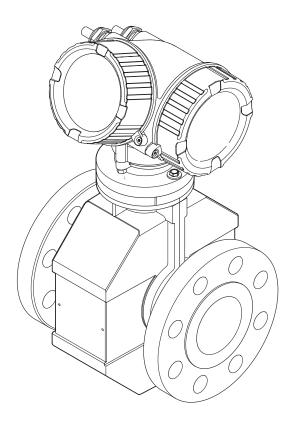
Valid as of version 01.00.zz (Device firmware) Products

Operating Instructions
Proline Promag P 200
PROFIBUS PA

Electromagnetic flowmeter





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

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## 1 Document information

### 1.1 Document function

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

## 1.2 Symbols used

## 1.2.1 Safety symbols

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

## 1.2.2 Electrical symbols

Symbol	Meaning	Symbol	Meaning
	Direct current	~	Alternating current
≂	Direct current and alternating current		Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.	<b>♦</b>	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
0	Flat blade screwdriver
0 6	Allen key
Ó	Open-ended wrench

## 1.2.4 Symbols for certain types of information

Symbol	Meaning
	Permitted Procedures, processes or actions that are permitted.
	Preferred Procedures, processes or actions that are preferred.
X	Forbidden Procedures, processes or actions that are forbidden.
i	Tip Indicates additional information.
Ţį.	Reference to documentation
	Reference to page
	Reference to graphic
1. , 2. , 3	Series of steps
L_	Result of a step
?	Help in the event of a problem
	Visual inspection

## 1.2.5 Symbols in graphics

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

## 1.3 Documentation

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

#### 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.		

## 1.3.2 Supplementary device-dependent documentation

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

## 1.4 Registered trademarks

#### **PROFIBUS®**

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

Applicator®, FieldCare®, Field Xpert<sup>TM</sup>, HistoROM®, Heartbeat Technology<sup>TM</sup> 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 is only suitable for flow measurement of liquids with a minimum conductivity of 20  $\mu$ S/cm.

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

Measuring devices for use in hazardous areas, in hygienic applications or 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.
- ► Check the nameplate to verify if the device ordered can be put to its intended use in the approval-related 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  $\rightarrow \boxdot$  7.
- ► Protect the measuring device permanently against corrosion from environmental influences.

#### Incorrect use

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

#### **A** WARNING

Danger of breakage of the sensor due to corrosive or abrasive fluids or from environmental conditions!

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

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

The external surface temperature of the housing can increase by max. 10 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.

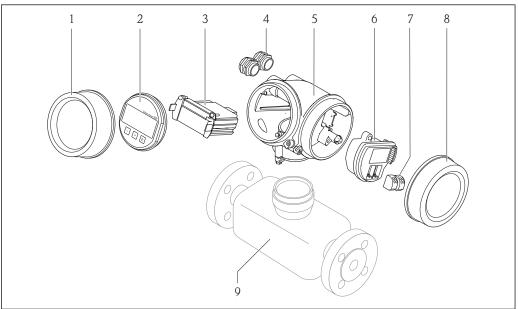
# 3 Product description

The device consists of a transmitter and a sensor.

The device is available as a compact version:

The transmitter and sensor form a mechanical unit.

## 3.1 Product design



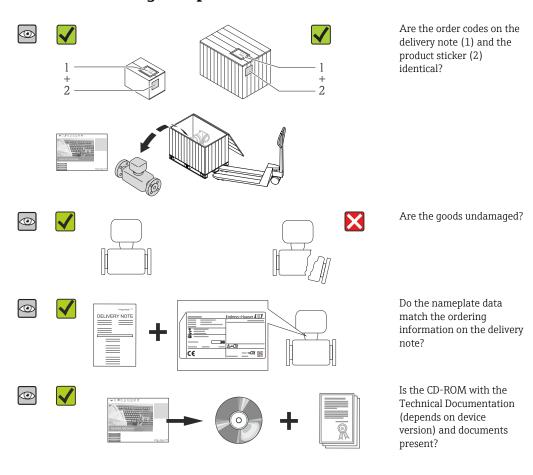
A001405

 $\blacksquare$  1 Important components of a measuring device

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

# 4 Incoming acceptance and product identification

## 4.1 Incoming acceptance



- If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.
   Depending on the device version, the CD-ROM might not be part of the delivery!
  - Depending on the device version, the CD-ROM might not be part of the delivery! The Technical Documentation is available via the Internet or via the *Endress+Hauser Operations App*, see the "Product identification" section  $\rightarrow \boxminus 14$ .

## 4.2 Product identification

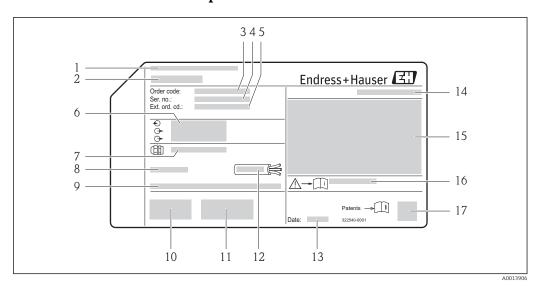
The following options are available for identification of the measuring device:

- 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"  $\rightarrow$   $\blacksquare$  8 and "Supplementary device-dependent documentation"  $\rightarrow$   $\blacksquare$  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.

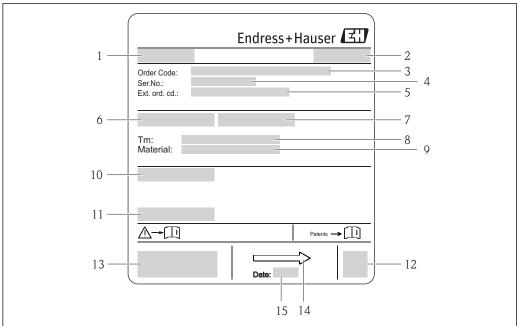
### 4.2.1 Transmitter nameplate



■ 2 Example of a transmitter nameplate

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

#### 4.2.2 Sensor nameplate



#### ₩ 3 Example of sensor nameplate

- 1 Name of the sensor
- Manufacturing location 2
- 3 Order code
- 4 Serial number (ser. no.)
- Extended order code (ext. ord. cd.)
- Nominal diameter of sensor
- *Test pressure of the sensor*
- 8 Fluid temperature range
- Material of lining and electrodes
- Degree of protection: e.g. IP, NEMA
- Permitted ambient temperature  $(T_a)$
- 12 2-D matrix code
- 13 CE mark, C-Tick
- Flow direction
- Manufacturing date: year-month

## Order code

The measuring device is reordered using the order code.

#### Extended order code

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

## 4.2.3 Symbols on measuring device

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

## 5 Storage and transport

## 5.1 Storage conditions

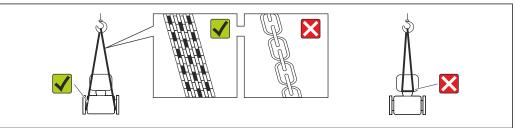
Observe the following notes for storage:

- Store in the original packaging to ensure protection from shock.
- Do not remove protective covers or protective caps installed on process connections.
   They prevent mechanical damage to the sealing surfaces and contamination in the measuring tube.
- Protect from direct sunlight to avoid unacceptably high surface temperatures.
- Select a storage location where moisture cannot collect in the measuring device as fungus and bacteria infestation can damage the lining.
- Store in a dry and dust-free place.
- Do not store outdoors.

Storage temperature → 🖺 142

## 5.2 Transporting the product

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



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

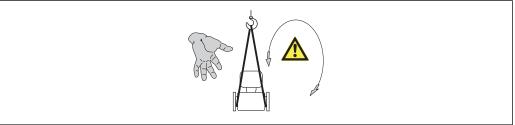
## 5.2.1 Measuring devices without lifting lugs

#### **A** WARNING

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

Risk of injury if the measuring device slips.

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



A001560

### 5.2.2 Measuring devices with lifting lugs

#### **A** CAUTION

### Special transportation instructions for devices with lifting lugs

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

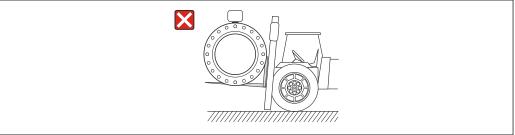
## 5.2.3 Transporting with a fork lift

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

#### **A** CAUTION

#### Risk of damaging the magnetic coil

- ► If transporting by forklift, do not lift the sensor by the metal casing.
- ▶ This would buckle the casing and damage the internal magnetic coils.



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## 5.3 Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:

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

or

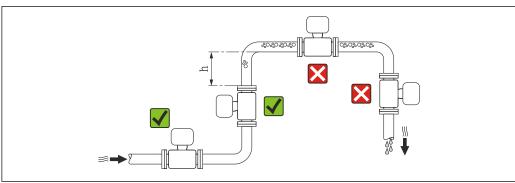
- Carton in accordance with European Packaging Directive 94/62EC; recyclability is confirmed by the affixed RESY symbol.
- Seaworthy packaging (optional): Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
- Carrying and mounting hardware:
  - Disposable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

#### 6 Installation

#### 6.1 Installation conditions

#### 6.1.1 Mounting position

#### Mounting location



Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow:  $h \ge 2 \times DN$ 

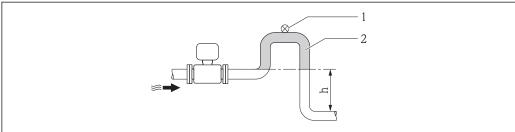
To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:

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

## Installation in down pipes

Install a siphon with a vent valve downstream of the sensor in down pipes whose length h  $\geq$  5 m (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the measuring tube. This measure also prevents the system losing prime.

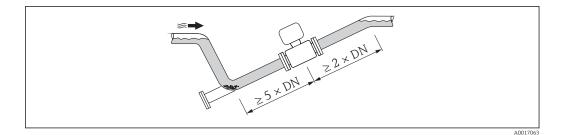
For information on the liner's resistance to partial vacuum



- € 4 Installation in a down pipe
- Vent valve
- Pipe siphon
- Length of down pipe

#### *Installation in partially filled pipes*

A partially filled pipe with a gradient necessitates a drain-type configuration.



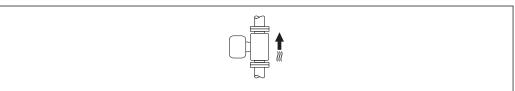
#### Orientation

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).

An optimum orientation position helps avoid gas and air accumulations and deposits in the measuring tube.

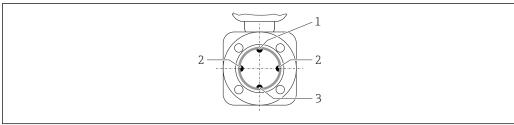
The measuring device also offers the empty pipe detection function to detect partially filled measuring pipes in the event of outgassing fluids or variable process pressures.

#### Vertical



Optimum for self-emptying pipe systems and for use in conjunction with empty pipe detection.

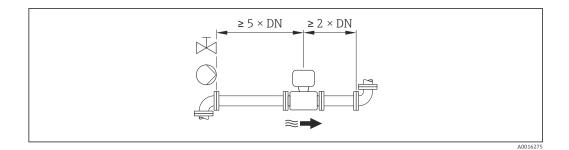
#### Horizontal



- EPD electrode for empty pipe detection
- 2 Measuring electrodes for signal detection
- Reference electrode for potential equalization
- The measuring electrode plane must be horizontal. This prevents brief insulation of the two measuring electrodes by entrained air bubbles.
- Empty pipe detection only works if the transmitter housing is pointing upwards as otherwise there is no quarantee that the empty pipe detection function will actually respond to a partially filled or empty measuring tube.

#### Inlet and outlet runs

If possible, install the sensor upstream from fittings such as valves, T-pieces or elbows. Observe the following inlet and outlet runs to comply with accuracy specifications:



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

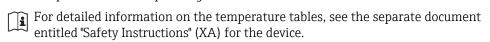
Transmitter	-40 to +60 °C (-40 to +140 °F)	
Local display	-20 to $+60$ °C ( $-4$ to $+140$ °F), the readability of the display may be impaired at temperatures outside the temperature range.	
Sensor	<ul> <li>Process connection material, carbon steel:         <ul> <li>10 to +60 °C (+14 to +140 °F)</li> </ul> </li> <li>Process connection material, stainless steel:         <ul> <li>40 to +60 °C (-40 to +140 °F)</li> </ul> </li> </ul>	
Liner	Do not exceed or fall below the permitted temperature range of the liner .	

#### If operating outdoors:

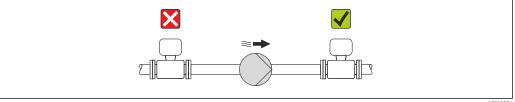
- Install the measuring device in a shady location.
- Avoid direct sunlight, particularly in warm climatic regions.
- Avoid direct exposure to weather conditions.

#### Temperature tables

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



#### System pressure



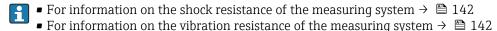
Never install the sensor on the pump suction side in order to avoid the risk of low pressure, and thus damage to the liner.

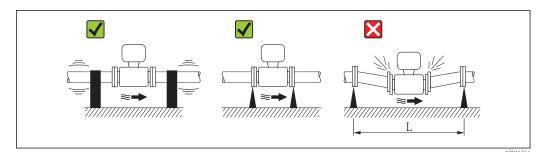
- Furthermore, install pulse dampers if reciprocating, diaphragm or peristaltic pumps are used.
- For information on the liner's resistance to partial vacuum  $\rightarrow = 143$ 

  - For information on the vibration resistance of the measuring system  $\rightarrow \blacksquare 142$

#### **Vibrations**

In the event of very strong vibrations, the pipe and sensor must be supported and fixed.



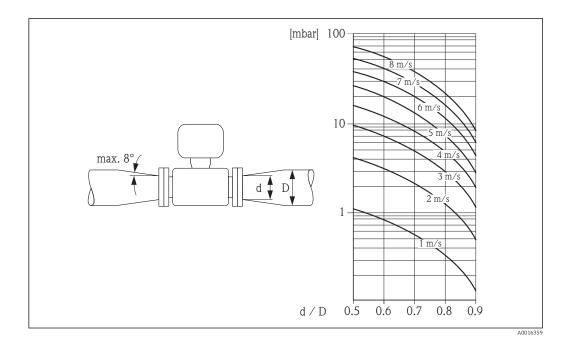


■ 5 Measures to avoid device vibrations (L > 10 m (33 ft))

#### Adapters

Suitable adapters to DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes. The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids. The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders.

- The nomogram only applies to liquids with a viscosity similar to that of water.
- 1. Calculate the ratio of the diameters d/D.
- 2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.



## 6.1.3 Special mounting instructions

#### Display protection

► To ensure that the optional display protection can be easily opened, maintain the following minimum head clearance: 350 mm (13.8 in)

## 6.2 Mounting the measuring device

## 6.2.1 Required tools

#### For transmitter

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

#### For sensor

For flanges and other process connections:

- Screws, nuts, seals etc. are not included in the scope of supply and must be provided by the customer.
- Appropriate mounting tools

### 6.2.2 Preparing the measuring device

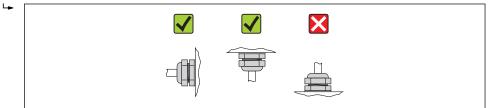
- 1. Remove all remaining transport packaging.
- 2. Remove any protective covers or protective caps present from the sensor.
- 3. Remove stick-on label on the electronics compartment cover.

## 6.2.3 Mounting the sensor

#### **WARNING**

### Danger due to improper process sealing!

- ► Ensure that the inside diameters of the gaskets are greater than or equal to that of the process connections and piping.
- ► Ensure that the gaskets are clean and undamaged.
- ► Install the gaskets correctly.
- 1. Ensure that the direction of the arrow on the sensor matches the flow direction of the medium.
- 2. To ensure compliance with device specifications, install the measuring device between the pipe flanges in a way that it is centered in the measurement section.
- 3. If using ground disks, comply with the Installation Instructions provided.
- 5. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.



A0013964

#### Mounting the seals

#### **CAUTION**

# An electrically conductive layer could form on the inside of the measuring tube! Risk of measuring signal short circuit.

▶ Do not use electrically conductive sealing compounds such as graphite.

Comply with the following instructions when installing seals:

- Make sure that the seals do not protrude into the piping cross-section.
- For DIN flanges: only use seals according to DIN EN 1514-1.
- For "PFA" lining: generally additional seals are **not** required.
- For "PTFE" lining: generally additional seals are **not** required.

#### Mounting the ground cable/ground disks

#### Screw tightening torques

Please note the following:

- The screw tightening torques listed below apply only to lubricated threads and to pipes not subjected to tensile stress.
- Tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.

Screw tightening torques for EN 1092-1 (DIN 2501), PN 40/25

Nominal diameter	Pressure rating	Threaded fasteners	Max. screw tightening torque [Nm]	
[mm]	[bar]	[mm]	PTFE	PFA
15	PN 40	4 × M12	11	-
25	PN 40	4 × M12	26	20

Nominal diameter	Pressure rating	Threaded fasteners	Max. screw tighte	ning torque [Nm]
[mm]	[bar]	[mm]	PTFE	PFA
32	PN 40	4 × M16	41	35
40	PN 40	4 × M16	52	47
50	PN 40	4 × M16	65	59
65 <sup>1)</sup>	PN 16	8 × M16	43	40
65	PN 40	8 × M16	43	40
80	PN 16	8 × M16	53	48
80	PN 40	8 × M16	53	48
100	PN 16	8 × M16	57	51
100	PN 40	8 × M20	78	70
125	PN 16	8 × M16	75	67
125	PN 40	8 × M24	111	99
150	PN 16	8 × M20	99	85
150	PN 40	8 × M24	136	120
200	PN 10	8 × M20	141	101
200	PN 16	12 × M20	94	67
200	PN 25	12 × M24	138	105
250	PN 10	12 × M20	110	_
250	PN 16	12 × M24	131	_
250	PN 25	12 × M27	200	-
300	PN 10	12 × M20	125	-
300	PN 16	12 × M24	179	-
300	PN 25	16 × M27	204	-
350	PN 10	16 × M20	188	-
350	PN 16	16 × M24	254	-
350	PN 25	16 × M30	380	-
400	PN 10	16 × M24	260	-
400	PN 16	16 × M27	330	-
400	PN 25	16 × M33	488	-
450	PN 10	20 × M24	235	-
450	PN 16	20 × M27	300	-
450	PN 25	20 × M33	385	-
500	PN 10	20 × M24	265	-
500	PN 16	20 × M30	448	-
500	PN 25	20 × M33	533	-
600	PN 10	20 × M27	345	-
600 <sup>1)</sup>	PN 16	20 × M33	658	-
600	PN 25	20 × M36	731	-

<sup>1)</sup> Designed acc. to EN 1092-1 (not to DIN 2501)

Screw tightening torques for ASME B16.5, Class 150/300

Nominal diameter		Pressure rating	Threaded fasteners	Max. screw tighte ([lbf	ening torque [Nm] ·ft])
[mm]	[in]	[psi]	[in]	PTFE	PFA
15	1/2	Class 150	4 × ½	6 (4)	- (-)
15	1/2	Class 300	4 × ½	6 (4)	- (-)
25	1	Class 150	4 × ½	11 (8)	10 (7)
25	1	Class 300	4 × 5/8	14 (10)	12 (9)
40	1 ½	Class 150	4 × ½	24 (18)	21 (15)
40	1 ½	Class 300	4 × ¾	34 (25)	31 (23)
50	2	Class 150	4 × 5/8	47 (35)	44 (32)
50	2	Class 300	8 × 5/8	23 (17)	22 (16)
80	3	Class 150	4 × 5/8	79 (58)	67 (49)
80	3	Class 300	8 × ¾	47 (35)	42 (31)
100	4	Class 150	8 × 5/8	56 (41)	50 (37)
100	4	Class 300	8 × ¾	67 (49)	59 (44)
150	6	Class 150	8 × ¾	106 (78)	86 (63)
150	6	Class 300	12 × ¾	73 (54)	67 (49)
200	8	Class 150	8 × ¾	143 (105)	109 (80)
250	10	Class 150	12 × 7/8	135 (100)	- (-)
300	12	Class 150	12 × 7/8	178 (131)	- (-)
350	14	Class 150	12 × 1	260 (192)	- (-)
400	16	Class 150	16 × 1	246 (181)	- (-)
450	18	Class 150	16 × 1 1/8	371 (274)	- (-)
500	20	Class 150	20 × 1 1/8	341 (252)	- (-)
600	24	Class 150	20 × 1 1/4	477 (352)	- (-)

## Screw tightening torques for JIS B2220, 10/20K

Nominal diameter	Pressure rating	Threaded fasteners	Max. screw tighte	ning torque [Nm]
[mm]	[bar]	[mm]	PTFE	PFA
25	10K	4 × M16	32	27
25	20K	4 × M16	32	27
32	10K	4 × M16	38	-
32	20K	4 × M16	38	-
40	10K	4 × M16	41	37
40	20K	4 × M16	41	37
50	10K	4 × M16	54	46
50	20K	8 × M16	27	23
65	10K	4 × M16	74	63
65	20K	8 × M16	37	31
80	10K	8 × M16	38	32
80	20K	8 × M20	57	46
100	10K	8 × M16	47	38
100	20K	8 × M20	75	58

Nominal diameter	Pressure rating	Threaded fasteners	Max. screw tightening torque [Nm	
[mm]	[bar]	[mm]	PTFE	PFA
125	10K	8 × M20	80	66
125	20K	8 × M22	121	103
150	10K	8 × M20	99	81
150	20K	12 × M22	108	72
200	10K	12 × M20	82	54
200	20K	12 × M22	121	88
250	10K	12 × M22	133	-
250	20K	12 × M24	212	-
300	10K	16 × M22	99	-
300	20K	16 × M24	183	_

Screw tightening torques for AS 2129, Table E

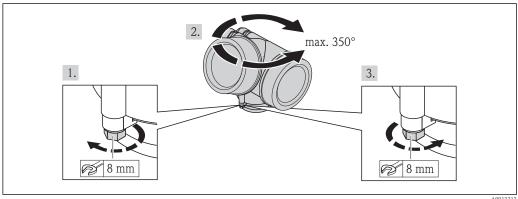
Nominal diameter	Threaded fasteners	Max. screw tightening torque [Nm]
[mm]	[mm]	PTFE
25	4 × M12	21
50	4 × M16	42

Screw tightening torques for AS 4087, PN 16

Nominal diameter	Threaded fasteners	Max. screw tightening torque [Nm]	
[mm]	[mm]	PTFE	
50	4 × M16	42	

## 6.2.4 Turning the transmitter housing

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

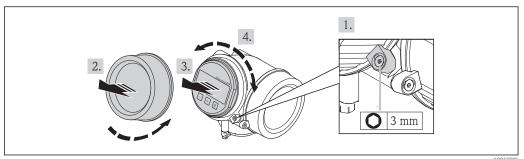


A0013713

- 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

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



- A00139
- 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)?	
Does the measuring device conform to the measuring point specifications?  For example:  Process temperature  Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document)  Ambient temperature  Measuring range	
Has the correct orientation for the sensor been selected?  According to sensor type According to medium temperature According to medium properties (outgassing, with entrained solids)	
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping ?	
Are the measuring point identification and labeling correct (visual inspection)?	
Is the device adequately protected from precipitation and direct sunlight?	
Have the fixing screws been tightened with the correct tightening torque?	

## 7 Electrical connection



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

#### 7.1 Connection conditions

#### 7.1.1 Required tools

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

### 7.1.2 Connecting cable requirements

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

#### **Electrical safety**

In accordance with applicable federal/national regulations.

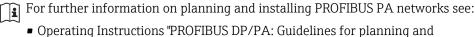
#### Permitted temperature range

- $-40 \,^{\circ}\text{C} \, (-40 \,^{\circ}\text{F}) \text{ to } +80 \,^{\circ}\text{C} \, (+176 \,^{\circ}\text{F})$
- Minimum requirement: cable temperature range ≥ ambient temperature +20 K

#### Signal cable

PROFIBUS PA

Twisted, shielded two-wire cable. Cable type A is recommended  $\rightarrow \triangleq 30$ .



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

*Pulse/frequency/switch output* 

Standard installation cable is sufficient.

#### Cable diameter

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

#### Fieldbus cable specification

PROFIBUS PA

Cable type

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

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

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

The following are examples of suitable cable types:

Non-hazardous area:

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

#### Maximum overall cable length

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

The maximum overall cable length for cable type A: 1900 m (6200 ft)

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

#### Maximum spur length

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

Number of spurs	Max. length per spur
112	120 m (400 ft)
1314	90 m (300 ft)
1518	60 m (200 ft)
1924	30 m (100 ft)
2532	1 m (3 ft)

30

#### Number of field devices

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

#### Bus termination

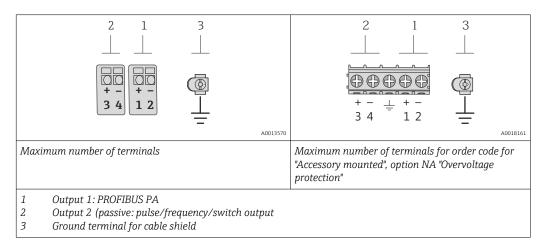
The start and end of each fieldbus segment must always be terminated by a bus terminator. With various junction boxes (non-Ex), the bus termination can be activated via a switch. If this is not the case, a separate bus terminator must be installed. Please also note the following:

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

## 7.1.3 Terminal assignment

#### **Transmitter**

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



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

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

### 7.1.4 Pin assignment, device plug

#### **PROFIBUS PA**

Device plug for signal transmission (device side)

	Pin		Assignment	Coding	Plug/socket
$2 \longrightarrow 3$	1	+	PROFIBUS PA +	A	Plug
1 4	2		Grounding		
A0019021	3	-	PROFIBUS PA -		
	4		Not assigned		

## 7.1.5 Shielding and grounding

#### **PROFIBUS PA**

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

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

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

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

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

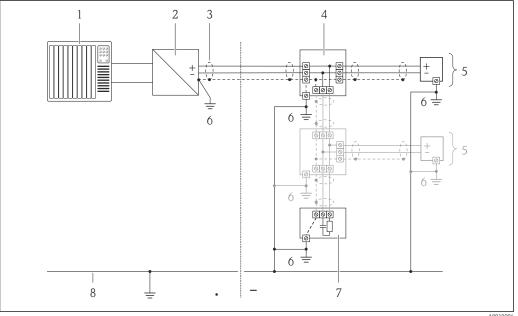
Where applicable, national installation regulations and guidelines must be observed during the installation!

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

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

Damage to the bus cable shield.

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



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

## 7.1.6 Requirements for the supply unit

#### Supply voltage

Transmitter

An external power supply is required for each output.

The following supply voltage values apply for the outputs available:

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

## 7.1.7 Preparing the measuring device

- 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 .

3. If measuring device is delivered with cable glands: Observe cable specification .

## 7.2 Connecting the measuring device

#### NOTICE

## Limitation of electrical safety due to incorrect connection!

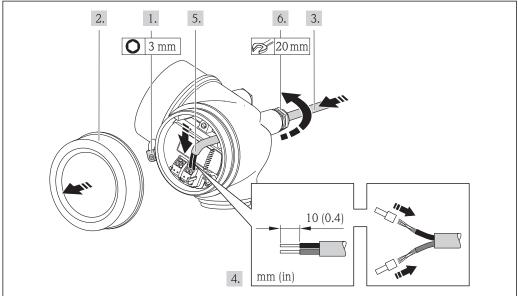
- ▶ Have electrical connection work carried out by correspondingly trained specialists only.
- ▶ Observe applicable federal/national installation codes and regulations.
- ► Comply with local workplace safety regulations.
- ► For use in potentially explosive atmospheres, observe the information in the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

## 7.2.1 Connecting the transmitter

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

Connection version: terminals or device plug

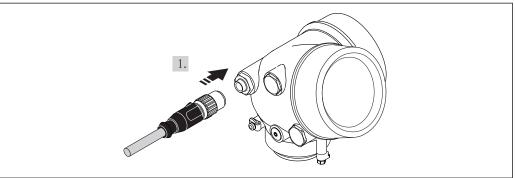
#### Connection via terminals



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

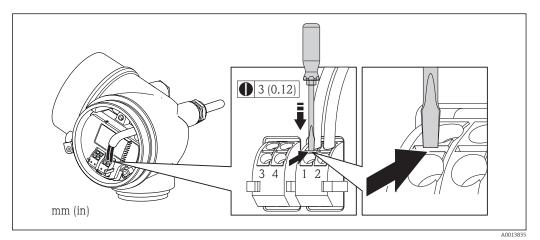
Reverse the removal procedure to reassemble the transmitter.

#### Connection via device plug



▶ Plug in the device plug and tighten firmly.

#### Removing a cable



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

### 7.2.2 Ensuring potential equalization

#### Requirements

## **A** CAUTION

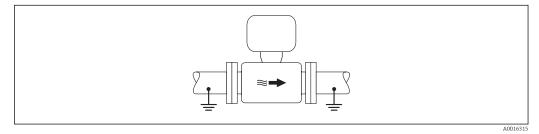
#### Electrode damage can result in the complete failure of the device!

- ▶ Same electrical potential for the fluid and sensor
- ► Company-internal grounding concepts
- Pipe material and grounding

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

#### Connection example, standard scenario

Metal, grounded pipe



 $\blacksquare$  6 Potential equalization via measuring tube

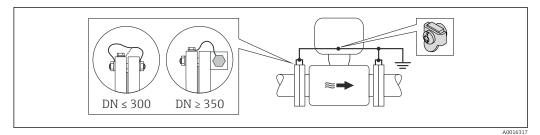
#### Connection example in special situations

Unlined and ungrounded metal pipe

This connection method also applies in situations where:

- The customary potential equalization is not used
- Equalizing currents are present

Ground cable Copper wire, at least 6 mm<sup>2</sup> (0.0093 in<sup>2</sup>)



■ 7 Potential equalization via ground terminal and pipe flanges

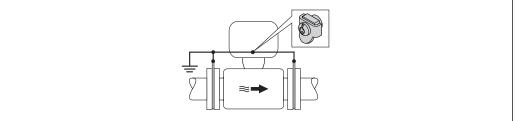
- 1. Connect both sensor flanges to the pipe flange via a ground cable and ground them.
- 2. If DN  $\leq$  300 (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws. If DN  $\geq$  350 (14"): Mount the ground cable directly on the metal transport bracket. Observe torques  $\rightarrow$   $\cong$  24.
- 3. Connect the connection housing of the transmitter or sensor to ground potential by means of the ground terminal provided for the purpose.

*Plastic pipe or pipe with insulating liner* 

This connection method also applies in situations where:

- The customary potential equalization is not used
- Equalizing currents are present

Ground cable Copper wire, at least 6 mm<sup>2</sup> (0.0093 in<sup>2</sup>)



A001631

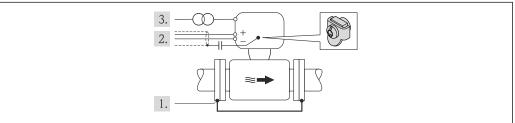
- $\blacksquare$  8 Potential equalization via ground terminal and ground disks
- 1. Connect the ground disks to the ground terminal via the ground cable.
- 2. Connect the ground disks to ground potential.

Pipe with a cathodic protection unit

This connection method is only used if the following two conditions are met:

- Metal pipe without liner or pipe with electrically conductive liner
- Cathodic protection is integrated in the personal protection equipment

Ground cable Copper wire, at least 6 mm<sup>2</sup> (0.0093 in<sup>2</sup>)



A0016319

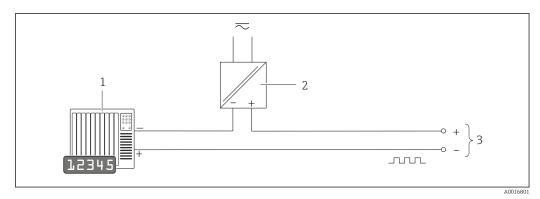
Prerequisite: The sensor is installed in the pipe in a way that provides electrical insulation.

- 1. Connect the two flanges of the pipe to one another via a ground cable.
- 2. Guide the shield of the signal lines through a capacitor.
- 3. Connect the measuring device to the power supply such that it is floating in relation to the protective ground (isolation transformer).

## 7.3 Special connection instructions

## 7.3.1 Connection examples

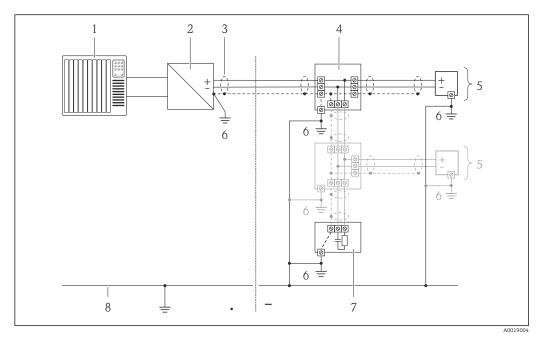
## Pulse/frequency output



- **■** 9 Connection example for pulse/frequency output (passive)
- 1 Automation system with pulse/frequency input (e.g. PLC)
- 2 Power supply
- *3 Transmitter: observe input values → 🖺 136*

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### **PROFIBUS-PA**



**■** 10 Connection example for PROFIBUS-PA

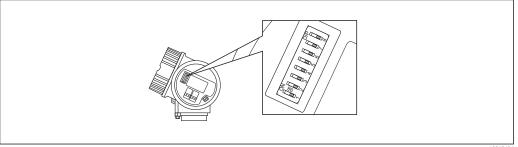
- Control system (e.g. PLC)
- 2 Segment coupler PROFIBUS DP/PA
- 3 Cable shield
- 4 T-box
- Measuring device
- Local grounding
- Bus terminator
- Potential matching line

#### 7.4 Hardware settings

#### 7.4.1 Setting the device address

### **PROFIBUS PA**

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



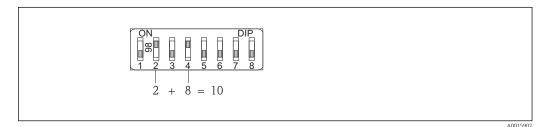
■ 11 Address switch in the connection compartment

### Hardware addressing

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

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

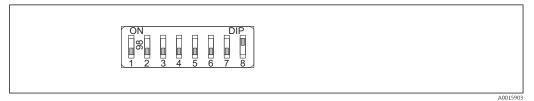
Switch		2	3	4	5	6	7
Value in "ON" position	1	2	4	8	16	32	64
Value in "OFF" position		0	0	0	0	0	0



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

### Software addressing

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



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

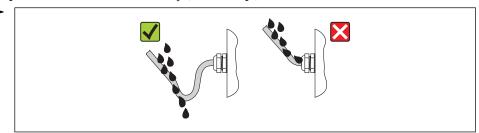
## 7.5 Ensuring the degree of protection

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

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

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

4. To ensure that moisture does not enter the cable entry, route the cable so that it loops down before the cable entry ("water trap").



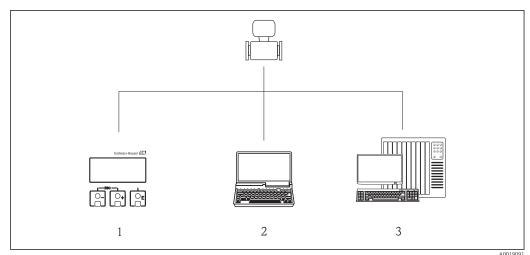
5. Insert dummy plugs into unused cable entries.

## 7.6 Post-connection check

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

### **Operating options** 8

#### Overview of operating options 8.1



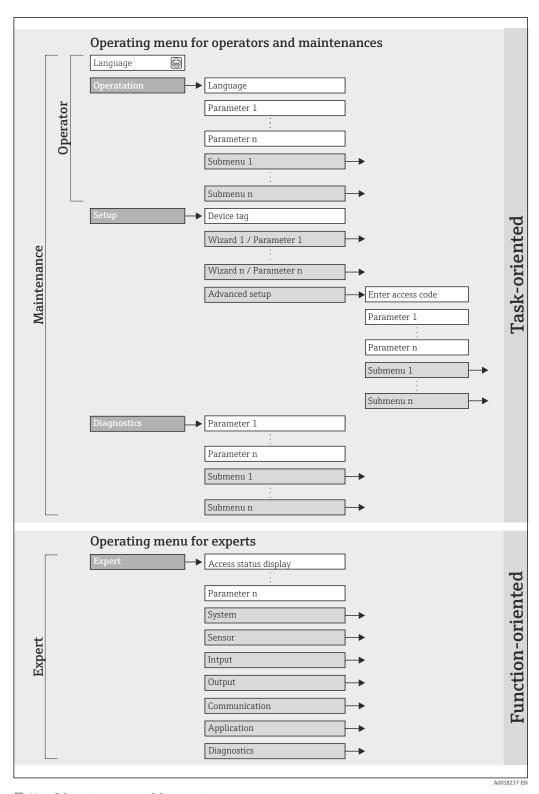
- 1 Local operation via display module
- Computer with operating tool (e.g. FieldCare, SIMATIC PDM) Automation system (e.g. PLC)

42

## 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



 $\blacksquare 14$  Schematic structure of the operating menu

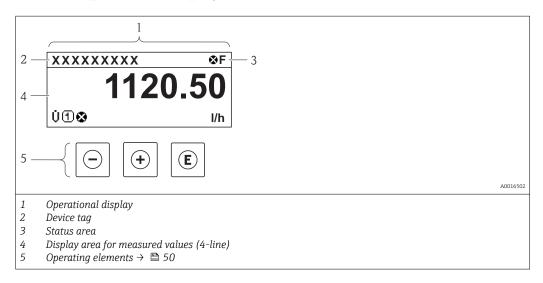
## 8.2.2 Operating philosophy

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

Menu/parameter		User role and tasks	Content/meaning		
Language	task-oriented	Role "Operator", "Maintenance"	Defining the operating language		
Operation		Tasks during operation:  Configuring the operational display Reading measured values	<ul> <li>Configuring the operational display (e.g. display format, display contrast)</li> <li>Resetting and controlling totalizers</li> </ul>		
Setup		"Maintenance" role Commissioning: Configuration of the measurement Configuration of the inputs and outputs	Wizards for fast commissioning:  Configure the outputs Configuring the operational display Define the output conditioning Empty pipe detection Set the low flow cut off		
			Advanced setup  For more customized configuration of the measurement (adaptation to special measuring conditions)  Configuration of totalizers  Configuration of electrode cleaning (optional)  Administration (define access code, reset measuring device)		
Diagnostics		"Maintenance" role Fault elimination:  Diagnostics and elimination of process and device errors  Measured value simulation	Contains all parameters for error detection and analyzing process and device errors:  Diagnostic list Contains up to 5 currently pending diagnostic messages.  Event logbook Contains up to 20 or 100 (order option "Extended HistoROM") event messages that have occurred.  Device information Contains information for identifying the device.  Measured values Contains all current measured values.  Analog inputs Is used to display the analog input.  Data logging (Order option "Extended HistoROM") Storage and visualization of up to 1000 measured values  Heartbeat The functionality of the device is checked on demand and the verification results are documented.  Simulation Is used to simulate measured values or output values.		
Expert	function-oriented	Tasks that require detailed knowledge of the function of the device:  Commissioning measurements under difficult conditions  Optimal adaptation of the measurement to difficult conditions  Detailed configuration of the communication interface  Error diagnostics in difficult cases	Contains all the parameters of the device and makes it possible to access these parameters directly using an access code. The structure of this menu is based on the function blocks of the device:  System Contains all higher-order device parameters which do not concern the measurement or the communication interface.  Sensor Configuration of the measurement.  Output Configuration of the pulse/frequency/status output.  Communication Configuration of the digital communication interface.  Submenus for function blocks (e.g. "Analog Inputs") Configuration of function blocks.  Application Configuration of the functions that go beyond the actual measurement (e.g. totalizer).  Diagnostics Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology.		

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

## 8.3.1 Operational display



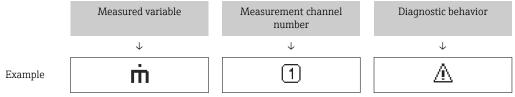
#### Status area

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

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

### Display area

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



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

### Measured variables

Symbol	Meaning
Ü	Volume flow

ṁ	Mass flow
Σ	Totalizer  The measurement channel number indicates which of the three totalizers is displayed.

#### Measurement channel numbers

	Symbol	Meaning
C	1 4	Measurement channel 1 to 4
	11 171	

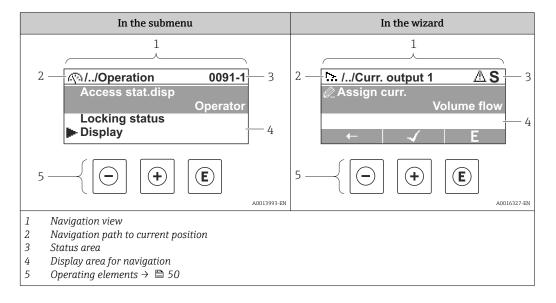
The measurement channel number is displayed only if more than one channel is present for the same measured variable type (e.g. totalizer 1-3).

### Diagnostic behavior

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

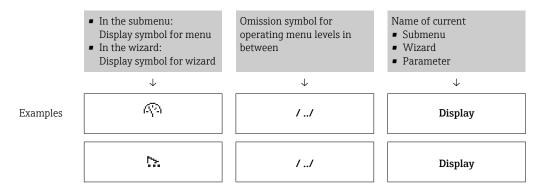
The number and display format of the measured values can be configured via the "Format display" parameter → 🗎 72. "Operation" menu → Display → Format display

## 8.3.2 Navigation view



### Navigation path

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





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

#### 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

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



- For information on the function and entry of the direct access code  $\rightarrow$   $\stackrel{\triangle}{=}$  52

### Display area

### Menus

Symbol	Meaning
P	Operation Appears: In the menu next to the "Operation" selection At the left in the navigation path in the "Operation" menu
۶	Setup Appears: In the menu next to the "Setup" selection At the left in the navigation path in the "Setup" menu
ય	Diagnostics Appears: In the menu next to the "Diagnostics" selection At the left in the navigation path in the "Diagnostics" menu
₹.	Expert Appears: In the menu next to the "Expert" selection At the left in the navigation path in the "Expert" menu

### Submenus, wizards, parameters

Symbol	Meaning
•	Submenu
<u> </u>	Wizard
Ø.	Parameters within a wizard  No display symbol exists for parameters in submenus.

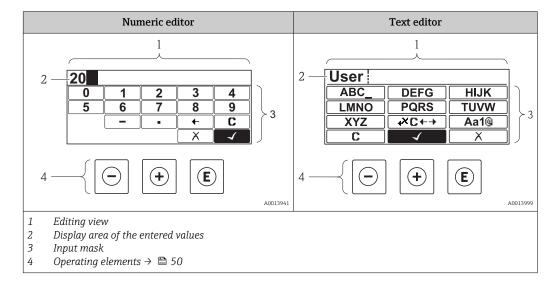
### Locking

Symbol	Meaning
û	Parameter locked  When displayed in front of a parameter name, indicates that the parameter is locked.  By a user-specific access code  By the hardware write protection switch

## Wizard operation

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

## 8.3.3 Editing view



## Input mask

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

### Numeric editor

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

## Text editor

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

## Correction symbols under₩€↔

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

## 8.3.4 Operating elements

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

## 8.3.5 Opening the context menu

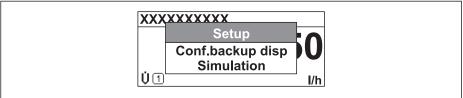
Using the context menu, the user can call up the following menus quickly and directly from the operational display:  $\frac{1}{2} \left( \frac{1}{2} \right) = \frac{1}{2} \left( \frac{1}{2} \right) \left( \frac{$ 

- Setup
- Conf. backup disp.
- Simulation

### Calling up and closing the context menu

The user is in the operational display.

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



A0016326-E

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

### Calling up the menu via the context menu

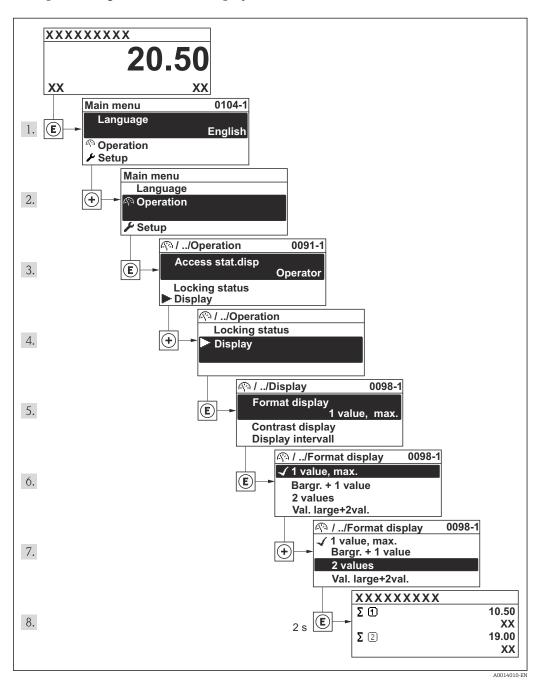
- 1. Open the context menu.
- 2. Press ± to navigate to the desired menu.
- 3. Press **E** to confirm the selection.
  - └ The selected menu opens.

## 8.3.6 Navigating and selecting from list

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

For an explanation of the navigation view with symbols and operating elements  $\rightarrow \stackrel{\cong}{=} 46$ 

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



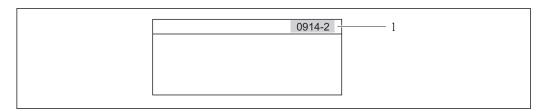
## 8.3.7 Calling the parameter directly

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

### Navigation path

"Expert" menu → Direct access

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



1 Direct access code

Note the following when entering the direct access code:

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

Example: Input of "0914-2" → Parameter **Totalizer 2** 

For the direct access codes of the individual parameters

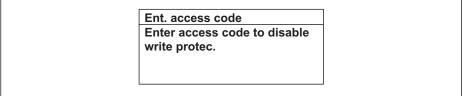
### 8.3.8 Calling up help text

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

### Calling up and closing the help text

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

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



A0014002-EN

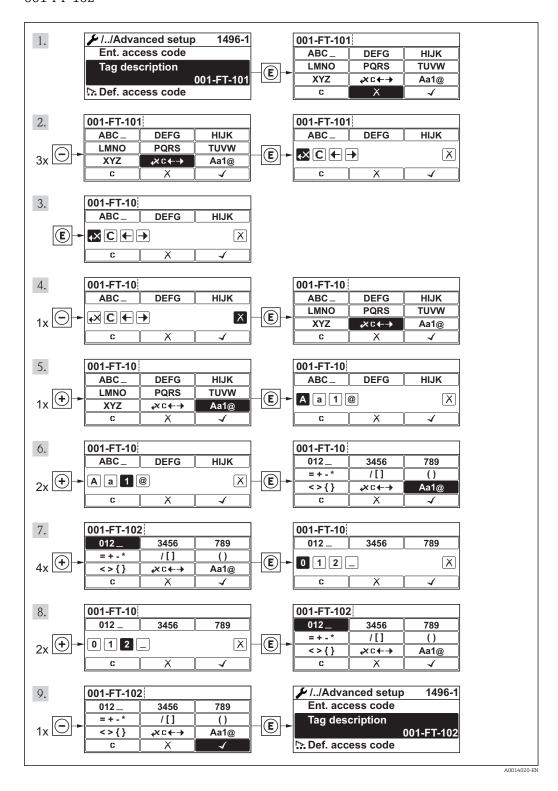
■ 15 Example: Help text for parameter "Enter access code"

- 2. Press  $\Box$  +  $\pm$  simultaneously.
  - ► The help text is closed.

## 8.3.9 Changing the parameters

For a description of the editing display - consisting of text editor and numeric editor - with symbols  $\rightarrow \stackrel{\triangle}{=} 48$ , for a description of the operating elements  $\rightarrow \stackrel{\triangle}{=} 50$ 

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



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

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

A0014049-EN

### 8.3.10 User roles and related access authorization

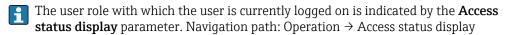
The two user roles "Operator" and "Maintenance" have different write access to the parameters if the customer defines a user-specific access code. This protects the device configuration via the local display from unauthorized access .

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	V	V	V	1)
Maintenance	V	V	V	V

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



## 8.3.11 Disabling write protection via access code

If the  $\widehat{\mathbb{R}}$ -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 .

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

## 8.3.12 Enabling and disabling the keypad lock

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

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 □ + ± + E 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 □ + ± + E 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 E 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 E key for longer than 2 seconds.
  - ► A context menu appears.
- 2. In the context menu, select the **Keylock off** option.
  - ► The keypad lock is switched off.

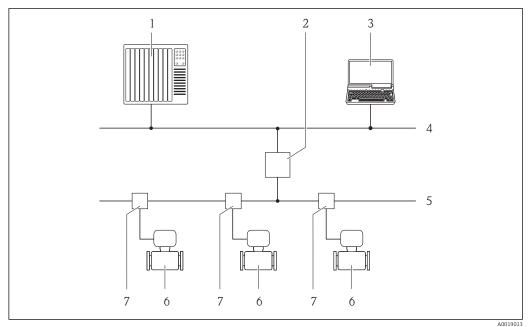
## 8.4 Access to the operating menu via the operating tool

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

### 8.4.1 Connecting the operating tool

### Via PROFIBUS PA network

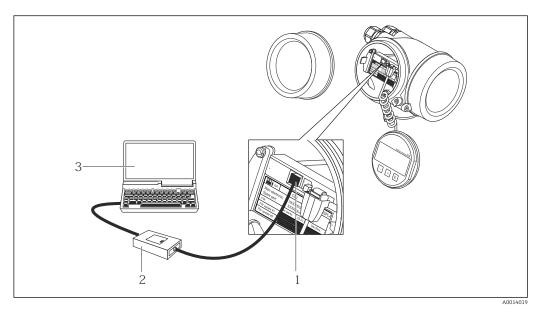
This communication interface is available in device versions with PROFIBUS PA.



■ 16 Options for remote operation via PROFIBUS PA network

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

## Via service interface (CDI)



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

### 8.4.2 FieldCare

### **Function scope**

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

### Access is via:

- PROFIBUS PA protocol → 16, 57
- Service interface CDI → 🖺 57

### 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
- $\ensuremath{\bigcap}$  For details, see Operating Instructions BA00027S and BA00059S

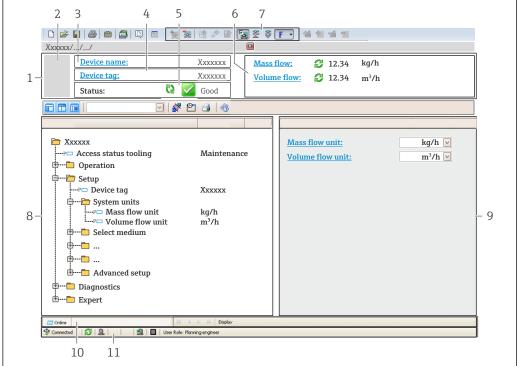
## Source for device description files

See data → 🗎 60

## Establishing a connection

 $\hfill \hfill \Box$  For details, see Operating Instructions BA00027S and BA00059S

### User interface



A00210E1 EN

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

### 8.4.3 SIMATIC PDM

### **Function scope**

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

### Source for device description files

See data → 🖺 60

## 9 System integration

## 9.1 Overview of device description files

### 9.1.1 Current version data for the device

Firmware version	01.01.zz	<ul> <li>On the title page of the Operating instructions</li> <li>On the transmitter nameplate → □ 13</li> <li>Firmware version</li> <li>"Diagnostics" menu → Device information → Firmware version</li> </ul>
Release date of firmware version	06.2015	
Manufacturer ID	0x11	Manufacturer ID "Diagnostics" menu → Device information → Manufacturer ID
Device type ID	0x1563	Device type "Diagnostics" menu → Device information → Device type
Profile version	3.02	

For an overview of the different firmware versions for the device  $\rightarrow \triangleq 128$ 

## 9.1.2 Operating tools

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

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

## 9.2 Device master file (GSD)

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

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

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

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

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

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

## 9.2.1 Manufacturer-specific GSD

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

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

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



Where to acquire the manufacturer-specific GSD:

www.endress.com → Download Area

### 9.2.2 Profile GSD

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

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

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

## 9.3 Cyclic data transmission

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

### 9.3.1 Block model

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

Measuring device					Control system
	Analog Input block 1 to 2	→ 🖺 62	Output value AI	$\rightarrow$	
			Output value TOTAL	$\rightarrow$	
Transducer	Totalizer block 1 to 3	→ 🖺 63	Controller SETTOT	<b>←</b>	
Block			Configuration MODETOT	<b>←</b>	PROFIBUS PA
	Discrete Input block 1 to 2	→ 🖺 65	Output values DI	$\rightarrow$	
	Discrete Output block 1 to 3	→ 🖺 65	Input values DO	+	

#### Defined order of modules

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

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

Slot	Module	Function block
12	AI	Analog Input block 1 to 2
3	TOTAL or SETTOT_TOTAL or SETOT MODETOT TOTAL	Totalizer block 1
4		Totalizer block 2
5		Totalizer block 3
67	DI	Discrete Input block 1 to 2
810	DO	Discrete Output block 1 to 3

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

## 9.3.2 Description of the modules



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

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

#### AI module (Analog Input)

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

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

Four Analog Input blocks are available (slot 1 to 2).

Selection: input variable

The input variable can be specified using the CHANNEL parameter.

CHANNEL	Input variable
9	Volume flow
11	Mass flow

## Factory setting

Function block	Factory setting
AI 1	Volume flow
AI 2	Mass flow

#### Data structure

### Input data of Analog Input

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

#### TOTAL module

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

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

Three Totalizer blocks are available (slot 3 to 5).

Selection: totalizer value

The totalizer value can be specified using the CHANNEL parameter.

CHANNEL	Input variable
9	Mass flow
11	Volume flow

#### Factory setting

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

#### Data structure

### Input data of TOTAL

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

### SETTOT\_TOTAL module

The module combination consists of the SETTOT and TOTAL functions:

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

Three Totalizer blocks are available (slot 3 to 5).

Selection: control totalizer

Value SETTOT	Control totalizer
0	Totalize
1	Resetting
2	Adopt totalizer initial setting

## Factory setting

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

#### Data structure

### Output data of SETTOT

Byte 1
Control variable 1

## Input data of TOTAL

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

## SETTOT\_MODETOT\_TOTAL module

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

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

Three Totalizer blocks are available (slot 3 to 5).

Selection: totalizer configuration

MODETOT value	Totalizer configuration
0	Balancing
1	Balance the positive flow
2	Balance the negative flow
3	Stop totalizing

### Factory setting

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

## Data structure

## Output data of SETTOT and MODETOT

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

## Input data of TOTAL

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

### DI module (Discrete Input)

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

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

Two Discrete Input blocks are available (slot 6 to 7).

Selection: device function

The device function can be specified using the CHANNEL parameter.

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

1) Only available with the Heartbeat Verification application package

#### Factory setting

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

#### Data structure

Input data of Discrete Input

Byte 1	Byte 2	
Discrete	Status	

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

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

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

Three Discrete Output blocks are available (slot 8 to 10).

## Assigned device functions

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

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

1) Only available with the Heartbeat Verification application package

### Data structure

## Output data of Discrete Output

Byte 1	Byte 2
Discrete	Status

## EMPTY\_MODULE module

# 10 Commissioning

### 10.1 Function check

Before commissioning the measuring device:

- ▶ Make sure that the post-installation and post-connection checks have been performed.
- "Post-installation check" checklist → 🖺 28
- "Post-connection check" checklist → 🖺 41

## 10.2 Switching on the measuring device

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

## 10.3 Configuring the device address via software

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

#### **Navigation**

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

## 10.3.1 PROFIBUS network

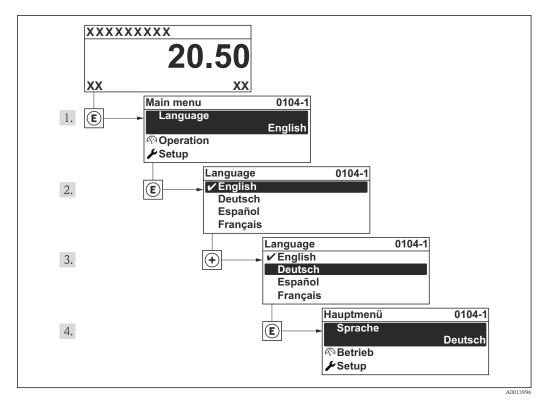
At time of delivery, the measuring device has the following factory setting:

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

If hardware addressing is active, software addressing is blocked  $\rightarrow \triangleq 39$ 

## 10.4 Setting the operating language

Factory setting: English or ordered local language

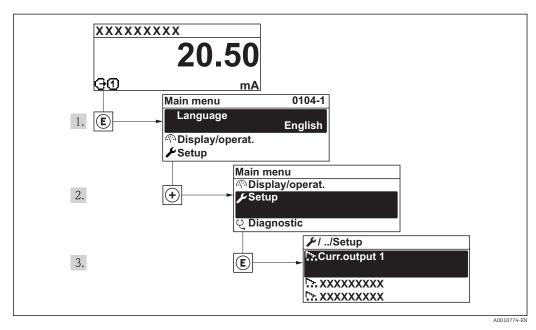


■ 17 Taking the example of the local display

## 10.5 Configuring the measuring device

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

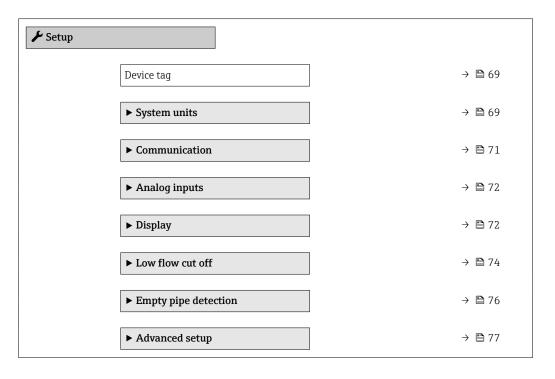
Navigation to the **Setup** menu



 $\blacksquare$  18 Illustrated using the example of the local display

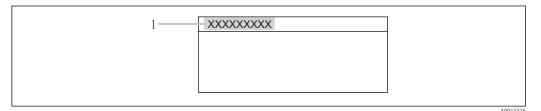
### **Navigation**

"Setup" menu



## 10.5.1 Defining the tag name

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



■ 19 Header of the operational display with tag name

1 Device tag

#### **Navigation**

"Setup" menu → Device tag

### Parameter overview with brief description

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

## 10.5.2 Setting the system units

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

 $\begin{array}{l} \textbf{Navigation} \\ \text{"Setup" menu} \rightarrow \text{System units} \end{array}$ 

► System units	
Volume flow unit	
Volume unit	
Mass flow unit	
Mass unit	
Density unit	
Temperature unit	

## Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Volume flow unit	Select volume flow unit.  Result  The selected unit applies for:  Output  Low flow cut off Simulation process variable	Unit choose list	Country-specific:  l/h gal/min (us)
Volume unit	Select volume unit.	Unit choose list	Country-specific:  m³ gal (us)
Mass flow unit	Select mass flow unit.  Result  The selected unit applies for:  Output  Low flow cut off Simulation process variable	Unit choose list	Country-specific:     kg/h     lb/min
Mass unit	Select mass unit.	Unit choose list	Country-specific:     kg     lb
Density unit	Select density unit.  Result  The selected unit applies for:  Output Simulation process variable	Unit choose list	Country-specific:  kg/l lb/ft³
Temperature unit	Select temperature unit.  Result  The selected unit applies for:  Maximum value  Minimum value  Maximum value  Minimum value  Average value	Unit choose list	Country-specific:  ■ °C ■ °F

## 10.5.3 Configuring communication interface

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

## Navigation

"Setup" menu  $\rightarrow$  Communication



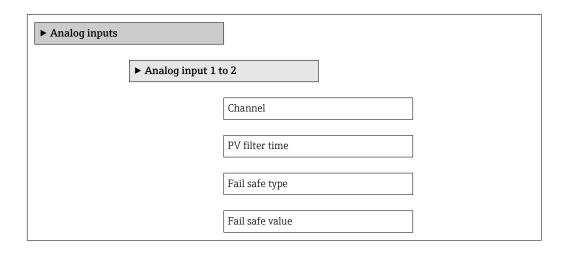
## Parameter overview with brief description

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

## 10.5.4 Configuring the analog inputs

### Navigation

"Setup" menu → Analog inputs



## Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Channel	-	Select the process variable.	<ul><li>Volume flow</li><li>Mass flow</li></ul>	Volume flow
PV filter time	-	Specify the time to suppress signal peaks. During the specified time the analog input does not respond to an erratic increase in the process variable.	Positive floating- point number	0
Fail safe type	-	Select the failure mode.	<ul><li>Fail safe value</li><li>Fallback value</li><li>Off</li></ul>	Off
Fail safe value	In <b>Fail safe type</b> parameter, the <b>Fail safe value</b> option is selected.	Specify the values to be output when an error occurs.	Signed floating-point number	0

## 10.5.5 Configuring the local display

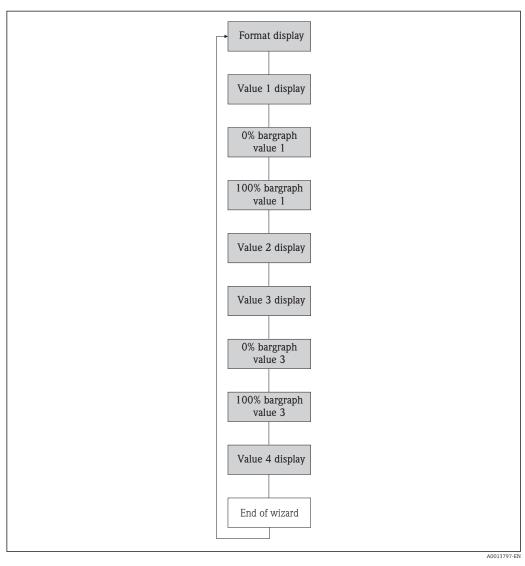
The **Display** wizard guides you systematically through all the parameters that can configured for configuring the local display.

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## Navigation

"Setup" menu → Display

## Structure of the wizard



■ 20 "Display" wizard in the "Setup" menu

## Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	<ul> <li>1 value, max. size</li> <li>1 bargraph + 1</li> <li>value</li> <li>2 values</li> <li>1 value large + 2</li> <li>values</li> <li>4 values</li> </ul>	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul> <li>Volume flow</li> <li>Mass flow</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> </ul>	Volume flow

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  • 0 l/h  • 0 gal/min (us)
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see Value 1 display parameter	None
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see Value 1 display parameter	None
0% bargraph value 3	A selection has been made in the Value 3 display parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  • 0 l/h  • 0 gal/min (us)
100% bargraph value 3	An option was selected in the Value 3 display parameter.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see Value 1 display parameter	None

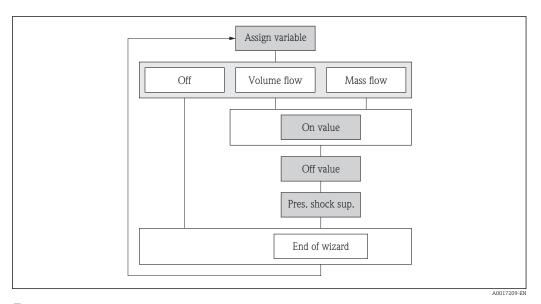
## 10.5.6 Configuring the low flow cut off

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  $\rightarrow$  Low flow cut off

#### Structure of the wizard



 $\blacksquare$  21 "Low flow cut off" wizard in the "Setup" menu

# Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Assign process variable	-	Select process variable for low flow cut off.	<ul><li> Off</li><li> Volume flow</li><li> Mass flow</li></ul>	Volume flow
On value low flow cutoff	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 🖺 75):  • Volume flow  • Mass flow	Enter on value for low flow cut off.	Signed floating-point number	Depends on country and nominal diameter
Off value low flow cutoff	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 🖺 75):  • Volume flow  • Mass flow	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 🖺 75):  • Volume flow  • Mass flow	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

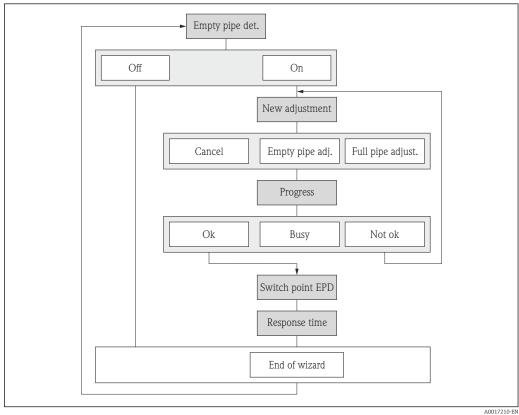
## 10.5.7 Configuring empty pipe detection

The **Empty pipe detection** wizard guides you systematically through all the parameters that have to be set for configuring empty pipe detection.

#### Navigation

"Setup" menu  $\rightarrow$  Empty pipe detection

#### Structure of the wizard



■ 22 "Empty pipe detection" wizard in the "Setup" menu

#### A0017210-EN

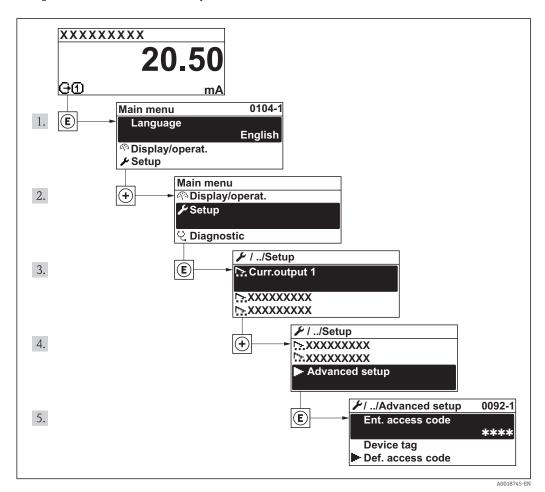
## Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User interface / User entry	Factory setting
Empty pipe detection	-	Switch empty pipe detection on and off.	<ul><li>Off</li><li>On</li></ul>	Off
New adjustment	The <b>On</b> option is selected in the <b>Empty pipe detection</b> parameter.	Select type of adjustment.	<ul><li>Cancel</li><li>Empty pipe adjust</li><li>Full pipe adjust</li></ul>	Cancel
Progress	The <b>On</b> option is selected in the <b>Empty pipe detection</b> parameter.	Shows the progress.	<ul><li>Ok</li><li>Busy</li><li>Not ok</li></ul>	_
Switch point empty pipe detection	The <b>On</b> option is selected in the <b>Empty pipe detection</b> parameter.	Enter hysteresis in %, below this value the measuring tube will detected as empty.	1 to 99 %	10 %
Response time empty pipe detection	In the <b>Empty pipe detection</b> parameter, the <b>On</b> option is selected.	Enter the time before diagnostic message S862 'Pipe empty' is displayed for empty pipe detection.	0 to 100 s	1 s

#### Advanced settings 10.6

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

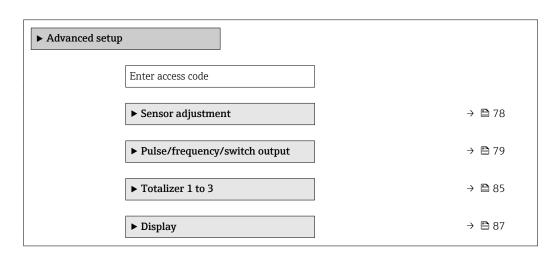
Navigation to the "Advanced setup" submenu

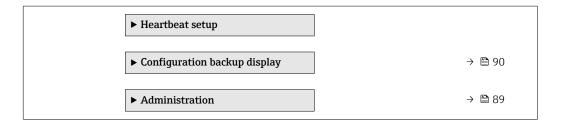


For detailed information on the parameter descriptions of the **Heartbeat Verification** application package, see the Special Documentation for the device

#### Navigation

"Setup" menu → Advanced setup





## 10.6.1 Carrying out a sensor adjustment

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

#### **Navigation**

"Setup" menu → Advanced setup → Sensor adjustment



#### Parameter overview with brief description

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

## 10.6.2 Configuring the pulse/frequency/switch output

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

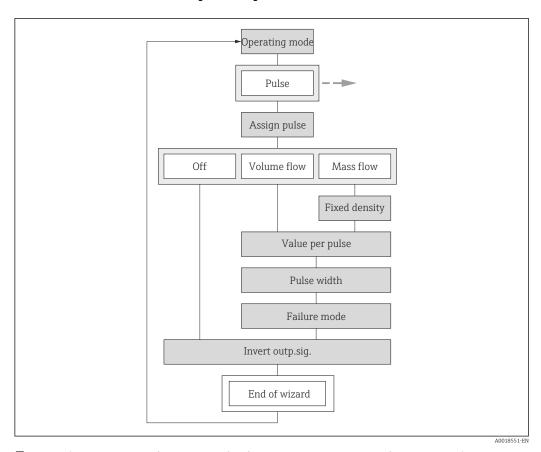
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## Configuring the pulse output

#### Navigation

"Setup" menu → Pulse/frequency/switch output

## Structure of the wizard for the pulse output



 $\blacksquare 23 \quad \text{"Pulse/frequency/switch output" wizard in the "Setup" menu: "Operating mode" parameter "Pulse" option \\$ 

## Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Operating mode	-	Define the output as a pulse, frequency or switch output.	<ul><li>Pulse</li><li>Frequency</li><li>Switch</li></ul>	Pulse
Assign pulse output	In <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected.	Select process variable for pulse output.	<ul><li>Off</li><li>Mass flow</li><li>Volume flow</li></ul>	Off
Value per pulse	In the <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected and one of the following options is selected in the <b>Assign pulse output</b> parameter (→ 🗎 79):  ■ Mass flow ■ Volume flow	Enter measured value at which a pulse is output.	Signed floating-point number	0

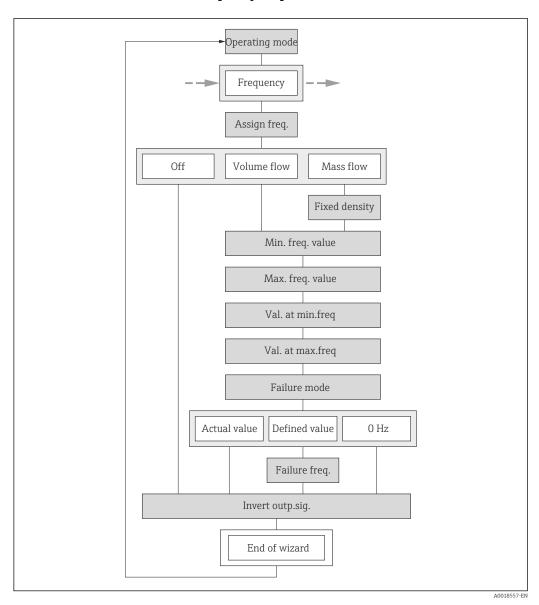
Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Pulse width	In the <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected and one of the following options is selected in the <b>Assign pulse output</b> parameter (→ 🗎 79):  ■ Mass flow ■ Volume flow	Define time width of the output pulse.	5 to 2 000 ms	100 ms
Failure mode	In the <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected and one of the following options is selected in the <b>Assign pulse output</b> parameter (→ 🗎 79):  ■ Mass flow ■ Volume flow	Define output behavior in alarm condition.	<ul><li>Actual value</li><li>No pulses</li></ul>	No pulses
Invert output signal	_	Invert the output signal.	<ul><li>No</li><li>Yes</li></ul>	No

## Configuring the frequency output

#### **Navigation**

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

#### Structure of the wizard for the frequency output



■ 24 "Pulse/frequency/switch output" wizard in the "Advanced setup" submenu: "Operating mode" parameter"Frequency" option

## Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Operating mode	-	Define the output as a pulse, frequency or switch output.	<ul><li>Pulse</li><li>Frequency</li><li>Switch</li></ul>	Pulse
Assign frequency output	In <b>Operating mode</b> parameter (→ 🖺 79), the <b>Frequency</b> option is selected.	Select process variable for frequency output.	<ul><li>Off</li><li>Volume flow</li><li>Mass flow</li></ul>	Off

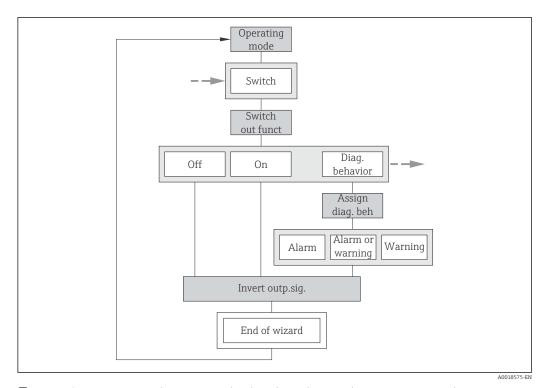
Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Minimum frequency value	In the Operating mode parameter, the Frequency option is selected and one of the following options is selected in the Assign frequency output parameter (→   ■ 81):  ■ Volume flow  ■ Mass flow	Enter minimum frequency.	0 to 1000 Hz	0 Hz
Maximum frequency value	In the <b>Operating mode</b> parameter, the <b>Frequency</b> option is selected and one of the following options is selected in the <b>Assign frequency output</b> parameter (→   ■ 81):  ■ Volume flow  ■ Mass flow	Enter maximum frequency.	0 to 1000 Hz	1000 Hz
Measuring value at minimum frequency	In the Operating mode parameter, the Frequency option is selected and one of the following options is selected in the Assign frequency output parameter (→   ■ 81):  ■ Volume flow  ■ Mass flow	Enter measured value for minmum frequency.	Signed floating-point number	Depends on country and nominal diameter
Measuring value at maximum frequency	In the Operating mode parameter, the Frequency option is selected and one of the following options is selected in the Assign frequency output parameter (→   ■ 81):  ■ Volume flow  ■ Mass flow	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	In the <b>Operating mode</b> parameter (→ 🖺 79), the <b>Frequency</b> option is selected and one of the following options is selected in the <b>Assign frequency output</b> parameter (→ 🖺 81):  ■ Volume flow  ■ Mass flow	Define output behavior in alarm condition.	<ul><li>Actual value</li><li>Defined value</li><li>0 Hz</li></ul>	0 Hz
Failure frequency	In the <b>Operating mode</b> parameter (→ 🖺 79), the <b>Frequency</b> option is selected and one of the following options is selected in the <b>Assign frequency output</b> parameter (→ 🖺 81):  ■ Volume flow  ■ Mass flow	Enter frequency output value in alarm condition.	0.0 to 1250.0 Hz	0.0 Hz
Invert output signal	-	Invert the output signal.	■ No ■ Yes	No

## Configuring the switch output

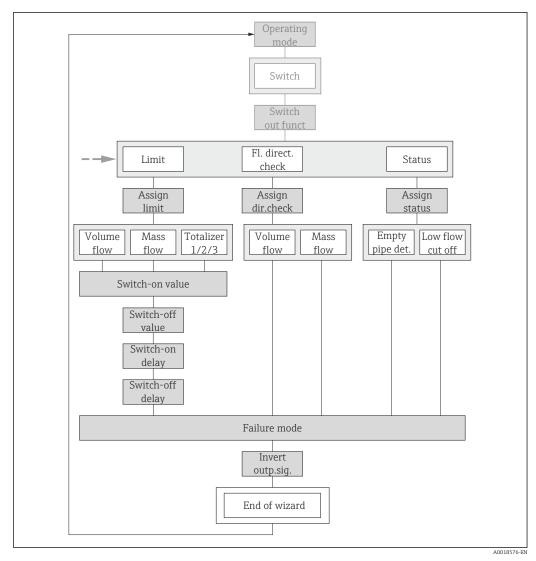
#### **Navigation**

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

## Structure of the wizard for the switch output



■ 25 "Pulse/frequency/switch output" wizard in the "Advanced setup" submenu: "Operating mode" parameter"Switch" option (part 1)



26 "Pulse/frequency/switch output" wizard in the "Advanced setup" submenu: "Operating mode" parameter"Switch" option (part 2)

## Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Operating mode	-	Define the output as a pulse, frequency or switch output.	<ul><li>Pulse</li><li>Frequency</li><li>Switch</li></ul>	Pulse
Switch output function	The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.	Select function for switch output.	<ul> <li>Off</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit</li> <li>Flow direction check</li> <li>Status</li> </ul>	Off
Assign diagnostic behavior	The <b>Diagnostic behavior</b> option is selected in the <b>Switch output function</b> parameter.	Select diagnostic behavior for switch output.	<ul><li>Alarm</li><li>Alarm or warning</li><li>Warning</li></ul>	Alarm

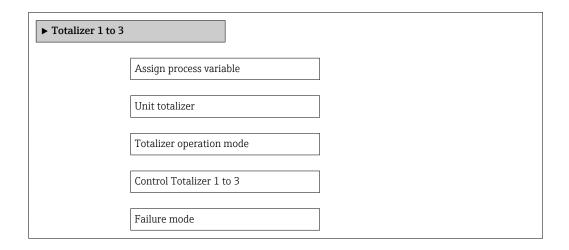
Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Assign limit	In <b>Switch output function</b> parameter, the <b>Limit</b> option is selected.	Select process variable for limit function.	<ul> <li>Volume flow</li> <li>Mass flow</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> </ul>	Volume flow
Assign flow direction check	The Flow direction check option is selected in the Switch output function parameter.	Select process variable for flow direction monitoring.	<ul><li>Volume flow</li><li>Mass flow</li></ul>	Volume flow
Assign status	The <b>Status</b> option is selected in the <b>Switch output function</b> parameter.	Select device status for switch output.	<ul><li>Empty pipe detection</li><li>Low flow cut off</li><li>Digital output 2</li></ul>	Empty pipe detection
Switch-on value	In <b>Switch output function</b> parameter, the <b>Limit</b> option is selected.	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific:  • 0 l/h  • 0 gal/min (us)
Switch-off value	In <b>Switch output function</b> parameter, the <b>Limit</b> option is selected.	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific:  • 0 l/h  • 0 gal/min (us)
Switch-on delay	The <b>Limit</b> option is selected in the <b>Switch output function</b> parameter.	Define delay for the switch-on of status output.	0.0 to 100.0 s	0.0 s
Switch-off delay	The <b>Limit</b> option is selected in the <b>Switch output function</b> parameter.	Define delay for the switch-off of status output.	0.0 to 100.0 s	0.0 s
Failure mode	-	Define output behavior in alarm condition.	<ul><li>Actual status</li><li>Open</li><li>Closed</li></ul>	Open
Invert output signal	-	Invert the output signal.	■ No ■ Yes	No

## 10.6.3 Configuring the totalizer

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

## Navigation

"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Totalizer 1 to 3



## Parameter overview with brief description

Parameter	Prerequsite	Description	Selection	Factory setting
Assign process variable	-	Select process variable for totalizer.	<ul><li>Volume flow</li><li>Mass flow</li></ul>	Volume flow
Unit totalizer	One of the following options is selected in the <b>Assign process</b> variable parameter:  Volume flow Mass flow	Select the unit for the process variable of the totalizer.	Unit choose list	Country-specific:  • m³  • ft³
Control Totalizer 1 to 3	One of the following options is selected in the <b>Assign process</b> variable parameter:  Volume flow Mass flow	Control totalizer value.	<ul><li>Totalize</li><li>Reset + hold</li><li>Preset + hold</li></ul>	Totalize
Totalizer operation mode	One of the following options is selected in the <b>Assign process</b> variable parameter:  Volume flow Mass flow	Select totalizer calculation mode.	<ul> <li>Net flow total</li> <li>Forward flow total</li> <li>Reverse flow total</li> <li>Last valid value</li> </ul>	Net flow total
Failure mode	One of the following options is selected in the <b>Assign process</b> variable parameter:  Volume flow Mass flow	Define the totalizer behavior in the event of a device alarm.	<ul><li>Stop</li><li>Actual value</li><li>Last valid value</li></ul>	Actual value

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## 10.6.4 Carrying out additional display configurations

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

## Navigation

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

► Display		
	Format display	
	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	Prerequsite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	<ul> <li>1 value, max. size</li> <li>1 bargraph + 1 value</li> <li>2 values</li> <li>1 value large + 2 values</li> <li>4 values</li> </ul>	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul> <li>Volume flow</li> <li>Mass flow</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> </ul>	Volume flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  0 1/h  0 gal/min (us)
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Decimal places 1	A measured value is specified in the <b>Value 1 display</b> parameter.	Select the number of decimal places for the display value.	• x • x.x • x.xx • x.xxx	x.xx
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see Value 1 display parameter	None
Decimal places 2	A measured value is specified in the <b>Value 2 display</b> parameter.	Select the number of decimal places for the display value.	• X • X.X • X.XX • X.XXX	x.xx
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see Value 1 display parameter	None
0% bargraph value 3	A selection has been made in the <b>Value 3 display</b> parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  0 l/h 0 gal/min (us)
100% bargraph value 3	An option was selected in the <b>Value 3 display</b> parameter.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Decimal places 3	A measured value is specified in the <b>Value 3 display</b> parameter.	Select the number of decimal places for the display value.	• X • X.X • X.XX • X.XXX • X.XXXX	x.xx
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see Value 1 display parameter	None
Decimal places 4	A measured value is specified in the <b>Value 4 display</b> parameter.	Select the number of decimal places for the display value.	<ul><li>X</li><li>X.X</li><li>X.XX</li><li>X.XXX</li><li>X.XXX</li></ul>	x.xx

English Deutsch * Français * Español * Italiano * Nederlands * Portuguesa * Polski * pycский язык (Russian) * Svenska * Türkçe * 中文 (Chinese) *	English (alternatively, the ordered language is preset in the device)
(Japanese) * 한국어 (Korean) * 한국어 (Korean) * Bahasa Indonesia * ภาษาไทย (Thai) * tiếng Việt (Vietnamese) * čeština (Czech) *	
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) to 999.9 s	0.0 s
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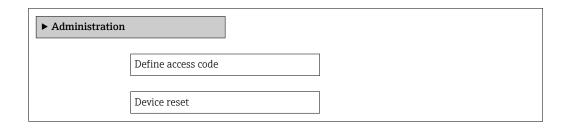
<sup>\*</sup> Visibility depends on order options or device settings

## 10.6.5 Administration configuration

The **Administration** submenu contains administrative parameters.

## Navigation

 $\texttt{"Setup"} \ menu \rightarrow Advanced \ setup \rightarrow Administration$ 



#### Parameter overview with brief description

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

Visibility depends on communication

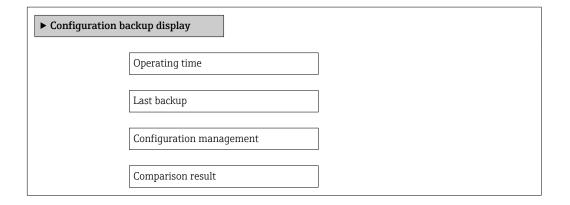
# 10.7 Configuration management

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

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

#### Navigation

"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Configuration backup display



#### Parameter overview with brief description

Parameter	Prerequsite	Description	User interface / Selection	Factory setting
Operating time	-	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)	-
Last backup	A local display is provided.	Indicates when the last data backup was saved to the display module.	Days (d), hours (h), minutes (m) and seconds (s)	_

Parameter	Prerequsite	Description	User interface/ Selection	Factory setting
Configuration management	A local display is provided.	Select action for managing the device data in the display module.	<ul> <li>Cancel</li> <li>Execute backup</li> <li>Restore</li> <li>Duplicate</li> <li>Compare</li> <li>Clear backup data</li> </ul>	Cancel
Comparison result	A local display is provided.	Comparison between present device data and display backup.	<ul> <li>Settings identical</li> <li>Settings not identical</li> <li>No backup available</li> <li>Backup settings corrupt</li> <li>Check not done</li> <li>Dataset incompatible</li> </ul>	Check not done

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

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

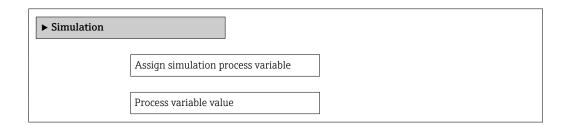
- Integrated HistoROM
  - A HistoROM is a "non-volatile" device memory in the form of an EEPROM.
- While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

## 10.8 Simulation

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

#### Navigation

"Diagnostics" menu  $\rightarrow$  Simulation



Simulation current output 1 to 2  $\,$ 

Value current output 1 to 2

Frequency output simulation

Frequency value

Pulse output simulation

Pulse value

Switch output simulation

Switch status

Simulation device alarm

Diagnostic event category

Diagnostic event simulation

## Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Assign simulation process variable	-	Select a process variable for the simulation process that is activated.	<ul><li> Off</li><li> Volume flow</li><li> Mass flow</li></ul>	Off
Process variable value	One of the following options is selected in the Assign simulation process variable parameter (→ 🖺 92):  Volume flow  Mass flow	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Simulation current output 1 to 2	-		Off On	Off
Value current output 1 to 2	In the Simulation current output 1 to 2 parameter, the On option is selected.		3.59 to 22.5 mA	3.59 mA
Frequency output simulation	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter.	Switch the simulation of the frequency output on and off.	• Off • On	Off
Frequency value	The <b>On</b> option is selected in the <b>Frequency output simulation</b> parameter.	Enter the frequency value for the simulation.	0.0 to 1250.0 Hz	0.0 Hz
Pulse output simulation	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter.	Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter (>  80) defines the pulse width of the pulses output.	<ul><li>Off</li><li>Fixed value</li><li>Down-counting value</li></ul>	Off

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Pulse value	In the <b>Pulse output</b> simulation parameter (→ 🗎 92), the <b>Down-</b> counting value option is selected.	Enter the number of pulses for simulation.	0 to 65 535	0
Switch output simulation	The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.	Switch the simulation of the switch output on and off.	• Off • On	Off
Switch status	The <b>On</b> option is selected in the <b>Switch output simulation</b> parameter (→ 🖺 93).	Select the status of the status output for the simulation.	<ul><li>Open</li><li>Closed</li></ul>	Open
Simulation device alarm	-	Switch the device alarm on and off.	Off On	Off
Diagnostic event category	-	Select a diagnostic event category.	<ul><li>Sensor</li><li>Electronics</li><li>Configuration</li><li>Process</li></ul>	Process
Diagnostic event simulation	-	Select a diagnostic event to simulate this event.	Off     Diagnostic event picklist (depends on the category selected)	Off

## 10.9 Protecting settings from unauthorized access

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

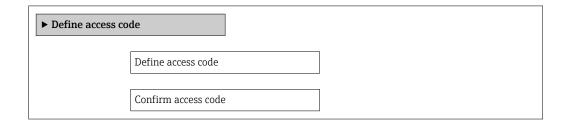
- Write protection via access code
- Write protection via write protection switch
- Write protection via keypad lock  $\rightarrow \triangleq 55$

## 10.9.1 Write protection via access code

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

#### Navigation

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



#### Defining the access code via local display

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

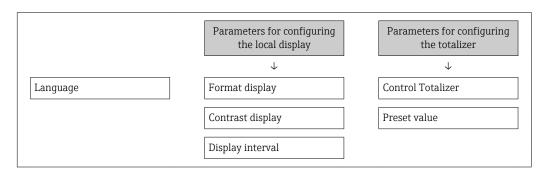
The device automatically locks the write-protected parameters again if a key is not pressed for 10 minutes in the navigation and editing view. The device locks the write-protected parameters automatically after 60 s if the user skips back to the operational display mode from the navigation and editing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



- If write access is activated via access code, it can be also be deactivated only via the access code  $\rightarrow \triangleq 55$ .
- The user role with which the user is currently logged on via the local display → 🗎 55 is indicated by the **Access status display** parameter. Navigation path: "Operation" menu → Access status display

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

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

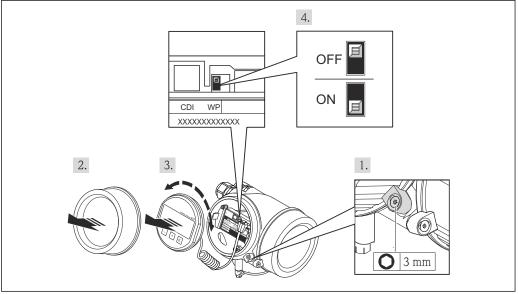


#### 10.9.2 Write protection via write protection switch

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

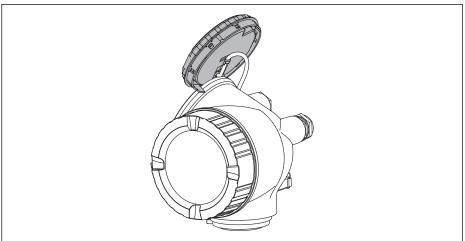
The parameter values are now read only and cannot be edited any more (exception "Contrast display" parameter):

- Via local display
- Via PROFIBUS PA protocol

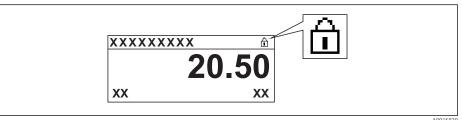


- 1. Loosen the securing clamp.
- 2. Unscrew the electronics compartment cover.

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



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



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

- 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 the device locking status

Device active write protection: Locking status parameter

#### Navigation

"Operation" menu → Locking status

Function scope of the "Locking status" parameter

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

## 11.2 Adjusting the operating language

Information  $\rightarrow \triangleq 67$ 

For information on the operating languages supported by the measuring device  $\rightarrow \stackrel{ riangle}{=} 150$ 

# 11.3 Configuring the display

- Basic settings for local display → 🗎 72

# 11.4 Reading measured values

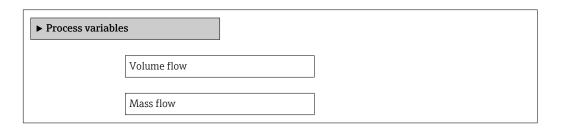
With the **Measured values** submenu, it is possible to read all the measured values.

#### 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  $\rightarrow$  Measured values  $\rightarrow$  Process variables



## Parameter overview with brief description

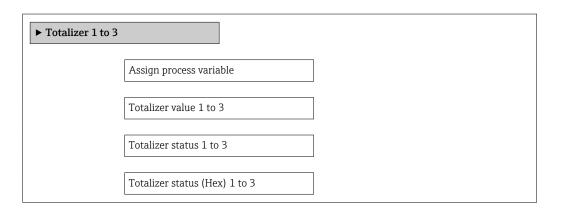
Parameter	Description	User interface
Volume flow	Displays the volume flow currently measured.	Signed floating-point number
	Dependency The unit is taken from the <b>Volume flow unit</b> parameter	
Mass flow	Displays the mass flow currently calculated.	Signed floating-point number
	Dependency The unit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

#### 11.4.2 Totalizer

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

#### Navigation

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Totalizer 1 to 3



## Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry / User interface	Factory setting
Assign process variable	-	Select process variable for totalizer.	<ul><li>Volume flow</li><li>Mass flow</li></ul>	Volume flow
Totalizer value 1 to 3	In the Assign process variable parameter one of the following options is selected:  Volume flow  Mass flow  Corrected volume flow  Total mass flow  Condensate mass flow  Energy flow  Heat flow difference	Displays the current totalizer counter value.	Signed floating-point number	0 m <sup>3</sup>
Totalizer status 1 to 3	-	Displays the current totalizer status.	<ul><li>Good</li><li>Uncertain</li><li>Bad</li></ul>	-
Totalizer status (Hex) 1 to 3	In <b>Target mode</b> parameter, the <b>Auto</b> option is selected.	Displays the current status value (hex) of the totalizer.	0 to 0xFF	-

# 11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu
- Advanced settings using the Advanced setup submenu

# 11.6 Performing a totalizer reset

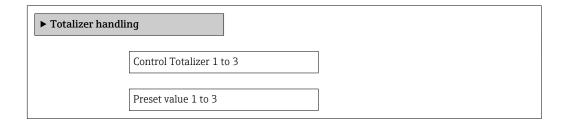
In the **Operation** submenu the totalizers are reset: Control Totalizer

Function scope of the "Control Totalizer" parameter

Options	Description
Totalize	The totalizer is started.
Reset + hold	The totaling process is stopped and the totalizer is reset to 0.
Preset + hold	The totaling process is stopped and the totalizer is set to its defined start value from the <b>Preset value 1 to 3</b> parameter.
Stop totalizing option	Totalizing is stopped.

#### Navigation

"Operation" menu → Operation



#### Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Control Totalizer	One of the following options is selected in the <b>Assign process variable</b> parameter:  Volume flow  Mass flow	Control totalizer value.	<ul><li>Totalize</li><li>Reset + hold</li><li>Preset + hold</li></ul>	Totalize
Preset value	In the Assign process variable parameter one of the following options is selected:  Volume flow  Mass flow  Corrected volume flow  Total mass flow  Condensate mass flow  Energy flow  Heat flow difference	Specify start value for totalizer.	Signed floating-point number	0 m³
Reset all totalizers	-	Reset all totalizers to 0 and start.	<ul><li>Cancel</li><li>Reset + totalize</li></ul>	Cancel

# 11.7 Showing data logging

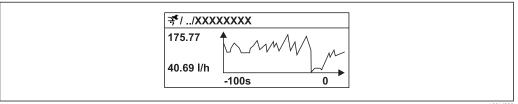
The **Extended HistoROM** application package must be enabled in the device (order option) for the **Data logging** submenu to appear. This contains all the parameters for the measured value history.



The measured value history is also accessible via the FieldCare plant asset management tool  $\rightarrow \triangleq 58$ .

#### **Function scope**

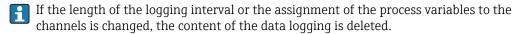
- A total of 1000 measured values can be stored
- 4 logging channels
- Adjustable logging interval for data logging
- Display of the measured value trend for each logging channel in the form of a chart



A0016222

■ 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.



#### **Navigation**

"Diagnostics" menu → Data logging

#### "Data logging" submenu

► Data logging			
Assign channel 1			
Assign channel 2			
Assign channel 3			
Assign channel 4			
Logging interval			
Clear logging data			
▶ Display channel	1		
► Display channel			
7 Display chainier			

► Display channel 3

▶ Display channel 4

## Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Assign channel 1 to 4	The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter.	Assign process variable to logging channel.	<ul> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Electronic temperature</li> <li>Current difference potential</li> </ul>	Off
Logging interval	The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter.	Define the logging interval for data logging. This value defines the time interval between the individual data points in the memory.	1.0 to 3 600.0 s	10.0 s
Clear logging data	The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter.	Clear the entire logging data.	<ul><li>Cancel</li><li>Clear data</li></ul>	Cancel

# 12 Diagnostics and troubleshooting

# 12.1 General troubleshooting

For local display

Problem	Possible causes	Remedy
Local display dark and no output signals	Supply voltage does not match the value indicated on the nameplate.	Apply the correct supply voltage .
Local display dark and no output signals	The polarity of the supply voltage is wrong.	Correct the polarity.
Local display dark and no output signals	No contact between connecting cables and terminals.	Check the connection of the cables and correct if necessary.
Local display dark and no output signals	Terminals are not plugged into the I/O electronics module correctly.	Check terminals.
Local display dark and no output signals	I/O electronics module is defective.	Order spare part → 🖺 130.
Local display is dark, but signal output is within the valid range	Display is set too bright or too dark.	<ul> <li>Set the display brighter by simultaneously pressing ± + E.</li> <li>Set the display darker by simultaneously pressing □+ E.</li> </ul>
Local display is dark, but signal output is within the valid range	The cable of the display module is not plugged in correctly.	Insert the plug correctly into the main electronics module and display module.
Local display is dark, but signal output is within the valid range	Display module is defective.	Order spare part → 🖺 130.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Perform remedial measures → 🖺 110
Text on local display appears in a foreign language and cannot be understood.	Incorrect operating language is configured.	1. Press 2 s □ + ⊕ ("home position"). 2. Press Ē. 3. Set the desired language in the Language parameter.
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	<ul> <li>Check the cable and the connector between the main electronics module and display module.</li> <li>Order spare part →   130.</li> </ul>

## For output signals

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

#### For access

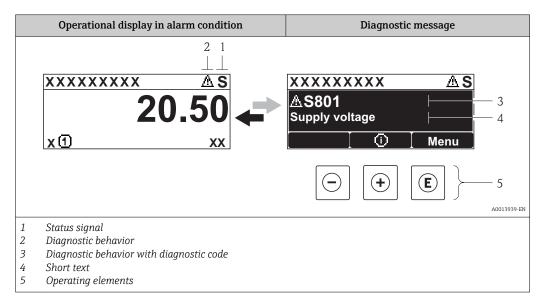
Problem	Possible causes	Remedy	
No write access to parameters	Hardware write protection enabled	Set the write protection switch on the main electronics module to the OFF position .	
No write access to parameters	Current user role has limited access authorization	1. Check user role → 🗎 55. 2. Enter correct customer-specific access code → 🗎 55.	
No connection via service interface	Incorrect configuration of USB interface on PC or driver not installed correctly.	Observe the documentation for the Commubox.  FXA291: Document  "Technical Information"  TI00405C	

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# 12.2 Diagnostic information on local display

## 12.2.1 Diagnostic message

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



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

- Other diagnostic events that have occurred can be called up in the **Diagnostics** menu:

#### Status signals

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

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

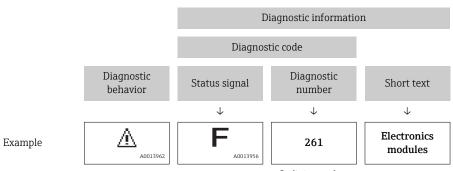
Symbol	Meaning
A0013956	<b>Failure</b> A device error has occurred. The measured value is no longer valid.
<b>C</b>	Function check The device is in service mode (e.g. during a simulation).
<b>S</b>	Out of specification The device is operated: Outside its technical specification limits (e.g. outside the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

#### Diagnostic behavior

Symbol	Meaning
A0013961	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.
A0013962	<b>Warning</b> Measurement is resumed. The signal outputs and totalizers are not affected. A diagnostic message is generated.

## Diagnostic information

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



3-digit number

## **Operating elements**

Key	Meaning
	Plus key
A0013970	In a menu, submenu Opens the message about remedy information.
	Enter key
A0013952	In a menu, submenu Opens the operating menu.

#### XXXXXXXX AS XXXXXXXX **∆S801** Supply voltage x ① 1. **(+)** Diagnostic list $\Delta$ S Diagnostics 1 ∆S801 Supply voltage Diagnostics 2 **Diagnostics 3** 2. (E) Supply voltage (ID:203) -3△ S801 0d00h02m25s Increase supply voltage 3. $| \ominus | + | \oplus |$

## 12.2.2 Calling up remedial measures

A0013940-EN

- 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 ± (i) symbol).
  - **└** The **Diagnostic list** submenu opens.
- 2. Select the desired diagnostic event with  $\pm$  or  $\Box$  and press  $\blacksquare$ .
  - └ The message for the remedial measures for the selected diagnostic event opens.
- 3. Press  $\Box$  +  $\pm$  simultaneously.
  - **→** The message for the remedial measures closes.

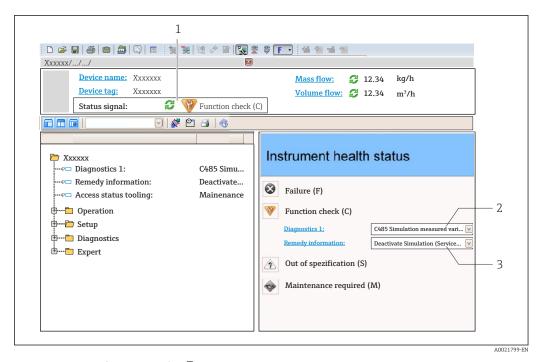
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or the **Previous diagnostics** parameter.

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

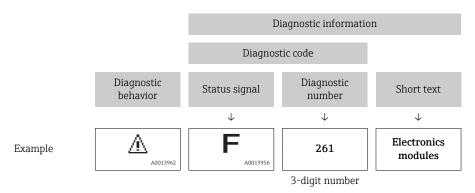


- 2 Diagnostic information  $\rightarrow = 104$
- 3 Remedy information with Service ID
- Furthermore, diagnostic events that have occurred can be viewed in the **Diagnostics** menu:
  - Via parameter → 

    122
  - Via submenu  $\rightarrow \implies 123$

#### 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.

106

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

## 12.4 Adapting the diagnostic information

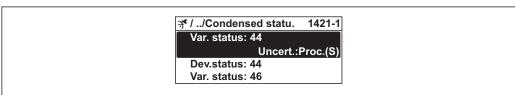
## 12.4.1 Adapting the measured value and device status

#### Measured value status

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

#### Navigation path

"Expert" menu  $\rightarrow$  System  $\rightarrow$  Diagnostic handling  $\rightarrow$  Condensed status  $\rightarrow$ Assign behavior of measured value status xx



A0019175-EN

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

#### **Device status**

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

#### Navigation path

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

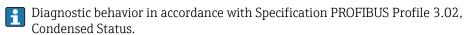
র্গ / ../Condensed statu. 1405-1
Var. status: 44
Dev.status: 44
Inval.proc.cond
Var. status: 46

A0019186-EN

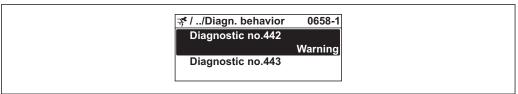
Mnemonic	Octet	Bit
Maintenance required	2	5
Maintenance alarm	3	0
Maintenance demanded	3	1
Function check	3	2
Invalid process conditions	3	3

## 12.4.2 Adapting the diagnostic behavior

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



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



A0019179-EN

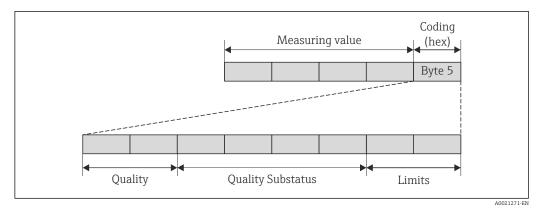
#### Available diagnostic behaviors

The following diagnostic behaviors can be assigned:

Diagnostic behavior	Description
Alarm	Measurement is interrupted. The totalizers assume the defined alarm condition. A diagnostic message is generated. For local display with touch control: the background lighting changes to red.
Warning	Measurement is resumed. Measured value output via PROFIBUS and totalizers are not affected. A 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.

## Displaying the measured value status

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



■ 29 Structure of the coding byte

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

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

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

The diagnostic information is grouped as follows:

- Diagnostic information pertaining to the sensor: diagnostic number 000 to 199  $\rightarrow$  🗎 109
- Diagnostic information pertaining to the electronics: diagnostic number 200 to 399  $\rightarrow$   $\stackrel{ riangle}{=}$  110
- Diagnostic information pertaining to the configuration: diagnostic number 400 to 599  $\rightarrow$   $\stackrel{ o}{=}$  110
- $\blacksquare$  Diagnostic information pertaining to the process: diagnostic number 800 to 999  $\rightarrow \; \trianglerighteq \; 110$

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

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

Diagnostis hohovion	Measured value status (fixed assignment)				Doving diagnostics
Diagnostic behavior (configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	Device diagnostics (fixed assignment)
Alarm	BAD	Maintenance alarm	0x24 to 0x27	F (Failure)	Maintenance alarm
Warning	GOOD	Maintenance demanded	0xA8 to 0xAB	M (Maintenance)	Maintenance demanded
Logbook entry only	GOOD	ok	0x80 to 0x8E	_	_
Off	GOOD	ok	UX8U to UX8E	_	_

<i>Diagnostic information</i>	pertaining to	the electronics	(diagnostic no	: 200 to 399)

Diagnostis habarian	Measured value status (fixed assignment)				Device dia succetica
Diagnostic behavior (configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	Device diagnostics (fixed assignment)
Alarm	BAD	Maintenance	0x24 to 0x27	F	Maintenance
Warning	BAD	alarm	0.24 (0.0.27	(Failure)	alarm
Logbook entry only	COOD	,	0.004.0.05		
Off	GOOD	ok	0x80 to 0x8E	_	_

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

Diagnostic hohovion	Measured value status (fixed assignment)				Device dia amentica
Diagnostic behavior (configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	Device diagnostics (fixed assignment)
Alarm	BAD	Process related	0x28 to 0x2B	F (Failure)	Invalid process condition
Warning	UNCERTA IN	Process related	0x78 to 0x7B	S (Out of specification)	Invalid process condition
Logbook entry only	GOOD	ok	0x80 to 0x8E	_	_
Off	GOOD	אס מסטיב	UXOU IO UXBE	_	_

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

Diagnostis hohovion	M	leasured value st	Device dia succetica		
Diagnostic behavior (configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	Device diagnostics (fixed assignment)
Alarm	BAD	Process related	0x28 to 0x2B	F (Failure)	Invalid process condition
Warning	UNCERTA IN	Process related	0x78 to 0x7B	S (Out of specification)	Invalid process condition
Logbook entry only	GOOD	ok	0x80 to 0x8E	_	_
Off	GOOD	UK	OXOU TO OXOE	_	_

# 12.5 Overview of diagnostic information

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

# 12.5.1 Diagnostic of sensor

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	SI	hort text		variables
004	Sensor		1. Change sensor	■ Empty pipe detection
	Measuring variable status [fr	rom the factory] 1)	Mass flow	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Uncertain		Switch output status     Volume flow
	Quality substatus	Process related		- Volume now
	Coding (hex) 0x78 to 0x7B			
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	SI	hort text		variables
082	Data storage		1. Change main electronic module	Empty pipe detection
	Measuring variable status		2. Change sensor	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		- volume now
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	S	hort text		variables
083	Memory content  Measuring variable status		1. Restart device	<ul><li>Empty pipe detection</li><li>Low flow cut off</li><li>Mass flow</li></ul>
			2. Restore S-Dat data 3. Change sensor	
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		- volume now
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

# 12.5.2 Diagnostic of electronic

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	SI	hort text		variables
222	Electronic drift		Change main electronic module	Empty pipe detection
	Measuring variable status			<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex) 0x24 to 0x27			
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	Short text			variables
242	Software incompatible  Measuring variable status		1. Check software	<ul><li>Empty pipe detection</li><li>Low flow cut off</li><li>Mass flow</li></ul>
			Flash or change main electronics     module	
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		- volume now
	Coding (hex)	0x24 to 0x27		
	Status signal F			
	Diagnostic behavior	Alarm		

	Diagnostic i	information	Remedy instructions	Influenced measuring
No.	SI	hort text		variables
252	Modules incompatible		1. Check electronic modules	<ul> <li>Empty pipe detection</li> <li>Low flow cut off</li> <li>Mass flow</li> <li>Switch output status</li> <li>Volume flow</li> </ul>
	Measuring variable status		2. Change I/O or main electronic module	
	Quality	Bad		
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic i	information	Remedy instructions	Influenced measuring
No.	SI	hort text		variables
261	Electronic modules		1. Restart device	■ Empty pipe detection
	Measuring variable status		Check electronic modules     Change I/O Modul or main electronics	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		- volume now
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	Short text			variables
262			1. Check module connections	Empty pipe detection
	Measuring variable status		2. Change electronic modules	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	Short text			variables
270	Main electronic failure  Measuring variable status		Change main electronic module	■ Empty pipe detection
				<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li> Switch output status</li><li> Status</li><li> Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	Short text			variables
271	Main electronic failure		1. Restart device	■ Empty pipe detection
	Measuring variable status		■ Mass flow	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	Short text			variables
272	Main electronic failure		1. Restart device	Empty pipe detection
	Measuring variable status		2. Contact service	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	SI	hort text		variables
273			1. Emergency operation via display	■ Empty pipe detection
	Measuring variable status		2. Change main electronics	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	Short text			variables
275	5 I/O module failure  Measuring variable status		Change I/O module	Empty pipe detection
				<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	<b>Diagnostic</b>	information	Remedy instructions	Influenced measuring
No.	SI	hort text		variables
276	I/O module failure		1. Restart device	Empty pipe detection
	Measuring variable status		2. Change I/O module  ■ Low flow cut off  ■ Mass flow  ■ Switch output status  ■ Volume flow	
	Quality	Bad		*
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	Short text			variables
282	2 Data storage		1. Restart device	Empty pipe detection
	Measuring variable status		2. Contact service	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	. Short text			variables
283	Memory content	1. Transfer data or reset device	Empty pipe detection	
	Measuring variable status		2. Contact service	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	. Short text			variables
302	Device verification active		Device verification active, please wait.	■ Empty pipe detection
	Measuring variable status			<ul><li>Mass flow</li><li>Switch output status</li></ul>
	Quality	Good		<ul><li>Status</li><li>Volume flow</li></ul>
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	Short text			variables
311	Electronic failure		1. Transfer data or reset device	■ Empty pipe detection
	Measuring variable status		2. Contact service  Low flow cut off  Mass flow  Switch output status  Volume flow	
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	Short text			variables
311			Maintenance required!	Empty pipe detection
	Measuring variable status		Do not perform reset     Contact service	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	M		
	Diagnostic behavior	Warning		

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	SI	hort text		variables
323	323 Electronic drift		1. Perform verification manually	-
	Measuring variable status		2. Change electronic	
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Alarm		

# 12.5.3 Diagnostic of configuration

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	Short text			variables
410	Data transfer		1. Check connection	■ Empty pipe detection
	Measuring variable status	2. Retry data transfer	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>	
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	Short text			variables
411	Up-/download active		Up-/download active, please wait	■ Empty pipe detection
	Measuring variable status			<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Function check		
	Coding (hex)	0x3C to 0x3F		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	Short text			variables
412	2 Processing Download		Download active, please wait	■ Empty pipe detection
	Measuring variable status			<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Uncertain		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Initial value		
	Coding (hex)	0x4C to 0x4F		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	Short text			variables
437	Configuration incompatible		1. Restart device	Empty pipe detection
	Measuring variable status		2. Contact service	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	Short text			variables
438	Dataset		1. Check data set file	Empty pipe detection
	Measuring variable status		Check device configuration     Up- and download new configuration	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Uncertain		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Maintenance demanded		
	Coding (hex)	0x68 to 0x6B		
	Status signal	M		
	Diagnostic behavior	Warning		

	Diagnostic i	information	Remedy instructions	Influenced measuring
No.	SI	hort text		variables
442	2 Frequency output		1. Check process	_
	Measuring variable status [from the factory] 1)	2. Check frequency output settings		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	SI	hort text		variables
443	Pulse output		1. Check process	-
	Measuring variable status [from the factory] 1)	2. Check pulse output settings		
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	S	hort text		variables
453	Flow override		Deactivate flow override	Empty pipe detection
	Measuring variable status			<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Good		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Function check		- volume now
	Coding (hex)	0xBC to 0xBF		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	Short text			variables
482	FB not Auto/Cas		Set Block in AUTO mode	-
	Measuring variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Alarm		

	<b>Diagnostic</b>	information	Remedy instructions	Influenced measuring
No.	. Short text			variables
484	Simulation failure mode  Measuring variable status		Deactivate simulation	Empty pipe detection
				<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Function check		
	Coding (hex)	0x3C to 0x3F		
	Status signal	С		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	Short text			variables
485	Simulation measured variable		Deactivate simulation	Empty pipe detection
	Measuring variable status			<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Good		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	o. Short text			variables
492	Simulation frequency output		Deactivate simulation frequency output	Empty pipe detection
	Measuring variable status			<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Good		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	o. Short text			variables
493	Simulation pulse output		Deactivate simulation pulse output	■ Empty pipe detection
	Measuring variable status			<ul><li>Low flow cut off</li><li>Mass flow</li><li>Switch output status</li><li>Volume flow</li></ul>
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	o. Short text			variables
494	Switch output simulation		Deactivate simulation switch output	■ Empty pipe detection
	Measuring variable status			<ul><li>Low flow cut off</li><li>Mass flow</li><li>Switch output status</li><li>Volume flow</li></ul>
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	. Short text			variables
495	Diagnostic event simulation		Deactivate simulation	-
	Measuring variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	. Short text			variables
497	Simulation block output		Deactivate simulation	-
	Measuring variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	Short text			variables
531	Empty pipe detection		Execute EPD adjustment	Empty pipe detection
	Measuring variable status [from the factory] 1)		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>	
	Quality	Uncertain		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Process related		- volume now
	Coding (hex)	0x78 to 0x7B		
	Status signal	S		
	Diagnostic behavior	Warning		

<sup>1)</sup> Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

## 12.5.4 Diagnostic of process

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	S	hort text		variables
801	Supply voltage too low  Measuring variable status [from the factory] 1)		Increase supply voltage	Empty pipe detection
				<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Uncertain		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Process related		
	Coding (hex)	0x78 to 0x7B		
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	Short text			variables
832	Electronic temperature too high		Reduce ambient temperature	■ Empty pipe detection
	Measuring variable status [fi	rom the factory] 1)		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Uncertain		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Process related		- volume now
	Coding (hex)	0x78 to 0x7B		
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

120

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	o. Short text			variables
833	Electronic temperature too low		Increase ambient temperature	■ Empty pipe detection
	Measuring variable status [fr	rom the factory] 1)		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Uncertain		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Process related		- volume now
	Coding (hex)	0x78 to 0x7B		
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

	Diagnostic information		Remedy instructions	Influenced measuring
No.	Short text			variables
842	2 Process limit		Low flow cut off active!	■ Empty pipe detection
	Measuring variable status		Check low flow cut off configuration	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Good		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Ok		- volume now
	Coding (hex)	0x80 to 0x83		
	Status signal	S		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measuring
No.	SI	hort text		variables
861	1 Process fluid		Check process conditions	■ Empty pipe detection
	Measuring variable status [fr	com the factory] 1)		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Process related		- volume now
	Coding (hex)	0x28 to 0x2B		
	Status signal	F		
	Diagnostic behavior	Alarm		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

	Diagnostic information		Remedy instructions	Influenced measuring
No.	SI	nort text		variables
862	Empty pipe		1. Check for gas in process	■ Empty pipe detection
	Measuring variable status [fr	om the factory] 1)	2. Adjust empty pipe detection	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Uncertain		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Process related		
	Coding (hex)	0x78 to 0x7B		
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	Short text			variables
937	EMC interference  Measuring variable status [from the factory] 1)		■ Lov	■ Empty pipe detection
				<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Uncertain		<ul><li>Switch output status</li><li>Volume flow</li></ul>
	Quality substatus	Process related		
	Coding (hex)	0x78 to 0x7B		
	Status signal	S		
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

	Diagnostic	information	Remedy instructions	Influenced measuring
No.	o. Short text			variables
937	EMC interference  Measuring variable status [from the factory] 1)		Change main electronic module	<ul><li>Empty pipe detection</li><li>Mass flow</li><li>Switch output status</li></ul>
	Quality	Uncertain		<ul> <li>Volume flow</li> </ul>
	Quality substatus	Process related		
	Coding (hex) 0x78 to 0x7B  Status signal S			
	Diagnostic behavior	Warning		

1) Diagnostic behavior can be changed. This causes the overall status of the measured variable to change.

# 12.6 Pending diagnostic events

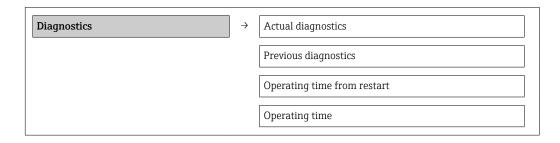
The **Diagnostics** menu allows the user to view the current diagnostic event and the previous diagnostic event separately.

- To call up the measures to rectify a diagnostic event:
  - Via local display → 🖺 105
  - Via "FieldCare" operating tool → 🖺 106
- Other pending diagnostic events can be displayed in the **Diagnostic list** submenu  $\rightarrow \ \ \cong \ 123$

#### Navigation

"Diagnostics" menu

#### Structure of the submenu



### Parameter overview with brief description

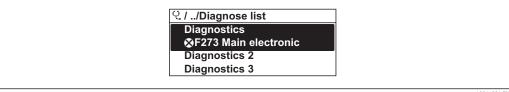
Parameter	Prerequsite	Description	User interface
Actual diagnostics	A diagnostic event has occurred.	Shows the current occured diagnostic event along with its diagnostic information.	Symbol for diagnostic behavior, diagnostic code and short message.
		If two or more messages occur simultaneously, the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

#### 12.7 Diagnostic list

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

 $\textbf{Diagnostics} \ menu \rightarrow \textbf{Diagnostic list} \ submenu$ 



A0014006-EN

**■** 30 Illustrated using the example of the local display

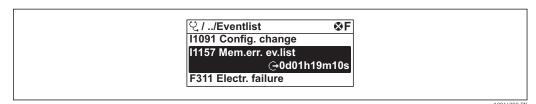


To call up the measures to rectify a diagnostic event:

- Via local display → 🖺 105
- Via "FieldCare" operating tool → 🗎 106

## 12.8 Event logbook

### 12.8.1 Event history



■ 31 Taking the example of the local display

To call up the measures to rectify a diagnostic event:

- Via local display → 

  105
- Via "FieldCare" operating tool → 🖺 106
- For filtering the displayed event messages  $\rightarrow \triangleq 124$

### 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  $\rightarrow$  Event logbook  $\rightarrow$  Filter options

### Filter categories

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

### 12.8.3 Overview of information events

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

Info number	Info name	
I1000	(Device ok)	
I1079	Sensor changed	
I1089	Power on	
I1090	Configuration reset	
I1091	Configuration changed	
I1092	Trend data deleted	
I1110	Write protection switch changed	
I1137	Electronic changed	
I1151	History reset	
I1154	Reset terminal voltage min/max	
I1155	Reset electronic temperature	
I1156	Memory error trend	
I1157	Memory error event list	

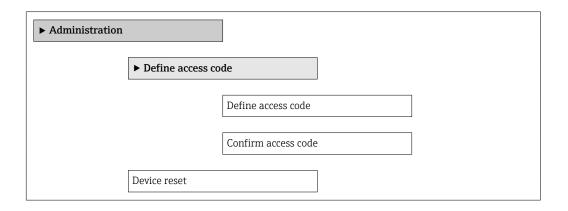
Info number	Info name	
I1185	Display backup done	
I1186	Restore via display done	
I1187	Settings downloaded with display	
I1188	Display data cleared	
I1189	Backup compared	
I1227	Sensor emergency mode activated	
I1228	Sensor emergency mode failed	
I1256	Display: access status changed	
I1264	Safety sequence aborted	
I1335	Firmware changed	
I1351	Empty pipe detection adjustment failure	
I1353	Empty pipe detection adjustment ok	
I1397	Fieldbus: access status changed	
I1398	CDI: access status changed	
I1440	Main electronic module changed	
I1442	I/O module changed	
I1444	Device verification passed	
I1445	Device verification failed	
I1459	Failed: I/O module verification	
I1461	Failed: Sensor verification	
I1512	Download started	
I1513	Download finished	
I1514	Upload started	
I1515	Upload finished	
I1552	Failed: Main electronic verification	
I1554	Safety sequence started	
I1555	Safety sequence confirmed	
I1556	Safety mode off	

# 12.9 Resetting the measuring device

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

### **Navigation**

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



### Parameter overview with brief description

Parameter	Description	Selection	Factory setting
	Reset the device configuration - either entirely or in part - to a defined state.	<ul> <li>Cancel</li> <li>To fieldbus defaults</li> <li>To factory defaults</li> <li>To delivery settings</li> <li>Restart device</li> </ul>	Cancel

Visibility depends on communication

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

Options	Description	
Cancel	No action is executed and the user exits the parameter.	
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting.	
Restart device	The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.	
History reset	Every parameter is reset to the 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

<b>▶</b> Device information			
Device tag			
Serial number			

Firmware version	
Device name	
Order code	
Extended order code 1	
Extended order code 2	
Extended order code 3	
ENP version	

## Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Device tag	Display the name for the measuring point.	Max. 32 characters such as letters, numbers or special characters (e.g. @, %, /)	Promag 200 PA
Serial number	Shows the serial number of the measuring device.	A maximum of 11-digit character string comprising letters and numbers.	-
Firmware version	Shows the device firmware version installed.	Character string with the following format: xx.yy.zz	01.01.zz
Device name			-
Order code	Shows the device order code.  The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field.	Character string composed of letters, numbers and certain punctuation marks (e.g. /).	_
Extended order code 1	Shows the 1st part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-
Extended order code 2	Shows the 2nd part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-
Extended order code 3	Shows the 3rd part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-
ENP version	Shows the version of the electronic nameplate (ENP).		2.02.00

Parameter	Description	User interface	Factory setting
PROFIBUS ident number	Displays the PROFIBUS identification number.	0 to FFFF	0x1563
Status PROFIBUS Master Config	Displays the status of the PROFIBUS Master configuration.	<ul><li>Active</li><li>Not active</li></ul>	Not active

# 12.11 Firmware history

Release date	Firmwar e version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
06.2015	01.00.zz	Option <b>77</b>	Original firmware	Operating Instructions	BA01376D/06/EN/ 01.15

- Flashing the firmware to the current version or to the previous version is possible via the service interface (CDI) .
- For the compatibility of the firmware version with the previous version, the installed device description files and operating tools, observe the information about the device in the "Manufacturer's information" document.
- The manufacturer's information is available:
  - $\blacksquare$  In the Download Area of the Endress+Hauser Internet site: www.endress.com  $\to$  Download
  - Specify the following details:
    - Text search: Manufacturer's information
    - Search range: documentation

### 13 Maintenance

### 13.1 Maintenance tasks

No special maintenance work is required.

### 13.1.1 Exterior cleaning

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

### 13.1.2 Interior cleaning

No interior cleaning is planned for the device.

### 13.1.3 Replacing seals

The sensor's seals (particularly aseptic molded seals) must be replaced periodically.

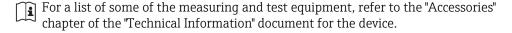
The interval between changes depends on the frequency of the cleaning cycles, the cleaning temperature and the medium temperature.

Replacement seals (accessory)  $\rightarrow \blacksquare 152$ 

# 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.



### 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.

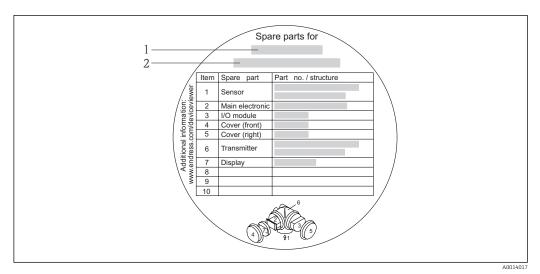
# 14.2 Spare parts

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.

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■ 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.

### 14.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

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

### 14.4 Return

The measuring device must be returned if it is need of repair or a factory calibration, or if the wrong measuring device has been delivered or ordered. Legal specifications require Endress+Hauser, as an ISO-certified company, to follow certain procedures when handling products that are in contact with the medium.

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

# 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
Remote display FHX50	FHX50 housing to accommodate a display module → ■ 149.  FHX50 housing suitable for:  SD02 display module (push buttons)  SD03 display module (touch control)  Housing material:  Plastic PBT  Stainless steel CF-3M (316L, 1.4404)  Length of connecting cable: up to max. 60 m (196 ft) (cable lengths available for order: 5 m (16 ft), 10 m (32 ft), 20 m (65 ft), 30 m (98 ft))
	The measuring device can be ordered with the FHX50 housing and a display module. The following options must be selected in the separate order codes:  Order code for measuring device, feature 030: Option L or M "Prepared for FHX50 display"  Order code for FHX50 housing, feature 050 (device version): Option A "Prepared for FHX50 display"  Order code for FHX50 housing, depends on the desired display module in feature 020 (display, operation): Option C: for an SD02 display module (push buttons) Option E: for an SD03 display module (touch control)
	The FHX50 housing can also be ordered as a retrofit kit. The measuring device display module is used in the FHX50 housing. The following options must be selected in the order code for the FHX50 housing:  Feature 050 (measuring device version): option B "Not prepared for FHX50 display"  Feature 020 (display, operation): option A "None, existing displayed used"  For details, see Special Documentation SD01007F
Overvoltage protection for 2-wire devices	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.  OVP10: For 1-channel devices (characteristic 020, option A): OVP20: For 2-channel devices (characteristic 020, options B, C, E or G) For details, see Special Documentation SD01090F.
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
Ground cable	Set, consisting of two ground cables for potential equalization.

### 15.1.2 For the sensor

Accessories	Description
Ground disks	Are used to ground the fluid in lined measuring tubes to ensure proper measurement.
	For details, see Installation Instructions EA00070D

# 15.2 Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices:  Calculation of all the data needed to determine the optimum flowmeter: e.g. nominal diameter, pressure drop, performance characteristics or process connections.  Graphic illustration of the calculation results
	Administration, documentation and access to all project-related data and parameters throughout the entire life cycle of a project.
	Applicator is available:  • Via the Internet: https://wapps.endress.com/applicator  • On CD-ROM for local PC installation.
W@M	Life cycle management for your plant 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 information is available for every measuring device over time entire life cycle, such as the device status, spare parts, device-specific documentation, etc. The application already contains the data of your Endress+Hauser device. Endress +Hauser also takes care of maintaining and updating the data records.  W@M is available:  Via the Internet: www.endress.com/lifecyclemanagement  On CD-ROM for local PC installation.
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.
	For details, see Operating Instructions BA00027S and BA00059S

# 15.3 System components

Accessories	Description
Memograph M graphic display recorder	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.
	For details, see "Technical Information" TI00133R and Operating Instructions BA00247R

### 16 Technical data

# 16.1 Application

The measuring device is only suitable for flow measurement of liquids with a minimum conductivity of 20  $\mu\text{S}/\text{cm}.$ 

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

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

### 16.2 Function and system design

Measuring principle

Electromagnetic flow measurement on the basis of Faraday's law of magnetic induction.

Measuring system

The device consists of a transmitter and a sensor.

The device is available as a compact version:

The transmitter and sensor form a mechanical unit.

For information on the structure of the measuring device  $\rightarrow = 12$ 

# **16.3** Input

Measured variable

#### Direct measured variables

Volume flow (proportional to induced voltage)

#### Calculated measured variables

Mass flow

Measuring range

Typically v = 0.01 to 10 m/s (0.03 to 33 ft/s) with the specified accuracy

Flow characteristic values in SI units

Nominal diameter		Recommended flow	Factory settings		
		Min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[dm³/min]	[dm³/min]	[dm³]	[dm³/min]
15	1/2	4 to 100	25	0,2	0,5
25	1	9 to 300	75	0,5	1
32	-	15 to 500	125	1	2
40	1 ½	25 to 700	200	1,5	3
50	2	35 to 1100	300	2,5	5
65	-	60 to 2 000	500	5	8
80	3	90 to 3 000	750	5	12

Nominal Recommended diameter flow		Recommended flow	Factory settings			
		Min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)	
[mm]	[in]	[dm³/min]	[dm³/min]	[dm³]	[dm³/min]	
100	4	145 to 4700	1200	10	20	
125	-	220 to 7500	1850	15	30	
150	6	20 to 600 m <sup>3</sup> /h	150 m <sup>3</sup> /h	0.03 m <sup>3</sup>	2.5 m <sup>3</sup> /h	
200	8	35 to 1100 m <sup>3</sup> /h	300 m <sup>3</sup> /h	0.05 m <sup>3</sup>	5 m <sup>3</sup> /h	

### Flow characteristic values in US units

Nominal diameter		Recommended flow	Factory settings		
		Min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/min]
1/2	15	1.0 to 27	6	0,1	0,15
1	25	2.5 to 80	18	0,2	0,25
1 ½	40	7 to 190	50	0,5	0,75
2	50	10 to 300	75	0,5	1,25
3	80	24 to 800	200	2	2,5
4	100	40 to 1250	300	2	4
6	150	90 to 2 650	600	5	12
8	200	155 to 4850	1200	10	15

### Recommended measuring range

"Flow limit" section  $\rightarrow$   $\ \ \,$  144

Operable flow range

Over 1000:1

# 16.4 Output

## Output signal Pulse/frequency/switch output

Function	Can be set to pulse, frequency or switch output
Version	Passive, open collector
Maximum input values	■ DC 35 V ■ 50 mA
Voltage drop	■ 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

Pulse value	Adjustable
Assignable measured variables	<ul><li>Volume flow</li><li>Mass flow</li></ul>
Frequency output	
Output frequency	Adjustable: 0 to 1000 Hz
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul><li>Volume flow</li><li>Mass flow</li></ul>
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Adjustable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	<ul> <li>Off</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit value  <ul> <li>Volume flow</li> <li>Mass flow</li> </ul> </li> <li>Flow direction monitoring</li> <li>Status  <ul> <li>Empty pipe detection</li> <li>Low flow cut off</li> </ul> </li> </ul>

### PROFIBUS PA

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

## Signal on alarm

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

### Pulse/frequency/switch output

### Pulse output

### Frequency output

Failure mode	Choose from:
	<ul> <li>Actual value</li> </ul>
	■ 0 Hz
	■ Defined value: 0 to 1250 Hz

### Switch output

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

### **PROFIBUS PA**

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

### Local display

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



Status signal as per NAMUR recommendation NE 107

### Operating tool

- Via digital communication: PROFIBUS PA
- Via service interface

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

Low flow cut off

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

Galvanic isolation

All outputs are galvanically isolated from one another.

### Protocol-specific data

### **PROFIBUS PA**

Manufacturer ID	0x11
Ident number	0x1563
Profile version	3.02
Device description files (GSD, DTM, DD)	Information and files under:  www.endress.com www.profibus.org
Output values (from measuring device to automation system)	Analog input 1 to 2  • Mass flow • Volume flow
	Digital input 1 to 2  Empty pipe detection  Low flow cut off  Status switch output  Status verification
	Totalizer 1 to 3  Mass flow Volume flow Corrected volume flow

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Input values (from automation system to measuring device)	Digital output 1 to 3 (fixed assignment)  Digital output 1: switch positive zero return on/off Digital output 2: switch switch output on/off Digital output 3: start verification
	Totalizer 1 to 3  ■ Totalize  ■ Reset and hold  ■ Preset and hold  ■ Operating mode configuration:  - Net flow total  - Forward flow total  - Reverse flow total
Supported functions	<ul> <li>Identification &amp; Maintenance         Simplest device identification on the part of the control system and         nameplate</li> <li>PROFIBUS upload/download         Reading and writing parameters is up to ten times faster with PROFIBUS         upload/download</li> <li>Condensed status         Simplest and self-explanatory diagnostic information by categorizing         diagnostic messages that occur</li> </ul>
Configuration of the device address	<ul> <li>DIP switches on the I/O electronics module</li> <li>Local display</li> <li>via operating tools (e.g. FieldCare)</li> </ul>

# 16.5 Power supply

Terminal assignment	→ 🖺 32
Pin assignment, device plug	→ 🗎 32

### Supply voltage

#### Transmitter

An external power supply is required for each output.

The following supply voltage values apply for the outputs available:

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

### Power consumption

### Transmitter

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

# Current consumption PROFIBUS PA

16 mA

### Power supply failure

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

Electrical connection	→ 🗎 34
Potential equalization	→ 🖺 36
Terminals	<ul> <li>For device version without integrated overvoltage protection: plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm<sup>2</sup> (20 to 14 AWG)</li> <li>For device version with integrated overvoltage protection: screw terminals for wire cross-sections 0.2 to 2.5 mm<sup>2</sup> (24 to 14 AWG)</li> </ul>
Cable entries	<ul> <li>Cable gland: M20 × 1.5 with cable \$\phi 6\$ to 12 mm (0.24 to 0.47 in)</li> <li>Thread for cable entry: <ul> <li>NPT ½"</li> <li>G ½"</li> </ul> </li> </ul>
Cable specification	→ 🖺 29

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

### 16.6 Performance characteristics

# Reference operating conditions

#### In accordance with DIN EN 29104

- Water, typically 15 to 45 °C (59 to 113 °F); 2 to 6 bar (29 to 87 psi)
- Data as indicated in the calibration protocol  $\pm 5$  °C ( $\pm 41$  °F) and  $\pm 2$  bar ( $\pm 29$  psi)
- Accuracy based on accredited calibration rigs traced to ISO 17025
- Medium temperature:  $+28 \pm 2$  °C ( $+82 \pm 4$  °F)
- Ambient temperature:  $+22 \pm 2$  °C ( $+72 \pm 4$  °F)
- Warm-up period: 30 min

### Installation

- Inlet run > 10 × DN
- Outlet run  $> 5 \times DN$
- Sensor and transmitter grounded.
- The sensor is centered in the pipe.

#### Maximum measured error

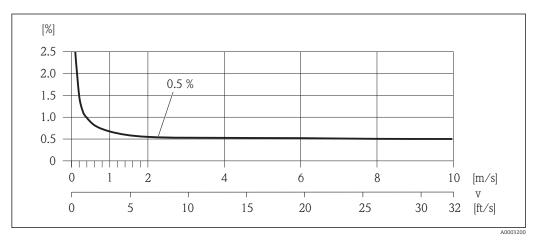
### Error limits under reference operating conditions

o.r. = of reading

#### Volume flow

 $\pm 0.5$  % o.r.  $\pm 2$  mm/s (0.08 in/s)

Fluctuations in the supply voltage do not have any effect within the specified range.



■ 33 Maximum measured error in % o.r.

### Accuracy of outputs

The outputs have the following base accuracy specifications.

Pulse/frequency output

o.r. = of reading

Accuracy	Max. ±100 ppm o.r.
----------	--------------------

### Repeatability

o.r. = of reading

#### Volume flow

Max.  $\pm 0.2$  % o.r.  $\pm 2$  mm/s (0.08 in/s)

### Influence of ambient temperature

### Pulse/frequency output

o.r. = of reading

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

#### 16.7 Installation

#### 16.8 **Environment**

Ambient temperature range

→ 🖺 21

#### Temperature tables

i

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



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

#### Storage temperature

The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors.

- Protect the measuring device against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Select a storage location where moisture cannot collect in the measuring device as fungus or bacteria infestation can damage the liner.
- If protection caps or protective covers are mounted these should never be removed before installing the measuring device.

#### Degree of protection

#### **Transmitter**

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

#### Sensor

IP66/67, type 4X enclosure

#### Connector

IP67, only in screwed situation

As per IEC/EN 60068-2-31

#### Vibration resistance

Acceleration up to 2 g, according to IEC 60068-2-6

#### Mechanical load

- Protect the transmitter housing against mechanical effects, such as shock or impact.
- Never use the transmitter housing as a ladder or climbing aid.

# Electromagnetic compatibility (EMC)

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

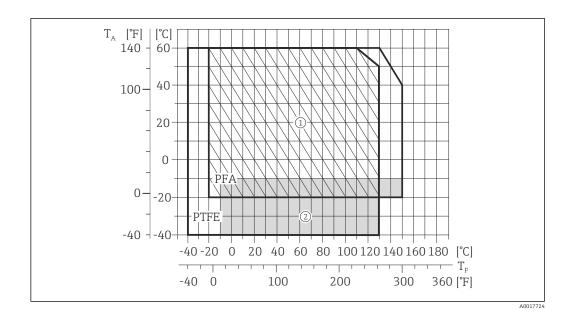


For details, refer to the Declaration of Conformity.

### 16.9 Process

#### Medium temperature range

- $-20 \text{ to } +150 \,^{\circ}\text{C} \, (-4 \text{ to } +302 \,^{\circ}\text{F}) \text{ for PFA}$
- $\bullet$  -40 to +130 °C (-40 to +266 °F) for PTFE



- T<sub>A</sub> Ambient temperature
- T<sub>F</sub> Medium temperature
- 1 Hatched area: harsh environment only up to +130  $^{\circ}$ C (+266  $^{\circ}$ F)
- 2 Gray area: the ambient and fluid temperature range of -10 to -40 °C (-14 to -40 °F) applies to stainless flanges only

### Conductivity

### $\geq 20~\mu S/cm$ for liquids in general

# Pressure-temperature ratings

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

Pressure tightness

"-" = no specifications possible

Liner: PFA

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures:			
[mm]	[in]	+25 ℃ (+77 ℉)	+80 °C (+176 °F)	+100 to +180 °C (+212 to +356 °F)	
25	1	0 (0)	0 (0)	0 (0)	
32	-	0 (0)	0 (0)	0 (0)	
40	1 ½	0 (0)	0 (0)	0 (0)	
50	2	0 (0)	0 (0)	0 (0)	
65	-	0 (0)	-	0 (0)	
80	3	0 (0)	-	0 (0)	
100	4	0 (0)	-	0 (0)	
125	-	0 (0)	-	0 (0)	
150	6	0 (0)	-	0 (0)	
200	8	0 (0)	-	0 (0)	

Liner: PTFE

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures:				
[mm]	[in]	+25 °C (+77 °F)	+80 °C (+176 °F)	+100 °C (+212 °F)	+130 °C (+266 °F)	
15	1/2	0 (0)	0 (0)	0 (0)	100 (1.45)	
25	1	0 (0)	0 (0)	0 (0)	100 (1.45)	
32	_	0 (0)	0 (0)	0 (0)	100 (1.45)	
40	1 ½	0 (0)	0 (0)	0 (0)	100 (1.45)	
50	2	0 (0)	0 (0)	0 (0)	100 (1.45)	
65	_	0 (0)	-	40 (0.58)	130 (1.89)	
80	3	0 (0)	-	40 (0.58)	130 (1.89)	
100	4	0 (0)	-	135 (1.96)	170 (2.47)	
125	-	135 (1.96)	-	240 (3.48)	385 (5.58)	
150	6	135 (1.96)	-	240 (3.48)	385 (5.58)	
200	8	200 (2.90)	-	290 (4.21)	410 (5.95)	

#### Flow limit

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 to 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the fluid:

- v < 2 m/s (6.56 ft/s): for abrasive fluids (e.g. potter's clay, lime milk, ore slurry)
- v > 2 m/s (6.56 ft/s): for fluids producing buildup (e.g. wastewater sludges)
- A necessary increase in the flow velocity can be achieved by reducing the sensor nominal diameter.
- For an overview of the measuring range full scale values, see the "Measuring range" section  $\rightarrow \implies 135$

### Pressure loss

- No pressure loss occurs if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545
   → 
   □ 22

System pressure

→ 🖺 21

Vibrations

→ 🖺 22

## 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**

- Including the transmitter (1.9 kg (4.2 lbs))
- Weight specifications apply to standard pressure ratings and without packaging material.

# Weight in SI units

Nominal d	iameter	EN (DIN), AS 1)		ASME		JIS	
[mm]	[in]	Pressure rating	[kg]	Pressure rating	[kg]	Pressure rating	[kg]
15	1/2	PN 40	5.0	Class 150	5.0	10K	5.0
25	1	PN 40	5.8	Class 150	5.8	10K	5.8
32	1 1/4	PN 40	6.5	Class 150	-	10K	5.8
40	1 ½	PN 40	7.9	Class 150	7.9	10K	6.8
50	2	PN 40	9.1	Class 150	9.1	10K	7.8
65	2 1/2	PN 16	10.5	Class 150	-	10K	9.6
80	3	PN 16	12.5	Class 150	12.5	10K	11.0
100	4	PN 16	14.5	Class 150	14.5	10K	13.2
125	5	PN 16	20.0	Class 150	-	10K	19.5
150	6	PN 16	24.0	Class 150	24.0	10K	23.0
200	8	PN 10	43.5	Class 150	43.5	10K	40.4

<sup>1)</sup> For flanges to AS, only DN 25 and 50 are available.

# Weight in US units

Nominal diameter		ASME		
[mm]	[in]	Pressure rating	[lbs]	
15	1/2	Class 150	11.0	
25	1	Class 150	12.8	
32	1 1/4	Class 150	-	
40	1 ½	Class 150	17.4	
50	2	Class 150	20.1	
65	2 ½	Class 150	-	
80	3	Class 150	27.6	
100	4	Class 150	32.0	
125	5	Class 150	-	
150	6	Class 150	52.9	
200	8	Class 150	95.9	

Measuring tube specification

Non dian	inal ieter		Pressure rating					connection	internal (	diameter
		EN (DIN)	ASME	AS 2129	AS 4087	JIS	PI	<sup>7</sup> A	PT	FE
[mm]	[in]	[bar]	[psi]	[bar]	[bar]	[bar]	[mm]	[in]	[mm]	[in]
15	1/2	PN 40	Class 150	-	-	20K	-	-	15	0.59
25	1	PN 40	Class 150	Table E	-	20K	23	0.91	26	1.02
32	-	PN 40	_	-	-	20K	32	1.26	35	1.38
40	1 ½	PN 40	Class 150	-	-	20K	36	1.42	41	1.61
50	2	PN 40	Class 150	Table E	PN 16	10K	48	1.89	52	2.05
65	-	PN 16	_	-	-	10K	63	2.48	67	2.64
80	3	PN 16	Class 150	-	-	10K	75	2.95	80	3.15

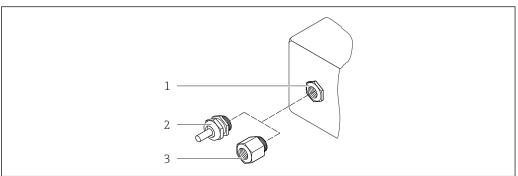
Non dian	inal ieter	Pressure rating					Process of	connection	internal (	diameter
		EN (DIN)	ASME	AS 2129	AS 4087	JIS	PI	FA	PT	FE
[mm]	[in]	[bar]	[psi]	[bar]	[bar]	[bar]	[mm]	[in]	[mm]	[in]
100	4	PN 16	Class 150	-	-	10K	101	3.98	104	4.09
125	-	PN 16	-	-	-	10K	126	4.96	129	5.08
150	6	PN 16	Class 150	-	-	10K	154	6.06	156	6.14
200	8	PN 10	Class 150	-	-	10K	201	7.91	202	7.95

#### Materials

# Transmitter housing

- Order code for "Housing", option C "Compact, aluminum coated": Aluminum, AlSi10Mg, coated
- Window material: glass

# Cable entries/cable glands



A002064

 $\blacksquare$  34 Possible cable entries/cable glands

- Cable entry in transmitter housing with internal thread M20 x 1.5
- 2 Cable gland M20 x 1.5
- 3 Adapter for cable entry with internal thread G  $\frac{1}{2}$ " or NPT  $\frac{1}{2}$ "

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

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

# Device plug

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

#### Sensor housing

Coated aluminum AlSi10Mg

#### Measuring tubes

Stainless steel, 1.4301/304/1.4306/304L; for flanges made of carbon steel with Al/Zn protective coating

#### Liner

- PFA
- PTFE

#### **Process connections**

EN 1092-1 (DIN 2501)

Stainless steel, 1.4571 (F316L); carbon steel, FE410WB/S235JRG2; Alloy C22, 2.4602 (UNS N06022) (with Al/Zn protective varnish)

**ASME B16.5** 

Stainless steel, F316L; carbon steel, A105 (with Al/Zn protective varnish)

JIS B2220

Stainless steel, 1.0425 (F316L); carbon steel, S235JRG2/HII (with Al/Zn protective varnish)

#### **Electrodes**

Stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); platinum; tantalum; titanium

#### Seals

In accordance with DIN EN 1514-1

# Accessories

Weather protection cover

Stainless steel 1.4404 (316L)

Ground disks

Stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum; titanium

#### Fitted electrodes

Measuring electrodes, reference electrodes and electrodes for empty pipe detection:

- Standard: stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum, titanium
- Optional: only platinum measuring electrodes

#### Process connections

- EN 1092-1 (DIN 2501); dimensions as per DIN 2501, DN 65 PN 16 only as per EN 1092-1
- ASME B16.5
- JIS B2220
- AS 2129 Table E
- AS 4087 PN 16
- For information on the materials of the process connections  $\rightarrow \triangleq 147$

Surface roughness

Stainless steel electrodes, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); platinum; tantalum; titanium:

 $\leq 0.3$  to 0.5 µm (11.8 to 19.7 µin)

(All data relate to parts in contact with fluid)

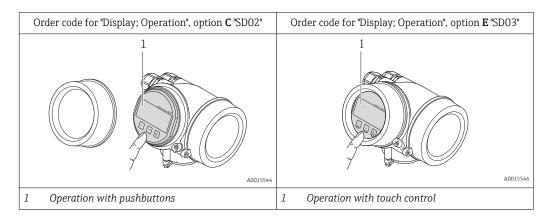
Liner with PFA:  $\leq 0.4 \mu \text{m} (15.7 \mu \text{in})$ 

(All data relate to parts in contact with fluid)

# 16.11 Operability

#### Local operation

#### Via display module



#### 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.

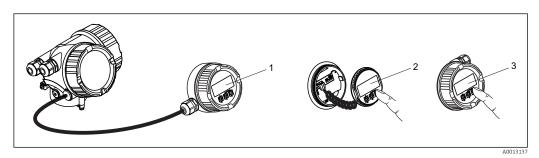
# Operating elements

- With order code for "Display; operation", option **C**: Local operation with 3 push buttons: ①, ②, ②
- With order code for "Display; operation", option **E**: External operation via touch control; 3 optical keys: ③, ⑤, ⑥
- 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



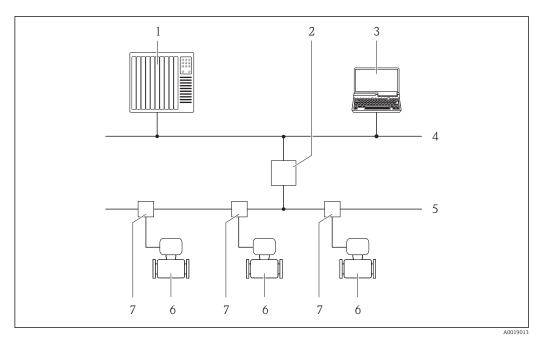
■ 35 Operating options via FHX50

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

#### Remote operation

#### Via PROFIBUS PA network

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

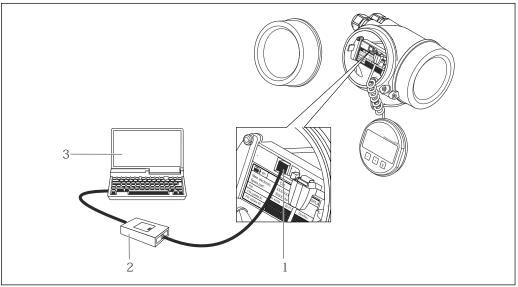


■ 36 Options for remote operation via PROFIBUS PA network

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

#### Service interface

#### Via service interface (CDI)



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

#### Languages

Can be operated in the following languages:

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

#### Certificates and approvals 16.12

#### CE mark

The measuring system is in conformity with the statutory requirements of the applicable EC Directives. These are listed in the corresponding EC Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

# C-Tick symbol

The measuring system meets the EMC requirements of the "Australian Communications" and Media Authority (ACMA)".

#### Ex approval

The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.

### Certification PROFIBUS

## **PROFIBUS** interface

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

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

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# Other standards and quidelines

■ EN 60529

Degrees of protection provided by enclosures (IP code)

■ EN 61010-1

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

■ IEC/EN 61326

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

■ ANSI/ISA-61010-1 (82.02.01): 2004

Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements

CAN/CSA-C22.2 No. 61010-1-04

Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements

■ NAMUR NE 21

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

■ NAMUR NE 32

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

■ NAMUR NE 43

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

■ NAMUR NE 53

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

■ NAMUR NE 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

# 16.13 Application packages

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

The application packages can be ordered with the device or subsequently from Endress+Hauser. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

# Diagnostics functions

Package	Description
HistoROM extended function	Comprises extended functions concerning the event log and the activation of the measured value memory.
	Event log: Memory volume is extended from 20 message entries (basic version) to up to 100 entries.
	Data logging (line recorder):  • Memory capacity for up to 1000 measured values is activated.  • 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user.  • Data logging is visualized via the local display or FieldCare.

# Heartbeat Technology

Package	Description
Heartbeat Verification	Heartbeat Verification: Makes it possible to check the device functionality on demand when the device is installed, without having to interrupt the process.  Access via local 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

 $\bigcirc$ i Overview of accessories available for order  $\rightarrow$   $\stackrel{ riangle}{ riangle}$  133

# 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
Promag P 200	KA01121D

#### **Device Parameters**

Measuring device	Documentation code				
	HART	FOUNDATION Fieldbus	PROFIBUS PA		
Promag 200	GP01026D	GP01028D	GP01027D		

# **Technical Information**

Measuring device	Documentation code
Promag P 200	TI01062D

# Supplementary devicedependent documentation

#### **Safety Instructions**

Contents	Documentation code
ATEX/IECEx Ex d[ia], Ex tb	XA01015D
ATEX/IECEx Ex ia, Ex tb	XA01016D
ATEX/IECEx Ex nA, Ex ic	XA01017D
cCSAus XP (Ex d)	XA01018D

Contents	Documentation code
cCSAus IS (Ex i)	XA01019D
NEPSI Ex d	XA01179D
NEPSI Ex i	XA01178D
NEPSI Ex nA, Ex ic	XA01180D
INMETRO Ex d	XA01309D
INMETRO Ex i	XA01310D
INMETRO Ex nA	XA01311D

# **Special Documentation**

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01056D
Heartbeat Technology	SD01452D

# **Installation Instructions**

Contents	Documentation code
Installation Instructions for spare part sets	Overview of accessories available for order → 🗎 133

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