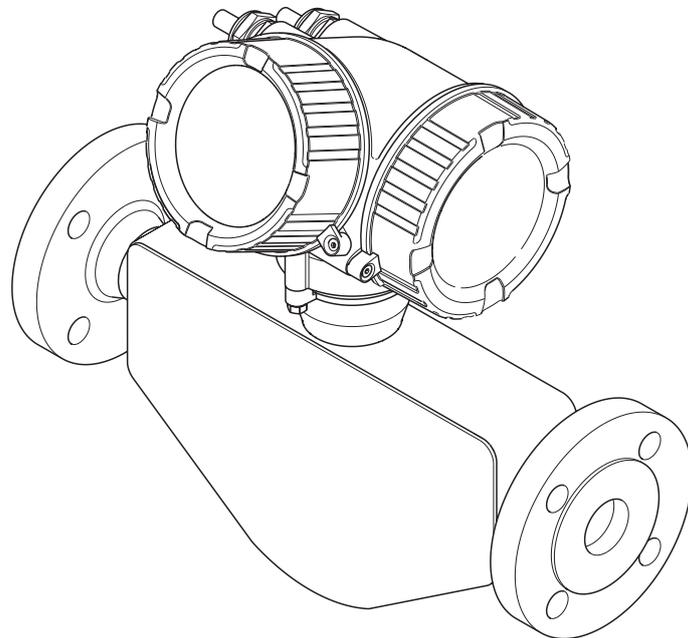


Operating Instructions

Proline Promass E 200

HART

Coriolis flowmeter



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

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1 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
 A0011189-EN	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 A0011190-EN	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 A0011191-EN	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
 A0011192-EN	NOTICE! This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 Electrical symbols

Symbol	Meaning
 A0011197	Direct current A terminal to which DC voltage is applied or through which direct current flows.
 A0011198	Alternating current A terminal to which alternating voltage is applied or through which alternating current flows.
 A0017381	Direct current and alternating current <ul style="list-style-type: none"> ▪ A terminal to which alternating voltage or DC voltage is applied. ▪ A terminal through which alternating current or direct current flows.
 A0011200	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
 A0011199	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.
 A0011201	Equipotential connection 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
 A0011220	Flat blade screwdriver
 A0011221	Allen key
 A0011222	Open-ended wrench

1.2.4 Symbols for certain types of information

Symbol	Meaning
 A0011182	Allowed Indicates procedures, processes or actions that are allowed.
 A0011183	Preferred Indicates procedures, processes or actions that are preferred.
 A0011184	Forbidden Indicates procedures, processes or actions that are forbidden.
 A0011193	Tip Indicates additional information.
 A0011194	Reference to documentation Refers to the corresponding device documentation.
 A0011195	Reference to page Refers to the corresponding page number.
 A0011196	Reference to graphic Refers to the corresponding graphic number and page number.
	Series of steps
	Result of a sequence of actions
 A0013562	Help in the event of a problem
 A0015502	Visual inspection

1.2.5 Symbols in graphics

Symbol	Meaning
1, 2, 3,...	Item numbers
	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
 A0013441	Flow direction

Symbol	Meaning
 A0011187	Hazardous area Indicates a hazardous area.
 A0011188	Safe area (non-hazardous area) Indicates a non-hazardous area.

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)
 - 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 (→  140)

1.3.1 Standard documentation

Document type	Purpose and content of the document
Technical Information	Planning aid for your device The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Brief Operating Instructions	Guide that takes you quickly to the 1st measured value The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.
Description of Device Parameters	Reference for your parameters The document provides a detailed explanation of each individual parameter in the operating menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

1.3.2 Supplementary device-dependent documentation

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

1.4 Registered trademarks

HART®

Registered trademark of the HART Communication Foundation, Austin, USA

TRI-CLAMP®

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

The measuring device described in these Instructions is intended only for flow measurement of liquids and gases.

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

Measuring devices for use in hazardous areas, in hygienic applications or 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 (→  8).

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 measuring tube due to corrosive or abrasive fluids.

Housing breakage due to mechanical overload possible!

- ▶ Verify the compatibility of the process fluid with the measuring tube 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



Danger of housing breaking due to measuring tube breakage!

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

The external surface temperature of the housing can increase by max. 20 K due to the power consumption of the electronic components. Hot process fluids passing through the measuring device will further increase the surface temperature of the housing. The surface of the sensor, in particular, can reach temperatures which are close to the fluid temperature.

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

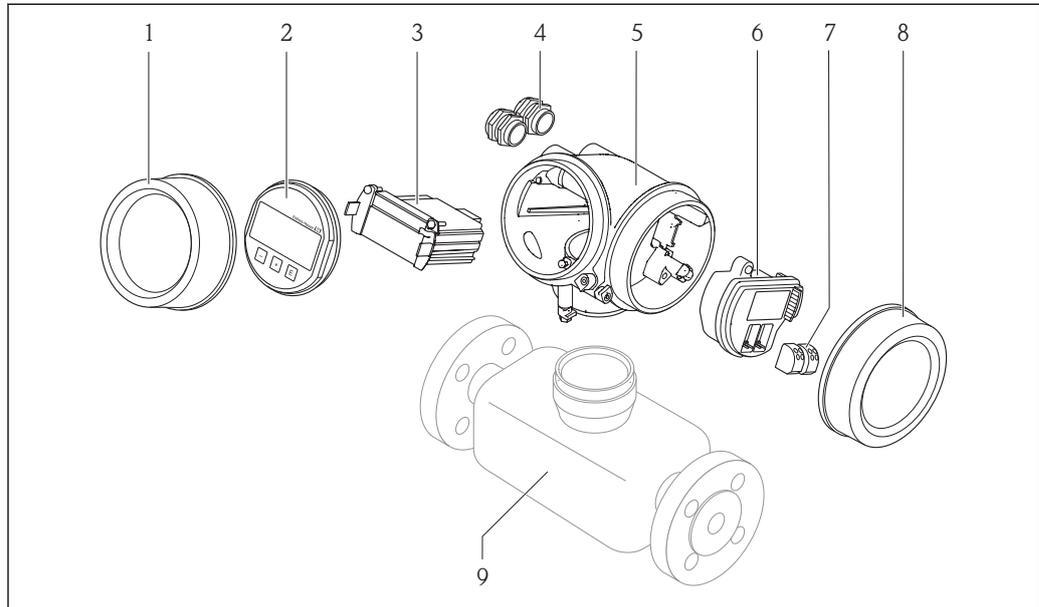
We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

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.

Endress+Hauser can be contacted to provide support in performing this task.

3 Product description

3.1 Product design



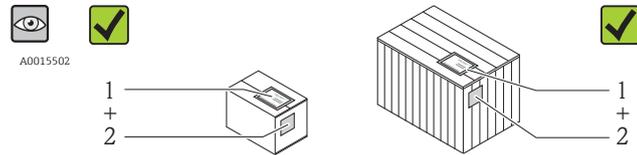
A0014056

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

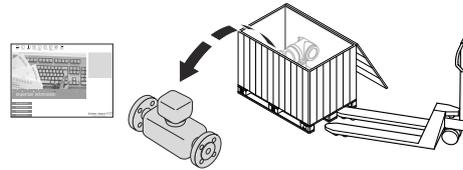
4 Incoming acceptance and product identification

4.1 Incoming acceptance

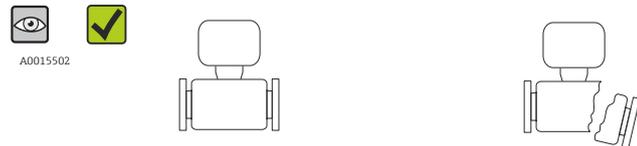


Are the order codes on the delivery note (1) and the product sticker (2) identical?

A0013843

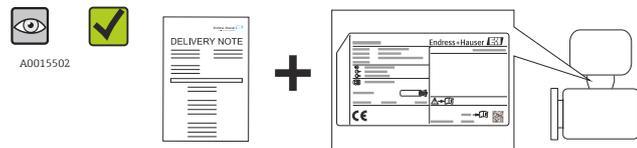


A0013695



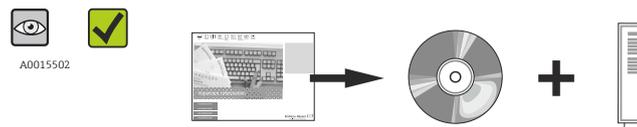
Are the goods undamaged?

A0013698



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

A0013699



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

A0013697

-  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! In such cases, the technical documentation is available via the Internet or via the *Endress+Hauser Operations App*, see the "Product identification" section (→  14).

4.2 Product identification

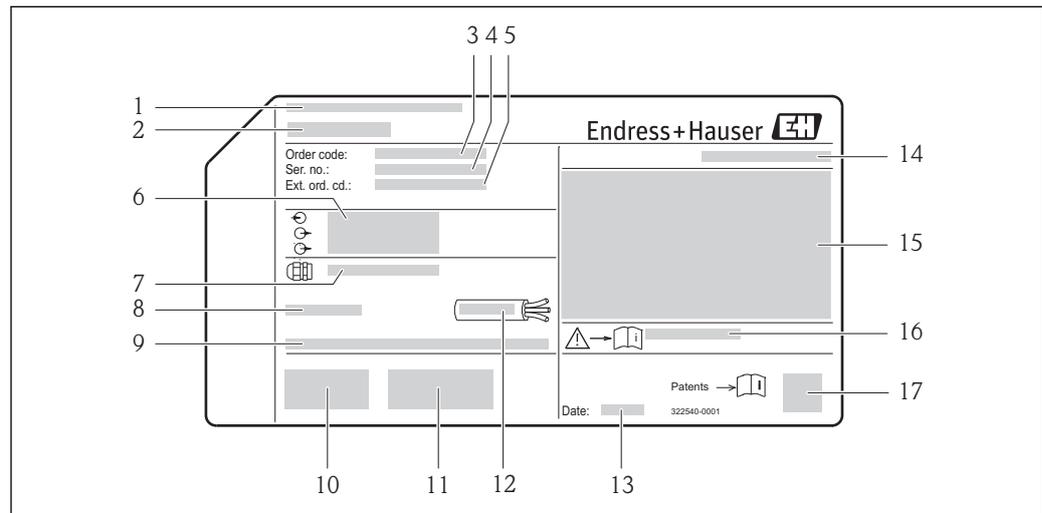
The following options are available for identification of the measuring device:

- 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): 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)
- 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

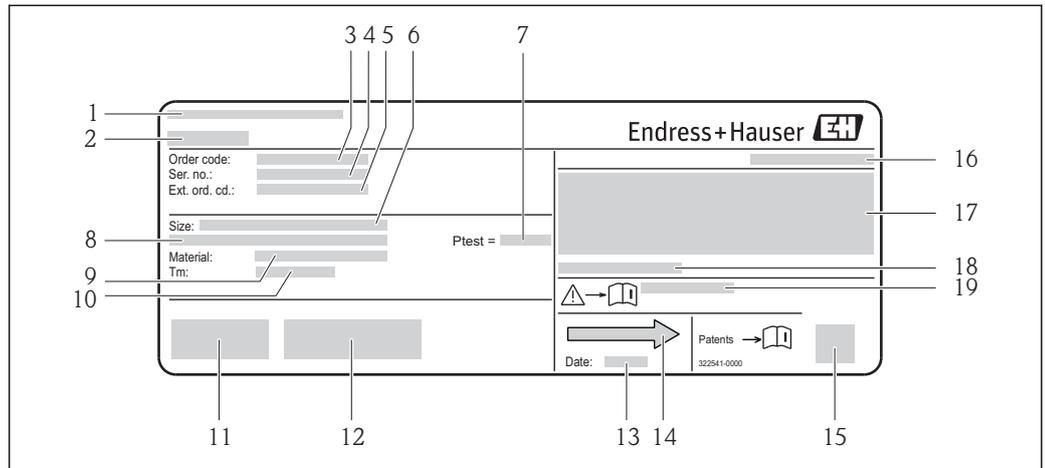


A0013906

 2 Example of a transmitter nameplate

- 1 Manufacturing location
- 2 Name of the transmitter
- 3 Order code
- 4 Serial number
- 5 Extended order code
- 6 Electrical connection data, e.g. available inputs and outputs, supply voltage
- 7 Type of cable glands
- 8 Permitted ambient temperature range (T_a)
- 9 Firmware version (FW) and device revision (Dev.Rev.) 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 Explosion protection approval information
- 16 Document number of safety-related supplementary documentation (→  140)
- 17 2-D matrix code

4.2.2 Sensor nameplate



A0013907

 3 Example of a sensor nameplate

- 1 Manufacturing location
- 2 Name of the sensor
- 3 Order code
- 4 Serial number (Ser. no.)
- 5 Extended order code (Ext. ord. cd.)
- 6 Nominal diameter of the sensor
- 7 Test pressure of the sensor
- 8 Flange nominal diameter/nominal pressure
- 9 Material of measuring tube and manifold
- 10 Medium temperature range
- 11 CE mark, C-Tick
- 12 Additional information on version: certificates, approvals
- 13 Manufacturing date: year-month
- 14 Flow direction
- 15 2-D matrix code
- 16 Degree of protection
- 17 Approval information for explosion protection and Pressure Equipment Directive
- 18 Permitted ambient temperature (T_a)
- 19 Document number of safety-related supplementary documentation (→  140)

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
	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 A0011194	Reference to documentation Refers to the corresponding device documentation.
 A0011199	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.

5 Storage and transport

5.1 Storage conditions

Observe the following notes for storage:

- Store in the original packaging to ensure protection from shock.
- Do not remove protective covers or protective caps installed on process connections. They prevent mechanical damage to the sealing surfaces and fouling in the measuring tube.
- Protect from direct sunlight to avoid unacceptably high surface temperatures.
- Storage temperature: -40 to $+80$ °C (-40 to $+176$ °F), preferable for $+20$ °C ($+68$ °F)
- Store in a dry and dust-free place.
- Do not store outdoors.

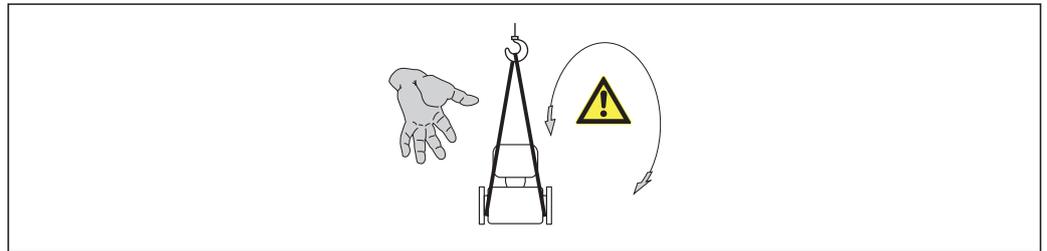
5.2 Transporting the product

⚠ 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 from rotating or slipping.
- ▶ Observe the weight specified on the packaging (stick-on label).
- ▶ Observe the transport instructions on the stick-on label on the electronics compartment cover.



A0015606

Observe the following notes during transport:

- Transport the measuring device to the measuring point in the original packaging.
- Lifting gear
 - Webbing slings: Do not use chains, as they could damage the housing.
 - For wood crates, the floor structure enables these to be loaded lengthwise or broadside using a forklift.
- For measuring device $> DN 40$ ($1\frac{1}{2}$ in): lift the measuring device using the webbing slings at the process connections; do not lift at the transmitter housing.
- Do not remove protective covers or protective caps installed on process connections. They prevent mechanical damage to the sealing surfaces and fouling in the measuring tube.

5.3 Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:

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

6 Installation

6.1 Installation conditions

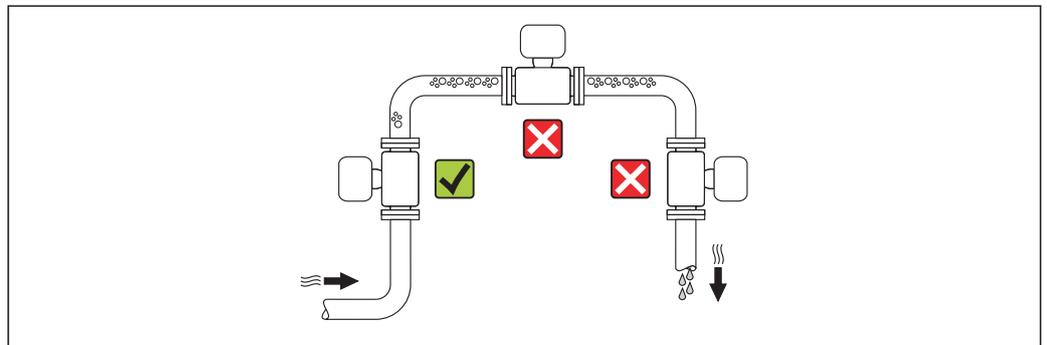
No special measures such as supports are necessary. External forces are absorbed by the construction of the device.

6.1.1 Mounting position

Mounting location

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

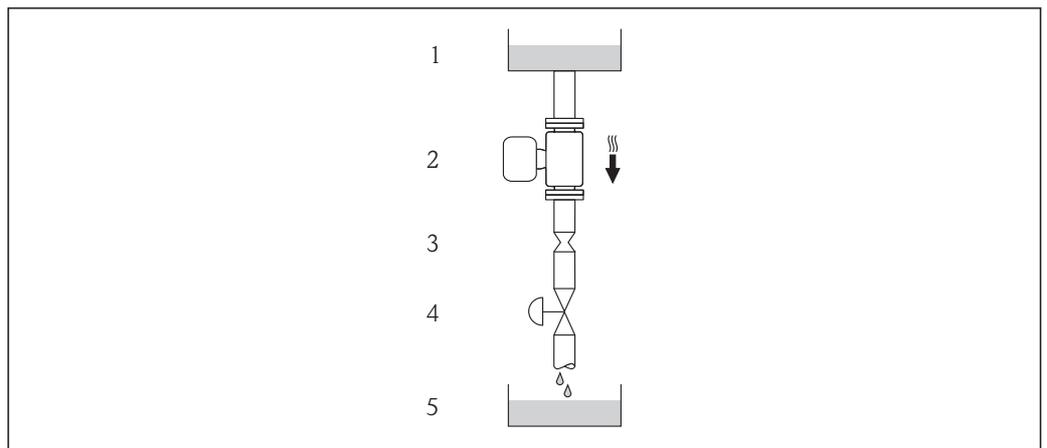
- Highest point of a pipeline.
- Directly upstream of a free pipe outlet in a down pipe.



A0015595

Installation in down pipes

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



A0015596

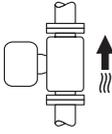
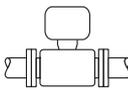
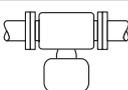
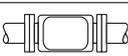
4 Installation in a down pipe (e.g. for batching applications)

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

DN		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
8	3/8	6	0.24
15	1/2	10	0.40
25	1	14	0.55
40	1 1/2	22	0.87
50	2	28	1.10

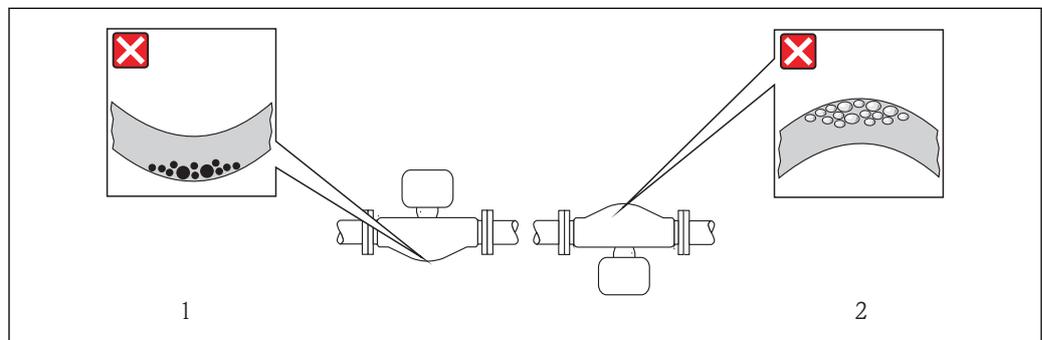
Orientation

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

Orientation			Recommendation
A	Vertical orientation	 A0015591	☑☑
B	Horizontal orientation, transmitter head up	 A0015589	☑☑ ¹⁾ Exception: (→ ☒ 5, ☒ 20)
C	Horizontal orientation, transmitter head down	 A0015590	☑☑ ²⁾ Exception: (→ ☒ 5, ☒ 20)
D	Horizontal orientation, transmitter head at side	 A0015592	☒

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

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

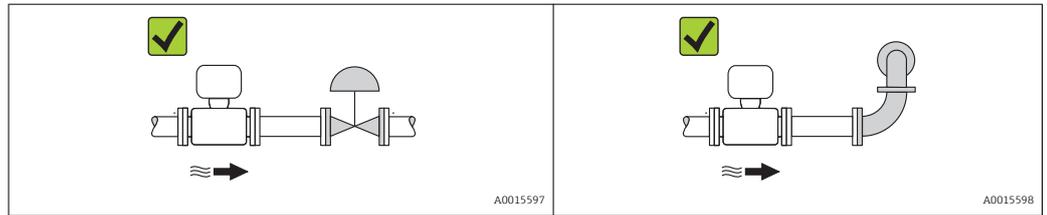


☒ 5 Orientation of sensor with curved measuring tube

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

Inlet and outlet runs

No special precautions need to be taken for fittings which create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs (→ 21).



Installation dimensions

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

6.1.2 Requirements from environment and process

Ambient temperature range

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

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

System pressure

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

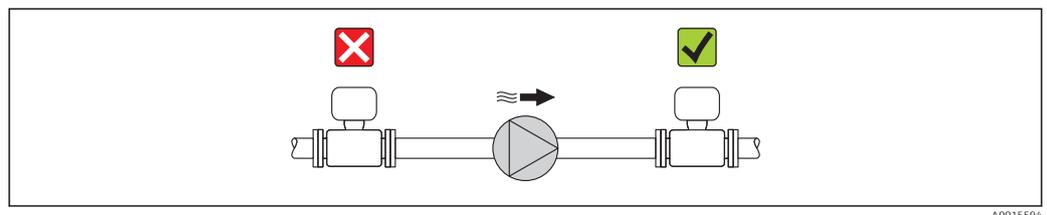
Cavitation is caused if the pressure drops below the vapor pressure:

- In liquids that have a low boiling point (e.g. hydrocarbons, solvents, liquefied gases)
- In suction lines

- ▶ Ensure the system pressure is sufficiently high to prevent cavitation and outgassing.

For this reason, the following mounting locations are recommended:

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

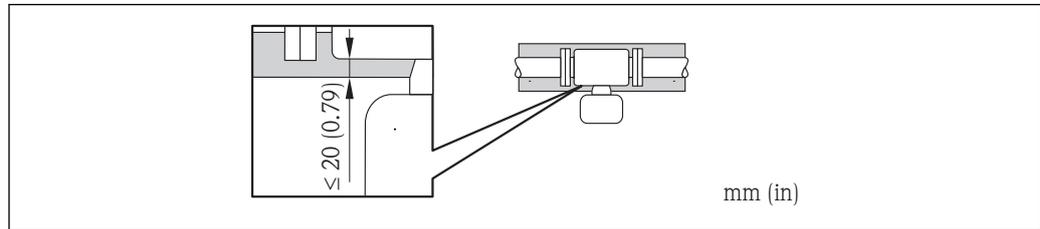


Thermal insulation

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

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

- ▶ Observe maximum permitted insulation height of the transmitter neck so that the transmitter head is completely free.



A0016749

Heating**NOTICE****Electronics can overheat due to elevated ambient temperature!**

- ▶ Observe maximum permitted ambient temperature for the transmitter (→ 21).
- ▶ Depending on the fluid temperature, take the device orientation requirements into account.

Heating options

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

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

Using an electrical trace heating system

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

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

The sheet must have the following properties:

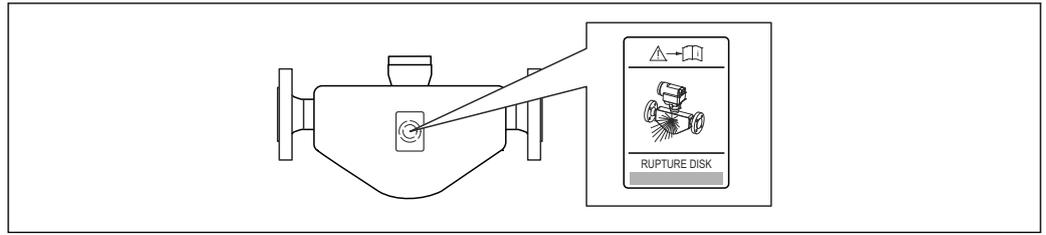
- Relative magnetic permeability $\mu_r \geq 300$
- Plate thickness $d \geq 0.35$ mm ($d \geq 0.014$ in)

Vibrations

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

6.1.3 Special mounting instructions**Rupture disk**

Make sure that the function and operation of the rupture disk is not impeded through the installation of the device. The position of the rupture disk is indicated on a sticker applied over it. If the rupture disk is triggered, the sticker is destroyed. The disk can therefore be visually monitored. For additional information that is relevant to the process (→ 131).



6 Rupture disk label

- ▶ After the rupture disk is actuated, do not operate the measuring device any more.

WARNING

Limited functional reliability of the rupture disk.

Danger to persons from escaping fluids!

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

Zero point adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions (→ 127). Therefore, a zero point adjustment in the field is generally not required.

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

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

6.2 Mounting the measuring device

6.2.1 Required tools

For 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. If present, remove transport protection of the rupture disk.
4. Remove stick-on label on the electronics compartment cover.

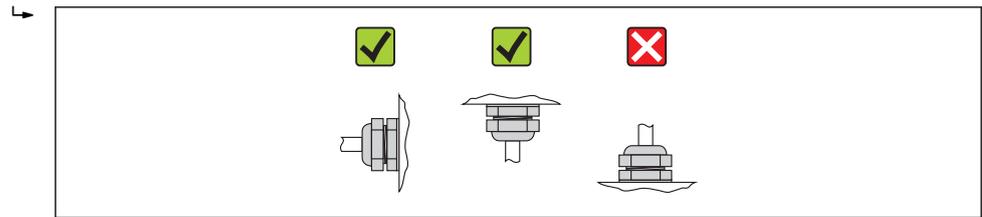
6.2.3 Mounting the measuring device

⚠ WARNING

Danger due to improper process sealing!

- ▶ Ensure that the inside diameters of the gaskets are greater than or equal to that of the process connections and piping.
- ▶ Ensure that the gaskets are clean and undamaged.
- ▶ Install the gaskets correctly.

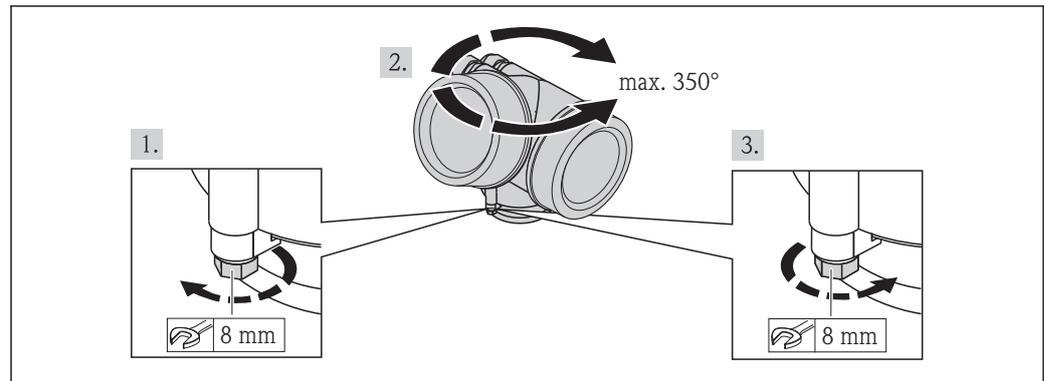
1. Ensure that the direction of the arrow on the nameplate of the sensor matches the flow direction of the fluid.
2. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.



A0013964

6.2.4 Turning the transmitter housing

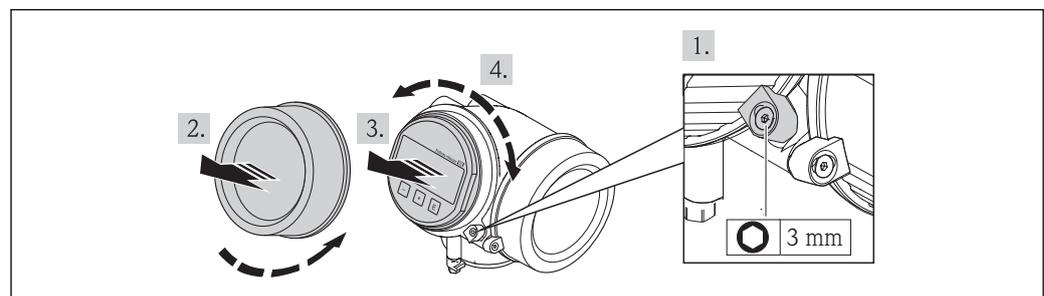
To provide easier access to the connection compartment or display module, the transmitter housing can be turned:



A0013713

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

6.2.5 Turning the display module



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"/>
Does the measuring device conform to the measuring point specifications? For example: <ul style="list-style-type: none"> ▪ Process temperature (→ 131) ▪ Process pressure (refer to the chapter on "Material load curves" of the "Technical Information" document) ▪ Ambient temperature (→ 21) ▪ Measuring range (→ 121) 	<input type="checkbox"/>
Has the correct orientation for the sensor been selected ? <ul style="list-style-type: none"> ▪ According to sensor type ▪ According to medium temperature ▪ According to medium properties (outgassing, with entrained solids) 	<input type="checkbox"/>
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping (→ 20)?	<input type="checkbox"/>
Are the measuring point identification and labeling correct (visual inspection)?	<input type="checkbox"/>
Is the device adequately protected from precipitation and direct sunlight?	<input type="checkbox"/>
Are the securing screw and securing clamp tightened securely?	<input type="checkbox"/>

7 Electrical connection

i 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 ≤ 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

Current output

- For 4-20 mA: standard installation cable is sufficient.
- For 4-20 mA HART: Shielded cable recommended. Observe grounding concept of the plant.

Pulse/frequency/switch output

Standard installation cable is sufficient.

Cable diameter

- Cable glands supplied:
M20 \times 1.5 with cable $\phi 6$ to 12 mm (0.24 to 0.47 in)
- Plug-in spring terminals for device version without integrated overvoltage protection:
wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- Screw terminals for device version with integrated overvoltage protection: wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)

7.1.3 Terminal assignment

Transmitter

4-20 mA HART connection version with additional outputs

<p>Maximum number of terminals, without integrated overvoltage protection</p>	<p>Maximum number of terminals, with integrated overvoltage protection</p>
<p>1 Output 1 (passive): supply voltage and signal transmission 2 Output 2 (passive): supply voltage and signal transmission 3 Ground terminal for cable shield</p>	

Order code for "Output"	Terminal numbers			
	Output 1		Output 2	
	1 (+)	2 (-)	3 (+)	4 (-)
Option A	4-20 mA HART (passive)		-	
Option B ¹⁾	4-20 mA HART (passive)		Pulse/frequency/switch output (passive)	
Option C ¹⁾	4-20 mA HART (passive)		4-20 mA (passive)	

1) Output 1 must always be used; output 2 is optional.

7.1.4 Requirements for the supply unit

Supply voltage

Transmitter

An external power supply is required for each output. The following supply voltage values apply for the 4-20 mA and 4-20 mA HART current output:

Order code for "Output"	Minimum terminal voltage	Maximum terminal voltage
Option A ^{1) 2)} : 4-20 mA HART	For 4 mA: ≥ DC 18 V For 20 mA: ≥ DC 14 V	DC 35 V
Option B ^{1) 2)} : 4-20 mA HART, pulse/frequency/switch output	For 4 mA: ≥ DC 18 V For 20 mA: ≥ DC 14 V	DC 35 V
Option C ^{1) 2)} : 4-20 mA HART, 4-20 mA	For 4 mA: ≥ DC 18 V For 20 mA: ≥ DC 14 V	DC 30 V

- 1) External supply voltage of the power supply unit with load.
- 2) For device versions with SD03 local display: The terminal voltage must be increased by DC 2 V if backlighting is used.

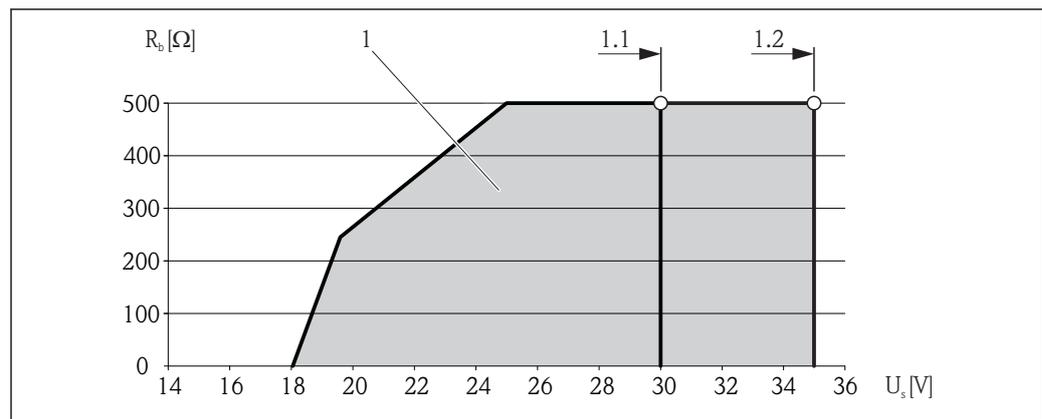
Load

Load for current output: 0 to 500 Ω , depending on the external supply voltage of the power supply unit

Calculation of the maximum load

Depending on the supply voltage of the power supply unit (U_S), the maximum load (R_B) including line resistance must be observed to ensure adequate terminal voltage at the device. In doing so, observe the minimum terminal voltage (\rightarrow 27)

- For $U_S = 18$ to 18.9 V: $R_B \leq (U_S - 18 \text{ V}) : 0.0036 \text{ A}$
- For $U_S = 18.9$ to 24.5 V: $R_B \leq (U_S - 13.5 \text{ V}) : 0.022 \text{ A}$
- For $U_S = 24.5$ to 30 V: $R_B \leq 500 \Omega$



A0013563

- 1 Operating range
- 1.1 For order code for "Output", option A "4-20 mA HART"/option B "4-20 mA HART, pulse/frequency/switch output" with Ex i and option C "4-20 mA HART, 4-20 mA"
- 1.2 For order code for "Output", option A "4-20 mA HART"/option B "4-20 mA HART, pulse/frequency/switch output" with non-Ex and Ex d

Sample calculation

Supply voltage of the supply unit: $U_S = 19 \text{ V}$

Maximum load: $R_B \leq (19 \text{ V} - 13.5 \text{ V}) : 0.022 \text{ A} = 250 \Omega$

7.1.5 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 (\rightarrow 26).
3. If measuring device is delivered with cable glands:
Observe cable specification (\rightarrow 26).

7.2 Connecting the measuring device

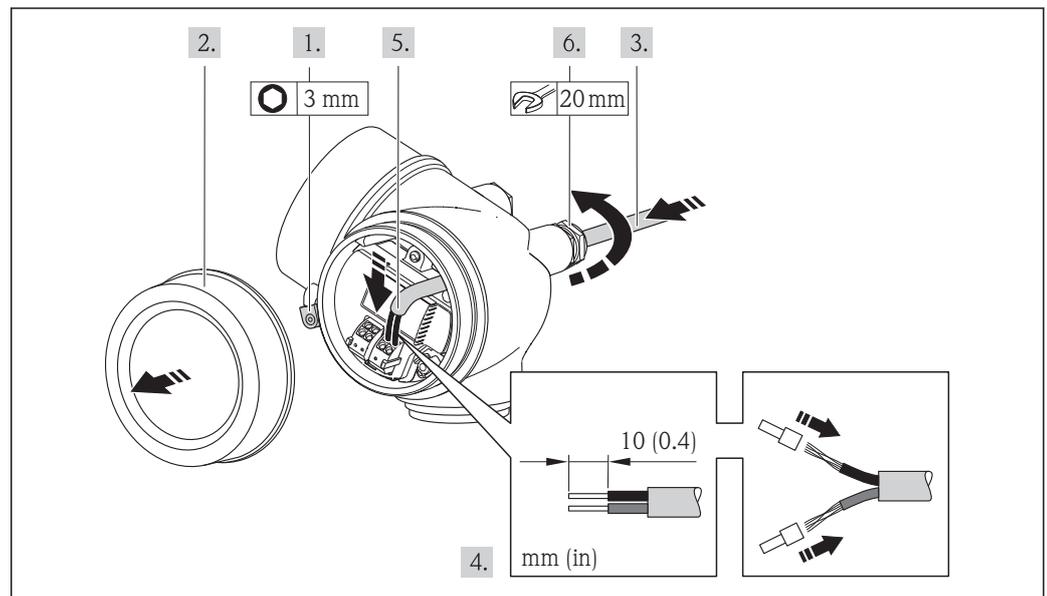
NOTICE

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 transmitter

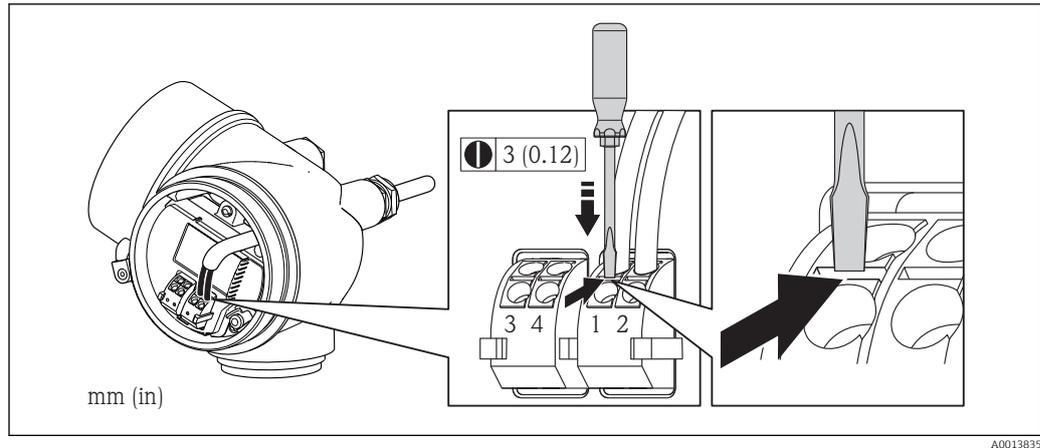
Connection via terminals



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 . For HART communication: When connecting the cable shielding to the ground terminal, observe the grounding concept of the facility.
6. Firmly tighten the cable glands.
7. **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.

Removing a cable

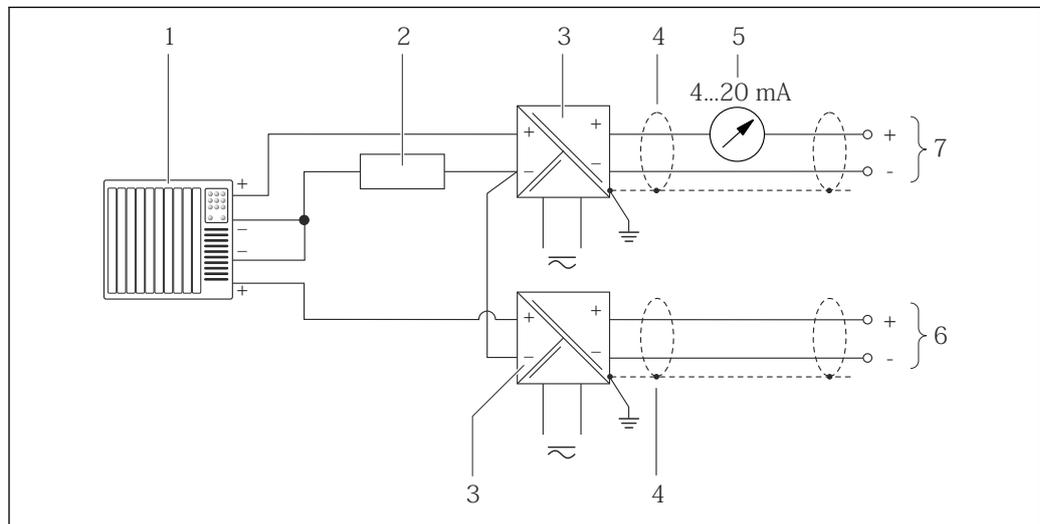


- ▶ To remove a cable from the terminal, use a flat-blade screwdriver to push the slot between the two terminal holes while simultaneously pulling the cable end out of the terminal.

7.3 Special connection instructions

7.3.1 Connection examples

HART input



7 Connection example for HART input with a common negative

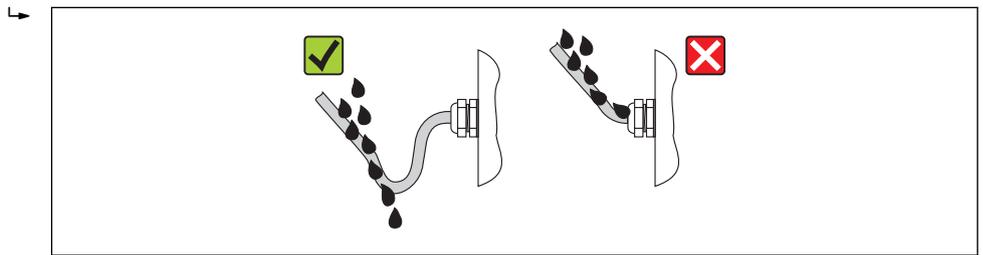
- 1 Automation system with HART output (e.g. PLC)
- 2 Resistor for HART communication ($\geq 250 \Omega$); observe maximum load (\rightarrow 28)
- 3 Active barrier for power supply (e.g. RN221N) (\rightarrow 27)
- 4 Cable shield, observe cable specifications
- 5 Analog display unit; observe maximum load (\rightarrow 28)
- 6 Pressure transmitter (e.g. Cerabar M, Cerabar S); see requirements (\rightarrow 122)
- 7 Transmitter

7.4 Ensuring the degree of protection

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

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

1. Check that the housing seals are clean and fitted correctly. 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

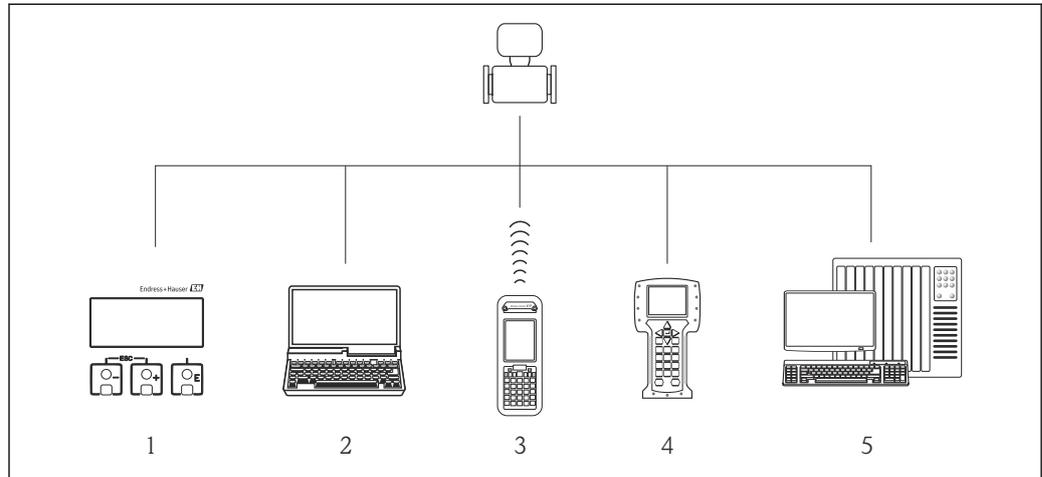
5. Insert dummy plugs into unused cable entries.

7.5 Post-connection check

Are cables or the device undamaged (visual inspection)?	<input type="checkbox"/>
Do the cables comply with the requirements (→ 26)?	<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" (→ 31)?	<input type="checkbox"/>
Depending on the device version: are all the device plugs firmly tightened (→ 29)?	<input type="checkbox"/>
Does the supply voltage match the specifications on the transmitter nameplate (→ 27)?	<input type="checkbox"/>
Is the terminal assignment 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

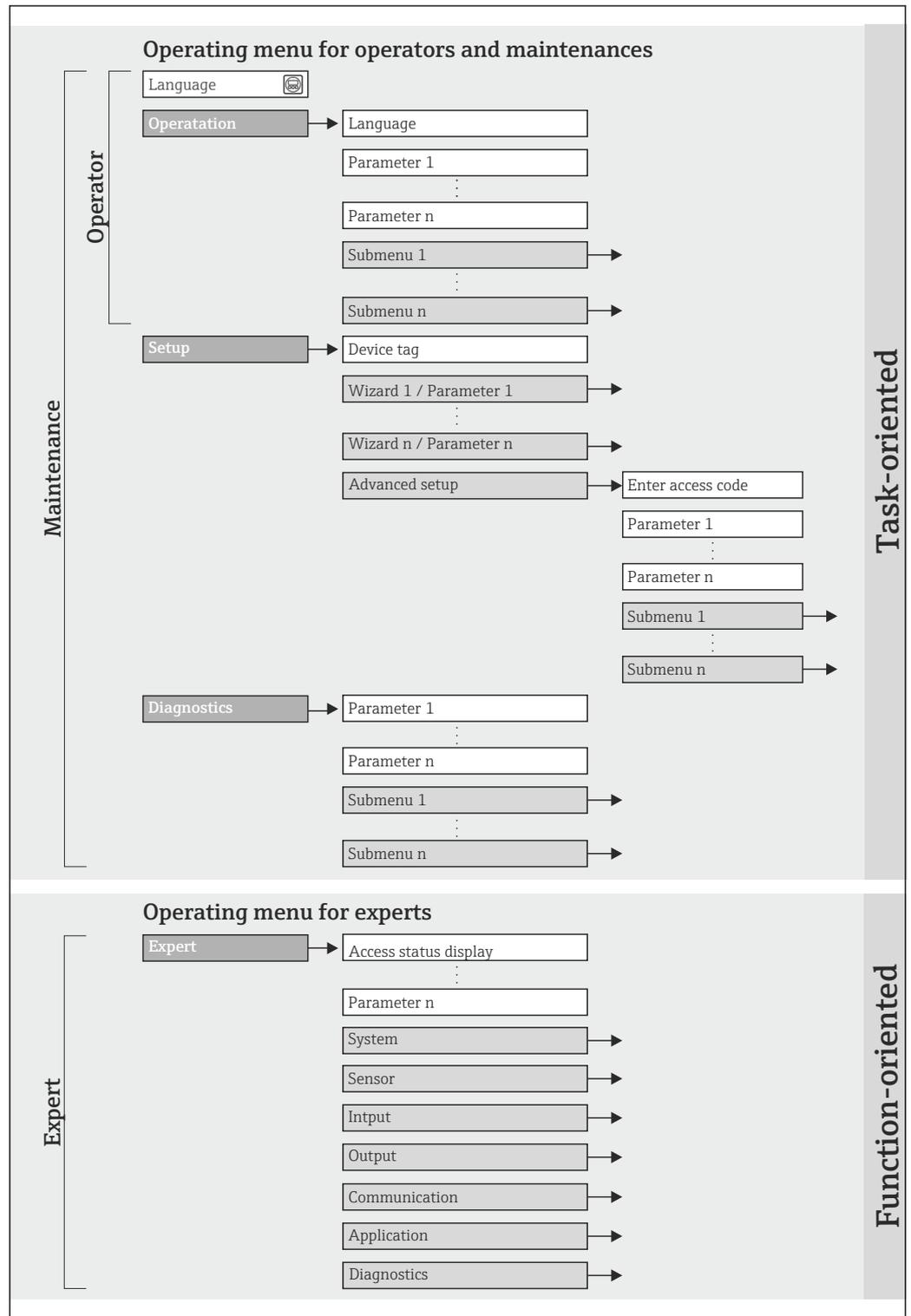


- 1 Local operation via display module
- 2 Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
- 3 Field Xpert SFX350 or SFX370
- 4 Field Communicator 475
- 5 Control system (e.g. PLC)

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 (→  141)



A0018237-EN

 8 Schematic structure of the operating menu

8.2.2 Operating philosophy

The individual parts of the operating menu are assigned to certain user roles. Each user role corresponds to typical tasks within the device lifecycle.

Menu		User role and tasks	Content/meaning
Language	task-oriented	Role "Operator", "Maintenance" Tasks during operation: <ul style="list-style-type: none"> ▪ Configuring the operational display ▪ Reading measured values 	Defining the operating language
Operation			<ul style="list-style-type: none"> ▪ Configuring the operational display (e.g. display format, display contrast) ▪ Resetting and controlling totalizers
Setup		"Maintenance" role Commissioning: <ul style="list-style-type: none"> ▪ Configuration of the measurement ▪ Configuration of the inputs and outputs 	Wizards for fast commissioning: <ul style="list-style-type: none"> ▪ Defining the medium ▪ Configuring the outputs ▪ Configuring the operational display ▪ Defining the output conditioning ▪ Configuring the low flow cut off ▪ Configuring the monitoring of partial and empty pipe detection "Advanced setup" submenu: <ul style="list-style-type: none"> ▪ For more customized configuration of the measurement (adaptation to special measuring conditions) ▪ Configuration of totalizers ▪ Administration (define access code, reset measuring device)
Diagnostics		"Maintenance" role Fault elimination: <ul style="list-style-type: none"> ▪ Diagnostics and elimination of process and device errors ▪ Measured value simulation 	Contains all parameters for error detection and analyzing process and device errors: <ul style="list-style-type: none"> ▪ "Diagnostic list" submenu Contains up to 5 currently pending diagnostic messages. ▪ "Event logbook" submenu Contains up to 20 or 100 (order option "Extended HistoROM") event messages that have occurred. ▪ "Device information" submenu Contains information for identifying the device. ▪ "Measured values" submenu Contains all current measured values. ▪ "Data logging" submenu (order option "Extended HistoROM") Storage and visualization of up to 1000 measured values ▪ "Heartbeat Technology" submenu The functionality of the device is checked on demand and the verification results are documented. ▪ "Simulation" submenu Is used to simulate measured values or output values.
Expert	function-oriented	Tasks that require detailed knowledge of the function of the device: <ul style="list-style-type: none"> ▪ Commissioning measurements under difficult conditions ▪ Optimal adaptation of the measurement to difficult conditions ▪ Detailed configuration of the communication interface ▪ Error diagnostics in difficult cases 	Contains all the parameters of the device and makes it possible to access these parameters directly using an access code. The structure of this menu is based on the function blocks of the device: <ul style="list-style-type: none"> ▪ "System" submenu Contains all higher-order device parameters that do not pertain either to measurement or the measured value communication. ▪ "Sensor" submenu Configuration of the measurement. ▪ "Input" submenu Configuration of the input. ▪ "Output" submenu Configuration of the outputs. ▪ "Communication" submenu Configuration of the digital communication interface. ▪ "Application" submenu Configuration of the functions that go beyond the actual measurement (e.g. totalizer). ▪ "Diagnostics" submenu Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology.

8.3 Access to the operating menu via the local display

8.3.1 Operational display

A0016501

1	Operational display
2	Device tag (→ 57)
3	Status area
4	Display area for measured values (4-line)
5	Operating elements (→ 40)

Status area

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

- Status signals(→ 100)
- Diagnostic behavior(→ 101)
- Locking
- Communication

Locking

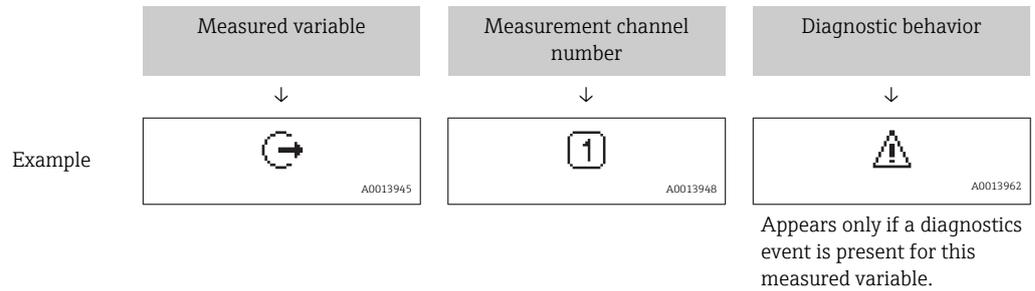
Symbol	Meaning
 <small>A0013963</small>	Device locked The measuring device is hardware locked (→ 91).

Communication

Symbol	Meaning
 <small>A0013965</small>	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
 <small>A0013710</small>	Mass flow
 <small>A0013711</small>	<ul style="list-style-type: none"> ▪ Volume flow ▪ Corrected volume flow
 <small>A0013946</small>	<ul style="list-style-type: none"> ▪ Density ▪ Reference density
 <small>A0013947</small>	Temperature
 <small>A0013943</small>	Totalizer  The measurement channel number indicates which of the three totalizers is displayed.
 <small>A0013945</small>	Output  The measurement channel number indicates which of the two current outputs is displayed.

Measurement channel numbers

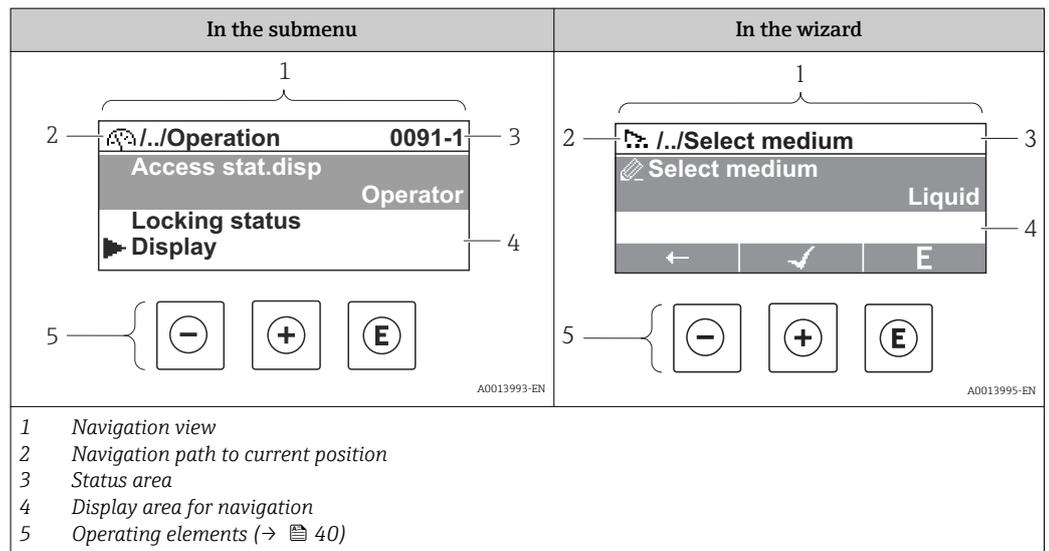
Symbol	Meaning
 <small>A0016325</small>	Measurement channel 1 to 4
The measurement channel number is displayed only if more than one channel is present for the same measured variable type (e.g. Totalizer 1 to 3).	

Diagnostic behavior

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable. For information on the symbols (→  101)

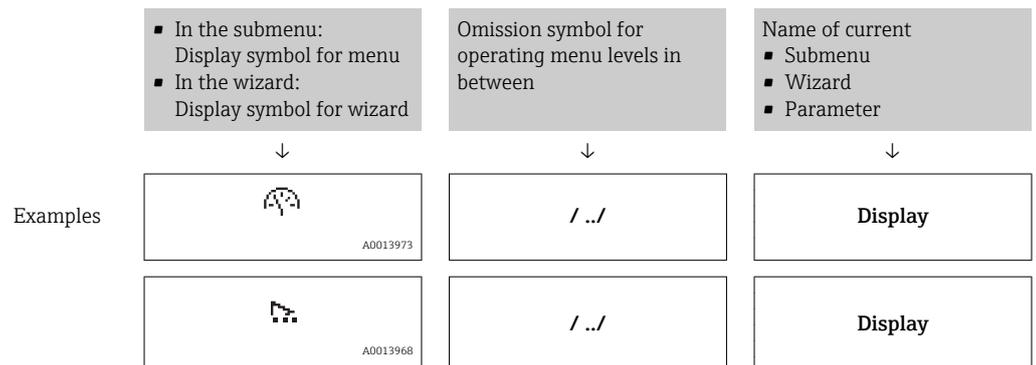
 The number and display format of the measured values can be configured via the **"Format display" parameter**(→  73). "Operation" menu → Display → Format display

8.3.2 Navigation view



Navigation path

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



i For more information about the menu icons, refer to the "Display area" section (→ 38)

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

- i** For information on the diagnostic behavior and status signal (→ 100)
- For information on the function and entry of the direct access code (→ 43)

Display area

Menus

Symbol	Meaning
 A0013973	Operation Appears: <ul style="list-style-type: none"> In the menu next to the "Operation" selection At the left in the navigation path in the "Operation" menu
 A0013974	Setup Appears: <ul style="list-style-type: none"> In the menu next to the "Setup" selection At the left in the navigation path in the "Setup" menu
 A0013975	Diagnostics Appears: <ul style="list-style-type: none"> In the menu next to the "Diagnostics" selection At the left in the navigation path in the "Diagnostics" menu
 A0013966	Expert Appears: <ul style="list-style-type: none"> In the menu next to the "Expert" selection At the left in the navigation path in the "Expert" menu

Submenus, wizards, parameters

Symbol	Meaning
 A0013967	Submenu
 A0013968	Wizard
 A0013972	Parameters within a wizard  No display symbol exists for parameters in submenus.

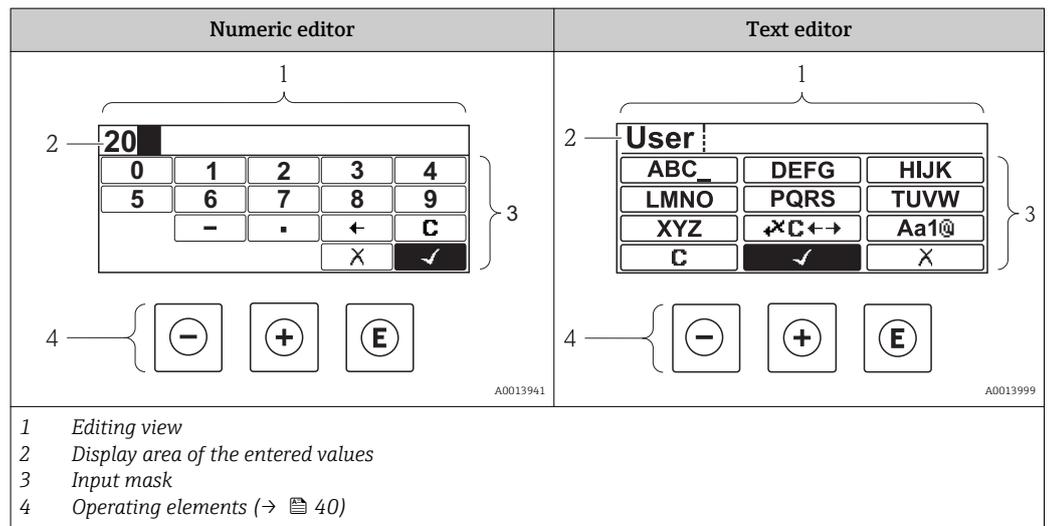
Locking

Symbol	Meaning
 A0013963	Parameter locked When displayed in front of a parameter name, indicates that the parameter is locked. <ul style="list-style-type: none"> By a user-specific access code (→  90) By the hardware write protection switch (→  91)

Wizard operation

Symbol	Meaning
 A0013978	Switches to the previous parameter.
 A0013976	Confirms the parameter value and switches to the next parameter.
 A0013977	Opens the editing view of the parameter.

8.3.3 Editing view



- 1 Editing view
- 2 Display area of the entered values
- 3 Input mask
- 4 Operating elements (→ 40)

Input mask

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

Numeric editor

Symbol	Meaning
	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.
	Exits the input without applying the changes.
	Clears all entered characters.

Text editor

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

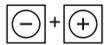
  <small>A0019094</small>	Selection of letters from a to z.
  <small>A0019095</small>	Selection of special characters.
 <small>A0013985</small>	Confirms selection.
 <small>A0013987</small>	Switches to the selection of the correction tools.
 <small>A0013986</small>	Exits the input without applying the changes.
 <small>A0014040</small>	Clears all entered characters.

Correction symbols under 

Symbol	Meaning
 <small>A0013989</small>	Clears all entered characters.
 <small>A0013991</small>	Moves the input position one position to the right.
 <small>A0013990</small>	Moves the input position one position to the left.
 <small>A0013988</small>	Deletes one character immediately to the left of the input position.

8.3.4 Operating elements

Key	Meaning
 <small>A0013969</small>	<p>Minus key</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>
 <small>A0013970</small>	<p>Plus key</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
 <small>A0013952</small>	<p>Enter key</p> <p><i>For operational display</i></p> <ul style="list-style-type: none"> Pressing the key briefly opens the operating menu. Pressing the key for 2 s opens the context menu. <p><i>In a menu, submenu</i></p> <ul style="list-style-type: none"> Pressing the key briefly: <ul style="list-style-type: none"> Opens the selected menu, submenu or parameter. Starts the wizard. If help text is open, closes the help text of the parameter. Pressing the key for 2 s for parameter: <ul style="list-style-type: none"> If present, opens the help text for the function of the parameter. <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"> Pressing the key briefly: <ul style="list-style-type: none"> Opens the selected group. Carries out the selected action. Pressing the key for 2 s confirms the edited parameter value.
 <small>A0013971</small>	<p>Escape key combination (press keys simultaneously)</p> <p><i>In a menu, submenu</i></p> <ul style="list-style-type: none"> Pressing the key briefly: <ul style="list-style-type: none"> Exits the current menu level and takes you to the next higher level. If help text is open, closes the help text of the parameter. Pressing the key for 2 s returns you to the operational display ("home position"). <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>
 <small>A0013953</small>	<p>Minus/Enter key combination (press the keys simultaneously)</p> <p>Reduces the contrast (brighter setting).</p>
 <small>A0013954</small>	<p>Plus/Enter key combination (press and hold down the keys simultaneously)</p> <p>Increases the contrast (darker setting).</p>
 <small>A0013955</small>	<p>Minus/Plus/Enter key combination (press the keys simultaneously)</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

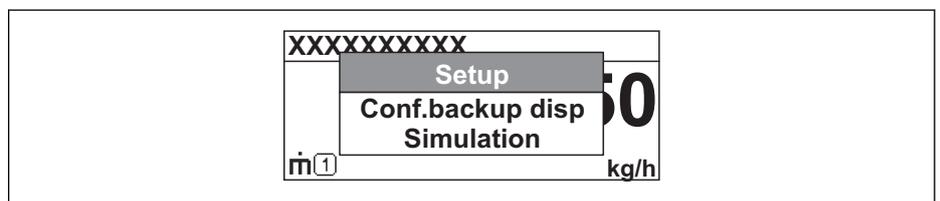
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Conf. backup disp.
- Simulation

Calling up and closing the context menu

The user is in the operational display.

1. Press  for 2 s.
 ↳ The context menu opens.



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

Calling up the menu via the context menu

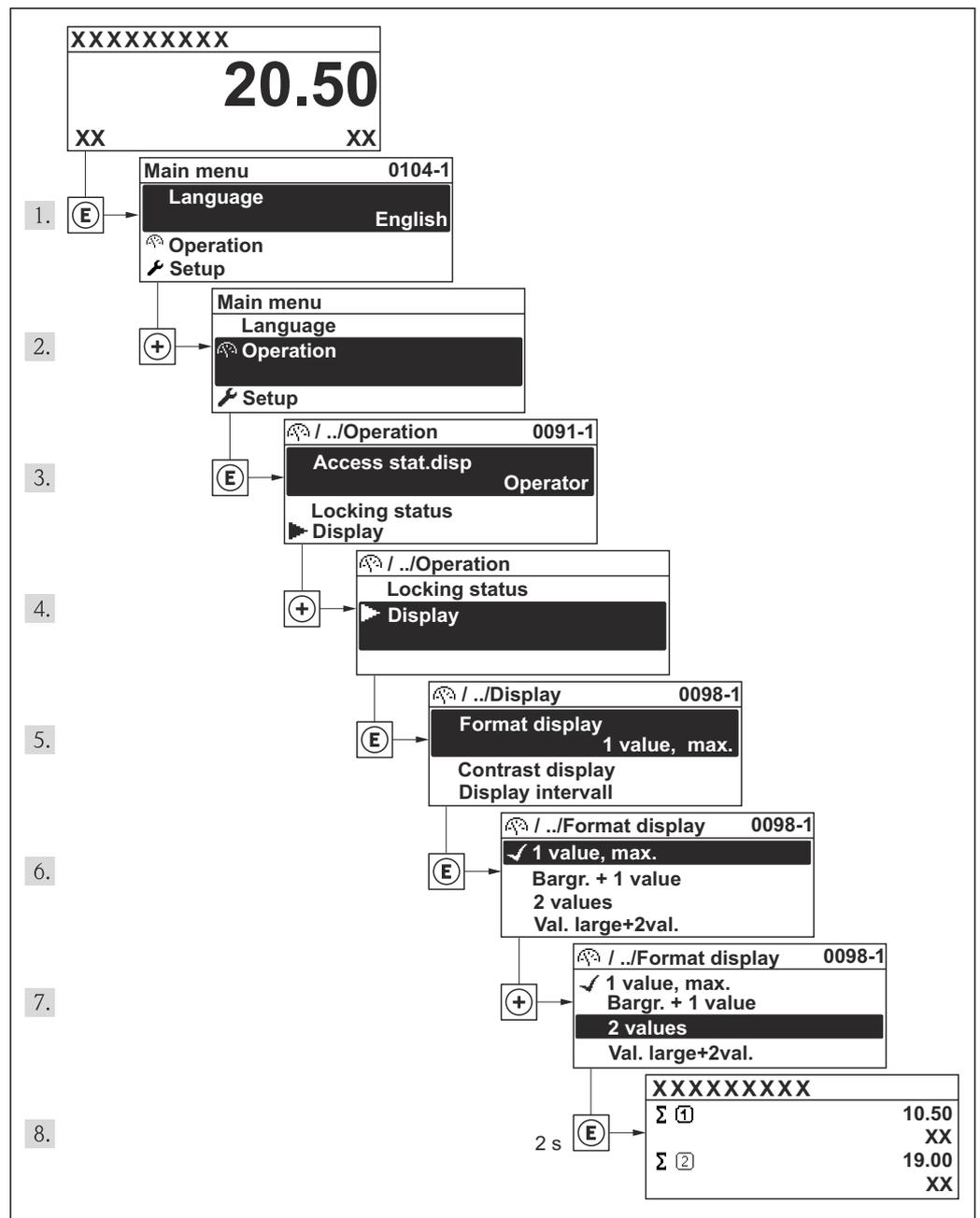
1. Open the context menu.
2. Press \boxplus to navigate to the desired menu.
3. Press \boxminus to confirm the selection.
 - ↳ The selected menu opens.

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 (→ 37)

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



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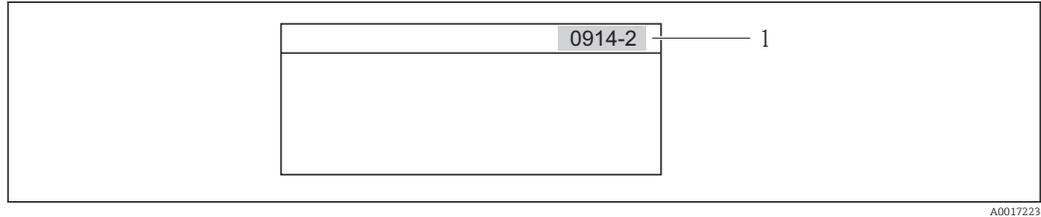
8.3.7 Calling the parameter directly

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 (→ 141)

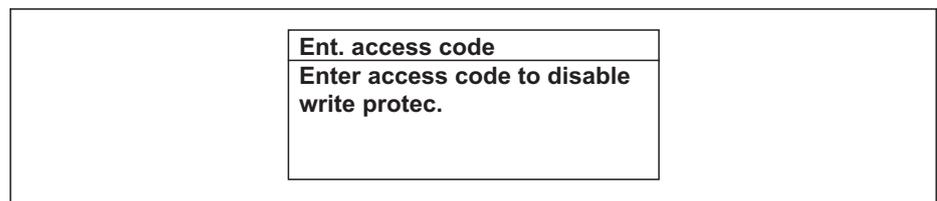
8.3.8 Calling up help text

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 **Enter** for 2 s.
 - ↳ The help text for the selected parameter opens.



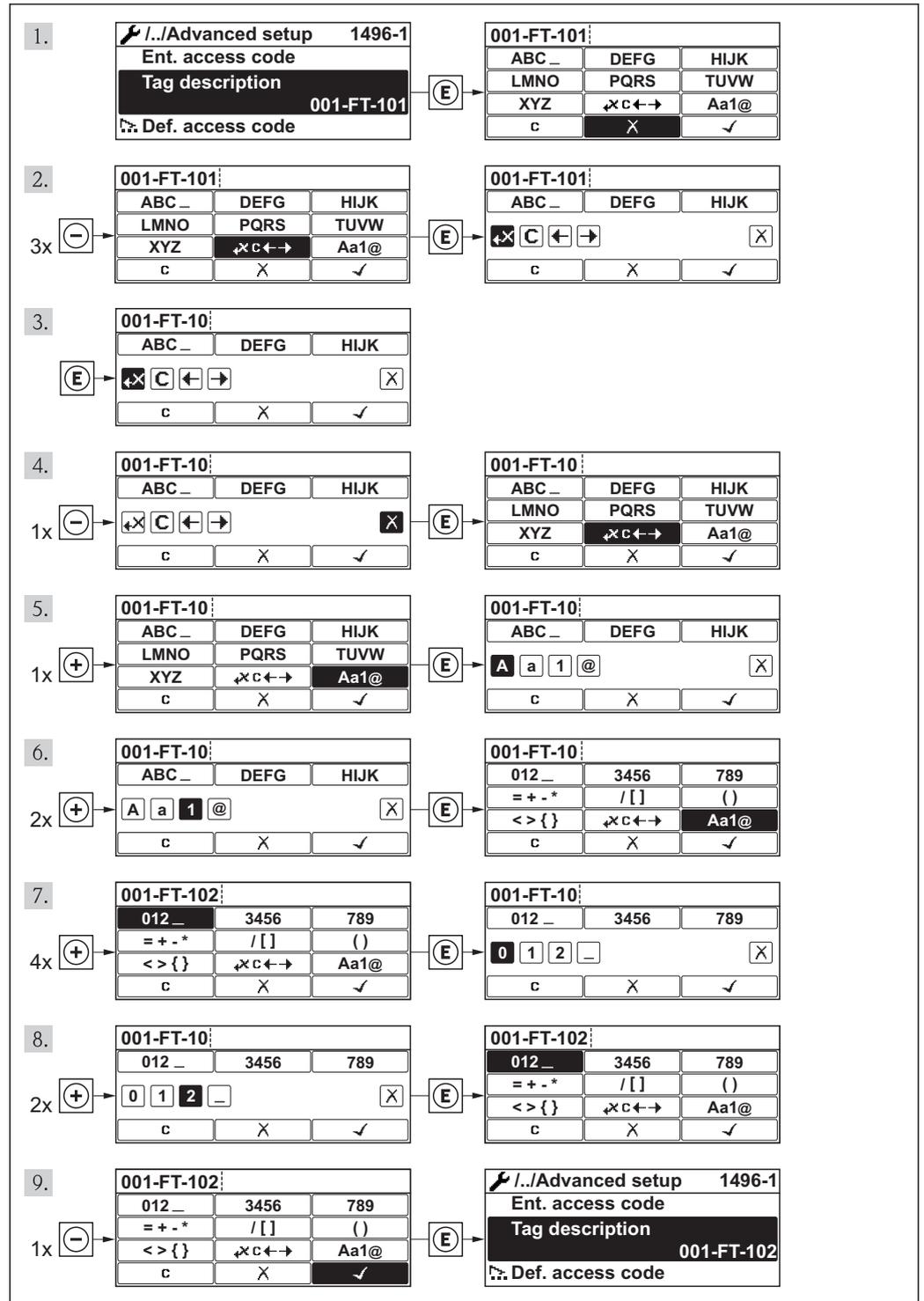
9 Example: Help text for parameter "Enter access code"

2. Press **Esc** + **Enter** 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 (→ 39), for a description of the operating elements (→ 40)

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 (→  90).

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 (→  90).

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

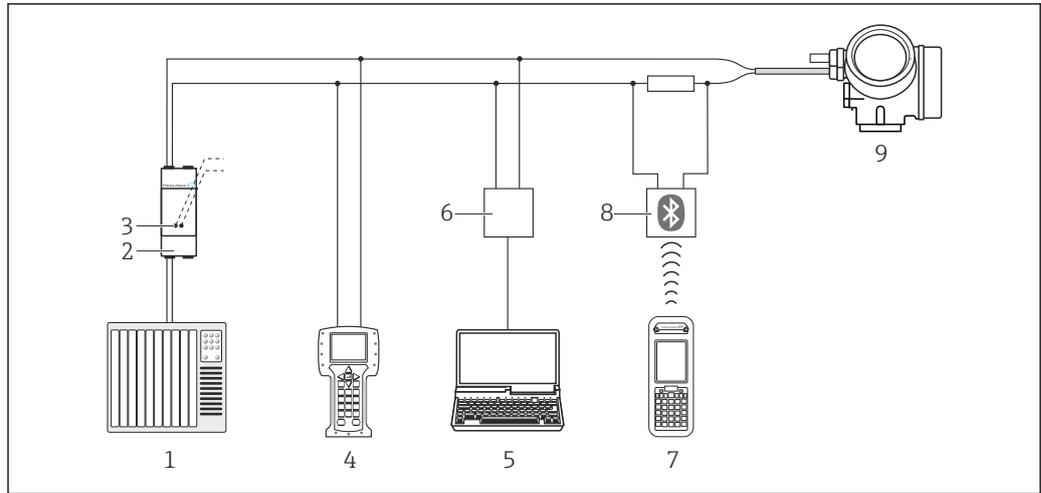
1. The keypad lock is switched on.
Press the  key for longer than 2 seconds.
 - ↳ A context menu appears.
2. In the context menu, select the **Keylock off** option.
 - ↳ The keypad lock is switched off.

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 HART protocol

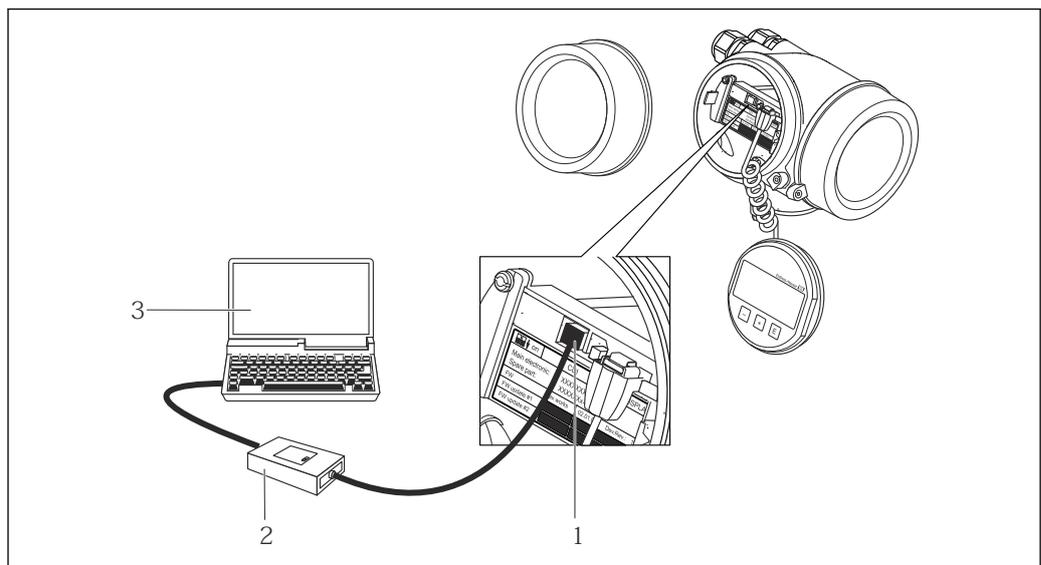


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10 Options for remote operation via HART protocol

- 1 Control system (e.g. PLC)
- 2 Transmitter power supply unit, e.g. RN221N (with communication resistor)
- 3 Connection for Commubox FXA195 and Field Communicator 475
- 4 Field Communicator 475
- 5 Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
- 6 Commubox FXA195 (USB)
- 7 Field Xpert SFX350 or SFX370
- 8 VIATOR Bluetooth modem with connecting cable
- 9 Transmitter

Via service interface (CDI)



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- 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 Field Xpert SFX350, SFX370

Function scope

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

 For details, see Operating Instructions BA01202S

Source for device description files

See data (→  52)

8.4.3 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:

- HART protocol (→  48)
- Service interface CDI (→  48)

Typical functions:

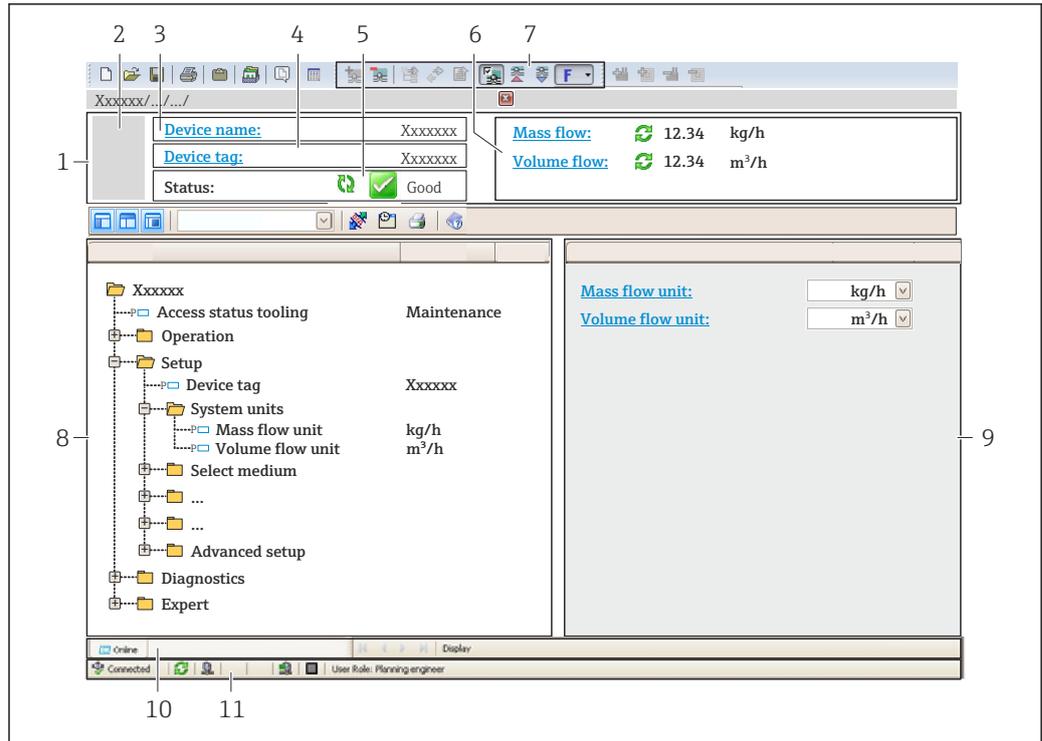
- Configuring parameters of transmitters
- Loading and saving device data (upload/download)
- Documentation of the measuring point
- Visualization of the measured value memory (line recorder) and event logbook

 For details, see Operating Instructions BA00027S and BA00059S

Source for device description files

See data (→  52)

User interface



A0021051-EN

- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Device tag (→ 57)
- 5 Status area with status signal
- 6 Display area for current measured values (→ 93)
- 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

8.4.4 AMS Device Manager

Function scope

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

Source for device description files

See data (→ 52)

8.4.5 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 HART protocol.

Source for device description files

See data (→ 52)

8.4.6 Field Communicator 475

Function scope

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

Source for device description files

See data (→  52)

9 System integration

9.1 Overview of device description files

9.1.1 Current version data for the device

Firmware version	01.03.zz	<ul style="list-style-type: none"> ▪ On the title page of the Operating instructions ▪ On transmitter nameplate (→  14) ▪ Parameter firmware version Diagnostics → Device info → Firmware version
Release date of firmware version	02.2014	---
Manufacturer ID	0x11	Manufacturer ID parameter Diagnostics → Device info → Manufacturer ID
Device type ID	0x54	Device type parameter Diagnostics → Device info → Device type
HART protocol revision	7	---
Device revision	4	<ul style="list-style-type: none"> ▪ On transmitter nameplate (→  14) ▪ Device revision parameter Diagnostics → Device info → Device revision



For an overview of the different firmware versions for the device (→  113)

9.1.2 Operating tools

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

Operating tool via HART protocol	Sources for obtaining device descriptions
<ul style="list-style-type: none"> ▪ Field Xpert SFX350 ▪ Field Xpert SFX370 	Use update function of handheld terminal
FieldCare	<ul style="list-style-type: none"> ▪ www.endress.com → Download Area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)
AMS Device Manager (Emerson Process Management)	www.endress.com → Download Area
SIMATIC PDM (Siemens)	www.endress.com → Download Area
Field Communicator 475 (Emerson Process Management)	Use update function of handheld terminal

9.2 Measured variables via HART protocol

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

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

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

- Expert → Communication → HART output → Assign PV
- Expert → Communication → HART output → Assign SV
- Expert → Communication → HART output → Assign TV
- Expert → Communication → HART output → Assign QV

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

Measured variables for PV (primary dynamic variable)

- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature

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

- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3

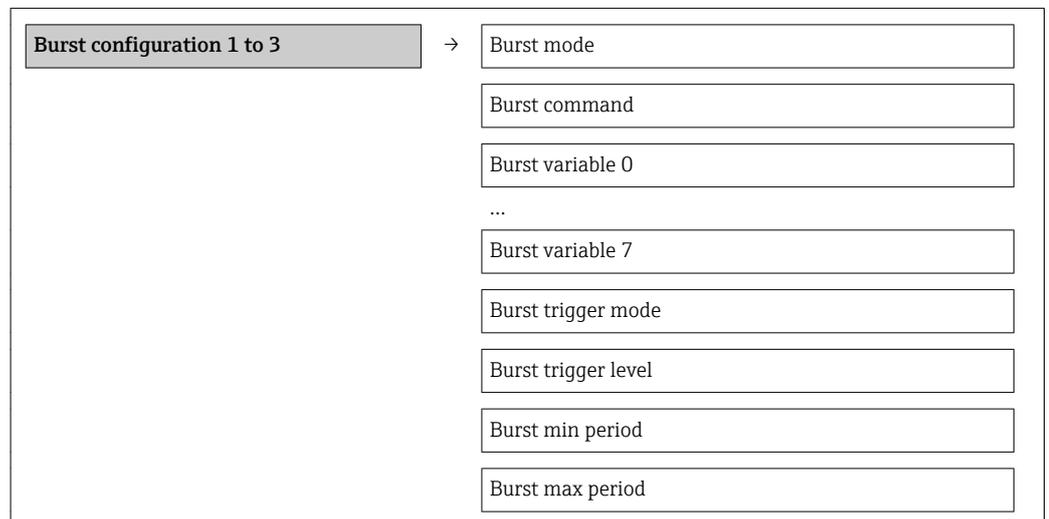
9.3 Other settings

9.3.1 Burst mode functionality in accordance with HART 7 Specification

Navigation

"Expert" menu → Communication → HART output → Burst configuration → Burst configuration 1 to 3

Structure of the submenu



Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Burst mode 1 to 2	Activation of the HART burst mode for burst message X.  An external pressure or temperature sensor must also be in the Burst mode.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Burst command 1 to 2	Select the HART command that is sent to the HART master. <ul style="list-style-type: none"> ■ Command 1 option: Read out the primary variable. ■ Command 2 option: Read out the current and the main measured value as a percentage. ■ Command 3 option: Read out the dynamic HART variables and the current. ■ Command 9 option: Read out the dynamic HART variables including the related status. ■ Command 33 option: Read out the dynamic HART variables including the related unit. ■ Command 48 option: Read out the complete device diagnostics. 	<ul style="list-style-type: none"> ■ Command 1 ■ Command 2 ■ Command 3 ■ Command 9 ■ Command 33 ■ Command 48 	Command 2
Burst variable 0	Assignment of the individual HART variables (PV, SV, TV, QV) and assignment of the process variables available in the device to the HART command.	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Carrier pipe temperature ■ Electronic temperature ■ Oscillation damping ■ Oscillation frequency ■ Oscillation amplitude 0 ■ Signal asymmetry ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ External pressure ■ Percent Of Range ■ Measured current ■ Primary variable (PV) ■ Secondary variable (SV) ■ Tertiary variable (TV) ■ Quaternary variable (QV) ■ Not used 	Mass flow
Burst variable 1	See burst variable 0.	See burst variable 0.	Not used
Burst variable 2	See burst variable 0.	See burst variable 0.	Not used
Burst variable 3	See burst variable 0.	See burst variable 0.	Not used
Burst variable 4	See burst variable 0.	See burst variable 0.	Not used
Burst variable 5	See burst variable 0.	See burst variable 0.	Not used
Burst variable 6	See burst variable 0.	See burst variable 0.	Not used
Burst variable 7	See burst variable 0.	See burst variable 0.	Not used

Parameter	Description	Selection / User entry	Factory setting
Burst trigger mode	<p>Use this function to select the event that triggers burst message X.</p> <ul style="list-style-type: none"> ▪ Continuous option: The message is triggered in a time-controlled manner, at least observing the time interval defined in the Burst min period parameter. ▪ Window option: The message is triggered if the specified measured value has changed by the value in the Burst trigger level parameter. ▪ Rising option: The message is triggered if the specified measured value exceeds the value in the Burst trigger level parameter. ▪ Falling option: The message is triggered if the specified measured value drops below the value in the Burst trigger level parameter. ▪ On change option: The message is triggered if the measured value changes. 	<ul style="list-style-type: none"> ▪ Continuous ▪ Window ▪ Rising ▪ Falling ▪ On change 	Continuous
Burst trigger level	<p>For entering the burst trigger value.</p> <p>Together with the option selected in the Burst trigger mode parameter the burst trigger value determines the time of burst message X.</p>	2.0E-38 to 3.4E+38	2.0E-38
Min. update period	Use this function to enter the minimum time span between two burst commands of burst message X.	100 to 36 000 000 ms	1 000 ms
Max. update period	Use this function to enter the maximum time span between two burst commands of burst message X.	100 to 36 000 000 ms	2 000 ms

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 (→  25)
- "Post-connection check" checklist (→  31)

10.2 Switching on the measuring device

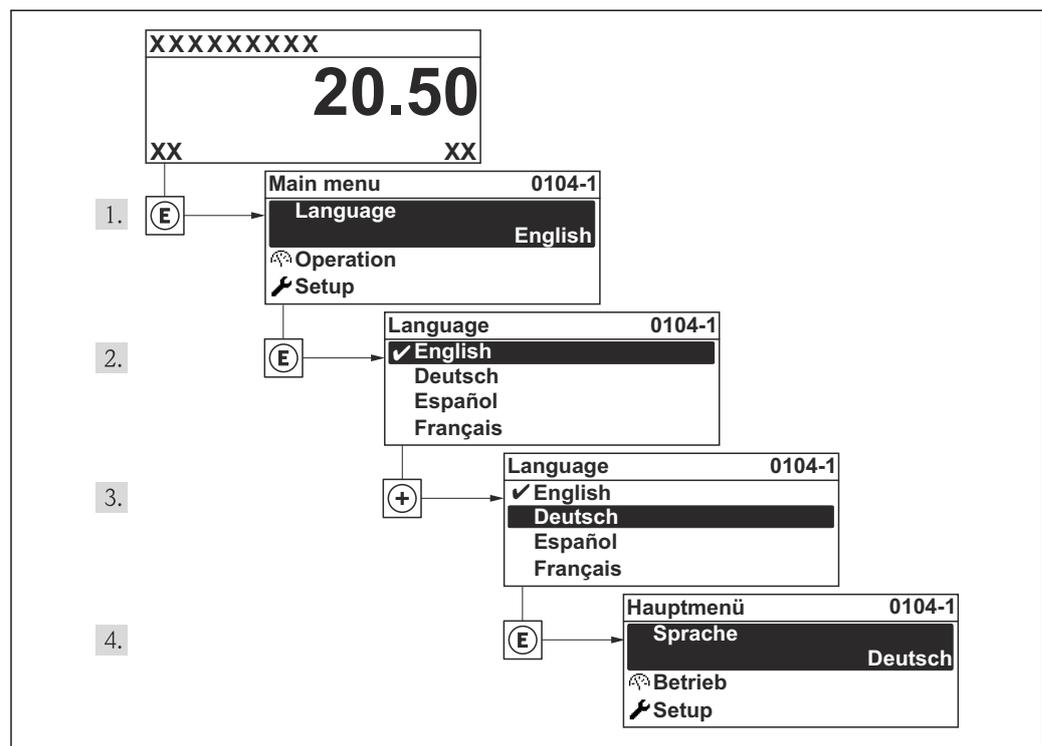
After a successful function check, switch on the measuring device.

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" (→  98).

10.3 Setting the operating language

Factory setting: English or ordered local language



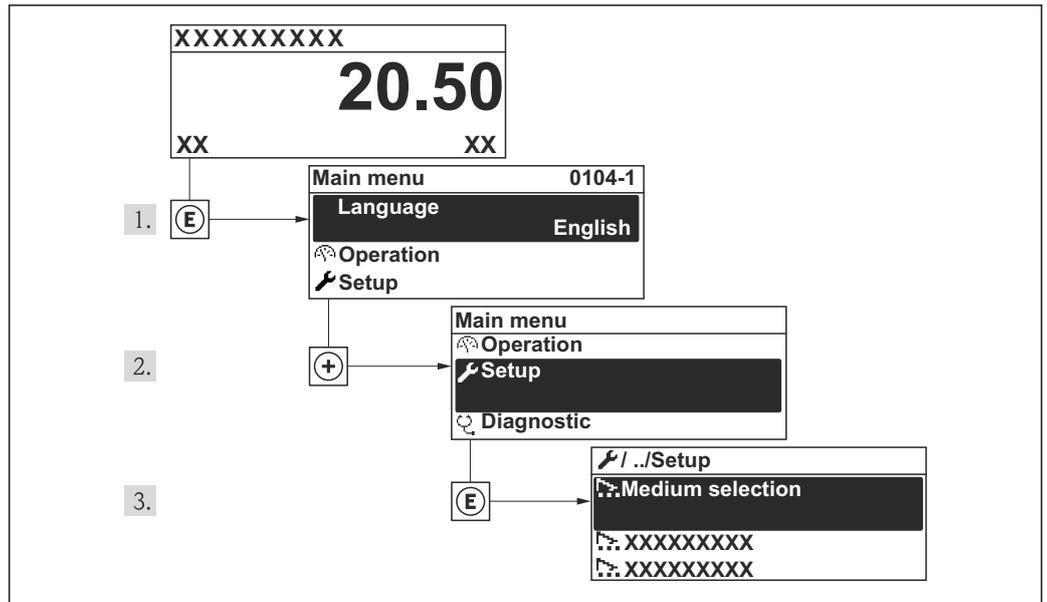
A0013996

 11 Taking the example of the local display

10.4 Configuring the measuring device

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

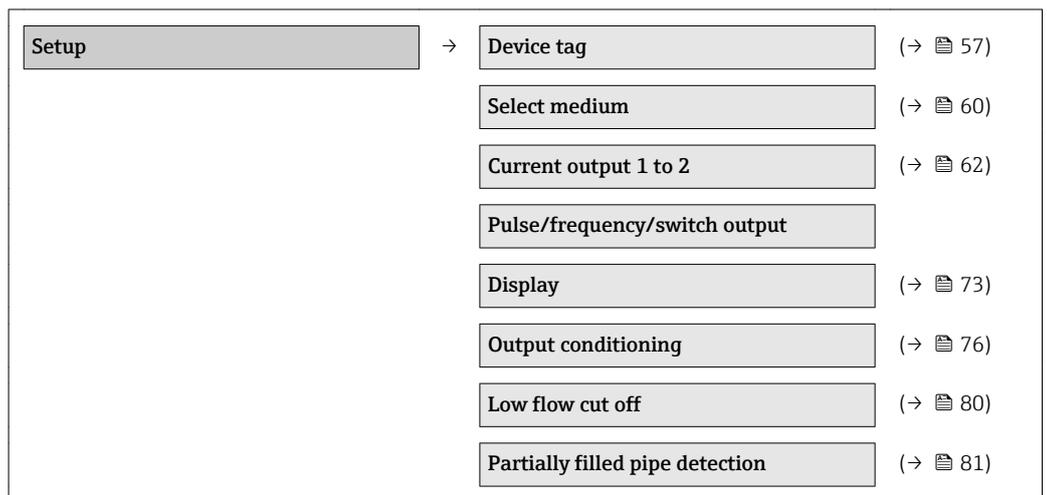
Navigation to the **Setup** menu



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12 Illustrated using the example of the local display

Overview of the wizards in the "Setup" menu

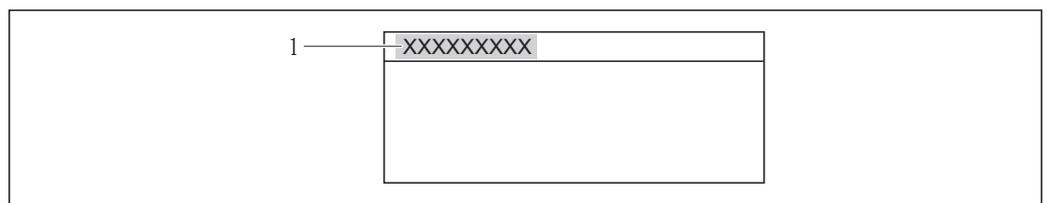


10.4.1 Defining the tag name

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

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

i For information on the tag name in the "FieldCare" operating tool (→ 50)



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13 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 tag for measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).	Promass

10.4.2 Setting the system units

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

Navigation

"Setup" menu → Advanced setup → System units

Structure of the submenu

System units

→

Mass flow unit

Mass unit

Volume flow unit

Volume unit

Corrected volume flow unit

Corrected volume unit

Density unit

Reference density unit

Temperature unit

Length unit

Pressure unit

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Mass flow unit	Select mass flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ▪ Output ▪ Low flow cut off ▪ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ kg/h ▪ lb/min
Mass unit	Select mass unit. <i>Result</i> The selected unit is taken from: Mass flow unit parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ kg ▪ lb

Parameter	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"> ■ Output ■ Low flow cut off ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ l/h ■ gal/min (us)
Volume unit	Select volume unit. Result The selected unit is taken from: Volume flow unit parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ l ■ gal (us)
Corrected volume flow unit	Select corrected volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Low flow cut off ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ NI/h ■ Sft³/h
Corrected volume unit	Select corrected volume unit. Result The selected unit is taken from: Corrected volume flow unit parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ NI ■ Sft³
Density unit	Select density unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Simulation process variable ■ Density adjustment (in Expert menu) 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ kg/l ■ lb/ft³
Reference density unit	Select reference density unit.	Unit choose list	kg/NI
Temperature unit	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Reference temperature ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ °C (Celsius) ■ °F (Fahrenheit)
Length unit	Select length unit for nominal diameter.	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ mm ■ in
Pressure unit	Select process pressure unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ bar ■ psi

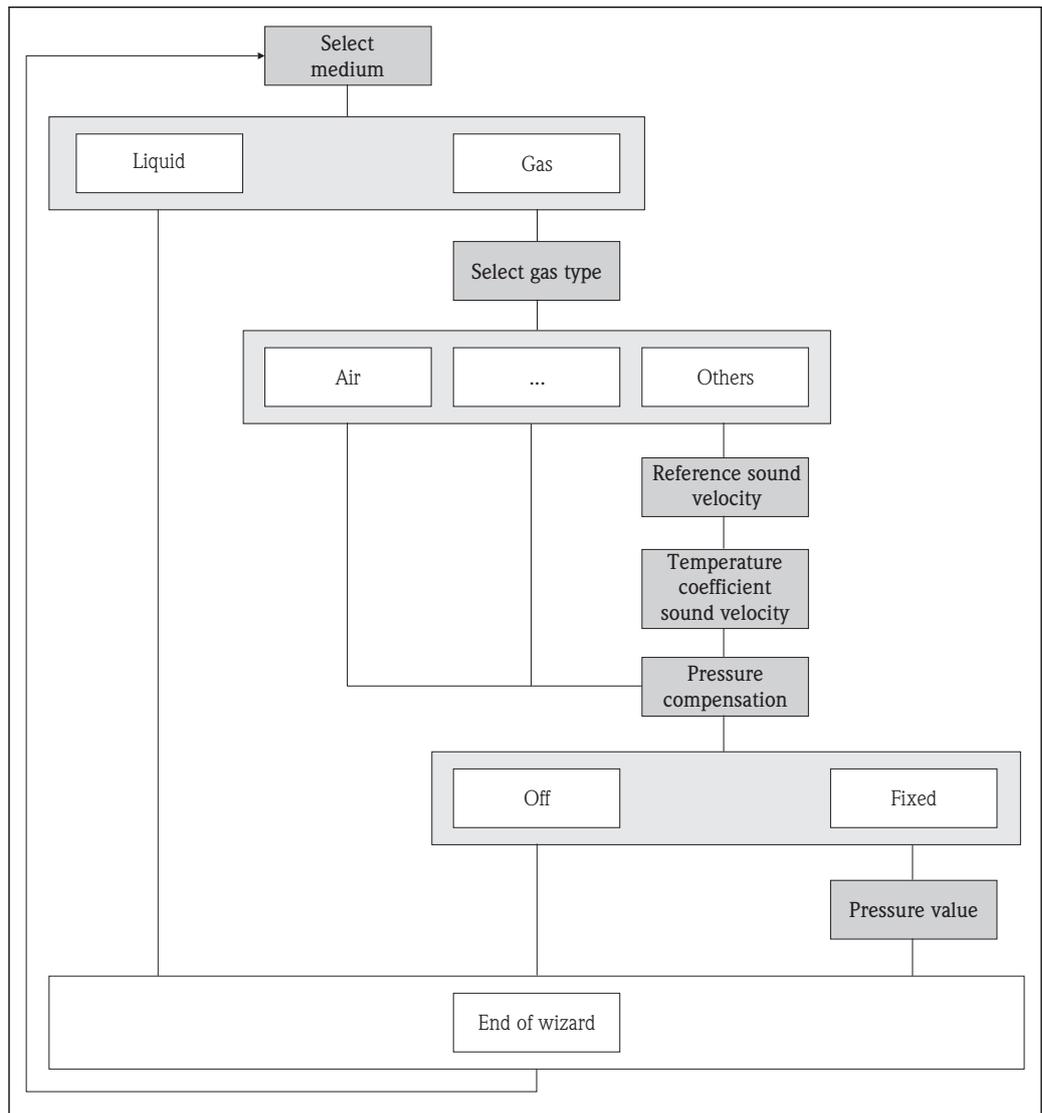
10.4.3 Selecting and setting the medium

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 → Select medium

Structure of the wizard



A0013795-EN

14 Wizard "Select medium" wizard in the "Setup" menu

Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Select medium	Select medium type.	<ul style="list-style-type: none"> ▪ Liquid ▪ Gas 	Liquid
Select gas type	Select measured gas type.	Gas type choose list	Air
Reference sound velocity	Enter sound velocity of gas at 0 °C (32 °F).	1 to 99999.9999 m/s	0 m/s
Temperature coefficient sound velocity	Enter temperature coefficient for the gas sound velocity.	Positive floating-point number	0 (m/s)/K

Parameter	Description	Selection / User entry	Factory setting
Pressure compensation	Select pressure compensation type.	<ul style="list-style-type: none">▪ Off▪ Fixed value▪ External value	Off
Pressure value	Enter process pressure to be used for pressure correction.	Positive floating-point number	101 325 bar

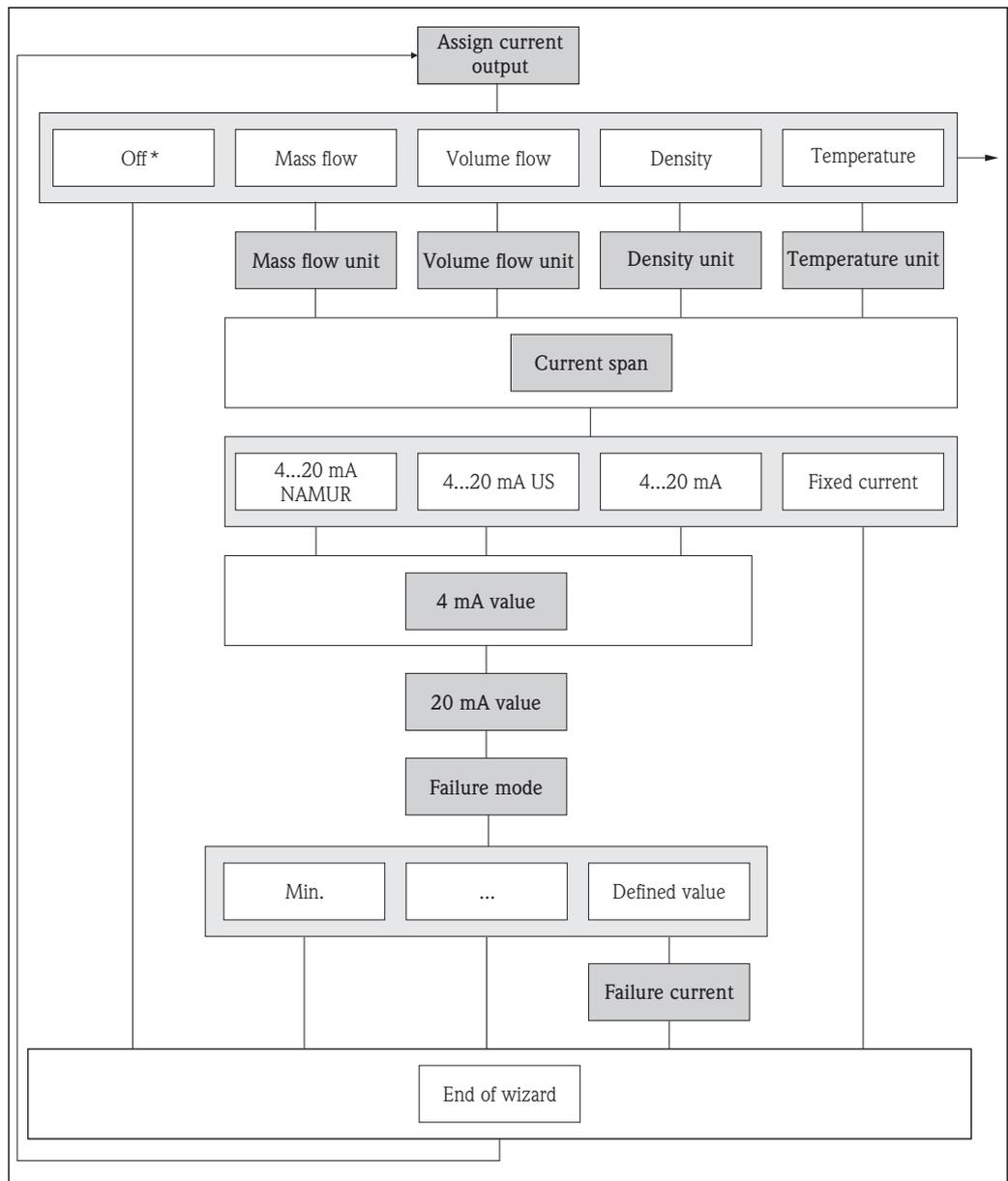
10.4.4 Configuring the current output

The "Current output 1 to 2" wizard guides you systematically through all the parameters that have to be set for configuring the particular current output.

Navigation

"Setup" menu → Current output 1 to 2

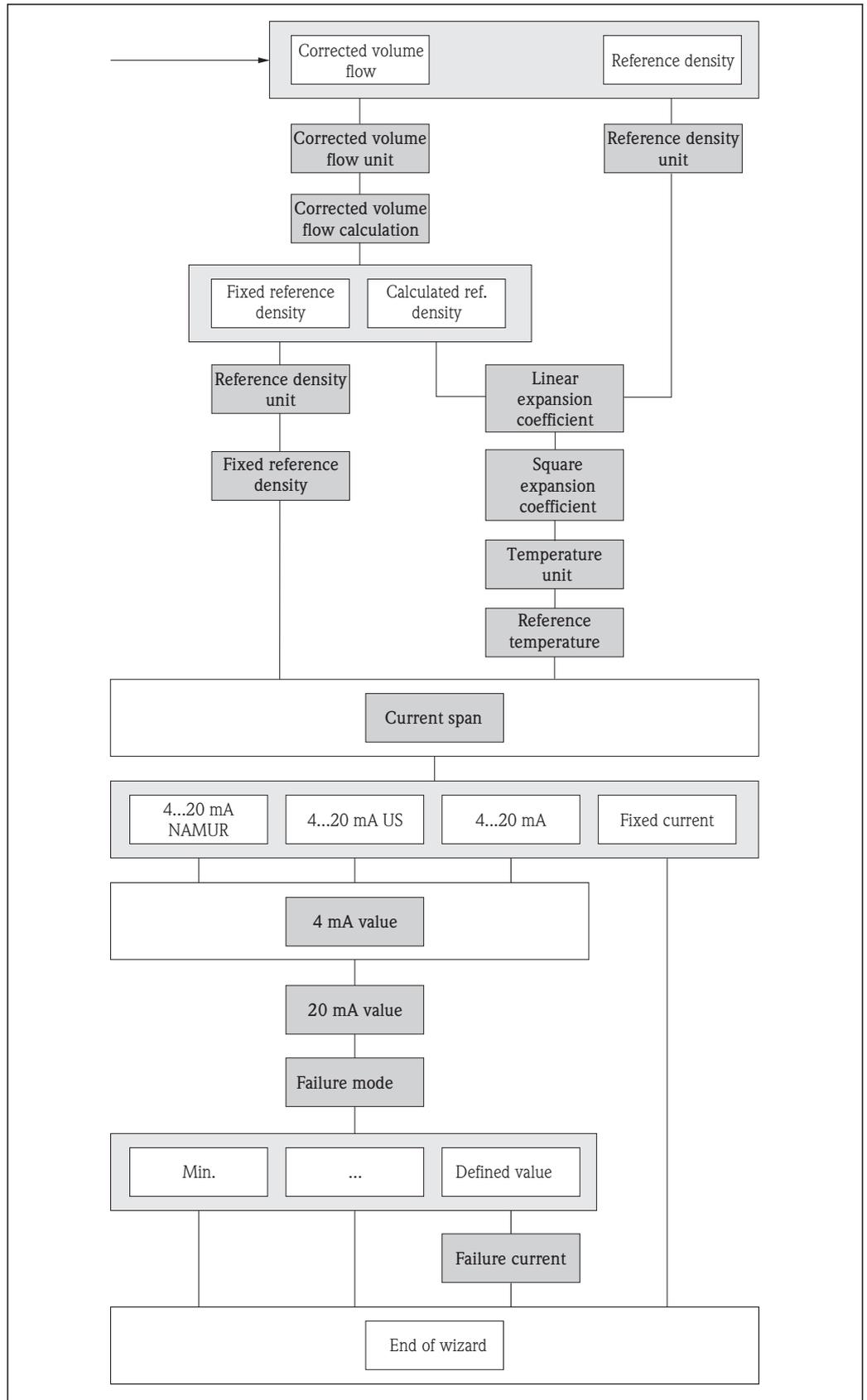
Structure of the wizard



A0013796-EN

15 "Current output 1-2" wizard in the "Setup" menu (Part 1)

Off* = Option only for current output 2



A0013844-EN

16 "Current output 1-2" wizard in the "Setup" menu (Part 2)

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign current output	–	Select process variable for current output.	<ul style="list-style-type: none"> ▪ Off ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Carrier pipe temperature ▪ Electronic temperature ▪ Oscillation frequency ▪ Oscillation amplitude ▪ Oscillation damping ▪ Signal asymmetry 	Mass flow
Mass flow unit	–	Select mass flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ▪ Output ▪ Low flow cut off ▪ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ kg/h ▪ lb/min
Volume flow unit	–	Select volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ▪ Output ▪ Low flow cut off ▪ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ l/h ▪ gal/min (us)
Density unit	–	Select density unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ▪ Output ▪ Simulation process variable ▪ Density adjustment (in Expert menu) 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ kg/l ▪ lb/ft³
Corrected volume flow unit	–	Select corrected volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ▪ Output ▪ Low flow cut off ▪ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ NI/h ▪ Sft³/h
Corrected volume flow calculation	–	Select reference density for calculating the corrected volume flow.	<ul style="list-style-type: none"> ▪ Fixed reference density ▪ Calculated reference density 	Calculated reference density
Reference density unit	–	Select reference density unit.	Unit choose list	kg/NI
Fixed reference density	The following option is selected in the Corrected volume flow calculation parameter: Fixed reference density	Enter fixed value for reference density.	Positive floating-point number	1 kg/NI

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Linear expansion coefficient	The following option is selected in the Corrected volume flow calculation parameter: Calculated reference density	Enter linear, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0
Square expansion coefficient	–	For media with a non-linear expansion pattern: enter the quadratic, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0
Temperature unit	–	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Reference temperature ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ °C (Celsius) ■ °F (Fahrenheit)
Reference temperature	The following option is selected in the Corrected volume flow calculation parameter: Calculated reference density	Enter reference temperature for calculating the reference density.	–273.15 to 99999 °C	20 °C
Current span	–	Select current range for process value output and upper/lower level for alarm signal.	<ul style="list-style-type: none"> ■ 4...20 mA NAMUR ■ 4...20 mA US ■ 4...20 mA ■ Fixed current 	4...20 mA NAMUR
4 mA value	–	Enter 4 mA value.	Signed floating-point number	0 kg/h
20 mA value	–	Enter 20 mA value.	Signed floating-point number	2.5 kg/h
Failure mode	–	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ■ Min. ■ Max. ■ Last valid value ■ Actual value ■ Defined value 	Max.
Failure current	–	Enter current output value in alarm condition.	3.59 to 22.5 mA	22.5 mA

10.4.5 Configuring the pulse/frequency/switch output

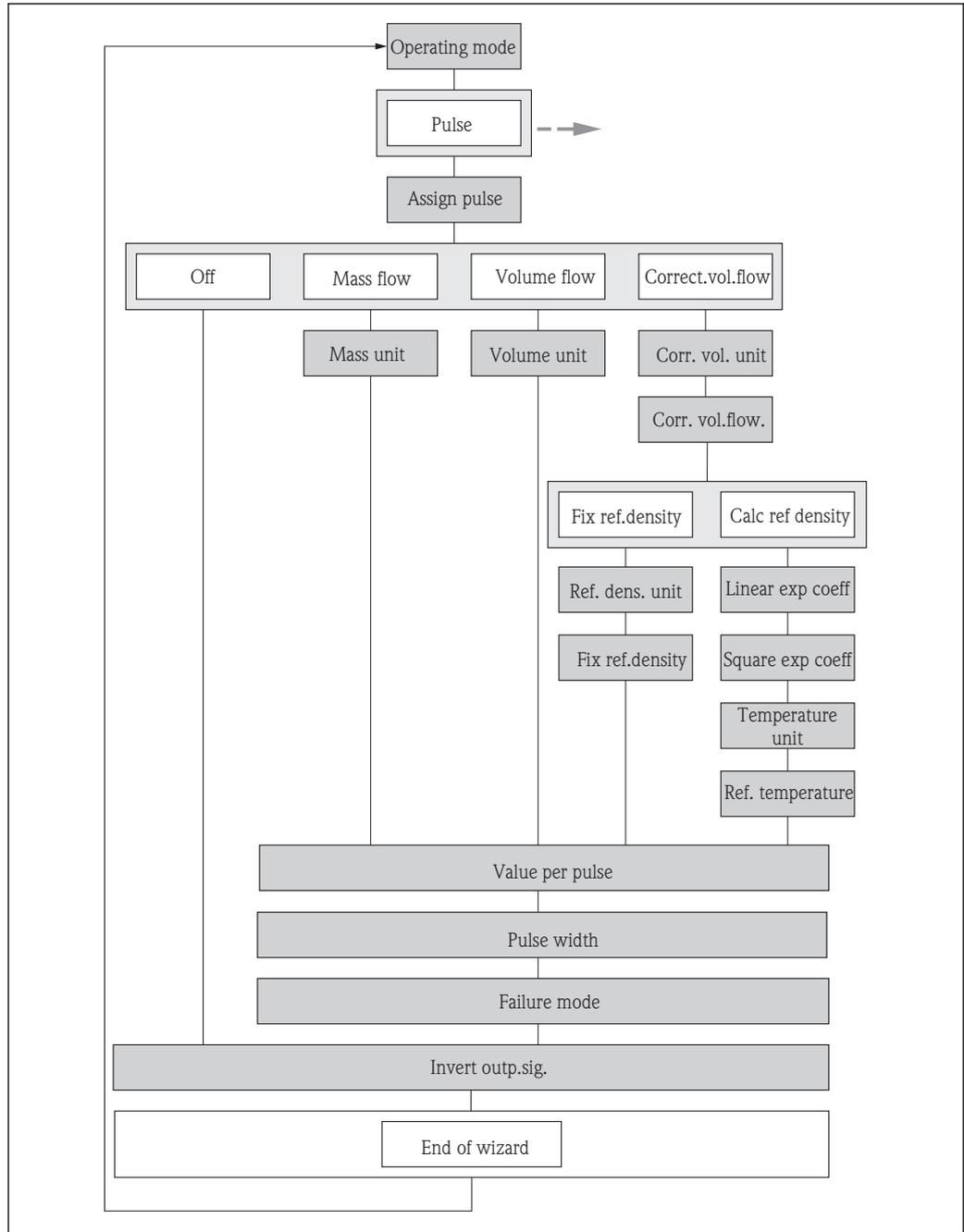
The **Pulse/frequency/switch output 1 to 2** wizard guides you systematically through all the parameters that can be set for configuring the selected output type.

Pulse output

Navigation

"Setup" menu → Pulse/frequency/switch output 1 to 2

Structure of the wizard for the pulse output



A0018173-EN

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

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Operating mode	-	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> ▪ Pulse ▪ Frequency ▪ Switch 	Pulse
Assign pulse output	-	Select process variable for pulse output.	<ul style="list-style-type: none"> ▪ Off ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow 	Off

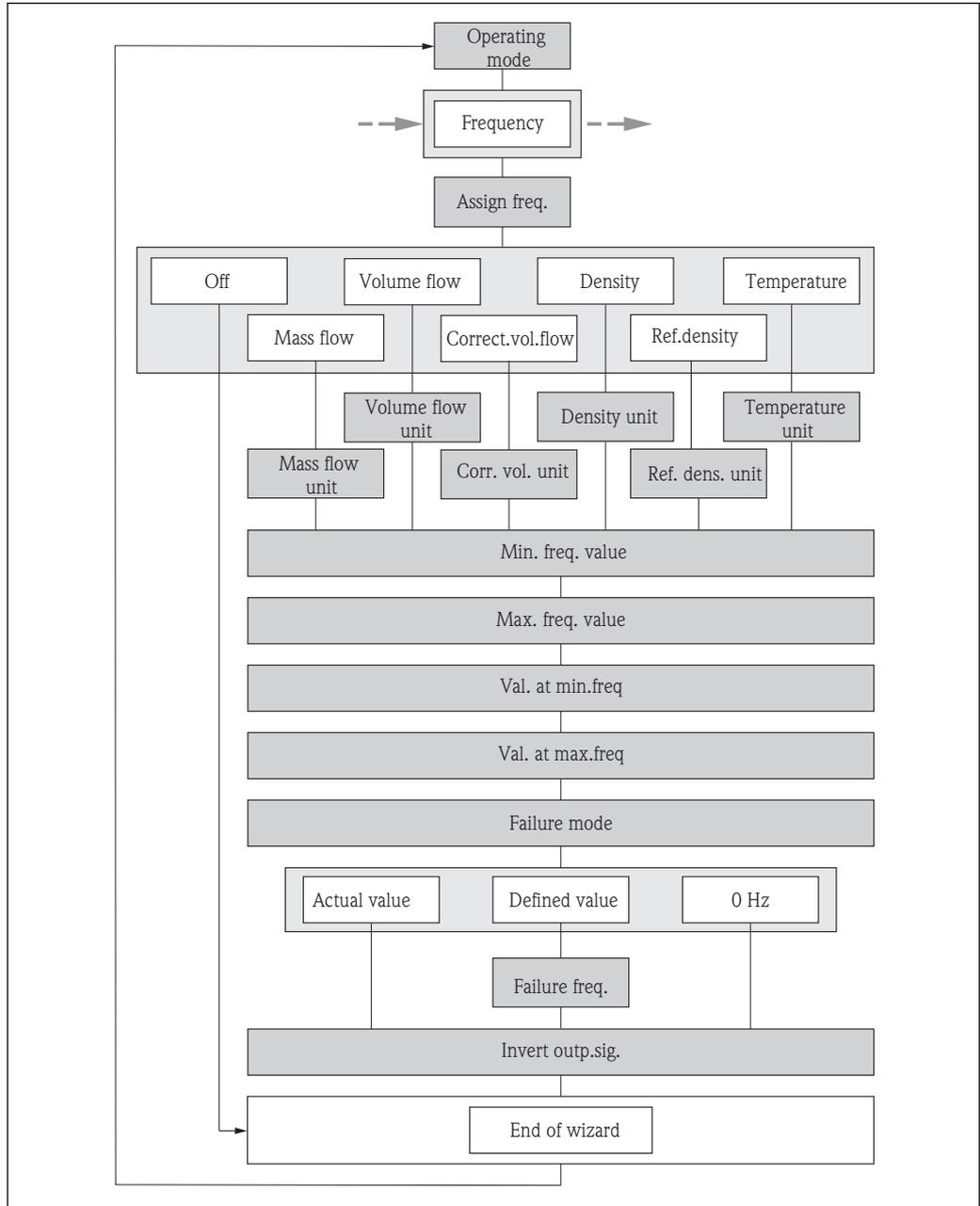
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Mass unit	–	Select mass unit. <i>Result</i> The selected unit is taken from: Mass flow unit parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ kg ▪ lb
Volume unit	–	Select volume unit. Result The selected unit is taken from: Volume flow unit parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ l ▪ gal (us)
Corrected volume unit	–	Select corrected volume unit. Result The selected unit is taken from: Corrected volume flow unit parameter	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ NI ▪ Sft³
Corrected volume flow calculation	–	Select reference density for calculating the corrected volume flow.	<ul style="list-style-type: none"> ▪ Fixed reference density ▪ Calculated reference density 	Calculated reference density
Reference density unit	–	Select reference density unit.	Unit choose list	kg/NI
Fixed reference density	The following option is selected in the Corrected volume flow calculation parameter: Fixed reference density	Enter fixed value for reference density.	Positive floating-point number	1 kg/NI
Linear expansion coefficient	The following option is selected in the Corrected volume flow calculation parameter: Calculated reference density	Enter linear, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0
Square expansion coefficient	–	For media with a non-linear expansion pattern: enter the quadratic, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0
Temperature unit	–	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ▪ Output ▪ Reference temperature ▪ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ▪ °C (Celsius) ▪ °F (Fahrenheit)
Reference temperature	The following option is selected in the Corrected volume flow calculation parameter: Calculated reference density	Enter reference temperature for calculating the reference density.	–273.15 to 99 999 °C	20 °C
Value per pulse	–	Enter measured value at which a pulse is output.	Signed floating-point number	0
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"> ▪ Actual value ▪ No pulses 	No pulses
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> ▪ No ▪ Yes 	No

Frequency output

Navigation

"Setup" menu → Pulse/frequency/switch output 1 to 2

Structure of the wizard for the frequency output



A0018171-EN

18 "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"> ■ Pulse ■ Frequency ■ Switch 	Pulse
Assign frequency output	Select process variable for frequency output.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Carrier pipe temperature ■ Electronic temperature ■ Oscillation frequency ■ Oscillation amplitude ■ Oscillation damping ■ Signal asymmetry 	Off
Mass flow unit	Select mass flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Low flow cut off ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ kg/h ■ lb/min
Volume flow unit	Select volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Low flow cut off ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ l/h ■ gal/min (us)
Corrected volume flow unit	Select corrected volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Low flow cut off ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ NI/h ■ Sft³/h
Density unit	Select density unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Simulation process variable ■ Density adjustment (in Expert menu) 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ kg/l ■ lb/ft³
Reference density unit	Select reference density unit.	Unit choose list	kg/NI
Temperature unit	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Reference temperature ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ °C (Celsius) ■ °F (Fahrenheit)
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
Measuring value at maximum frequency	Enter measured value for maximum frequency.	Signed floating-point number	0

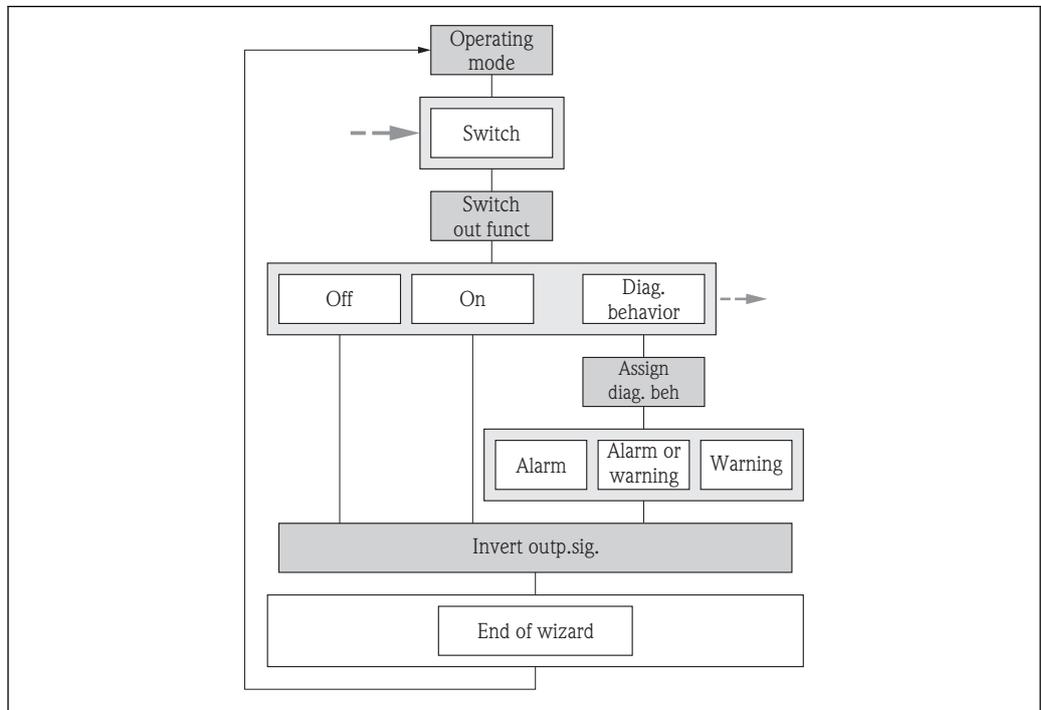
Parameter	Description	Selection / User entry	Factory setting
Failure mode	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ▪ Actual value ▪ Defined value ▪ 0 Hz 	0 Hz
Failure frequency	Enter frequency output value in alarm condition.	0.0 to 1 250.0 Hz	0.0 Hz
Invert output signal	Invert the output signal.	<ul style="list-style-type: none"> ▪ No ▪ Yes 	No

Switch output

Navigation

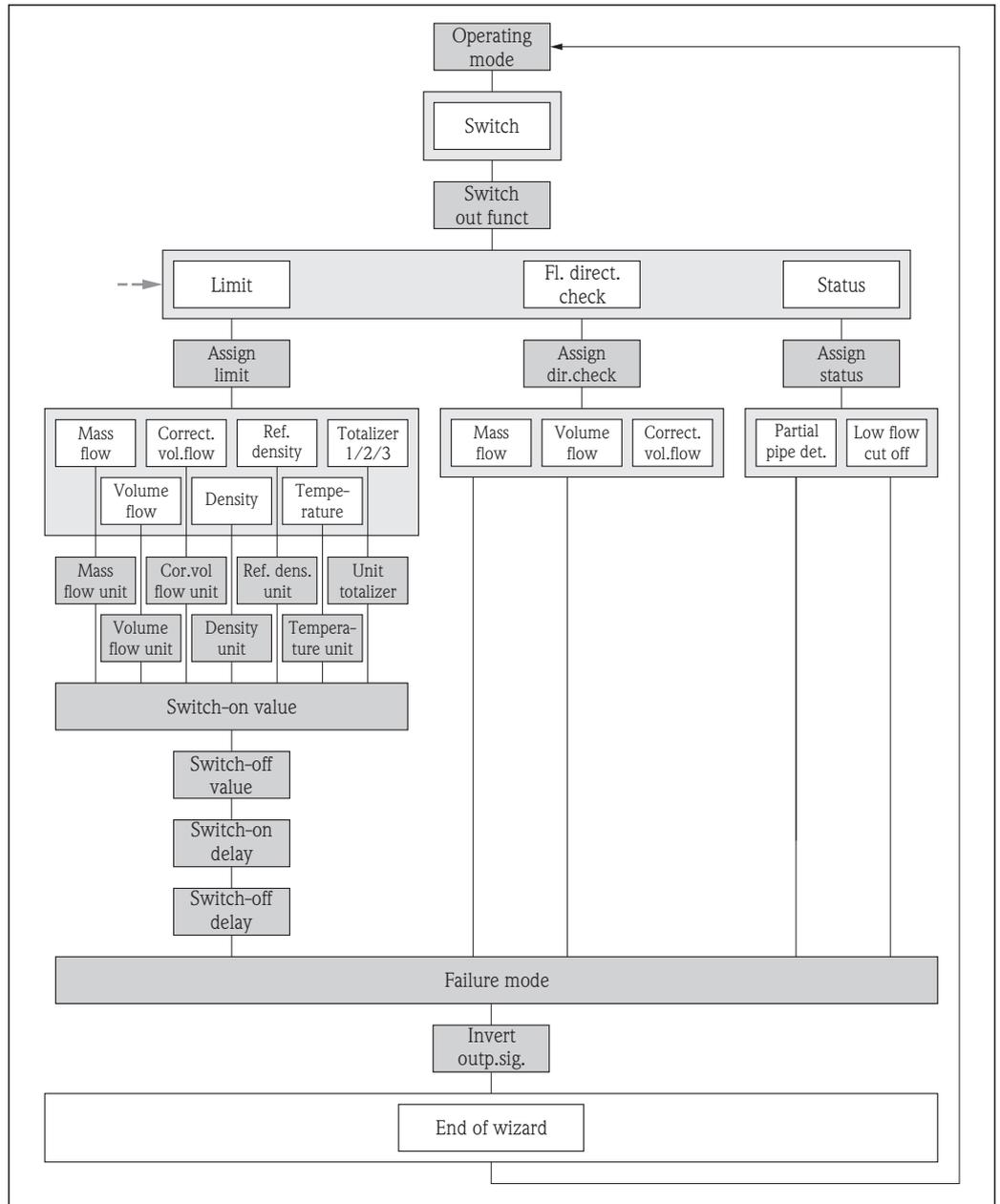
"Setup" menu → Pulse/frequency/switch output 1 to 2

Structure of the wizard for the switch output



A0017439-EN

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



A0018172-EN

20 "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"> ■ Pulse ■ Frequency ■ Switch 	Pulse
Switch output function	Select function for switch output.	<ul style="list-style-type: none"> ■ Off ■ On ■ Diagnostic behavior ■ Limit ■ Flow direction check ■ Status 	Off
Assign diagnostic behavior	Select diagnostic behavior for switch output.	<ul style="list-style-type: none"> ■ Alarm ■ Alarm or warning ■ Warning 	Alarm

Parameter	Description	Selection / User entry	Factory setting
Assign limit	Select process variable for limit function.	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 	Mass flow
Assign flow direction check	Select process variable for flow direction monitoring.	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow 	Mass flow
Assign status	Select device status for switch output.	<ul style="list-style-type: none"> ■ Partially filled pipe detection ■ Low flow cut off 	Partially filled pipe detection
Mass flow unit	Select mass flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Low flow cut off ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ kg/h ■ lb/min
Volume flow unit	Select volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Low flow cut off ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ l/h ■ gal/min (us)
Corrected volume flow unit	Select corrected volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Low flow cut off ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ NI/h ■ Sft³/h
Density unit	Select density unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Simulation process variable ■ Density adjustment (in Expert menu) 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ kg/l ■ lb/ft³
Reference density unit	Select reference density unit.	Unit choose list	kg/NI
Temperature unit	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> ■ Output ■ Reference temperature ■ Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ °C (Celsius) ■ °F (Fahrenheit)
Unit totalizer	Select process variable totalizer unit.	Unit choose list	kg
Switch-on value	Enter measured value for the switch-on point.	Signed floating-point number	0 kg/h
Switch-off value	Enter measured value for the switch-off point.	Signed floating-point number	0 kg/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

Parameter	Description	Selection / User entry	Factory setting
Failure mode	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ▪ Actual status ▪ Open ▪ Closed 	Open
Invert output signal	Invert the output signal.	<ul style="list-style-type: none"> ▪ No ▪ Yes 	No

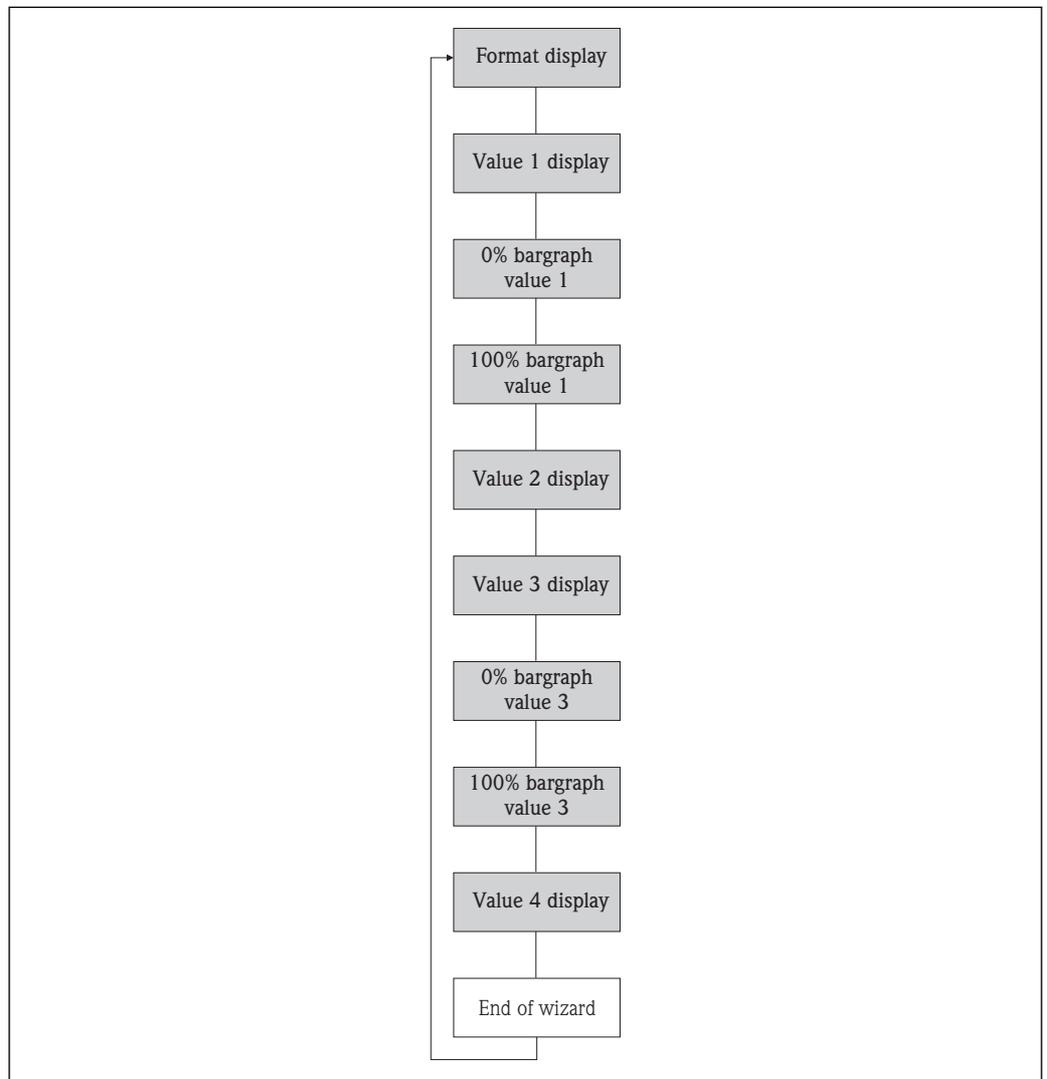
10.4.6 Configuring the local display

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



21 "Display" wizard in the "Setup" menu

A0013797-EN

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"> ■ 1 value, max. size ■ 1 bargraph + 1 value ■ 2 values ■ 1 value large + 2 values ■ 4 values 	1 value, max. size
Value 1 display	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> ■ None ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current output 1 ■ Current output 2 	Mass flow
0% bargraph value 1	Enter 0% value for bar graph display.	Signed floating-point number	0 kg/h
100% bargraph value 1	Enter 100% value for bar graph display.	Signed floating-point number	2.5 kg/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	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
Value 4 display	Select the measured value that is shown on the local display.	Picklist (see 1st display value)	None

10.4.7 Configuring the HART input

The **HART input** submenu contains all the parameters that must be configured for the configuration of the HART input.

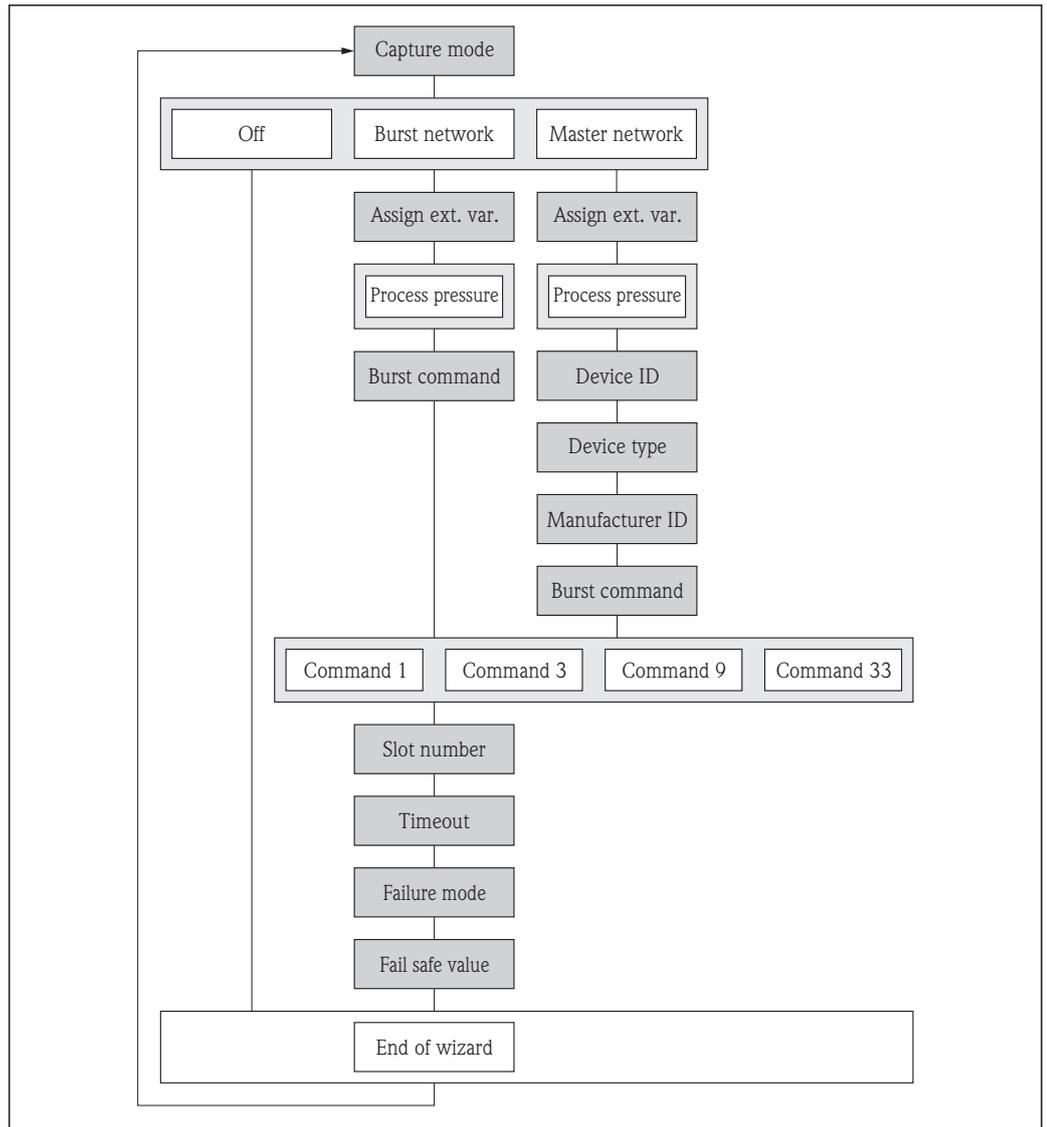


For the **HART input** submenu to appear:

The **External value** option must be selected in the **Pressure compensation** parameter in the **Medium selection** wizard.

Navigation

"Expert" menu → Communication → HART input → Configuration



A0016338-EN

22 "HART input" wizard in the "Setup" menu

Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Capture mode	Select capture mode via burst or master communication.	<ul style="list-style-type: none"> ■ Off ■ Burst network ■ Master network 	Off
Manufacturer ID	Enter manufacture ID of external device.	0 to 255	0
Device ID	Enter device ID of external device.	Positive integer	0
Device type	Enter device type of external device.	0 to 255	0
Burst command	Select command to read in external process variable.	<ul style="list-style-type: none"> ■ Command 1 ■ Command 3 ■ Command 9 ■ Command 33 	Command 1
Slot number	Define position of external process variable in burst command.	1 to 4	1

Parameter	Description	Selection / User entry	Factory setting
Timeout	Enter deadline for process variable of external device.  If the deadline is exceeded, diagnostic message F410 data transmission is output.	1 to 120 s	5 s
Failure mode	Define behavior if external process variable is missed.	<ul style="list-style-type: none"> ■ Alarm ■ Last valid value ■ Defined value 	Alarm
Failure value	Enter value to be used by the device if input value from external device is missing.	Signed floating-point number	0

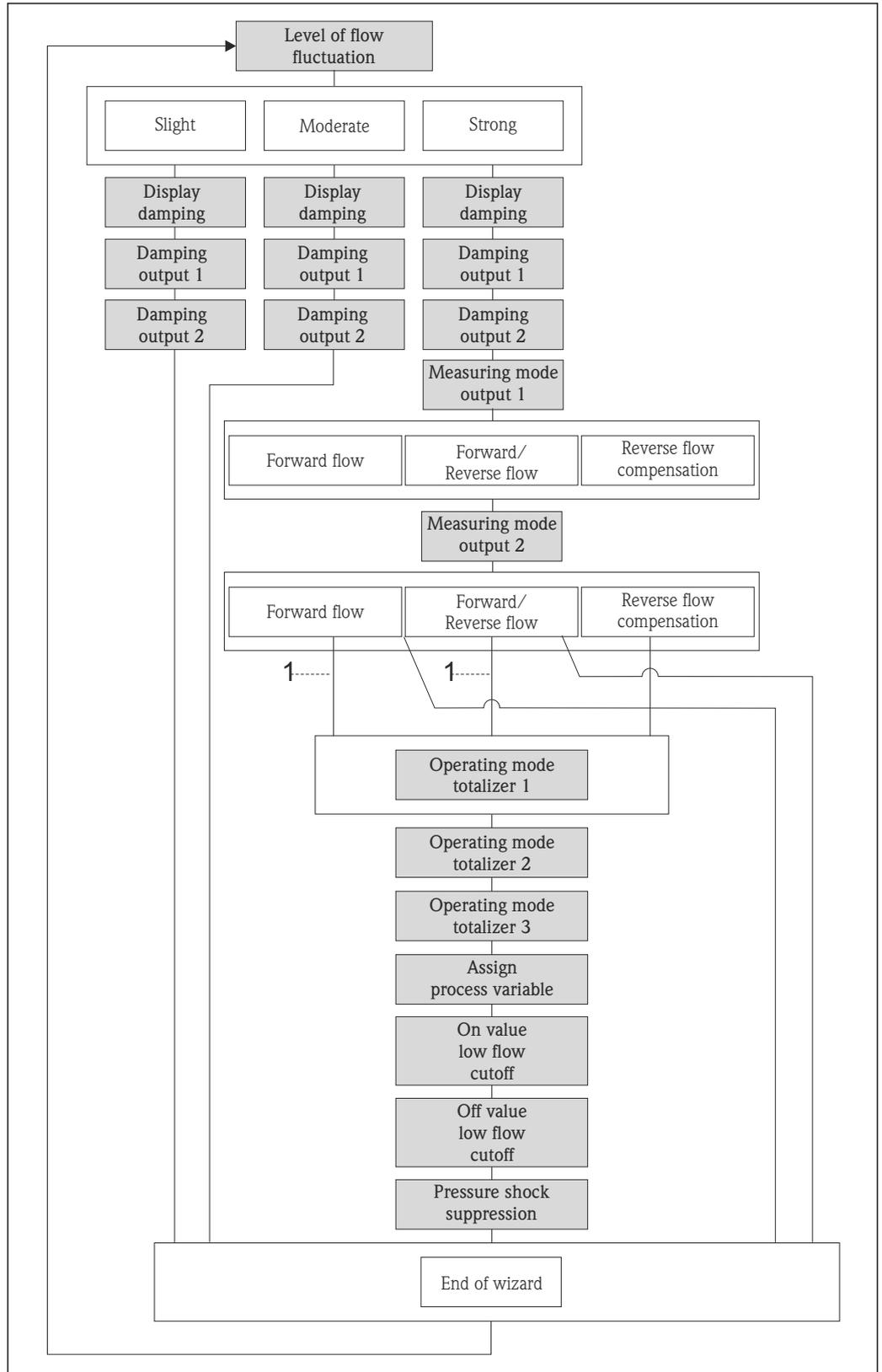
10.4.8 Configuring the output conditioning

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

Navigation

"Setup" menu → Output conditioning

Structure of the wizard



A0013908-EN

23 "Output conditioning" wizard in the "Setup" menu

1 The "Reverse flow compensation" option was selected in the "Measuring mode output 1" parameter

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Level of flow fluctuation	–	Select fluctuation level of measured value.	<ul style="list-style-type: none"> ▪ Slight ▪ Moderate ▪ Strong 	Moderate
Display damping	–	Set display reaction time to fluctuations in the measured value.	0.0 to 999.9 s	0.0 s
Damping output 1	–	Set the reaction time of the output signal of the current output to fluctuations in the measured value.	0 to 999.9 s	1 s
Damping output 2	The measuring device has a second current output.	Set the reaction time of the output signal of the second current output to fluctuations in the measured value.	0 to 999.9 s	1 s
Damping output 2	The measuring device has a pulse/frequency/switch output.	Set the reaction time of the output signal of the frequency output to fluctuations in the measured value.	0 to 999.9 s	1 s
Measuring mode output 1	–	Select measuring mode for output.	<ul style="list-style-type: none"> ▪ Forward flow ▪ Forward/Reverse flow ▪ Reverse flow compensation 	Forward flow
Measuring mode output 2	–	Select measuring mode for output.	<ul style="list-style-type: none"> ▪ Forward flow ▪ Forward/Reverse flow ▪ Reverse flow compensation 	Forward flow
Measuring mode output 1	–	Select measuring mode for output.	<ul style="list-style-type: none"> ▪ Forward flow ▪ Forward/Reverse flow ▪ Reverse flow ▪ Reverse flow compensation 	Forward flow
Measuring mode output 1	–	Select measuring mode for output.	<ul style="list-style-type: none"> ▪ Forward flow ▪ Forward/Reverse flow ▪ Reverse flow ▪ Reverse flow compensation 	Forward flow
Operating mode totalizer 1	–	Select totalizer calculation mode.	<ul style="list-style-type: none"> ▪ Net flow total ▪ Forward flow total ▪ Reverse flow total 	Net flow total
Operating mode totalizer 2	–	Select totalizer calculation mode.	<ul style="list-style-type: none"> ▪ Net flow total ▪ Forward flow total ▪ Reverse flow total 	Net flow total
Operating mode totalizer 3	–	Select totalizer calculation mode.	<ul style="list-style-type: none"> ▪ Net flow total ▪ Forward flow total ▪ Reverse flow total 	Net flow total
Assign process variable	–	Select process variable for low flow cut off.	<ul style="list-style-type: none"> ▪ Off ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow 	Mass flow
On value low flow cutoff	–	Enter on value for low flow cut off.	Positive floating-point number	0 kg/h

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Off value low flow cutoff	-	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	-	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

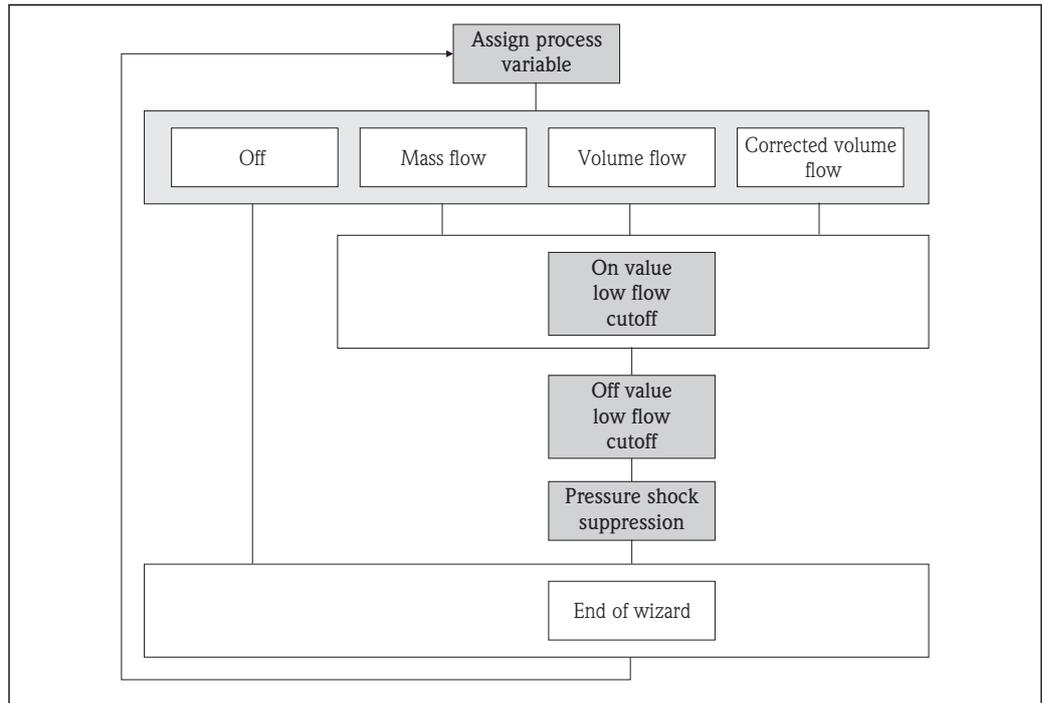
10.4.9 Configuring the low flow cut off

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



A0013799-EN

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

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"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow 	Mass flow
On value low flow cutoff	Enter on value for low flow cut off.	Positive floating-point number	0 kg/h
Off value low flow cutoff	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

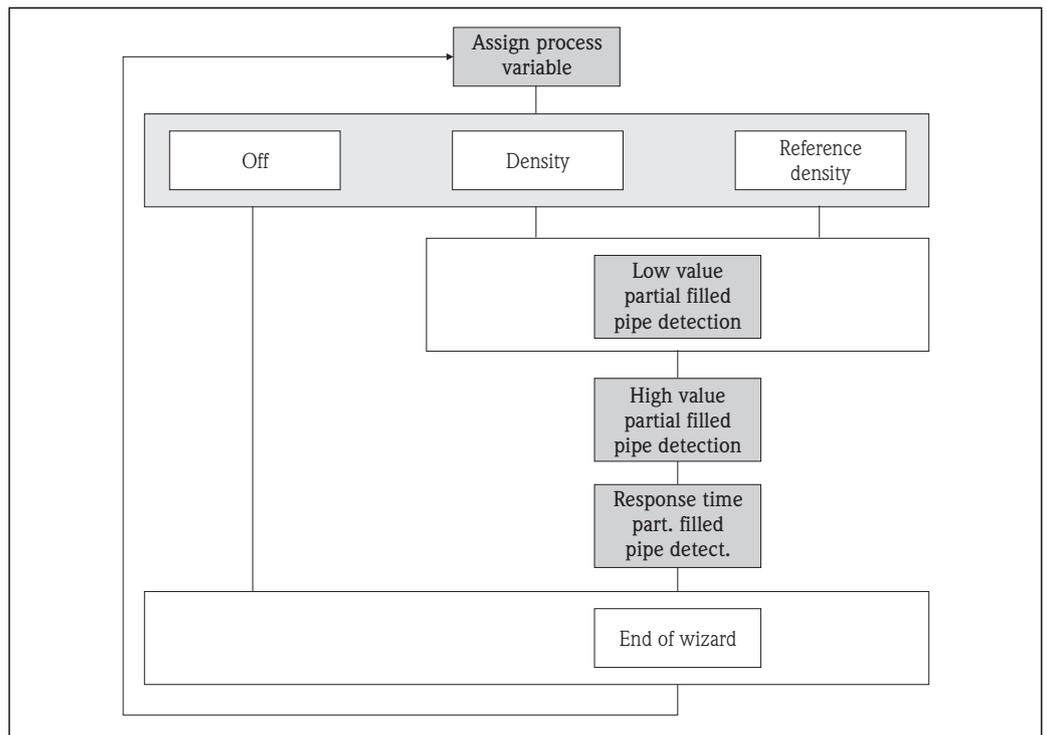
10.4.10 Configuring the partial filled pipe detection

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

Navigation

"Setup" menu → Partially filled pipe detection

Structure of the wizard



A0013801-EN

25 Wizard "Partially filled pipe detection" wizard in the "Setup" menu

Parameter overview with brief description

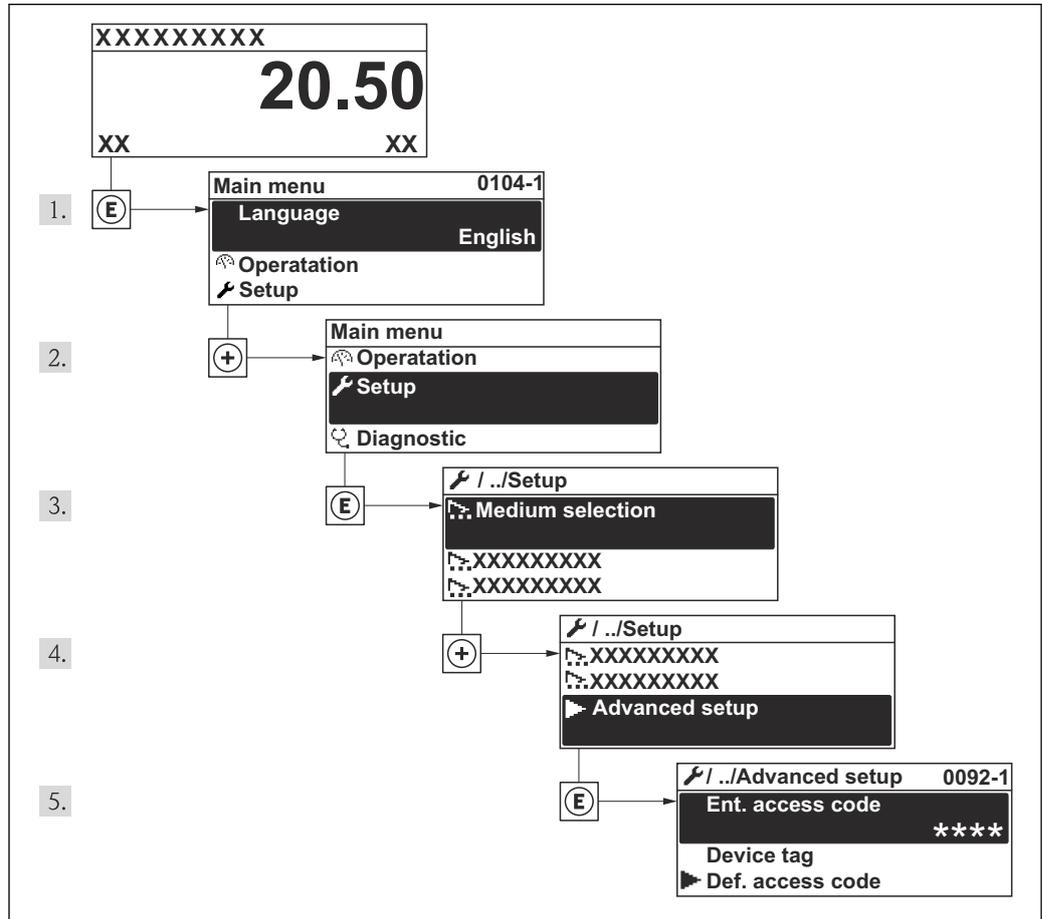
Parameter	Description	Selection / User entry	Factory setting
Assign process variable	Select process variable for partially filled pipe detection.	<ul style="list-style-type: none"> ■ Off ■ Density ■ Reference density 	Off
Low value partial filled pipe detection	Enter lower limit value for deactivating partially filled pipe detection.	Signed floating-point number	Country-dependent: <ul style="list-style-type: none"> ■ 0.2 kg/l ■ 12.5 lb/ft³
High value partial filled pipe detection	Enter upper limit value for deactivating partially filled pipe detection.	Signed floating-point number	Country-dependent: <ul style="list-style-type: none"> ■ 6 kg/l ■ 374.6 lb/ft³
Response time part. filled pipe detect.	Enter time before diagnostic message is displayed for partially filled pipe detection.	0 to 100 s	1 s

10.5 Advanced settings

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

"Setup" menu → Advanced setup

Navigation to the "Advanced setup" submenu



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26 Illustrated using the example of the local display

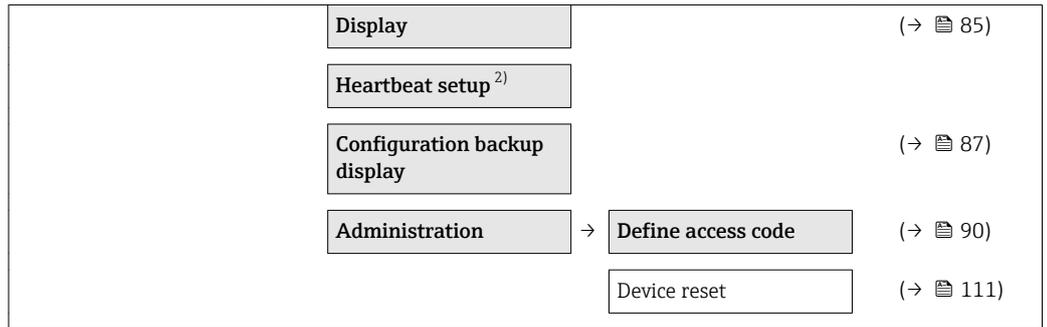
Navigation

"Setup" menu → Advanced setup

Overview of the parameters and submenus in the "Advanced setup" submenu

Overview of the parameters and submenus in the "Advanced setup" menu

Advanced setup	→	Enter access code	(→ ⓘ 46)
		System units	(→ ⓘ 58)
		Sensor adjustment	(→ ⓘ 83)
		Totalizer 1 to 3	(→ ⓘ 83)
		SIL confirmation ¹⁾	
		Deactivate SIL	



- 1) Order code for additional approval, option LA "SIL", see device-dependent supplementary documentation
- 2) Order code for "Application package", option EB "Heartbeat Verification", see the Special Documentation for the device

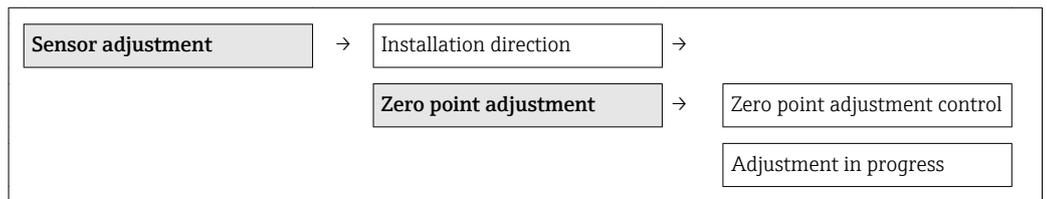
10.5.1 Carrying out a sensor adjustment

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

Navigation

"Setup" menu → Advanced setup → Sensor adjustment

Structure of the submenu



Parameter overview with brief description

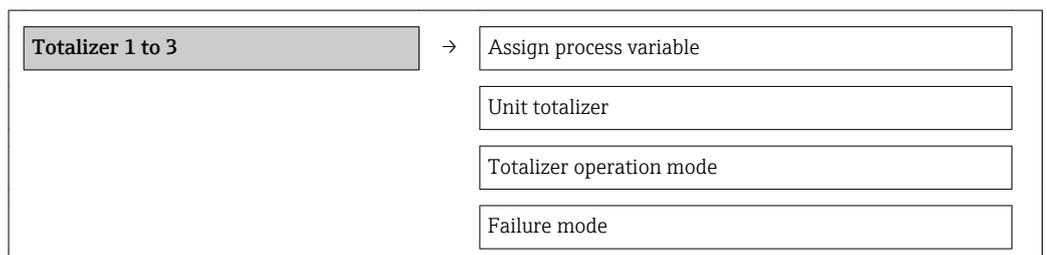
Parameter	Description	Selection / User interface	Factory setting
Installation direction	Set sign of flow direction to match the direction of the arrow on the sensor.	<ul style="list-style-type: none"> ▪ Flow in arrow direction ▪ Flow against arrow direction 	Flow in arrow direction
Zero point adjustment control	Start zero point adjustment.	<ul style="list-style-type: none"> ▪ Cancel ▪ Busy ▪ Zero point adjust failure ▪ Start 	Cancel
Adjustment in progress		0 to 100 %	100 %

10.5.2 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



Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Assign process variable	Select process variable for totalizer.	<ul style="list-style-type: none"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow 	Mass flow
Unit totalizer	Select process variable totalizer unit.	Unit choose list	kg
Totalizer operation mode	Select totalizer calculation mode.	<ul style="list-style-type: none"> ▪ Net flow total ▪ Forward flow total ▪ Reverse flow total 	Net flow total
Failure mode	Define totalizer behavior in alarm condition.	<ul style="list-style-type: none"> ▪ Stop ▪ Actual value ▪ Last valid value 	Stop

10.5.3 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

Structure of the submenu

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"> ■ 1 value, max. size ■ 1 bargraph + 1 value ■ 2 values ■ 1 value large + 2 values ■ 4 values 	1 value, max. size
Value 1 display	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> ■ None ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current output 1 ■ Current output 2 	Mass flow
0% bargraph value 1	Enter 0% value for bar graph display.	Signed floating-point number	0 kg/h
100% bargraph value 1	Enter 100% value for bar graph display.	Signed floating-point number	2.5 kg/h
Decimal places 1	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	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"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	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"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	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"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	x.xx

Parameter	Description	Selection / User entry	Factory setting
Language	Set display language.	<ul style="list-style-type: none"> ▪ English ▪ Deutsch ▪ Français ▪ Español ▪ Italiano ▪ Nederlands ▪ Portuguesa ▪ Polski ▪ русский язык (Russian) ▪ Svenska ▪ Türkçe ▪ 中文 (Chinese) ▪ 日本語 (Japanese) ▪ 한국어 (Korean) ▪ العربية (Arabic) ▪ Bahasa Indonesia ▪ ภาษาไทย (Thai) ▪ tiếng Việt (Vietnamese) ▪ čeština (Czech) 	English
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	0.0 s
Header	Select header contents on local display.	Enter display header text.	Device tag
Header text	Enter display header text.		-----
Separator	Select decimal separator for displaying numerical values.	<ul style="list-style-type: none"> ▪ . ▪ , 	.
Backlight	Switch the local display backlight on and off.	<ul style="list-style-type: none"> ▪ Disable ▪ Enable 	Disable

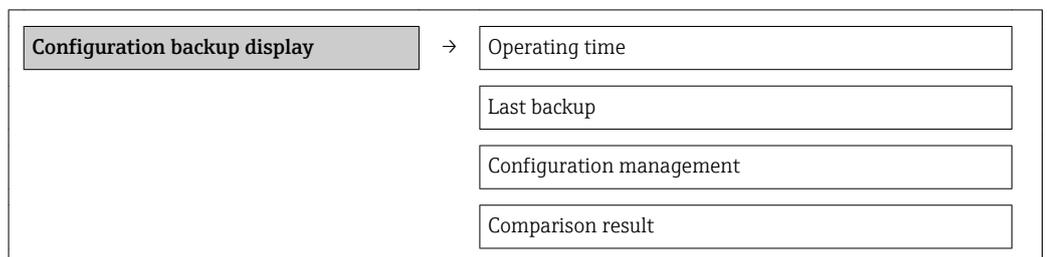
10.6 Configuration management

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)	-

Parameter	Description	User interface / Selection	Factory setting
Configuration management	Select action for managing the device data in the display module.	<ul style="list-style-type: none"> ■ Cancel ■ Execute backup ■ Restore ■ Duplicate ■ Compare ■ Clear backup data 	Cancel
Comparison result	Comparison between present device data and display backup.	<ul style="list-style-type: none"> ■ Settings identical ■ Settings not identical ■ No backup available ■ Backup settings corrupt ■ Check not done ■ Dataset incompatible 	Check not done

10.6.1 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.

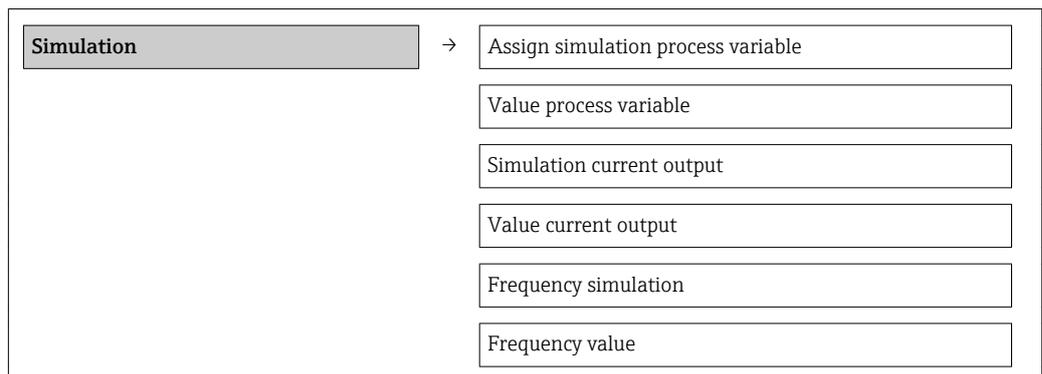
 While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

10.7 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



Pulse simulation
Pulse value
Switch output simulation
Switch status
Simulation device alarm
Diagnostic event category
Simulation diagnostic event

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"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature 	Off
Value process variable	A process variable is selected in the Assign simulation process variable parameter.	Enter the simulation value for the selected process variable.	Signed floating-point number	0
Simulation current output 1 to 2	–	Switch simulation of the current output on and off.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Value current output 1 to 2	The On option is selected in the Current output simulation parameter.	Enter the current value for simulation.	3.59 to 22.5 mA	3.59 mA
Frequency simulation	–	Switch simulation of the frequency output on and off.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Frequency value	The On option is selected in the Frequency output simulation parameter.	Enter the frequency value for simulation.	0.0 to 1250.0 Hz	0.0 Hz
Pulse simulation	The Down-count. val. option is selected in the Simulation pulse output parameter.	Switch simulation of the pulse output on and off.  If the Fixed value option is selected, the Pulse width parameter defines the pulse width of the pulses output.	<ul style="list-style-type: none"> ■ Off ■ Fixed value ■ Down-counting value 	Off
Pulse value	The Down-count. val. option is selected in the Simulation pulse output 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"> ■ Off ■ On 	Off
Switch status	The On option is selected in the Switch output simulation parameter.	Select the status of the status output for the simulation.	<ul style="list-style-type: none"> ■ Open ■ Closed 	Open
Simulation device alarm	–	Switch the device alarm on and off.	<ul style="list-style-type: none"> ■ Off ■ On 	Off

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Diagnostic event category	–	Select the category of the diagnostic event.	<ul style="list-style-type: none"> ▪ Sensor ▪ Electronics ▪ Configuration ▪ Process 	Sensor
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 Diagnostic event category parameter.	<ul style="list-style-type: none"> ▪ Off ▪ Picklist Diagnostic events (depends on the selected category) 	Off

10.8 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 (→  90)
- Write protection via write protection switch (→  91)
- Write protection via keypad lock (→  46)

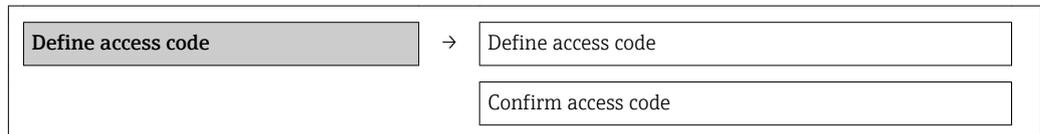
10.8.1 Write protection via access code

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

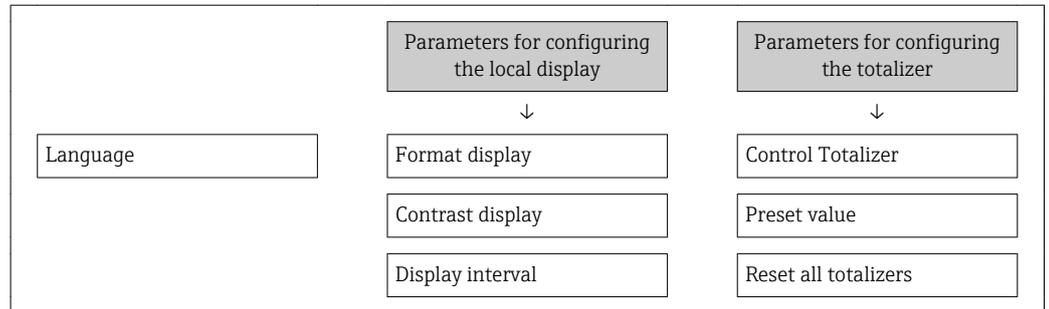
1. Navigate to the **Enter access code** parameter.
2. Define a max. 4-digit numeric code as an access code.
3. Enter the access code again to confirm the code.
 - ↳ The -symbol appears in front of all write-protected parameters.

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 (→  46).
- 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.

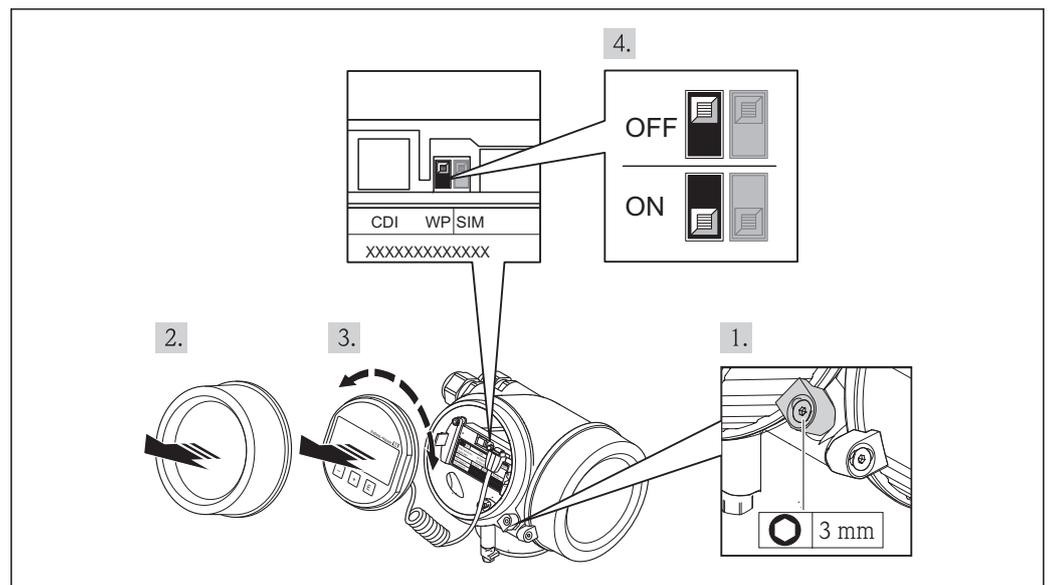


10.8.2 Write protection via write protection switch

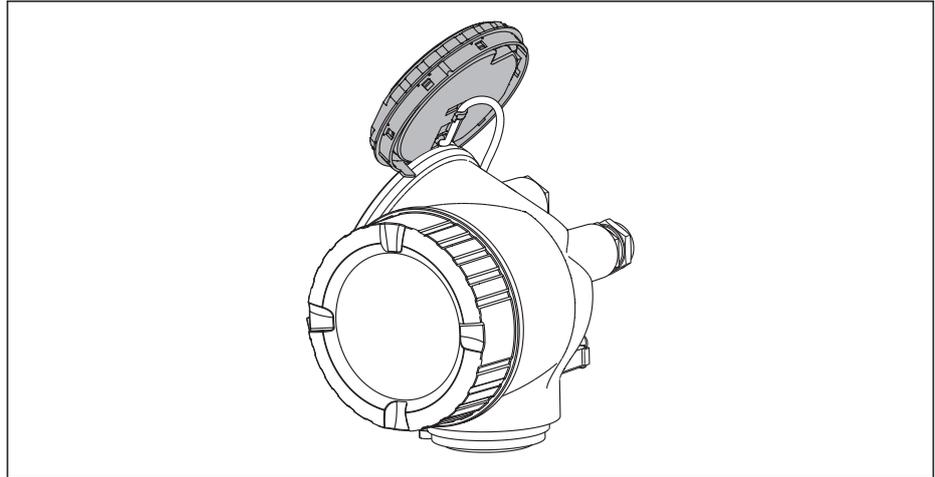
Unlike write protection via user-specific access code, this allows write access to the entire operating menu - other than the **"Contrast display" parameter** - to be locked.

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

- Via local display
- Via service interface (CDI)
- Via HART protocol

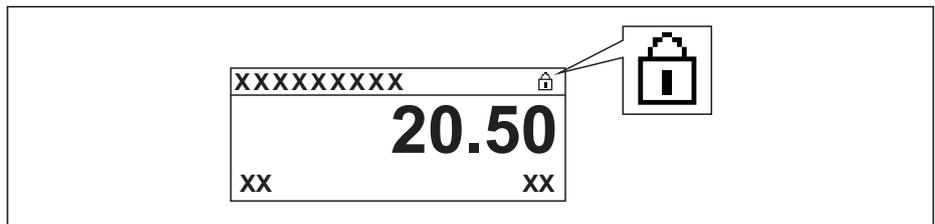


1. Loosen the securing clamp.
2. Unscrew the electronics compartment cover.
3. Pull out the display module with a gentle rotational movement. To make it easier to access the lock switch, attach the display module to the edge of the electronics compartment.
 - ↳ Display module is attached to the edge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



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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 (→ 93). 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.



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If hardware write protection is disabled, no option is displayed in the **Locking status** parameter (→ 93). 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 " Access status display " parameter applies (→ 46). 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 (→ 91).
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 (→ 56)

 For information on the operating languages supported by the measuring device (→ 137)

11.3 Configuring the display

- Basic settings for local display (→ 73)
- Advanced settings for local display (→ 85)

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

Process variables	Mass flow
	Volume flow
	Corrected volume flow
	Density
	Reference density

	Temperature
--	-------------

Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Mass flow	Displays the mass flow currently measured.	Signed floating-point number	1 kg/h
Volume flow	Displays the volume flow currently measured.	Signed floating-point number	0 l/h
Corrected volume flow	Displays the corrected volume flow currently calculated.	Signed floating-point number	1 NI/h
Density	Displays the density currently measured.	Positive floating-point number	1 kg/l
Reference density	Displays the density currently measured at reference temperature.	Positive floating-point number	1 kg/NI
Temperature	Displays the medium temperature currently measured.	Positive floating-point number	293.15 °C

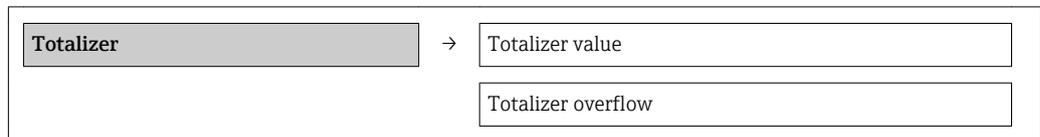
11.4.2 Totalizer

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

Navigation

"Diagnostics" menu → Measured values → Totalizer

Structure of the submenu



Parameter overview with brief description

Parameter	Prerequisite	Description	User interface	Factory setting
Totalizer value 1 to 2	In the Assign process variable parameter of Totalizer 1 to 3 submenu one of the following options is selected: <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow 	Displays the current totalizer counter value.	Signed floating-point number	0 kg
Totalizer overflow 1 to 2	In the Assign process variable parameter of Totalizer 1 to 3 submenu one of the following options is selected: <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow 	Displays the current totalizer overflow.	-32 000.0 to 32 000.0	0

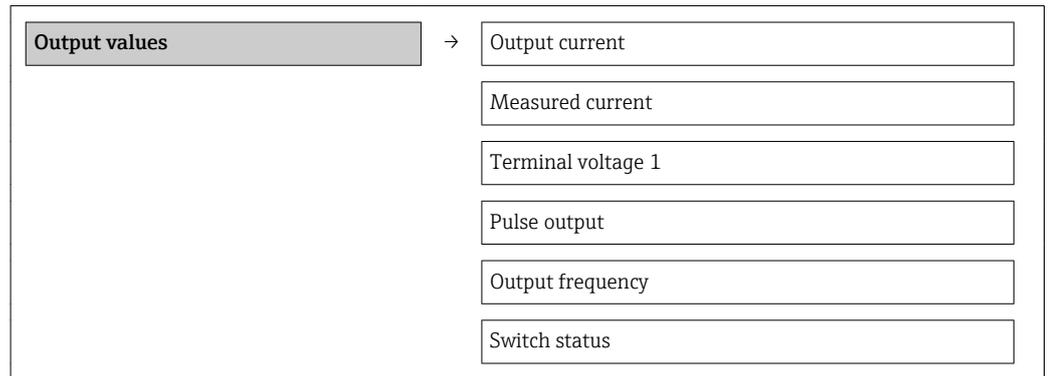
11.4.3 Output values

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

Structure of the submenu



Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Output current 1 to 2	Displays the current value currently calculated for the current output.	3.59 to 22.5 mA	3.59 mA
Measured current 1 to 2	Displays the current value currently measured for the current output.	0 to 30 mA	0 mA
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 1250.0 Hz	0.0 Hz
Switch status	Displays the current switch output status.	<ul style="list-style-type: none"> ▪ Open ▪ Closed 	Open

11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu(→ 56)
- Advanced settings using the **Advanced setup** submenu(→ 82)

11.6 Performing a totalizer reset

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

- Control Totalizer
- Reset all totalizers

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 Preset value parameter.
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.
Preset + totalize	The totalizer is set to the defined start value in Preset value parameter and the totaling process is restarted.

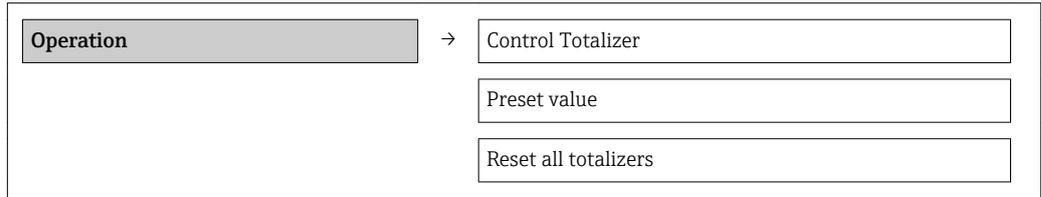
Function scope of "Reset all totalizers" parameter

Options	Description
Reset + totalize	Resets all totalizers to 0 and restarts the totaling process. This deletes all the flow values previously totalized.

Navigation

"Operation" menu → Operation

Structure of the submenu



Parameter overview with brief description

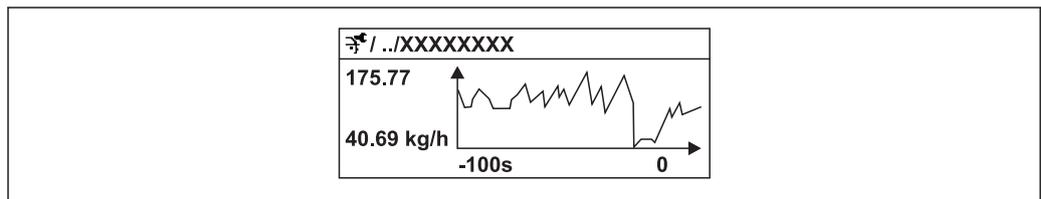
Parameter	Description	Selection / User entry	Factory setting
Control Totalizer 1 to 2	Control totalizer value.	<ul style="list-style-type: none"> ■ Totalize ■ Reset + hold ■ Preset + hold ■ Reset + totalize ■ Preset + totalize 	Totalize
Preset value 1 to 2	Specify start value for totalizer.	Signed floating-point number	0 kg
Reset all totalizers	Reset all totalizers to 0 and start.	<ul style="list-style-type: none"> ■ Cancel ■ Reset + totalize 	Cancel

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.

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



27 Chart of a measured value trend

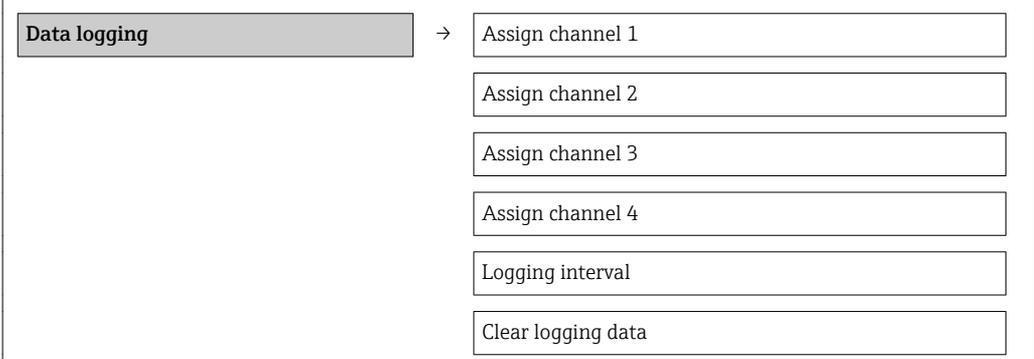
- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

 If the length of the logging interval or the assignment of the process variables to the channels is changed, the content of the data logging is deleted.

Navigation

"Diagnostics" menu → Data logging

"Data logging" submenu



The screenshot shows a menu titled "Data logging" with a right-pointing arrow. Below the arrow are six menu items, each in a rectangular box: "Assign channel 1", "Assign channel 2", "Assign channel 3", "Assign channel 4", "Logging interval", and "Clear logging data".

Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Assign channel 1	Assign process variable to logging channel.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Carrier pipe temperature ■ Electronic temperature ■ Oscillation frequency ■ Oscillation amplitude ■ Oscillation damping ■ Signal asymmetry ■ Current output 1 ■ Current output 2 	Off
Assign channel 2	Assign process variable to logging channel.	Picklist (see Assign chan. 1 parameter)	Off
Assign channel 3	Assign process variable to logging channel.	Picklist (see Assign chan. 1 parameter)	Off
Assign channel 4	Assign process variable to logging channel.	Picklist (see Assign chan. 1 parameter)	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"> ■ Cancel ■ Clear data 	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 (→ 29).
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 (→ 116).
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"> ■ Set the display brighter by simultaneously pressing + . ■ Set the display darker by simultaneously pressing + .
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 (→ 116).
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures (→ 105)
Text on local display appears in a foreign language and cannot be understood.	Incorrect operating language is configured.	<ol style="list-style-type: none"> 1. Press + for 2 s ("home position"). 2. Press . 3. Set the desired language in the Language parameter.

For output signals

Problem	Possible causes	Remedy
Signal output outside the valid range	Main electronics module is defective.	Order spare part (→ 116).
Signal output outside the valid current range (< 3.6 mA or > 22 mA)	I/O electronics module is defective.	Order spare part (→ 116).
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"> 1. Check and correct parameter configuration. 2. Observe limit values specified in the "Technical Data".

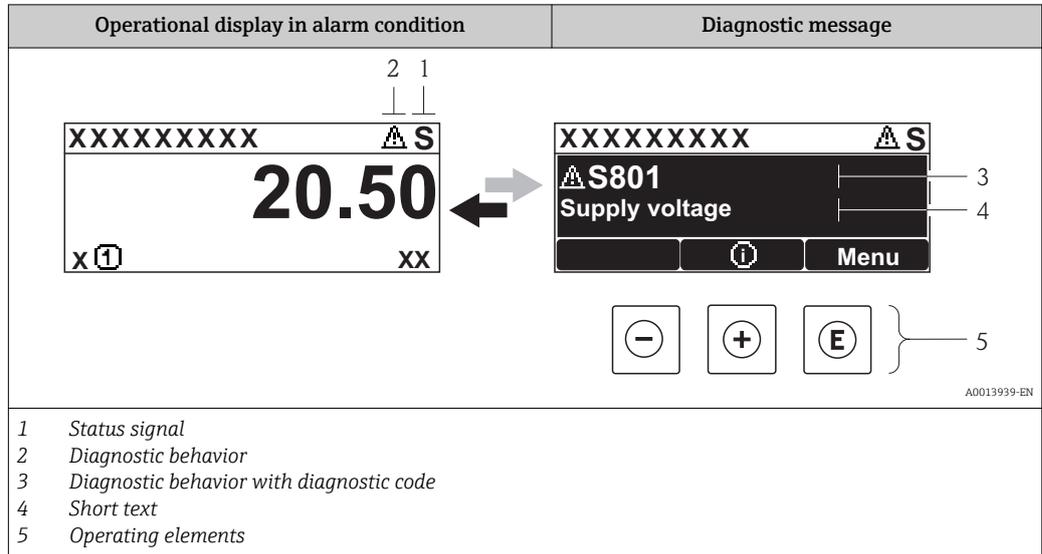
For access

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 (→  91).
No write access to parameters	Current user role has limited access authorization	1. Check user role (→  46). 2. Enter correct customer-specific access code (→  46).
No connection via HART protocol	Missing or incorrectly installed communication resistor.	Install the communication resistor (250 Ω) correctly. Observe the maximum load (→  28) (→  123).
No connection via HART protocol	Commubox <ul style="list-style-type: none"> ▪ Connected incorrectly ▪ Configured incorrectly ▪ Drivers not installed correctly ▪ USB interface on computer configured incorrectly 	Observe the documentation for the Commubox.  FXA195 HART: Document "Technical Information" TI00404F
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
 - Via submenus (→ 109)

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

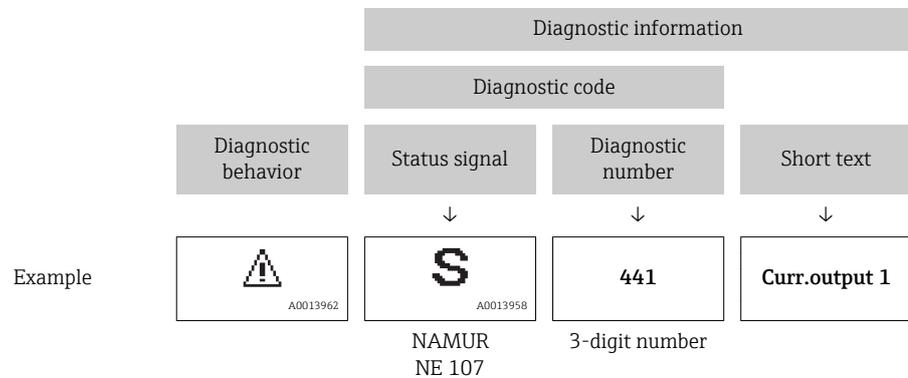
Symbol	Meaning
F <small>A0013956</small>	Failure A device error has occurred. The measured value is no longer valid.
C <small>A0013959</small>	Function check The device is in service mode (e.g. during a simulation).
S <small>A0013958</small>	Out of specification The device is operated: <ul style="list-style-type: none"> ▪ Outside its technical specification limits (e.g. outside the process temperature range) ▪ Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)
M <small>A0013957</small>	Maintenance required Maintenance is required. The measured value remains valid.

Diagnostic behavior

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

Diagnostic information

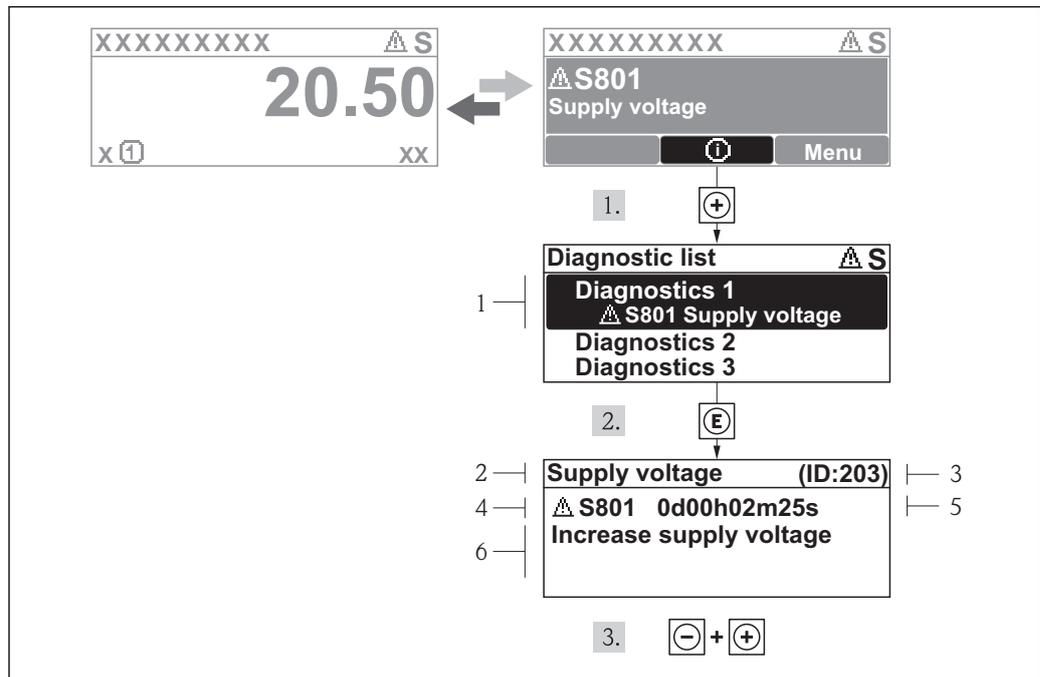
The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.



Operating elements

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

12.2.2 Calling up remedial measures



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

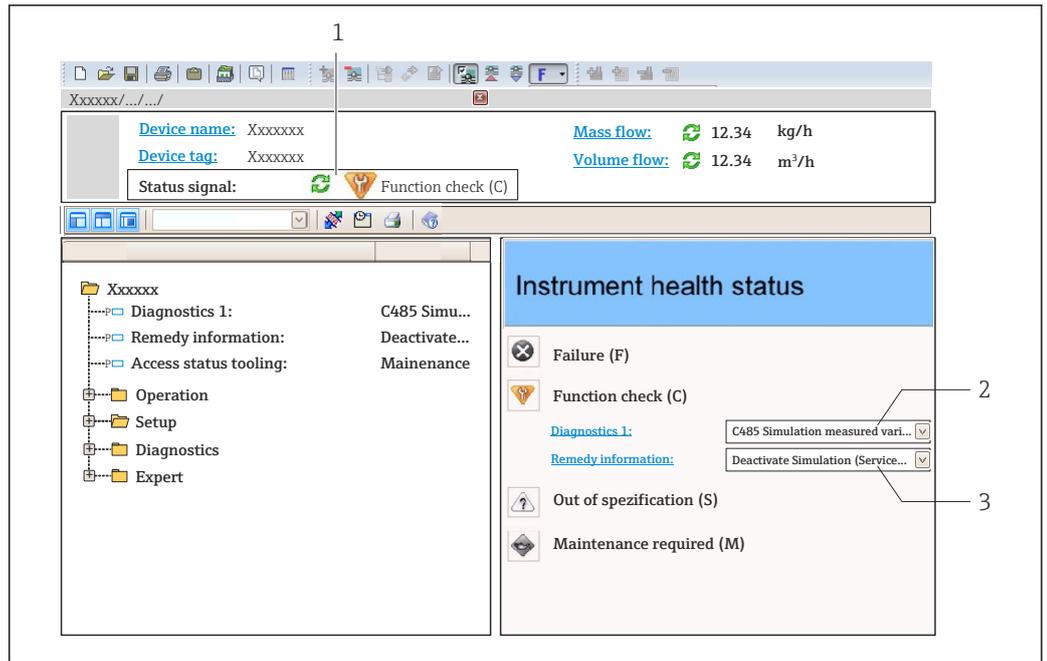
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or the **Previous diagnostics** parameter.

1. Press ⏏ .
↳ 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.

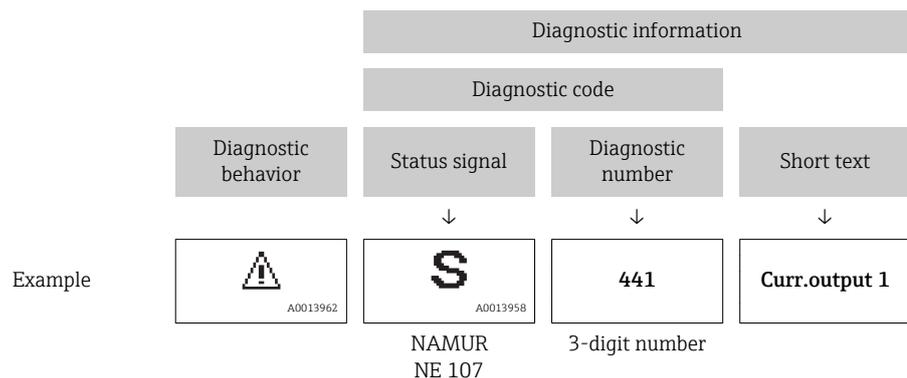


- 1 Status area with status signal (→ 100)
- 2 Diagnostic information (→ 101)
- 3 Remedial measures with Service ID

- i** Furthermore, diagnostic events that have occurred can be viewed in the **Diagnostics** menu:
 - Via parameters
 - Via submenu (→ 109)

Diagnostic information

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



12.3.2 Calling up remedy information

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

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

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

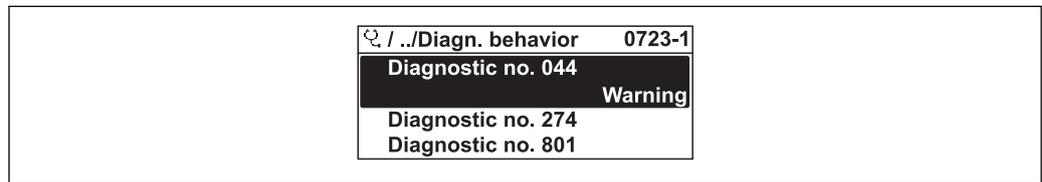
1. Call up the desired parameter.
2. On the right in the working area, mouse over the parameter.
 - ↳ A tool tip with remedy information for the diagnostic event appears.

12.4 Adapting the diagnostic information

12.4.1 Adapting the diagnostic behavior

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

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



A0014048-EN

29 Taking the example of the local display

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

Options	Description
Alarm	Measurement is interrupted. Signal outputs and 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. The signal outputs and totalizers are not affected. A diagnostic message is generated.
Logbook entry only	The device continues to measure. The diagnostic message is 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.

12.4.2 Changing the diagnostic category

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

"Expert" menu → Communication → Diagnostic event category

Diagnostic categories available

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

Symbol	Meaning
F <small>A0013956</small>	Failure A device error has occurred. The measured value is no longer valid.
M <small>A0013957</small>	Maintenance required Maintenance is required. The measured value remains valid.

Symbol	Meaning
	Out of specification The device is operated: <ul style="list-style-type: none"> ▪ Outside its technical specification limits (e.g. outside the process temperature range) ▪ Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)
No effect	Has no effect on the condensed status.

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.

 The diagnostic behavior (→  104) and the diagnostic category (→  104) can be changed in the event of the following diagnostic information:

Diagnostics for the sensor

- Δ S046 Sensor limit exceeded
- Δ S140 Sensor signal

Diagnostics for the electronics

- Δ S274 Main electronic failure

Diagnostics for the configuration

- Δ S441 Current output 1 to 2
- Δ S442 Frequency output
- Δ S443 Pulse output

Diagnostics for the process

- Δ S801 Supply voltage too low
- Δ S830 Sensor temperature too high
- Δ S831 Sensor temperature too low
- Δ S832 Ambient temperature too high
- Δ S833 Ambient temperature too low
- Δ S834 Process temperature too high
- Δ S835 Process temperature too low
- Δ S862 Partly filled pipe
- Δ S912 Medium inhomogeneous
- Δ S913 Medium unsuitable

Diagnostic number	Short text	Repairing action	Status signal from the factory	Diagnostic behaviour from the factory
Diagnostic of sensor				
022	Sensor temperature	1.Change main electronic module 2.Change sensor	F	Alarm
046	Sensor limit exceeded	1. Inspect sensor 2. Check process condition	S	Warning ¹⁾
062	Sensor connection	1.Change main electronic module 2.Change sensor	F	Alarm
082	Data storage	1.Change main electronic module 2.Change sensor	F	Alarm
083	Memory content	1. Restart device 2. Restore S-Dat data 3. Change sensor	F	Alarm
140	Sensor signal	1.Check or change main electronics 2.Change sensor	S	Warning ¹⁾
Diagnostic of electronic				

Diagnostic number	Short text	Repairing action	Status signal from the factory	Diagnostic behaviour from the factory
242	Software incompatible	1. Check software 2. Flash or change main electronics module	F	Alarm
252	Modules incompatible	1. Check electronic modules 2. Change I/O or main electronic module	F	Alarm ¹⁾
261	Electronic modules	1. Restart device 2. Check electronic modules 3. Change I/O Modul or main electronics	F	Alarm
262	Module connection	1. Check module connections 2. Change electronic modules	F	Alarm
270	Main electronic failure	Change main electronic module	F	Alarm
271	Main electronic failure	1. Restart device 2. Change main electronic module	F	Alarm
272	Main electronic failure	1. Restart device 2. Contact service	F	Alarm
273	Main electronic failure	1. Emergency operation via display 2. Change main electronics	F	Alarm
274	Main electronic failure	Unstable measurement 1. Change main electronics	S	Warning ¹⁾
275	I/O module failure	Change I/O module	F	Alarm
276	I/O module failure	1. Restart device 2. Change I/O module	F	Alarm
282	Data storage	1. Restart device 2. Contact service	F	Alarm
283	Memory content	1. Transfer data or reset device 2. Contact service	F	Alarm
302	Device verification active	Device verification active, please wait.	C	Warning
311	Electronic failure	1. Transfer data or reset device 2. Contact service	F	Alarm
311	Electronic failure	Maintenance required! 1. Do not perform reset 2. Contact service	M	Warning
362	Main electronic failure	1. Change main electronic module 2. Change sensor	F	Alarm
Diagnostic of configuration				
410	Data transfer	1. Check connection 2. Retry data transfer	F	Alarm
411	Up-/download active	Up-/download active, please wait	C	Warning
431	Trim 1 to 2	Carry out trim	C	Warning
437	Configuration incompatible	1. Restart device 2. Contact service	F	Alarm
438	Dataset	1. Check data set file 2. Check device configuration 3. Up- and download new configuration	M	Warning
441	Current output 1 to 2	1. Check process 2. Check current output settings	S	Warning ¹⁾

Diagnostic number	Short text	Repairing action	Status signal from the factory	Diagnostic behaviour from the factory
442	Frequency output	1. Check process 2. Check frequency output settings	S	Warning ¹⁾
443	Pulse output	1. Check process 2. Check pulse output settings	S	Warning ¹⁾
444	Current input 1	1. Check process 2. Check current input settings	S	Warning ¹⁾
453	Flow override	Deactivate flow override	C	Warning
484	Simulation failure mode	Deactivate simulation	C	Alarm
485	Simulation measured variable	Deactivate simulation	C	Warning
486	Simulation current input 1	Deactivate simulation	C	Warning
491	Simulation current output 1 to 2	Deactivate simulation	C	Warning
492	Simulation frequency output	Deactivate simulation frequency output	C	Warning
493	Simulation pulse output	Deactivate simulation pulse output	C	Warning
494	Switch output simulation	Deactivate simulation switch output	C	Warning
495	Simulation diagnostic event	Deactivate simulation	C	Warning
Diagnostic of process				
801	Supply voltage too low	Increase supply voltage	S	Warning ¹⁾
803	Current loop	1. Check wiring 2. Change I/O module	F	Alarm
830	Sensor temperature too high	Reduce ambient temp. around the sensor housing	S	Warning ¹⁾
831	Sensor temperature too low	Increase ambient temp. around the sensor housing	S	Warning ¹⁾
832	Electronic temperature too high	Reduce ambient temperature	S	Warning ¹⁾
833	Electronic temperature too low	Increase ambient temperature	S	Warning ¹⁾
834	Process temperature too high	Reduce process temperature	S	Warning ¹⁾
835	Process temperature too low	Increase process temperature	S	Warning ¹⁾
842	Process limit	Low flow cut off active! 1. Check low flow cut off configuration	S	Warning
862	Partly filled pipe	1. Check for gas in process 2. Adjust detection limits	S	Warning ¹⁾
882	Input signal	1. Check input configuration 2. Check external device or process conditions	F	Alarm
910	Tubes not oscillating	1. Check process conditions 2. Increase supply 3. Check main electronic or sensor	F	Alarm

Diagnostic number	Short text	Repairing action	Status signal from the factory	Diagnostic behaviour from the factory
912	Medium inhomogeneous	1. Check process cond. 2. Increase system pressure	S	Warning ¹⁾
913	Medium unsuitable	1. Check process conditions 2. Increase supply 3. Check main electronic or sensor	S	Warning ¹⁾

1) Diagnostic status is changeable.

12.6 Pending diagnostic events

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

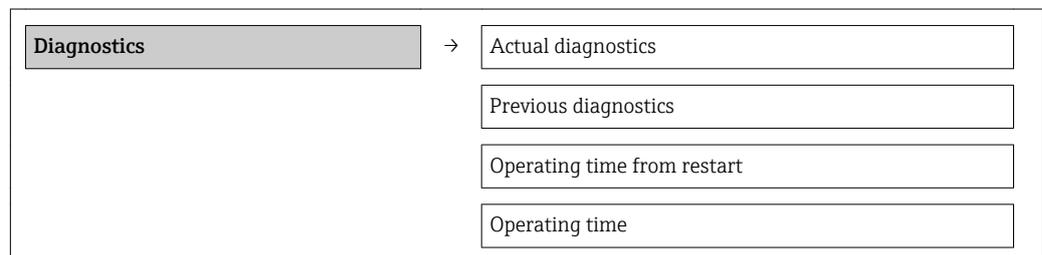
-  To call up the measures to rectify a diagnostic event:
- Via local display (→  102)
 - Via "FieldCare" operating tool (→  103)

-  Other pending diagnostic events can be displayed in the **Diagnostic list** submenu (→  109)

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.	–

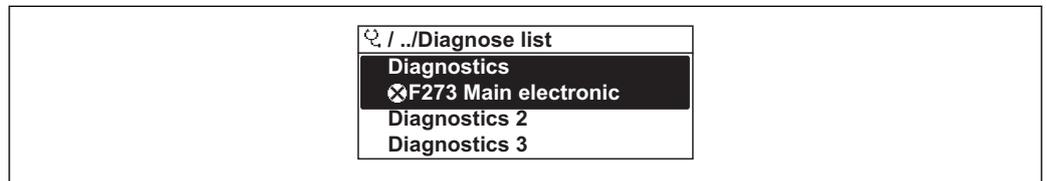
Parameter	Prerequisite	Description	User interface	Factory setting
Operating time from restart	-		Days (d), hours (h), minutes (m), seconds (s)	
Operating time	-	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m), seconds (s)	-

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

30 Illustrated using the example of the local display

-  To call up the measures to rectify a diagnostic event:
 - Via local display (→  102)
 - Via "FieldCare" operating tool (→  103)

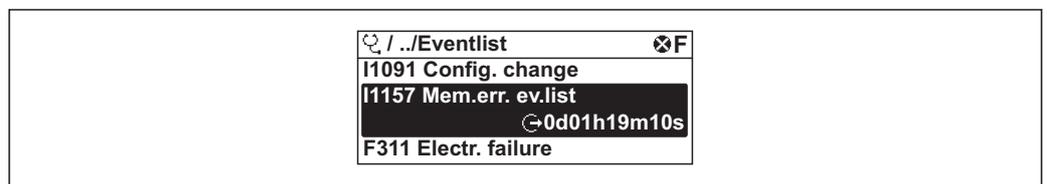
12.8 Event logbook

12.8.1 Event history

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

Navigation path

"Diagnostics" menu → Event logbook → Events list



A0014008-EN

31 Illustrated using the example of the local display

A maximum of 20 event messages can be displayed in chronological order. If the advanced HistoROM function is enabled in the device (order option), up to 100 entries can be displayed.

The event history includes entries for:

- Diagnostic events (→  105)
- Information events (→  110)

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

- Diagnostic event
 - : Event has occurred
 - : Event has ended
 - Information event
 - : Event has occurred
-  To call up the measures to rectify a diagnostic event:
- Via local display (→  102)
 - Via "FieldCare" operating tool (→  103)
-  For filtering the displayed event messages (→  110)

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
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed
I1092	Trend data deleted
I1110	Write protection switch changed
I1111	Density adjust failure
I1137	Electronic changed
I1151	History reset
I1154	Reset terminal voltage min/max
I1155	Reset electronic temperature
I1156	Memory error trend
I1157	Memory error event list
I1185	Display backup done
I1186	Restore via display done
I1187	Settings downloaded with display
I1188	Display data cleared

Info number	Info name
I1189	Backup compared
I1209	Density adjustment ok
I1221	Zero point adjust failure
I1222	Zero point adjustment ok
I1227	Sensor emergency mode activated
I1228	Sensor emergency mode failed
I1256	Display: access status changed
I1264	Safety sequence aborted
I1335	Firmware changed
I1397	Fieldbus: access status changed
I1398	CDI: access status changed

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.

"Setup" menu → Advanced setup → Administration

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.  This option is not visible if no customer-specific settings have been ordered.
Restart device	The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.
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
Device revision
Device ID
Device type
Manufacturer ID

Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Device tag	Enter tag for measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /)	Promass
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	01.03
Device name	Displays the name of the transmitter.	Character string composed of letters, numbers and certain punctuation marks.	Promass 200
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
Device revision	Displays the device revision with which the device is registered with the HART Communication Foundation.	0 to 255	4
Device ID	Displays the device ID for identifying the device in a HART network.	Positive integer	6-digit hexadecimal number
Device type	Displays the device type with which the measuring device is registered with the HART Communication Foundation.	0 to 255	84
Manufacturer ID	Displays the manufacturer ID with which the measuring device is registered with the HART Communication Foundation.	0 to 255	17

12.11 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
06.2010	01.00.zz	Option 78	Original firmware	Operating Instructions	BA01027D/06/EN/06.10
				Description Device Parameters	GP01009D/06/EN/06.10
				Functional Safety Manual	SD00147D/06/EN/01.11
07.2011	01.01.zz	Option 76	<ul style="list-style-type: none"> ▪ SIL integrated (optional) ▪ Integrated additional operating languages: Portuguese, Polish, Russian, Turkish, Bahasa (Indonesian), Vietnamese, Czech ▪ Data logging submenu: Assign channel 1 to 4 extended ▪ Min/max values submenu extended ▪ For diagnostic event S441: diagnostic behavior can be changed 	Operating Instructions	BA01027D/06/EN/13.11
				Description Device Parameters	GP01010D/06/EN/01.11
				Manual Functional Safety	SD00147D/06/EN/01.11
07.2012	01.02.zz	Option 75	<ul style="list-style-type: none"> ▪ Integrated additional operating languages: Chinese ▪ New numeric editor ▪ SDO3 local display with backlighting ▪ New menu: <ul style="list-style-type: none"> – Pulse/frequency/switch output wizard – Define access code submenu with prompt to confirm code 	Operating Instructions	See title page
				Manual Functional Safety	SD00147D/06/EN/02.12
02.2014	01.03.zz	Option 74	<ul style="list-style-type: none"> ▪ In accordance with HART 7 Specification ▪ Integrated HART input ▪ SDO3 keypad lock ▪ Modification of SIL functionality ▪ HistoROM data logging in FieldCare "HistoROM" module ▪ Simulation of diagnostic events ▪ Ability to access Heartbeat Technology application package 	Operating Instructions	See title page



Flashing the firmware to the current version or to the previous version is possible via the service interface (CDI) (→ 136).

 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 → Download
 - Specify the following details:
 - Product root, e.g. 8E2B
 - 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

Observe the following points for CIP and SIP cleaning:

- Use only cleaning agents to which the process-wetted materials are adequately resistant.
- Observe the maximum permitted medium temperature for the measuring device (→  131).

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:

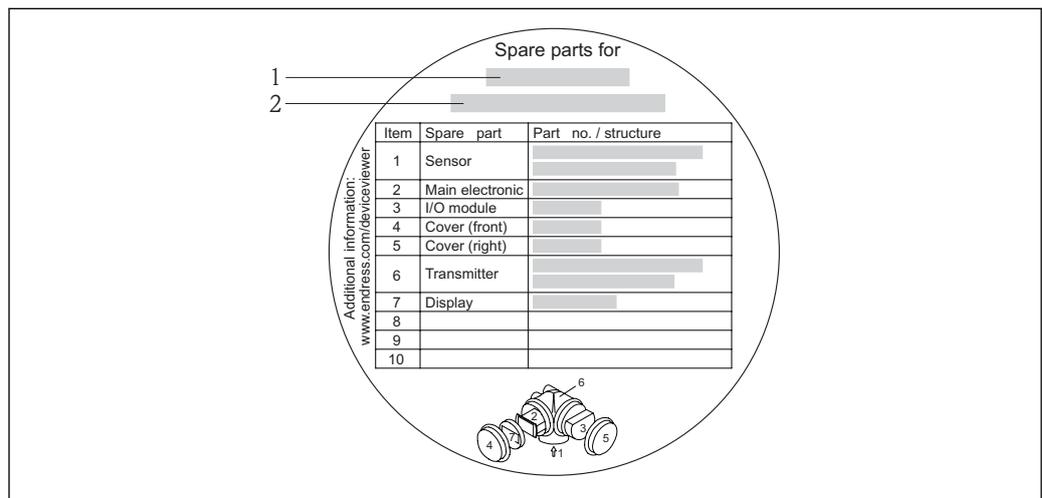
- Use only original Endress+Hauser spare parts.
- Carry out the repair according to the Installation Instructions.
- Observe the applicable standards, federal/national regulations, Ex documentation (XA) and certificates.
- Document every repair and each conversion and enter them into the W@M life cycle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



32 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 (→  111).

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 repairs or a factory calibration are required, or if the wrong measuring device has been ordered or delivered. According to legal regulations, Endress+Hauser, as an ISO-certified company, is required to follow certain procedures when handling returned products that are in contact with medium.

To ensure swift, safe and professional device returns, please read the return procedures and conditions on the Endress+Hauser website at www.services.endress.com/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.

15.1 Device-specific accessories

15.1.1 For the transmitter

Accessories	Description
Promass 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"> ▪ Approvals ▪ Output ▪ Display / operation ▪ Housing ▪ Software <p> For details, see Installation Instructions EA00104D</p>
Remote display FHX50	<p>FHX50 housing to accommodate a display module (→  137).</p> <ul style="list-style-type: none"> ▪ FHX50 housing suitable for: <ul style="list-style-type: none"> – SD02 display module (push buttons) – SD03 display module (touch control) ▪ Housing material: <ul style="list-style-type: none"> – Plastic PBT – 316L ▪ 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)) <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"> ▪ Order code for measuring device, feature 030: Option L or M "Prepared for FHX50 display" ▪ Order code for FHX50 housing, feature 050 (device version): Option A "Prepared for FHX50 display" ▪ Order code for FHX50 housing, depends on the desired display module in feature 020 (display, operation): <ul style="list-style-type: none"> – Option C: for an SD02 display module (push buttons) – Option E: for an SD03 display module (touch control) <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"> ▪ Feature 050 (measuring device version): option B "Not prepared for FHX50 display" ▪ Feature 020 (display, operation): option A "None, existing displayed used" <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"> ▪ OVP10: For 1-channel devices (characteristic 020, option A): ▪ OVP20: For 2-channel devices (characteristic 020, options B, C, E or G) <p> For details, see Special Documentation SD01090F.</p>

Weather protection cover	Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight or extreme cold in winter.  For details, see Special Documentation SD00333F
Pipe mounting set	Pipe mounting set for transmitter.

15.1.2 For the sensor

Accessories	Description
Heating jacket	Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids. If using oil as a heating medium, please consult with Endress+Hauser. Heating jackets cannot be used with sensors fitted with a rupture disk.  For details, see Operating Instructions BA00099D

15.2 Communication-specific accessories

Accessories	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface.  For details, see "Technical Information" TI00404F
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.  For details, see "Technical Information" TI00405C
HART Loop Converter HMX50	Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.  For details, see "Technical Information" TI00429F and Operating Instructions BA00371F
Wireless HART adapter SWA70	Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity.  For details, see Operating Instructions BA00061S
Fieldgate FXA320	Gateway for the remote monitoring of connected 4-20 mA measuring devices via a Web browser.  For details, see "Technical Information" TI00025S and Operating Instructions BA00053S
Fieldgate FXA520	Gateway for the remote diagnostics and remote configuration of connected HART measuring devices via a Web browser.  For details, see "Technical Information" TI00025S and Operating Instructions BA00051S
Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the non-Ex area .  For details, see Operating Instructions BA01202S
Field Xpert SFX370	Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the non-Ex area and the Ex area .  For details, see Operating Instructions BA01202S

15.3 Service-specific accessories

Accessories	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> ■ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections. ■ Graphic illustration of the calculation results <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"> ■ Via the Internet: https://wapps.endress.com/applicator ■ On CD-ROM for local PC installation.
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"> ■ Via the Internet: www.endress.com/lifecyclemanagement ■ On CD-ROM for local PC installation.
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>

15.4 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>
RN221N	<p>Active barrier with power supply for safe separation of 4-20 mA standard signal circuits. Offers bidirectional HART transmission.</p> <p> For details, see "Technical Information" TI00073R and Operating Instructions BA00202R</p>
RNS221	<p>Supply unit for powering two 2-wire measuring devices solely in the non-Ex area. Bidirectional communication is possible via the HART communication jacks.</p> <p> For details, see "Technical Information" TI00081R and Brief Operating Instructions KA00110R</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

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

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

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

16.2 Function and system design

Measuring principle	Mass flow measurement based on the Coriolis measuring principle
Measuring system	<p>The device consists of a transmitter and a sensor.</p> <p>One device version is available: compact version, transmitter and sensor form a mechanical unit.</p> <p>For information on the structure of the device (→  12)</p>

16.3 Input

Measured variable	<p>Direct measured variables</p> <ul style="list-style-type: none"> ▪ Mass flow ▪ Density ▪ Temperature <p>Calculated measured variables</p> <ul style="list-style-type: none"> ▪ Volume flow ▪ Corrected volume flow ▪ Reference density
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Measuring range	Measuring ranges for liquids			
	DN		Measuring range full scale values $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$	
	[mm]	[in]	[kg/h]	[lb/min]
	8	$\frac{3}{8}$	0 to 2 000	0 to 73.5
	15	$\frac{1}{2}$	0 to 6 500	0 to 238
	25	1	0 to 18 000	0 to 660
	40	$1\frac{1}{2}$	0 to 45 000	0 to 1 650
	50	2	0 to 70 000	0 to 2 570

Measuring ranges for gases

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

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

$\dot{m}_{\max(G)}$	Maximum full scale value for gas [kg/h]
$\dot{m}_{\max(F)}$	Maximum full scale value for liquid [kg/h]
$\dot{m}_{\max(G)} < \dot{m}_{\max(F)}$	$\dot{m}_{\max(G)}$ can never be greater than $\dot{m}_{\max(F)}$
ρ_G	Gas density in [kg/m ³] at operating conditions

	DN		x [kg/m ³]
	[mm]	[in]	
	8	3/8	85
	15	1/2	110
	25	1	125
	40	1 1/2	125
	50	2	125

Calculation example for gas

- Sensor: Promass E, DN 50
- Gas: Air with a density of 60.3 kg/m³ (at 20 °C and 50 bar)
- Measuring range (liquid): 70 000 kg/h
- x = 125 kg/m³ (for Promass E, DN 50)

Maximum possible full scale value:

$$\dot{m}_{\max(G)} = \dot{m}_{\max(F)} \cdot \rho_G : x = 70\,000 \text{ kg/h} \cdot 60.3 \text{ kg/m}^3 : 125 \text{ kg/m}^3 = 33\,800 \text{ kg/h}$$

Recommended measuring range

"Flow limit" section (→  131)

Operable flow range

Over 1000 : 1.

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

Input signal

External measured values

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

 Various pressure transmitters and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section (→  120)

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

- Mass flow
- Corrected volume flow

HART protocol

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

- HART protocol
- Burst mode

16.4 Output

Output signal

Current output

Current output 1	4-20 mA HART (passive)
Current output 2	4-20 mA (passive)
Resolution	<1 μ A
Damping	Adjustable: 0.0 to 999.9 s
Assignable measured variables	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature

Pulse/frequency/switch output

Function	Can be set to pulse, frequency or switch output
Version	Passive, open collector
Maximum input values	<ul style="list-style-type: none"> ■ DC 35 V ■ 50 mA
Voltage drop	<ul style="list-style-type: none"> ■ For ≤ 2 mA: 2 V ■ For 10 mA: 8 V
Residual current	≤ 0.05 mA
Pulse output	
Pulse width	Adjustable: 5 to 2 000 ms
Maximum pulse rate	100 Impulse/s
Value per pulse	Adjustable
Assignable measured variables	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow
Frequency output	
Output frequency	Adjustable: 0 to 1 000 Hz
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature
Switch output	
Switching behavior	Binary, conductive or non-conductive

Switching delay	Adjustable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	<ul style="list-style-type: none"> ■ Off ■ On ■ Diagnostic behavior ■ Limit value <ul style="list-style-type: none"> - Mass flow - Volume flow - Corrected volume flow - Density - Reference density - Temperature - Totalizer 1-3 ■ Flow direction monitoring ■ Status <ul style="list-style-type: none"> - Partially filled pipe detection - Low flow cut off

Signal on alarm

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

Current output

4-20 mA

Failure mode	Selectable (as per NAMUR recommendation NE 43): <ul style="list-style-type: none"> ■ Minimum value: 3.6 mA ■ Maximum value: 22 mA ■ Defined value: 3.59 to 22.5 mA ■ Actual value ■ Last valid value
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HART

Device diagnostics	Device condition can be read out via HART Command 48
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Pulse/frequency/switch output

Pulse output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Actual value ■ No pulses
Frequency output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Actual value ■ Defined value: 0 to 1250 Hz ■ 0 Hz
Switch output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Current status ■ Open ■ Closed

Local display

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

 Status signal as per NAMUR recommendation NE 107

Operating tool

- Via digital communication:
HART protocol
- Via service interface

Plain text display	With information on cause and remedial measures
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Load (→  28)

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

HART

- For information on the device description files (→  52)
- For information on the dynamic variables and measured variables (HART device variables) (→  52)

16.5 Power supply

Terminal assignment (→  27)

Supply voltage

Transmitter

An external power supply is required for each output. The following supply voltage values apply for the 4-20 mA and 4-20 mA HART current output:

Order code for "Output"	Minimum terminal voltage	Maximum terminal voltage
Option A ^{1) 2)} : 4-20 mA HART	For 4 mA: ≥ DC 18 V For 20 mA: ≥ DC 14 V	DC 35 V
Option B ^{1) 2)} : 4-20 mA HART, pulse/frequency/switch output	For 4 mA: ≥ DC 18 V For 20 mA: ≥ DC 14 V	DC 35 V
Option C ^{1) 2)} : 4-20 mA HART, 4-20 mA	For 4 mA: ≥ DC 18 V For 20 mA: ≥ DC 14 V	DC 30 V

1) External supply voltage of the power supply unit with load.

2) For device versions with SD03 local display: The terminal voltage must be increased by DC 2 V if backlighting is used.

Power consumption

Transmitter

Order code for "Output"	Maximum Power consumption
Option A: 4-20 mA HART	770 mW
Option B: 4-20 mA HART, Pulse/frequency/switch output	<ul style="list-style-type: none"> ▪ Operation with output 1: 770 mW ▪ Operation with output 1 and 2: 2 770 mW
Option C: 4-20 mA HART, 4-20 mA	<ul style="list-style-type: none"> ▪ Operation with output 1: 660 mW ▪ Operation with output 1 and 2: 1 320 mW

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

(→  29)

Potential equalization

No special measures for potential equalization are required.

Terminals

- For device version without integrated overvoltage protection: plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- For device version with integrated overvoltage protection: screw terminals for wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)

Cable entries

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

Cable specification

(→  26)

Overvoltage protection

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

Input voltage range	Values correspond to supply voltage specifications (→  27) ¹⁾
Resistance per channel	2 · 0.5 Ω max
DC sparkover voltage	400 to 700 V
Trip surge voltage	<800 V
Capacitance at 1 MHz	<1.5 pF
Nominal discharge current (8/20 μs)	10 kA
Temperature range	–40 to +85 °C (–40 to +185 °F)

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

 Depending on the temperature class, restrictions apply to the ambient temperature for device versions with overvoltage protection

16.6 Performance characteristics

Reference operating conditions

- Error limits based on ISO 11631
- Water with +15 to +45 °C (+59 to +113 °F) at 2 to 6 bar (29 to 87 psi)
- Specifications as per calibration protocol
- Accuracy based on accredited calibration rigs that are traced to ISO 17025.

 To obtain measured errors, use the *Applicator* sizing tool (→  139)

Maximum measured error o.r. = of reading; 1 g/cm³ = 1 kg/l; T = medium temperature

Base accuracy

Mass flow and volume flow (liquids)

±0.25 % o.r.

Mass flow (gases)

±0.75 % o.r.

 Design fundamentals (→  129)

Density (liquids)

- Reference conditions: ±0.0005 g/cm³
- Standard density calibration: ±0.02 g/cm³
(valid over the entire temperature range and density range)

Temperature

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

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
8	$\frac{3}{8}$	0.24	0.0088
15	$\frac{1}{2}$	0.78	0.0287
25	1	2.16	0.0794
40	$1\frac{1}{2}$	5.40	0.1985
50	2	8.40	0.3087

Flow values

Flow values as turndown parameter depending on nominal diameter.

SI units

DN [mm]	1:1	1:10	1:20	1:50	1:100	1:500
	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
8	2 000	200	100	40	20	4
15	6 500	650	325	130	65	13
25	18 000	1 800	900	360	180	36
40	45 000	4 500	2 250	900	450	90
50	70 000	7 000	3 500	1 400	700	140

US units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[inch]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
$\frac{3}{8}$	73.5	7.35	3.675	1.47	0.735	0.147
$\frac{1}{2}$	238	23.8	11.9	4.76	2.38	476
1	660	66	33	13.2	6.6	1.32
1½	1650	165	82.5	33	16.5	3.3
2	2570	257	128.5	51.4	25.7	5.14

Accuracy of outputs

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

Current output

Accuracy	±10 µA
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Pulse/frequency output

Accuracy	Max. ±100 ppm o.r.
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Repeatability

o.r. = of reading; 1 g/cm³ = 1 kg/l; T = medium temperature

Base repeatability

Mass flow and volume flow (liquids)

±0.125 % o.r.

Mass flow (gases)

±0.35 % o.r.

 [Design fundamentals](#) (→  129)

Density (liquids)

±0.00025 g/cm³

Temperature

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

Response time

- The response time depends on the configuration (damping).
- Response time in the event of erratic changes in the measured variable: after 500 ms → 95 % of the full scale value

Influence of ambient temperature

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

Current output

Additional error, in relation to the span of 16 mA:

Temperature coefficient at zero point (4 mA)	0.02 %/10 K, max. 0.35 % over the entire temperature range -40 to +60 °C (-40 to +140 °F)
Temperature coefficient with span (20 mA)	0.05 %/10 K, max. 0.5 % over the entire temperature range -40 to +60 °C (-40 to +140 °F)

Pulse/frequency output

Temperature coefficient	Max. ± 100 ppm o.r.
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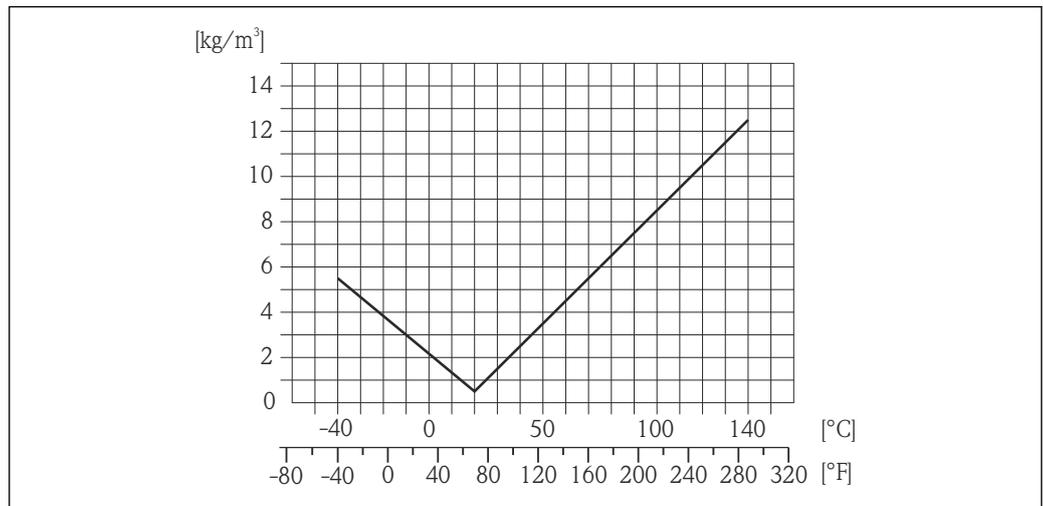
Influence of medium temperature

Mass flow and volume flow

When there is a difference between the temperature for zero point adjustment and the process temperature, the typical measured error of the sensor is $\pm 0.0002\%$ of the full scale value/ $^{\circ}\text{C}$ ($\pm 0.0001\%$ of the full scale value/ $^{\circ}\text{F}$).

Density

When there is a difference between the density calibration temperature and the process temperature, the typical measured error of the sensor is $\pm 0.0001 \text{ g/cm}^3 / ^{\circ}\text{C}$ ($\pm 0.00005 \text{ g/cm}^3 / ^{\circ}\text{F}$). Field density calibration is possible.



A0016609

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

Temperature

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

Influence of medium pressure

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

o.r. = of reading

DN		[% o.r./bar]	[% o.r./psi]
[mm]	[in]		
8	$\frac{3}{8}$	no influence	
15	$\frac{1}{2}$	no influence	
25	1	no influence	
40	$1\frac{1}{2}$	no influence	
50	2	-0.009	-0.0006

Design fundamentals

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

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

MeasValue = measured value; ZeroPoint = zero point stability

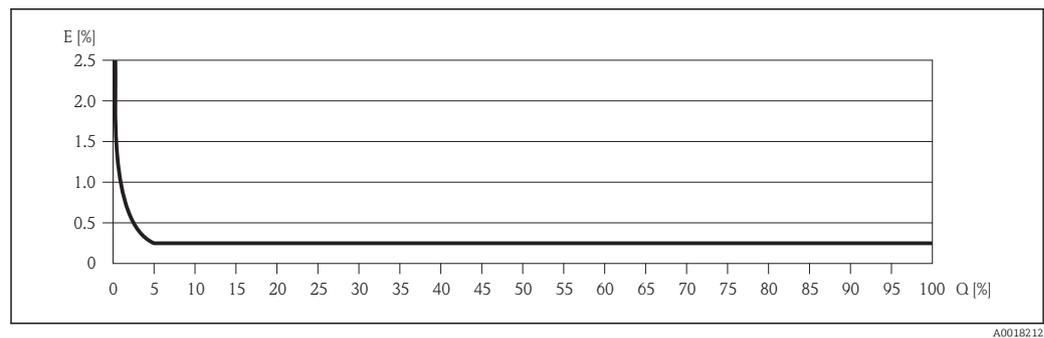
Calculation of the maximum measured error as a function of the flow rate

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

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

Flow rate	Maximum repeatability in % o.r.
$\geq \frac{4/3 \cdot \text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A0021341</small>	$\pm 1/2 \cdot \text{BaseAccu}$ <small>A0021343</small>
$< \frac{4/3 \cdot \text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A0021342</small>	$\pm 2/3 \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ <small>A0021344</small>

Example for max. measured error



34 Maximum measured error in % o.r. (example: DN 25)

i Design fundamentals (→ 129)

16.7 Installation

"Mounting requirements" (→ 19)

16.8 Environment

Ambient temperature range (→ 21)

Storage temperature -40 to +80 °C (-40 to +176 °F), preferably at +20 °C (+68 °F)

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

Degree of protection	<p>Transmitter</p> <ul style="list-style-type: none"> ■ As standard: IP66/67, type 4X enclosure ■ When housing is open: IP20, type 1 enclosure ■ Display module: IP20, type 1 enclosure <p>Sensor IP66/67, type 4X enclosure</p>
Shock resistance	As per IEC/EN 60068-2-31
Vibration resistance	Acceleration up to 1 g, 10 to 150 Hz, based on IEC/EN 60068-2-6
Interior cleaning	<ul style="list-style-type: none"> ■ SIP cleaning ■ CIP cleaning
Electromagnetic compatibility (EMC)	<p>As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)</p> <p> Details are provided in the Declaration of Conformity.</p>

16.9 Process

Medium temperature range	<p>Sensor -40 to +140 °C (-40 to +284 °F)</p> <p>Seals No internal seals</p>
Medium density	0 to 2 000 kg/m ³ (0 to 125 lb/cf)
Pressure-temperature ratings	<p> An overview of the material load diagrams (pressure/temperature curves) for the process connections is provided in the "Technical Information" document for the device on the CD-ROM provided.</p>
Secondary containment pressure range	<p>The sensor housing is filled with dry nitrogen and protects the electronics and mechanics inside.</p> <p>The housing does not have pressure vessel classification.</p> <p>Reference value for the pressure loading capacity of the sensor housing: 16 bar (232 psi)</p>
Rupture disk	<p>To increase the level of safety, a device version with a rupture disk with a triggering pressure of 10 to 15 bar (145 to 217.5 psi) can be used. Special mounting instructions: (→  22)</p> <p>Rupture disks cannot be combined with the separately available heating jacket (→  118) (→  118).</p>
Flow limit	<p>Select the nominal diameter by optimizing between the required flow range and permissible pressure loss.</p> <p> For an overview of the measuring range full scale values, see the "Measuring range" section (→  121)</p>

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
- In most applications, 20 to 50 % of the maximum full scale value can be considered ideal
- Select a lower full scale value for abrasive substances (such as liquids with entrained solids): flow velocity <1 m/s (<3 ft/s).
- For gas measurement the following rules apply:
 - The flow velocity in the measuring tubes should not exceed half the sonic velocity (0.5 Mach).
 - The maximum mass flow depends on the density of the gas: formula (→  122)

Pressure loss



To calculate the pressure loss, use the *Applicator* sizing tool (→  139)

16.10 Mechanical construction

Design, dimensions



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

Weight

Compact version

Weight in SI units

All values (weight) refer to devices with EN/DIN PN 40 flanges. Weight information in [kg].

DN [mm]	Weight [kg]	
	Order code for "Housing", option C Aluminum coated	Order code for "Housing", option B 1.4404 (316L)
8	6	8.5
15	6.5	9
25	8	10.5
40	13	15.5
50	22	24.5

Weight in US units

All values (weight) refer to devices with EN/DIN PN 40 flanges. Weight information in [lbs].

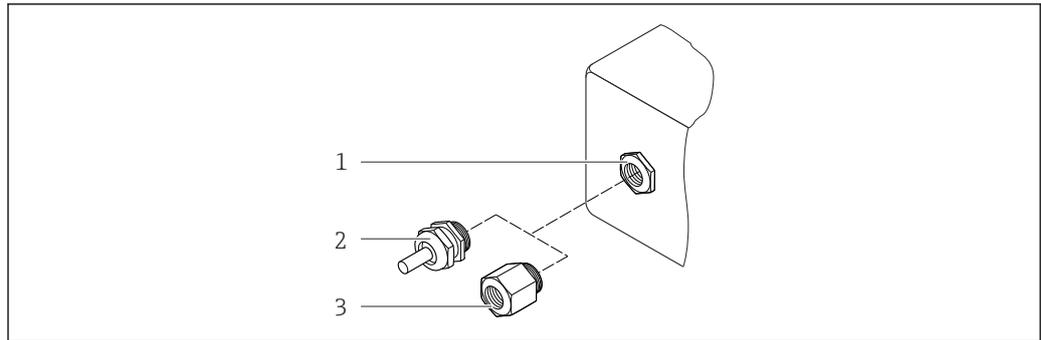
DN [in]	Weight [lbs]	
	Order code for "Housing", option C Aluminum coated	Order code for "Housing", option B 1.4404 (316L)
$\frac{3}{8}$	13.2	18.7
$\frac{1}{2}$	14.3	19.8
1	17.6	23.2
1 $\frac{1}{2}$	28.7	34.2
2	48.5	54.0

Materials

Transmitter housing

- Order code for "Housing", option **B**: stainless steel 1.4404 (316L)
- Order code for "Housing", option **C**: aluminum coated AlSi10Mg
- Window material: glass

Cable entries/cable glands



A0020640

35 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 "GT18 two-chamber, 316L"

Cable entry/cable gland	Type of protection	Material
Cable gland M20 x 1.5	<ul style="list-style-type: none"> ■ Non-Ex ■ Ex ia ■ Ex ic ■ Ex nA ■ Ex tb 	Stainless steel 1.4404
Adapter for cable entry with internal thread G 1/2"	For non-Ex and Ex (except for CSA Ex d/XP)	Stainless steel 1.4404 (316L)
Adapter for cable entry with internal thread NPT 1/2"	For non-Ex and Ex	

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

Cable entry/cable gland	Type of protection	Material
Cable gland M20 x 1.5	<ul style="list-style-type: none"> ■ Non-Ex ■ Ex ia ■ Ex ic 	Plastic
	Adapter for cable entry with internal thread G 1/2"	Nickel-plated brass
Adapter for cable entry with internal thread NPT 1/2"	For non-Ex and Ex (except for CSA Ex d/XP)	Nickel-plated brass
Thread NPT 1/2" via adapter	For non-Ex and Ex	

Sensor housing

- Acid and alkali-resistant outer surface
- Stainless steel 1.4301 (304)

Measuring tubes

Stainless steel 1.4539 (904L); manifold: 1.4404 (316L)

Surface quality:

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

Process connections

- Flanges according to EN 1092-1 (DIN2501) / according to ASME B 16.5 / as per JIS B2220:
Stainless steel 1.4404 (F316/F316L)
- All other process connections:
Stainless steel 1.4404 (316/316L)



List of all available process connections (→ 135)

Seals

Welded process connections without internal seals

Accessories

Weather protection cover

Stainless steel 1.4301

Process connections

- Flanges:
 - EN 1092-1 (DIN 2501)
 - Namur lengths in accordance with NE 132
 - ASME B16.5
 - JIS B2220
- VCO connections
- Tri-Clamp (OD tubes)
- Threaded hygienic connection:
 - DIN 11851
 - SMS 1145
 - ISO 2853
 - DIN 11864-1 Form A
- Flange:
 - DIN 11864-2 Form A

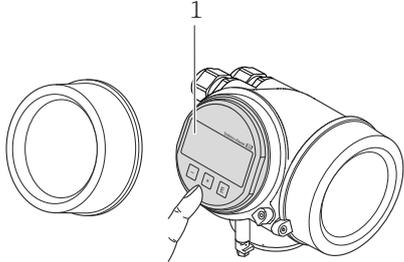
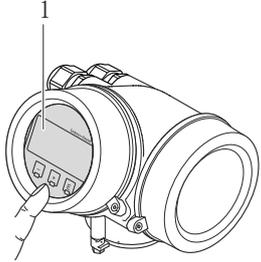


For information on the materials of the process connections (→ 135)

16.11 Operability

Local operation

Via display module

Order code for "Display; Operation", option C "SD02"	Order code for "Display; Operation", option E "SD03"
 <p style="text-align: right; font-size: small;">A0015544</p>	 <p style="text-align: right; font-size: small;">A0015546</p>
<p>1 Operation with pushbuttons</p>	<p>1 Operation with touch control</p>

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.

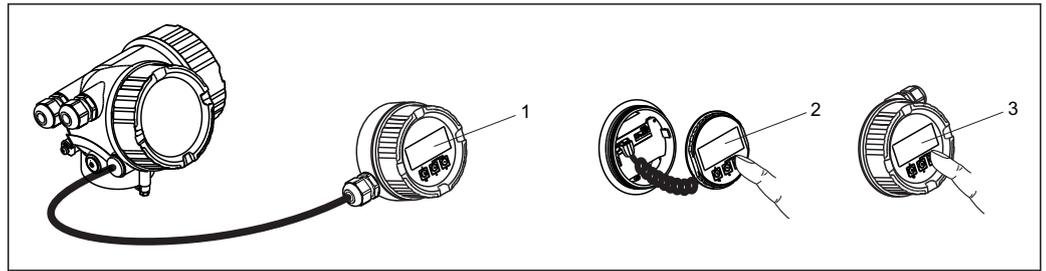
Operating elements

- 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



A0013137

36 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

Service interface (CDI)

Operation of the measuring device with the service interface (CDI) via: "FieldCare" operating tool with COM DTM "CDI Communication FXA291" via Commubox FXA291

HART protocol

Operation via:

- HART protocol
- Operating tools via FXA191, FXA195
 - FieldCare (→ 139)
 - AMS Device Manager
 - SIMATIC PDM
- HART handheld terminals
 - Field Communicator 475
 - Field Xpert SFX350
 - Field Xpert SFX370

Languages

Can be operated in the following languages:

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

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.
Hygienic compatibility	3A approval
Functional safety	<p>The measuring device can be used for flow monitoring systems (min., max., range) up to SIL 2 (single-channel architecture) and SIL 3 (multichannel architecture with homogeneous redundancy) and is independently evaluated and certified by the TÜV in accordance with IEC 61508.</p> <p>The following types of monitoring in safety equipment are possible:</p> <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Density <p> Functional Safety Manual with information on the SIL device (→  140)</p>
Pressure Equipment Directive	<ul style="list-style-type: none"> ■ 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. ■ 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.
Other standards and guidelines	<ul style="list-style-type: none"> ■ EN 60529 Degrees of protection by housing (IP code) ■ IEC/EN 60068-2-6 Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal). ■ IEC/EN 60068-2-31 Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices. ■ EN 61010-1 Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures. ■ IEC/EN 61326 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements) ■ IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems ■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment. ■ NAMUR NE 32 Data Retention in the Event of a Power Failure in Field and Control Instruments with Microprocessors ■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal. ■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics ■ NAMUR NE 80 The Application of the Pressure Equipment Directive to Process Control Devices

- NAMUR NE 105
Specifications for Integrating Fieldbus Devices in Engineering Tools for Field Devices
- NAMUR NE 107
Self-monitoring and diagnosis of field devices
- NAMUR NE 131
Requirements for field devices for standard applications
- NAMUR NE 132
Coriolis mass meter

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.

Diagnostics functions	Package	Description
	HistoROM extended function	<p>Comprises extended functions concerning the event log and the activation of the measured value memory.</p> <p>Event log: Memory volume is extended from 20 message entries (basic version) to up to 100 entries.</p> <p>Data logging (line recorder):</p> <ul style="list-style-type: none"> ▪ Memory capacity for up to 1000 measured values is activated. ▪ 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user. ▪ Data logging is visualized via the local display or FieldCare.
Heartbeat Technology	Package	Description
	Heartbeat Verification	<p>Heartbeat Verification: Makes it possible to check the device functionality on demand when the device is installed, without having to interrupt the process.</p> <ul style="list-style-type: none"> ▪ Access via onsite operation or other operating interfaces, such as FieldCare for instance. ▪ Documentation of device functionality within the framework of manufacturer specifications, for proof testing for instance. ▪ End-to-end, traceable documentation of the verification results, including report. ▪ Makes it possible to extend calibration intervals in accordance with operator's risk assessment.

16.14 Accessories

 Overview of accessories available for order (→  118)

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)
 - 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
Promass E 200	KA00050D

Technical Information

Measuring device	Documentation code
Promass E 200	TI01009D

Supplementary device-dependent documentation

Safety Instructions

Contents	Documentation code
ATEX/IECEX Ex i	XA00144D
ATEX/IECEX Ex d	XA00143D
ATEX/IECEX Ex nA	XA00145D
cCSAus IS	XA00151D
cCSAus XP	XA00152D
NEPSI Ex i	XA00156D
NEPSI Ex d	XA00155D
NEPSI Ex nA	XA00157D

Special Documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD00142D
Functional Safety Manual	SD00147D
Heartbeat Technology	SD01300D

Installation Instructions

Contents	Documentation code
Installation Instructions for spare parts	Specified for each individual accessory (→  118)  Overview of accessories available for order (→  118)

17 Appendix

17.1 Overview of the operating menu

The following table provides an overview of the entire operating menu structure with menus 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.

17.1.1 Main menu

Main menu	→	Language	(→ 56)
		Operation	(→ 141)
		Setup	(→ 141)
		Diagnostics	(→ 148)
		Expert	(→ 151)

17.1.2 "Operation" menu

Operation	→		
Access status display			(→ 46)
Locking status			(→ 90)
		Display	→ (→ 73)
		Format display	(→ 74)
		Contrast display	(→ 41)
		Backlight	(→ 87)
		Display interval	(→ 87)
		Operation	→ (→ 95)
		Control Totalizer 1 to 3	(→ 96)
		Preset value	(→ 96)
		Reset all totalizers	(→ 95)

17.1.3 "Setup" menu

Setup	→		(→ 56)
Device tag			(→ 58)
		Select medium	→ (→ 60)

Select medium		(→ 60)
Select gas type		(→ 60)
Reference sound velocity		(→ 60)
Temperature coefficient sound velocity		(→ 60)
Pressure compensation		(→ 61)
Pressure value		(→ 61)
Current output 1 to 2	→	(→ 62)
Assign current output		(→ 64)
Mass flow unit		(→ 58)
Volume flow unit		(→ 59)
Density unit		(→ 59)
Corrected volume flow unit		(→ 59)
Corrected volume flow calculation		(→ 64)
Reference density unit		(→ 59)
Fixed reference density		(→ 64)
Linear expansion coefficient		(→ 140)
Square expansion coefficient		(→ 140)
Temperature unit		(→ 59)
Reference temperature		
Current span		(→ 65)
4 mA value		(→ 65)
20 mA value		(→ 65)
Failure mode		(→ 65)
Failure current		(→ 65)
Pulse/frequency/switch output	→	(→ 65)
Operating mode		(→ 66)
Assign pulse output		(→ 66)
Assign frequency output		(→ 69)
Switch output function		(→ 71)

Assign diagnostic behavior	(→  71)
Assign limit	(→  72)
Assign flow direction check	(→  72)
Assign status	(→  72)
Mass flow unit	(→  58)
Mass unit	(→  58)
Volume flow unit	(→  59)
Volume unit	(→  59)
Corrected volume flow unit	(→  59)
Corrected volume unit	(→  59)
Corrected volume flow calculation	(→  64)
Density unit	(→  59)
Unit totalizer 1 to 3	(→  72)
Reference density unit	(→  59)
Fixed reference density	(→  72)
Linear expansion coefficient	
Square expansion coefficient	
Temperature unit	(→  59)
Reference temperature	(→  59)
Value per pulse	(→  67)
Pulse width	(→  67)
Failure mode	(→  67)
Minimum frequency value	(→  69)
Maximum frequency value	(→  69)
Measuring value at minimum frequency	(→  69)
Measuring value at maximum frequency	(→  69)
Failure mode	(→  70)

Failure frequency		(→  70)
Switch-on value		(→  72)
Switch-off value		(→  72)
Switch-on delay		(→  72)
Switch-off delay		(→  72)
Failure mode		(→  73)
Invert output signal		(→  67)
Display	→	(→  73)
Format display		(→  74)
Value 1 display		(→  74)
0% bargraph value 1		(→  74)
100% bargraph value 1		(→  74)
Value 2 display		(→  74)
Value 3 display		(→  74)
0% bargraph value 3		(→  74)
100% bargraph value 3		(→  74)
Value 4 display		(→  74)
Output conditioning	→	(→  76)
Level of flow fluctuation		
Display damping		(→  78)
Damping output 1		(→  78)
Damping output 2		(→  78)
Damping output 2		(→  78)
Measuring mode output 1		(→  78)
Measuring mode output 2		(→  78)
Measuring mode output		(→  78)
Measuring mode output		(→  78)
Operating mode totalizer 1...3		(→  78)
Assign process variable		(→  78)
On value low flow cutoff		(→  78)

Off value low flow cutoff		(→  79)
Pressure shock suppression		(→  79)
Low flow cut off	→	(→  80)
Assign process variable		(→  78)
On value low flow cutoff		(→  78)
Off value low flow cutoff		(→  79)
Pressure shock suppression		(→  79)
Partially filled pipe detection	→	(→  81)
Assign process variable		(→  81)
Low value partial filled pipe detection		(→  81)
High value partial filled pipe detection		(→  81)
Response time part. filled pipe detect.		(→  81)
Advanced setup	→	(→  82)
Enter access code		(→  46)
	System units	→ (→  58)
	Mass flow unit	(→  58)
	Mass unit	(→  58)
	Volume flow unit	(→  59)
	Volume unit	(→  59)
	Corrected volume flow unit	(→  59)
	Corrected volume unit	(→  59)
	Density unit	(→  59)
	Reference density unit	(→  59)
	Temperature unit	(→  59)
	Length unit	
	Pressure unit	(→  59)
	Sensor adjustment	→
	Installation direction	(→  83)

	Zero point adjustment	→	
	Zero point adjustment control		(→ 83)
	Adjustment in progress		(→ 83)
	Totalizer 1 to 3	→	(→ 83)
	Assign process variable		(→ 84)
	Unit totalizer		(→ 72)
	Totalizer operation mode		(→ 84)
	Failure mode		(→ 84)
	SIL confirmation	→	(→ 140)
	Set write protection		
	SIL preparation		
	Character Test String		
	Installation direction		
	Assign current output		
	Current span		
	4 mA value		
	20 mA value		
	Damping		
	Failure mode		
	Medium		
	Gas type		
	Reference sound velocity		
	Temperature coefficient sound velocity		
	Partially filled pipe detection		
	Low value partial filled pipe detection		
	High value partial filled pipe detection		
	Maximum damping partial filled pipe det.		
	Pressure compensation		
	Pressure value		

Zero point		
Code incorrect		
Deactivate SIL	→	(→  140)
Reset write protection		
Display	→	(→  85)
Format display		(→  74)
Value 1 display		(→  86)
0% bargraph value 1		(→  74)
100% bargraph value 1		(→  74)
Decimal places 1		(→  86)
Value 2 display		(→  74)
Decimal places 2		(→  86)
Value 3 display		(→  74)
0% bargraph value 3		(→  74)
100% bargraph value 3		(→  74)
Decimal places 3		(→  86)
Value 4 display		(→  74)
Decimal places 4		(→  86)
Language		(→  87)
Display interval		(→  87)
Display damping		(→  87)
Header		(→  87)
Header text		(→  87)
Separator		(→  87)
Backlight		(→  87)
Heartbeat¹⁾	→	(→  140)
		Heartbeat base settings →
		Customer
		Location
Configuration backup display	→	(→  87)
Operating time		(→  87)

Last backup	(→ ⓘ 87)
Configuration management	(→ ⓘ 88)
Comparison result	(→ ⓘ 88)
Administration →	(→ ⓘ 90)
Define access code →	(→ ⓘ 90)
Define access code	(→ ⓘ 90)
Confirm access code	(→ ⓘ 90)
Device reset	(→ ⓘ 111)

1) Order code for "Application package", option EB "Heartbeat Verification", see the Special Documentation for the device

17.1.4 "Diagnostics" menu

Diagnostics (→ ⓘ 148) →	(→ ⓘ 98)
Actual diagnostics	(→ ⓘ 109)
Previous diagnostics	(→ ⓘ 109)
Operating time from restart	(→ ⓘ 109)
Operating time	(→ ⓘ 0)
Diagnostic list →	(→ ⓘ 109)
Diagnostics 1 to 5	(→ ⓘ 109)
Event logbook →	(→ ⓘ 109)
Filter options	(→ ⓘ 110)
Device information →	(→ ⓘ 111)
Device tag	(→ ⓘ 112)
Serial number	(→ ⓘ 112)
Firmware version	(→ ⓘ 112)
Device name	(→ ⓘ 112)
Order code	(→ ⓘ 112)
Extended order code 1 to 3	(→ ⓘ 112)
ENP version	(→ ⓘ 112)
Device revision	(→ ⓘ 112)
Device ID	(→ ⓘ 112)

Device type		(→  112)
Manufacturer ID		(→  112)
Measured values	→	(→  93)
	Process variables	→ (→  93)
	Mass flow	(→  94)
	Volume flow	(→  94)
	Corrected volume flow	(→  94)
	Density	(→  94)
	Reference density	(→  94)
	Temperature	(→  94)
	Totalizer 1 to 3	→ (→  94)
	Totalizer value 1 to 3	(→  94)
	Totalizer overflow 1 to 3	(→  94)
	Output values	→ (→  94)
	Output current	(→  95)
	Measured current	(→  95)
	Terminal voltage 1	(→  95)
	Pulse output	(→  95)
	Output frequency	(→  95)
	Switch status	(→  95)
	Data logging ¹⁾	→ (→  96)
	Assign channel 1 to 4	(→  97)
	Logging interval	(→  97)
	Clear logging data	(→  97)
	Heartbeat ²⁾	→ (→  140)
	Performing verification	→
	Year	
	Month	
	Day	
	Hour	
	AM/PM	

	Minute	
	Start verification	
	Status	
	Measured values	
	Output values	
	Overall result	
	Verification results	→
	Date/time	
	Verification ID	
	Operating time	
	Overall result	
	Sensor	
	Main electronic module	
	I/O module	
	Simulation	→
	Assign simulation process variable	(→ ⓘ 89)
	Value process variable	(→ ⓘ 89)
	Simulation current output	(→ ⓘ 89)
	Value current output	(→ ⓘ 89)
	Frequency simulation	(→ ⓘ 89)
	Frequency value	(→ ⓘ 89)
	Pulse simulation	(→ ⓘ 89)
	Pulse value	(→ ⓘ 89)
	Switch output simulation	(→ ⓘ 89)
	Switch status	(→ ⓘ 89)
	Simulation device alarm	(→ ⓘ 89)
	Diagnostic event category	(→ ⓘ 90)
	Simulation diagnostic event	(→ ⓘ 90)

- 1) Order code for "Application package", option EA "Extended HistoROM", see Technical Information for device, "Application packages" section
- 2) Order code for "Application package", option EB "Heartbeat Verification", see the Special Documentation for the device

17.1.5 "Expert" menu

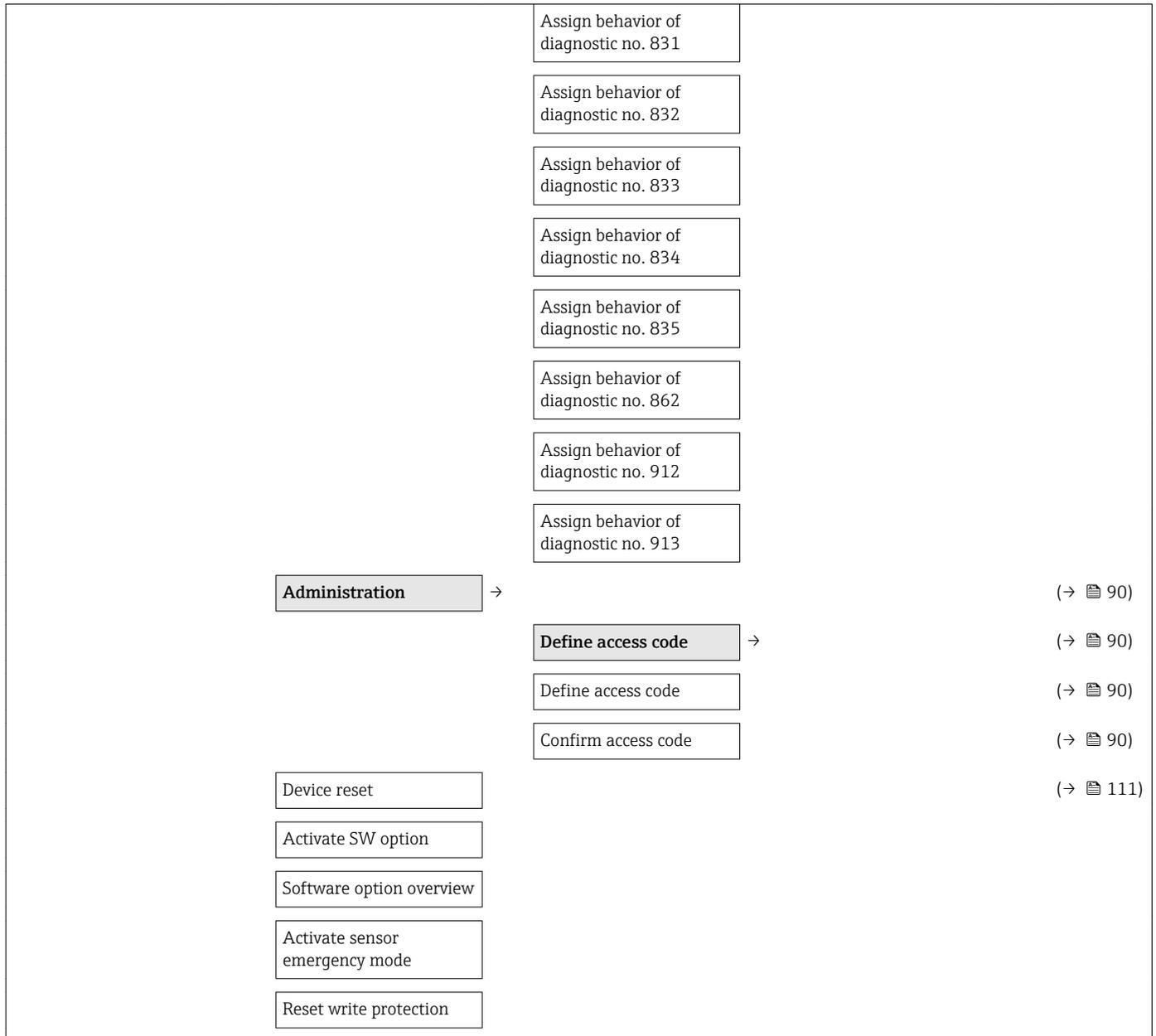
Overview "Expert" menu

Expert	→	(→ ⓘ 34)
Direct access (0106)		(→ ⓘ 43)
Locking status (0004)		(→ ⓘ 93)
Access status display (0091)		(→ ⓘ 46)
Enter access code (0092)		(→ ⓘ 46)
System		(→ ⓘ 151)
Sensor		(→ ⓘ 153)
Output		(→ ⓘ 157)
Communication		(→ ⓘ 158)
Application		(→ ⓘ 161)
Diagnostics		(→ ⓘ 161)

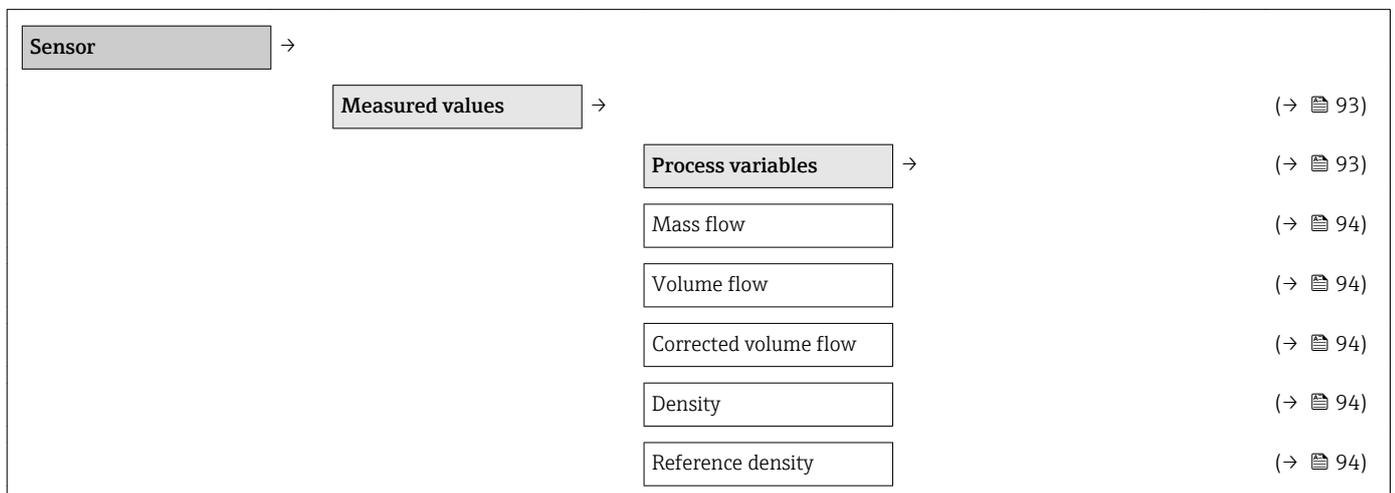
"System" submenu

System	→	
Display	→	(→ ⓘ 85)
Language (0104)		(→ ⓘ 74)
Format display (0098)		(→ ⓘ 86)
Value 1 display (0107)		(→ ⓘ 74)
0% bargraph value 1 (0123)		(→ ⓘ 74)
100% bargraph value 1 (0125)		(→ ⓘ 86)
Decimal places 1 (0095)		(→ ⓘ 74)
Value 2 display (0108)		(→ ⓘ 86)
Decimal places 2 (0117)		(→ ⓘ 74)
Value 3 display (0110)		(→ ⓘ 74)
0% bargraph value 3 (0124)		(→ ⓘ 74)
100% bargraph value 3 (0126)		(→ ⓘ 86)
Decimal places 3 (0118)		(→ ⓘ 74)

Value 4 display (0109)		(→  86)
Decimal places 4 (0119)		(→  87)
Display interval (0096)		(→  87)
Display damping (0094)		(→  87)
Header (0097)		(→  87)
Header text (0112)		(→  87)
Separator (0101)		(→  87)
Contrast display (0105)		(→  41)
Backlight (0111)		(→  87)
Access status display (0091)		(→  46)
Configuration backup display	→	(→  87)
Operating time (0652)		(→  87)
Last backup (0102)		(→  87)
Configuration management (0100)		(→  88)
Comparison result (0103)		(→  88)
Diagnostic handling	→	
Alarm delay		(→  101)
	Diagnostic behavior	(→  104)
	Assign behavior of diagnostic no. 046	
	Assign behavior of diagnostic no. 140	
	Assign behavior of diagnostic no. 274	
	Assign behavior of diagnostic no. 441	
	Assign behavior of diagnostic no. 442	
	Assign behavior of diagnostic no. 443	
	Assign behavior of diagnostic no. 801	
	Assign behavior of diagnostic no. 830	



"Sensor" submenu



	Temperature		(→  94)
	Totalizer 1 to 3	→	(→  83)
	Assign process variable		(→  84)
	Totalizer value 1 to 3		(→  94)
	Output values	→	(→  94)
	Output current (0361)		(→  95)
	Measured current (0366)		(→  95)
	Terminal voltage 1 (0662)		(→  95)
	Pulse output (0456)		(→  95)
	Output frequency (0471)		(→  95)
	Switch status (0461)		(→  95)
	System units	→	(→  58)
	Mass flow unit		(→  58)
	Mass unit		(→  58)
	Volume flow unit		(→  59)
	Volume unit		(→  59)
	Corrected volume flow unit		(→  59)
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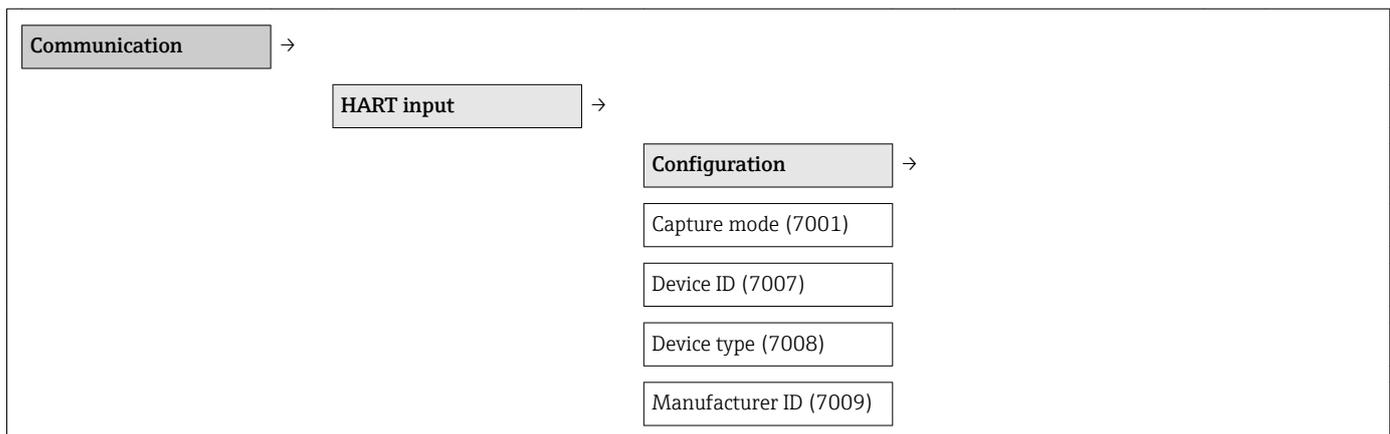
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- 1) Order code for "Application package", option EA "Extended HistoROM", see Technical Information for device, "Application packages" section
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