reference density (7700)	(→  87)
Reference gross calorific value (7701)	(→  87)
Reference pressure (7702)	(→  87)
Reference temperature (7703)	(→  87)
Reference Z-factor (7704)	(→  88)
Linear expansion coefficient (7621)	(→  88)
Relative density (7705)	(→  88)
Specific heat capacity (7716)	(→  88)
Calorific value (7626)	(→  88)
Z-factor (7631)	(→  88)
Dynamic viscosity (7733)	(→  89)





Dynamic viscosity (7732)	(→  89)
► Gas composition	(→  89)
Gas type (7714)	(→  91)
Gas mixture (7640)	(→  91)
Mol% Ar (7663)	(→  92)
Mol% C <sub>2</sub> H <sub>3</sub> Cl (7664)	(→  92)
Mol% C <sub>2</sub> H <sub>4</sub> (7665)	(→  92)
Mol% C <sub>2</sub> H <sub>6</sub> (7666)	(→  92)
Mol% C <sub>3</sub> H <sub>8</sub> (7667)	(→  93)
Mol% CH <sub>4</sub> (7668)	(→  93)
Mol% Cl <sub>2</sub> (7707)	(→  93)
Mol% CO (7669)	(→  93)
Mol% CO <sub>2</sub> (7670)	(→  94)
Mol% H <sub>2</sub> (7671)	(→  94)
Mol% H <sub>2</sub> O (7672)	(→  94)
Mol% H <sub>2</sub> S (7673)	(→  94)
Mol% HCl (7674)	(→  95)
Mol% He (7675)	(→  95)
Mol% i-C <sub>4</sub> H <sub>10</sub> (7676)	(→  95)
Mol% i-C <sub>5</sub> H <sub>12</sub> (7677)	(→  95)
Mol% Kr (7678)	(→  95)
Mol% N <sub>2</sub> (7679)	(→  96)
Mol% n-C <sub>10</sub> H <sub>22</sub> (7680)	(→  96)
Mol% n-C <sub>4</sub> H <sub>10</sub> (7681)	(→  96)
Mol% n-C <sub>5</sub> H <sub>12</sub> (7682)	(→  96)

	Mol% n-C6H14 (7683)	(→  97)
	Mol% n-C7H16 (7684)	(→  97)
	Mol% n-C8H18 (7685)	(→  97)
	Mol% n-C9H20 (7686)	(→  97)
	Mol% Ne (7687)	(→  98)
	Mol% NH3 (7688)	(→  98)
	Mol% O2 (7689)	(→  98)
	Mol% SO2 (7691)	(→  98)
	Mol% Xe (7692)	(→  98)
	Mol% other gas (7690)	(→  99)
	Relative humidity (7731)	(→  99)
	<b>► External compensation</b>	(→  99)
	External value (7622)	(→  100)
	Atmospheric pressure (7601)	(→  100)
	Delta heat calculation (7736)	(→  100)
	Fixed density (7627)	(→  100)
	Fixed temperature (7628)	(→  100)
	2nd temperature delta heat (7625)	(→  100)
	Fixed process pressure (7629)	(→  101)
	Steam quality (7605)	(→  101)
	Steam quality value (7630)	(→  101)
	<b>► Sensor adjustment</b>	(→  101)
	Inlet configuration (7641)	(→  102)
	Inlet run (7642)	(→  102)

Mating pipe diameter (7648)	(→  102)
Installation factor (7616)	(→  102)
<b>► Calibration</b>	
Calibration factor (7604)	
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