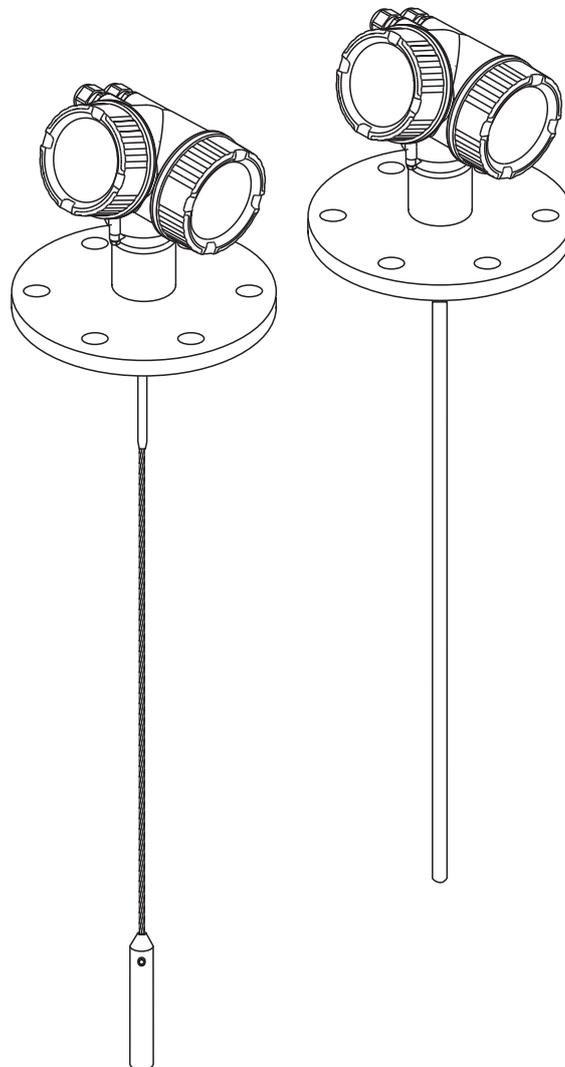


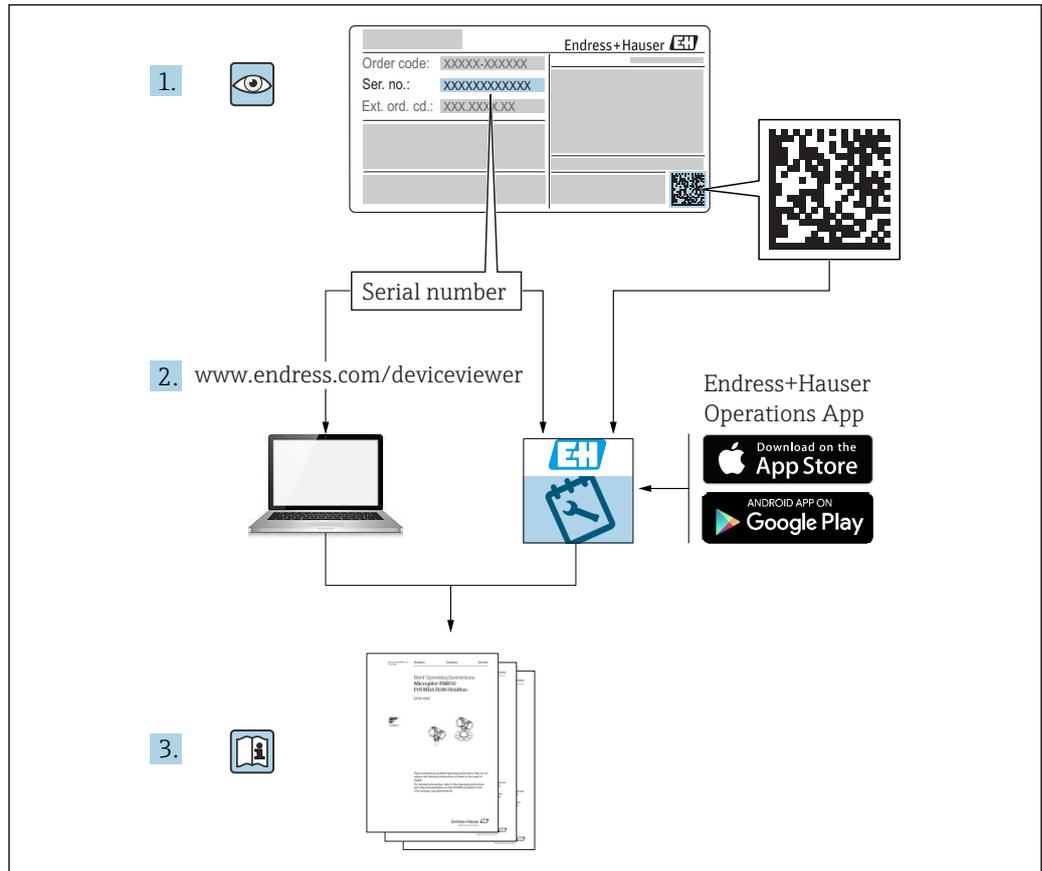
Operating Instructions

Levelflex FMP56, FMP57

PROFIBUS PA

Guided wave radar





A0023555

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1 Important 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

1.2.1 Safety symbols

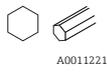
| Symbol | Meaning |
|---|--|
|  | DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury. |
|  | WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. |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

1.2.2 Electrical symbols

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

1.2.3 Tool symbols

| Symbol | Meaning |
|---|------------------------|
|  | Torx screwdriver |
|  | Flat blade screwdriver |

| Symbol | Meaning |
|---|------------------------|
|  A0011219 | Cross-head screwdriver |
|  A0011221 | Allen key |
|  A0011222 | Hexagon 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. |
|  | Forbidden Procedures, processes or actions that are forbidden. |
|  | Tip Indicates additional information. |
|  | Reference to documentation. |
|  | Reference to page. |
|  | Reference to graphic. |
|  | Notice or individual step to be observed. |
|  | Series of steps. |
|  | Result of a step. |
|  | Help in the event of a problem. |
|  | Visual inspection. |

1.2.5 Symbols in graphics

| Symbol | Meaning |
|---|--|
|  | Item numbers |
|  | Series of steps |
|  | Views |
|  | Sections |
|  | Hazardous area Indicates a hazardous area. |
|  | Safe area (non-hazardous area) Indicates the non-hazardous area. |

1.2.6 Symbols at the device

| Symbol | Meaning |
|---|---|
|  | Safety instructions Observe the safety instructions contained in the associated Operating Instructions. |
|  | Temperature resistance of the connection cables Specifies the minimum value of the temperature resistance of the connection cables. |

1.3 Supplementary documentation

| Document | Purpose and content of the document |
|--|--|
| Technical Information TI01004F (FMP56, FMP57) | 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 KA01073F (FMP56/FMP57, PROFIBUS PA) | Guide that takes you quickly to the 1st measured value The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning. |
| Description of Device Parameters GPO1001F (FMP5x, PROFIBUS PA) | Reference for your parameters The document provides a detailed explanation of each individual parameter in the operating menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations. |
| Special documentation SD00326F | Functional Safety Manual The document is part of the Operating Instructions and serves as a reference for application-specific parameters and notes. |
| Special documentation SD01872F | Manual for Heartbeat Verification and Heartbeat Monitoring The document contains descriptions of the additional parameters and technical data which are available with the Heartbeat Verification and Heartbeat Monitoring application packages. |

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

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

1.4 Terms and abbreviations

| Term/abbreviation | Explanation |
|-------------------------|---|
| BA | Document type "Operating Instructions" |
| KA | Document type "Brief Operating Instructions" |
| TI | Document type "Technical Information" |
| SD | Document type "Special Documentation" |
| XA | Document type "Safety Instructions" |
| PN | Nominal pressure |
| MWP | Maximum Working Pressure The MWP can also be found on the nameplate. |
| ToF | Time of Flight |
| FieldCare | Scalable software tool for device configuration and integrated plant asset management solutions |
| DeviceCare | Universal configuration software for Endress+Hauser HART, PROFIBUS, FOUNDATION Fieldbus and Ethernet field devices |
| DTM | Device Type Manager |
| DD | Device Description for HART communication protocol |
| ϵ_r (DC value) | Relative dielectric constant |
| Operating tool | The term "operating tool" is used in place of the following operating software: <ul style="list-style-type: none"> ▪ FieldCare / DeviceCare, for operation via HART communication and PC ▪ SmartBlue (app), for operation using an Android or iOS smartphone or tablet. |
| BD | Blocking Distance; no signals are analyzed within the BD. |
| PLC | Programmable Logic Controller |
| CDI | Common Data Interface |
| PFS | Pulse Frequency Status (Switching output) |

1.5 Registered trademarks

PROFIBUS®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

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Android®

Android, Google Play and the Google Play logo are trademarks of Google Inc.

KALREZ®, VITON®

Registered trademark of DuPont Performance Elastomers L.L.C., Wilmington, USA

TEFLON®

Registered trademark of E.I. DuPont de Nemours & Co., Wilmington, USA

TRI CLAMP®

Registered trademark of Alfa Laval Inc., Kenosha, USA

2 Basic safety instructions

2.1 Requirements for the personnel

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

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

The operating personnel must fulfill the following requirements:

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

2.2 Designated use

Application and measured materials

The measuring device described in these Operating Instructions is intended only for level measurement of bulk solids. Depending on the version ordered the device can also measure potentially explosive, flammable, poisonous and oxidizing materials.

Observing the limit values specified in the "Technical data" and listed in the Operating Instructions and supplementary documentation, the measuring device may be used for the following measurements only:

- ▶ Measured process variables: level
- ▶ Calculated process variables: Volume or mass in arbitrarily shaped vessels (calculated from the level by the linearization functionality)

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

- ▶ Use the measuring device only for measured materials against which the process-wetted materials are adequately resistant.
- ▶ Observe the limit values in "Technical data".

Incorrect use

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

Verification for borderline cases:

- ▶ For special measured materials and cleaning agents, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of wetted materials, but does not accept any warranty or liability.

Residual risk

The electronics housing and its built-in components such as display module, main electronics module and I/O electronics module may heat to 80 °C (176 °F) during operation through heat transfer from the process as well as power dissipation within the electronics. During operation the sensor may assume a temperature near the temperature of the measured material.

Danger of burns due to heated surfaces!

- ▶ For high process temperatures: Install protection against contact in order 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.

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 the manufacturer.

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 the manufacturer only.

Hazardous area

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):

- ▶ Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area.
- ▶ Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

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.

NOTICE

Loss of degree of protection by opening of the device in humid environments

- ▶ If the device is opened in a humid environment, the degree of protection indicated on the nameplate is no longer valid. This may also impair the safe operation of the device.

2.5.1 CE mark

The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied.

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

2.5.2 EAC conformity

The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity together with the standards applied.

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

2.6 Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

| Feature 010 | Approval | Available for | Feature 020: "Power Supply; Output" | | | | |
|-------------|--|--|-------------------------------------|-----------------|-----------------|--------------------------------|--------------------------------|
| | | | A ¹⁾ | B ²⁾ | C ³⁾ | E ^{4)/G⁵⁾} | K ^{6)/L⁷⁾} |
| BA | ATEX II 1G Ex ia IIC T6 Ga | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00496F | XA01125F | XA01126F | XA00516F | - |
| BB | ATEX II 1/2G Ex ia IIC T6 Ga/Gb | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00496F | XA01125F | XA01126F | XA00516F | - |
| BE | ATEX II 1D Ex t IIIC Da | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00501F | XA00501F | XA00501F | XA00521F | XA00501F |
| BF | ATEX II 1/2D Ex t IIIC Da/Db | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00501F | XA00501F | XA00501F | XA00521F | XA00501F |
| BG | ATEX II 3G Ex nA IIC T6 Gc | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00498F | XA01130F | XA01131F | XA00518F | XA01132F |
| BH | ATEX II 3G Ex ic IIC T6 Gc | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00498F | XA01130F | XA01131F | XA00518F | - |
| B2 | ATEX II 1/2G Ex ia IIC T6 Ga/Gb, 1/2D Ex ia IIIC Da/Db | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00502F | XA00502F | XA00502F | XA00522F | - |
| B3 | ATEX II 1/2G Ex d[ia] IIC T6 Ga/Gb, 1/2 D Ex t IIIC Da/Db | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00503F | XA00503F | XA00503F | XA00523F | XA01136F |
| CD | CSA C/US DIP Cl.I,II,III Div.1 Gr.E-G | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00529F | XA00529F | XA00529F | XA00570F | XA00529F |
| C2 | CSA C/US IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex ia | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00530F | XA00530F | XA00530F | XA00571F | XA00530F |
| C3 | CSA C/US XP Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex d | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00529F | XA00529F | XA00529F | XA00570F | XA00529F |
| FB | FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, NI Cl.1 Div.2 | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00531F | XA00531F | XA00531F | XA00573F | XA00531F |
| FD | FM XP Cl.I,II,III Div.1 Gr.A-G, AEx d, NI Cl.1 Div.2 | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00532F | XA00532F | XA00532F | XA00572F | XA00532F |
| FE | FM DIP Cl.I,II,III Div.1 Gr.E-G | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00532F | XA00532F | XA00532F | XA00572F | XA00532F |
| GA | EAC Ex ia IIC T6 Ga | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA01380F | XA01380F | XA01380F | XA01381F | XA01380F |
| GB | EAC Ex ia IIC T6 Ga/Gb | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA01380F | XA01380F | XA01380F | XA01381F | XA01380F |
| IA | IEC Ex ia IIC T6 Ga | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00496F | XA01125F | XA01126F | XA00516F | - |
| IB | IEC Ex ia IIC T6 Ga/Gb | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00496F | XA01125F | XA01126F | XA00516F | - |
| IE | IEC Ex t IIIC Da | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00501F | XA00501F | XA00501F | XA00521F | XA00501F |
| IF | IEC Ex t IIIC Da/Db | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00501F | XA00501F | XA00501F | XA00521F | XA00501F |
| IG | IEC Ex nA IIC T6 Gc | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00498F | XA01130F | XA01131F | XA00518F | XA01132F |
| IH | IEC Ex ic IIC T6 Gc | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00498F | XA01130F | XA01131F | XA00518F | - |
| I2 | IEC Ex ia IIC T6 Ga/Gb, Ex ia IIIC Da/Db | <ul style="list-style-type: none"> ▪ FMP56 ▪ FMP57 | XA00502F | XA00502F | XA00502F | XA00522F | - |

| Feature 010 | Approval | Available for | Feature 020: "Power Supply; Output" | | | | |
|-------------|---|--|-------------------------------------|----------------------|----------------------|----------------------------------|----------------------------------|
| | | | A ¹⁾ | B ²⁾ | C ³⁾ | E ⁴⁾ /G ⁵⁾ | K ⁶⁾ /L ⁷⁾ |
| I3 | IEC Ex d [ia] IIC T6 Ga/Gb, Ex t IIIC Da/Db | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA00503F | XA00503F | XA00503F | XA00523F | XA01136F |
| JC | JPN Ex d[ia] IIC T4 Ga/Gb | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | - | - | XA01718F | - | - |
| KA | KC Ex ia IIC T6 Ga | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA01169F | - | XA01169F | - | - |
| KB | KC Ex ia IIC T6 Ga/Gb | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA01169F | - | XA01169F | - | - |
| MA | INMETRO Ex ia IIC T6 Ga | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA01038F | XA01038F | XA01038F | - | XA01038F |
| ME | INMETRO Ex t IIIC Da | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA01043F | XA01043F | XA01043F | - | XA01043F |
| MH | INMETRO Ex ic IIC T6 Gc | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA01040F | XA01040F | XA01040F | - | XA01040F |
| NA | NEPSI Ex ia IIC T6 Ga | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA00634F | XA00634F | XA00634F | XA00640F | XA00634F |
| NB | NEPSI Ex ia IIC T6 Ga/Gb | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA00634F | XA00634F | XA00634F | XA00640F | XA00634F |
| NF | NEPSI DIP A20/21 T85...90°C IP66 | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA00637F | XA00637F | XA00637F | XA00643F | XA00637F |
| NG | NEPSI Ex nA II T6 Gc | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA00635F | XA00635F | XA00635F | XA00641F | XA00635F |
| NH | NEPSI Ex ic IIC T6 Gc | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA00635F | XA00635F | XA00635F | XA00641F | XA00635F |
| N2 | NEPSI Ex ia IIC T6 Ga/Gb, Ex iaD 20/21 T85...90°C | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA00638F | XA00638F | XA00638F | XA00644F | XA00638F |
| N3 | NEPSI Ex d[ia] IIC T6 Ga/Gb, DIP A20/21 T85...90°C IP66 | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA00639F | XA00639F | XA00639F | XA00645F | XA00639F |
| 8A | FM/CSA IS+XP Cl.I,II,III Div.1 Gr.A-G | <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | XA00531F XA00532F | XA00531F XA00532F | XA00531F XA00532F | XA00572F XA00573F | XA00531F XA00532F |

- 1) A: 2-wire; 4-20mA HART
- 2) B: 2-wire; 4-20mA HART, switch output
- 3) C: 2-wire; 4-20mA HART, 4-20mA
- 4) E: 2-wire; FOUNDATION Fieldbus, switch output
- 5) G: 2-wire; PROFIBUS PA, switch output
- 6) K: 4-wire 90-253VAC; 4-20mA HART
- 7) L: 4-wire 10,4-48VDC; 4-20mA HART



For certified devices the relevant Safety Instructions (XA) are indicated on the nameplate.

2.6.1 Ex-marking in case of connected FHX50 remote display

If the device is prepared for the remote display FHX50 (product structure: feature 030: "Display, Operation", option L or M), the Ex marking of some certificates changes according to the following table ¹⁾:

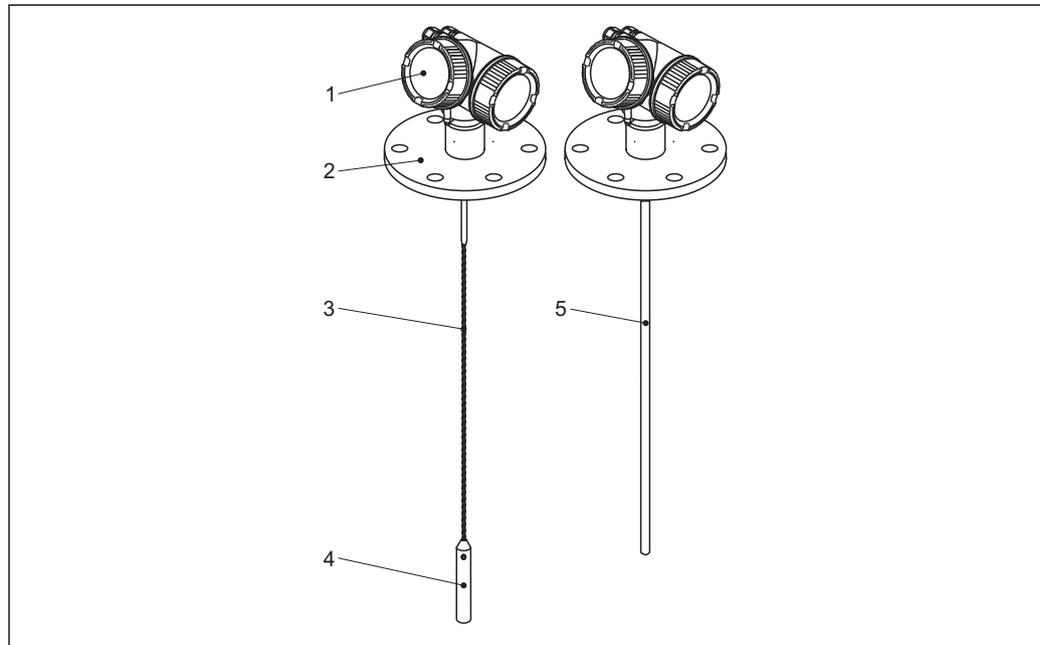
| Feature 010 ("Approval") | Feature 030 ("Display, Operation") | Ex-marking |
|--------------------------|------------------------------------|---|
| BE | L, M or N | ATEX II 1D Ex ta [ia] IIIC T ₅₀₀ xx°C Da |
| BF | L, M or N | ATEX II 1/2 D Ex ta [ia Db] IIIC Txx°C Da/Db |
| BG | L, M or N | ATEX II 3G Ex nA [ia Ga] IIC T6 Gc |
| BH | L, M or N | ATEX II 3G Ex ic [ia Ga] IIC T6 Gc |
| B3 | L, M or N | ATEX II 1/2G Ex d [ia] IIC T6 Ga/Gb, ATEX II 1/2D Ex ta [ia Db] IIIC Txx°C Da/Db |
| IE | L, M or N | IECEX Ex ta [ia] IIIC T500 xx°C Da |
| IF | L, M or N | IECEX ta [ia Db] IIIC Txx°C Da/Db |
| IG | L, M or N | IECEX Ex nA [ia Ga] IIC T6 Gc |
| IH | L, M or N | IECEX Ex ic [ia Ga] IIC T6 Gc |
| I3 | L, M or N | IECEX Ex d [ia] IIC T6 Ga/Gb, IECEX Ex ta [ia Db] IIIC Txx°C Da/Db |

1) The marking of certificates not mentioned in this table are not affected by the FHX50.

3 Product description

3.1 Product design

3.1.1 Levelflex FMP56/FMP57

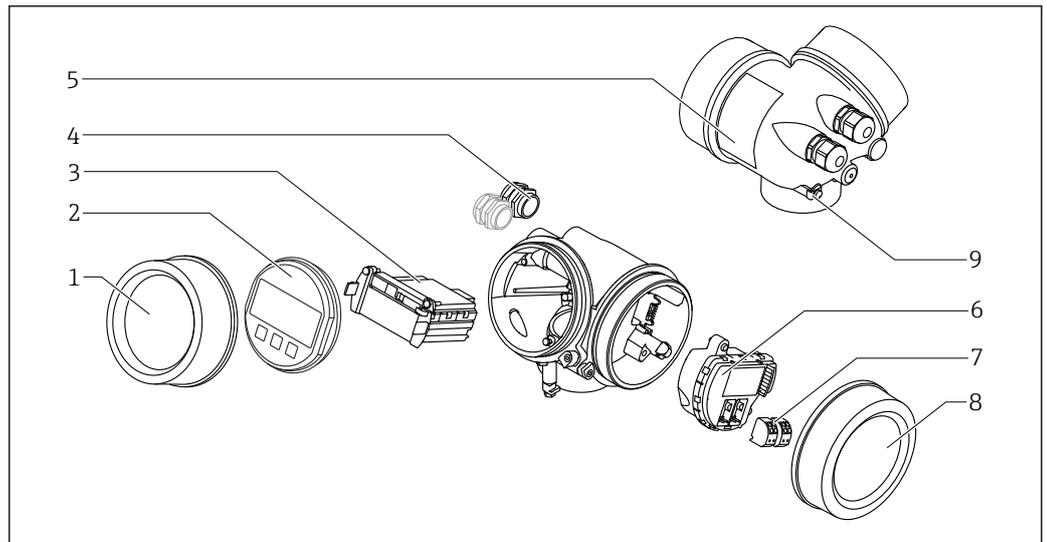


A0012470

1 Design of the Levelflex

- 1 Electronics housing
- 2 Process connection (here as an example: flange)
- 3 Rope probe
- 4 End-of-probe weight
- 5 Rod probe

3.1.2 Electronics housing



A0012422

2 Design of the electronics housing

- 1 Electronics compartment cover
- 2 Display module
- 3 Main electronics module
- 4 Cable glands (1 or 2, depending on instrument version)
- 5 Nameplate
- 6 I/O electronics module
- 7 Terminals (pluggable spring terminals)
- 8 Connection compartment cover
- 9 Grounding terminal

4 Incoming acceptance and product identification

4.1 Incoming acceptance

Upon receipt of the goods check the following:

- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): Are the Safety Instructions (XA) present?



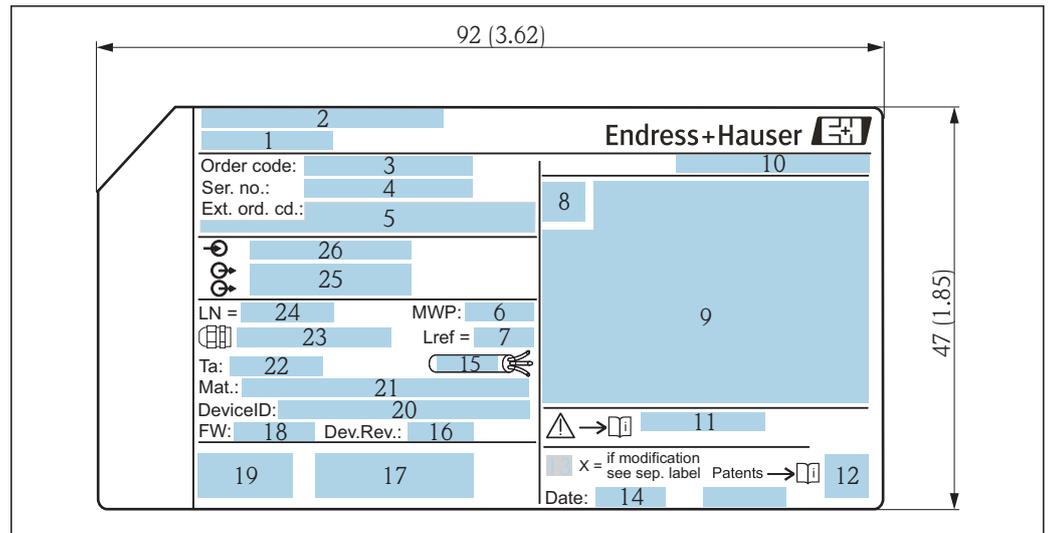
If one of these conditions is not satisfied, contact your Endress+Hauser Sales Center.

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.

4.2.1 Nameplate



3 Nameplate of the Levelflex; Dimensions: mm (in)

- 1 Device name
- 2 Address of manufacturer
- 3 Order code
- 4 Serial number (Ser. no.)
- 5 Extended order code (Ext. ord. cd.)
- 6 Process pressure
- 7 Gas phase compensation: reference distance
- 8 Certificate symbol
- 9 Certificate and approval relevant data
- 10 Degree of protection: e.g. IP, NEMA
- 11 Document number of the Safety Instructions: e.g. XA, ZD, ZE
- 12 2-D matrix code (QR code)
- 13 Modification mark
- 14 Manufacturing date: year-month
- 15 Permitted temperature range for cable
- 16 Device revision (Dev.Rev.)
- 17 Additional information about the device version (certificates, approvals, communication): e.g. SIL, PROFIBUS
- 18 Firmware version (FW)
- 19 CE mark, C-Tick
- 20 DeviceID
- 21 Material in contact with process
- 22 Permitted ambient temperature (T_a)
- 23 Size of the thread of the cable glands
- 24 Length of probe
- 25 Signal outputs
- 26 Operating voltage

i Only 33 digits of the extended order code can be indicated on the nameplate. If the extended order code exceeds 33 digits, the rest will not be shown. However, the complete extended order code can be viewed in the operating menu of the device in the **Extended order code 1 to 3** parameter.

5 Storage, Transport

5.1 Storage conditions

- Permitted storage temperature: -40 to $+80$ °C (-40 to $+176$ °F)
- Use the original packaging.

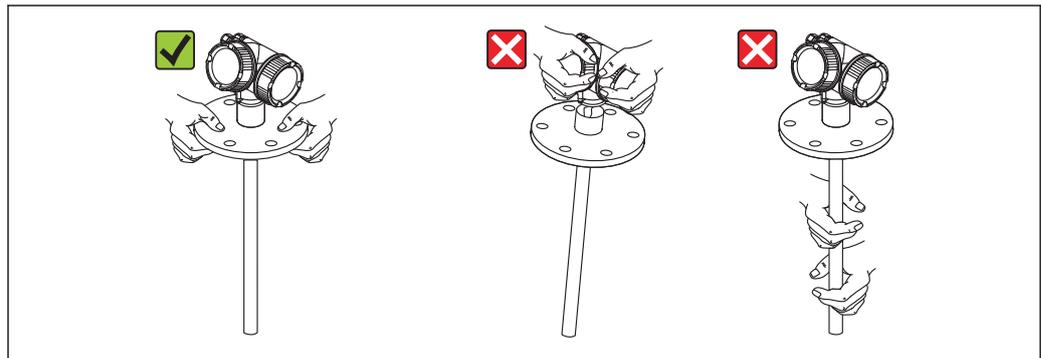
5.2 Transport product to the measuring point

⚠ WARNING

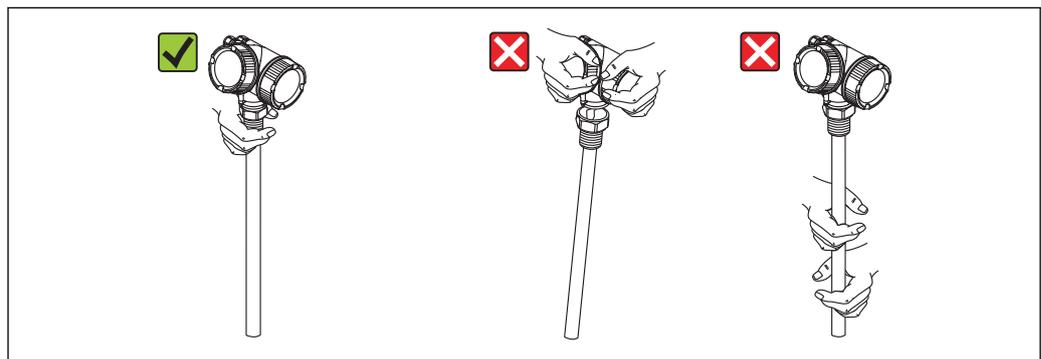
Housing or probe may be damaged or break away.

Risk of injury!

- ▶ Transport the measuring device to the measuring point in its original packaging or at the process connection.
- ▶ Do not fasten lifting devices (hoisting slings, lifting eyes etc.) at the housing or the probe but at the process connection. Take into account the mass center of the device in order to avoid unintended tilting.
- ▶ Comply with the safety instructions, transport conditions for devices over 18kg (39.6lbs) (IEC61010).



A0013920

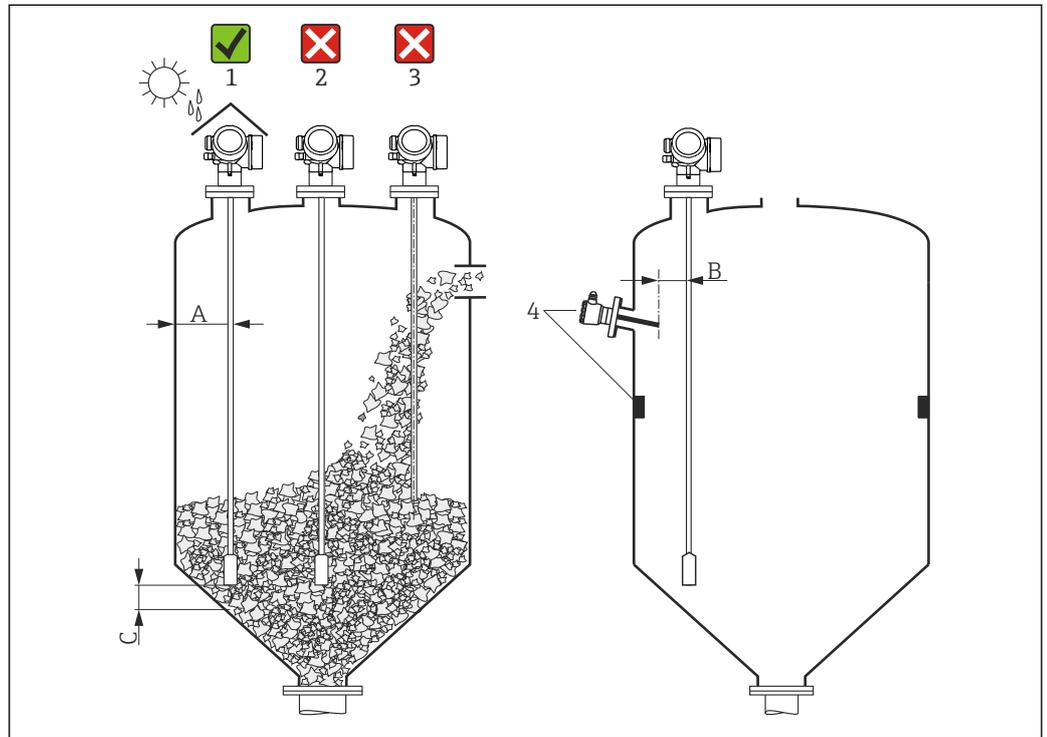


A0014264

6 Mounting

6.1 Mounting requirements

6.1.1 Suitable mounting position



4 Mounting requirements for Levelflex

A0021468

Mounting distances

- Distance (A) between wall and rod or rope probe:
 - for smooth metallic walls: > 50 mm (2 in)
 - for plastic walls: > 300 mm (12 in) to metallic parts outside the vessel
 - for concrete walls: > 500 mm (20 in), otherwise the available measuring range may be reduced.
- Distance (B) between rod or rope probe and internal fittings in the vessel: > 300 mm (12 in)
- When using more than one Levelflex:
 - Minimum distance between the sensor axes: 100 mm (3.94 in)
- Distance (C) from end of probe to bottom of the vessel:
 - Rope probe: > 150 mm (6 in)
 - Rod probe: > 10 mm (0.4 in)

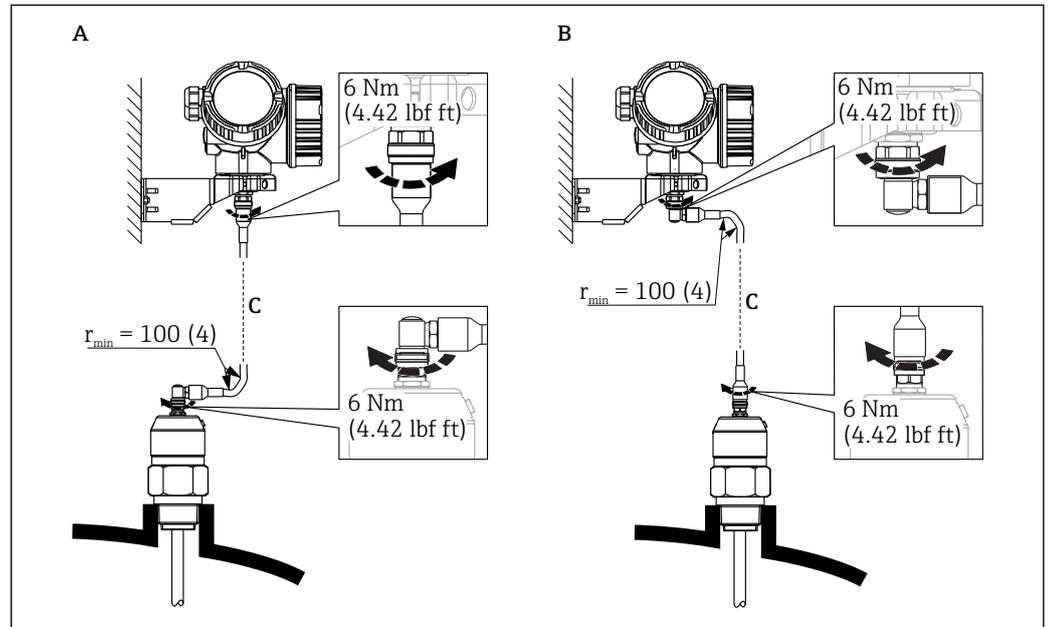
Additional conditions

- When mounting in the open, a weather protection cover (1) may be installed to protect the device against extreme weather conditions.
 - In metallic vessels: Preferably do not mount the probe in the center of the vessel (2), as this would lead to increased interference echoes.
If a central mounting position can not be avoided, it is crucial to perform an interference echo suppression(mapping) after the commissioning of the device.
 - Do not mount the probe in the filling curtain (3).
 - Avoid buckling the rope probe during installation or operation (e.g. through product movement against silo wall) by selecting a suitable mounting location.
 - Check the probe regularly for defects.
-  With suspended rope probes (probe end not fixed at the bottom) the distance between the probe rope and internal fittings in the tank must not fall below 300 mm (12") during the entire process. A sporadic contact between the probe weight and the cone of the vessel, however, does not influence the measurement as long as the dielectric constant of the medium is at least $DC = 1.8$.
-  When mounting the electronics housing into a recess (e.g. in a concrete ceiling), observe a minimum distance of 100 mm (4 inch) between the cover of the terminal compartment / electronics compartment and the wall. Otherwise the connection compartment / electronics compartment is not accessible after installation.

6.1.2 Applications with restricted mounting space

Mounting with remote sensor

The device version with a remote sensor is suited for applications with restricted mounting space. In this case the electronics housing is mounted at a separate position from which it is easier accessible.



- A Angled plug at the probe
 B Angled plug at the electronics housing
 C Length of the remote cable as ordered

- Product structure, feature 600 "Probe Design":
 - Option MB "Sensor remote, 3m/9ft cable"
 - Option MC "Sensor remote, 6m/18ft cable"
 - Option MB "Sensor remote, 9m/27ft cable"
 - The remote cable is supplied with these device versions
 Minimum bending radius: 100 mm (4 inch)
 - A mounting bracket for the electronics housing is supplied with these device versions.
 Mounting options:
 - Wall mounting
 - Pipe mounting; diameter: 42 to 60 mm (1-1/4 to 2 inch)
 - The connection cable has got one straight and one angled plug (90°). Depending on the local conditions the angled plug can be connected at the probe or at the electronics housing.
- i** Probe, electronics and connection cable are adjusted to match each other. They are marked by a common serial number. Only components with the same serial number shall be connected to each other.

6.1.3 Notes on the mechanical load of the probe

Tensile load limit of rope probes

| Sensor | Feature 060 | Probe | Tensile load limit [kN] | Max. rupture load [kN] ¹⁾ |
|--------|-------------|--------------------------|-------------------------|--------------------------------------|
| FMP56 | LA, LB | Rope 4mm (1/6") 316 | 12 | 20 |
| | NB, NE | Rope 6mm (1/4") PA>Steel | 12 | 20 |
| FMP57 | LA, LB | Rope 4mm (1/6") 316 | 12 | 20 |
| | LC, LD | Rope 6mm (1/4") 316 | 30 | 42 |
| | NB, NE | Rope 6mm (1/4") PA>Steel | 12 | 20 |
| | NC, NF | Rope 8mm (1/3") PA>Steel | 30 | 42 |

1) The ceiling of the silo must be designed to withstand this load.

Tensile load

Bulk solids exert tensile forces on rope probes whose height increases with:

- the length of the probe, i.e. max. cover
- the bulk density of the product,
- the silo diameter and
- the diameter of the probe rope

Since the tensile forces are also heavily dependent on the viscosity of the product, a higher safety factor is necessary for highly viscous products and if there is a risk of cornice buildup. In critical cases it is better to use a 6 mm rope instead of a 4 mm one.

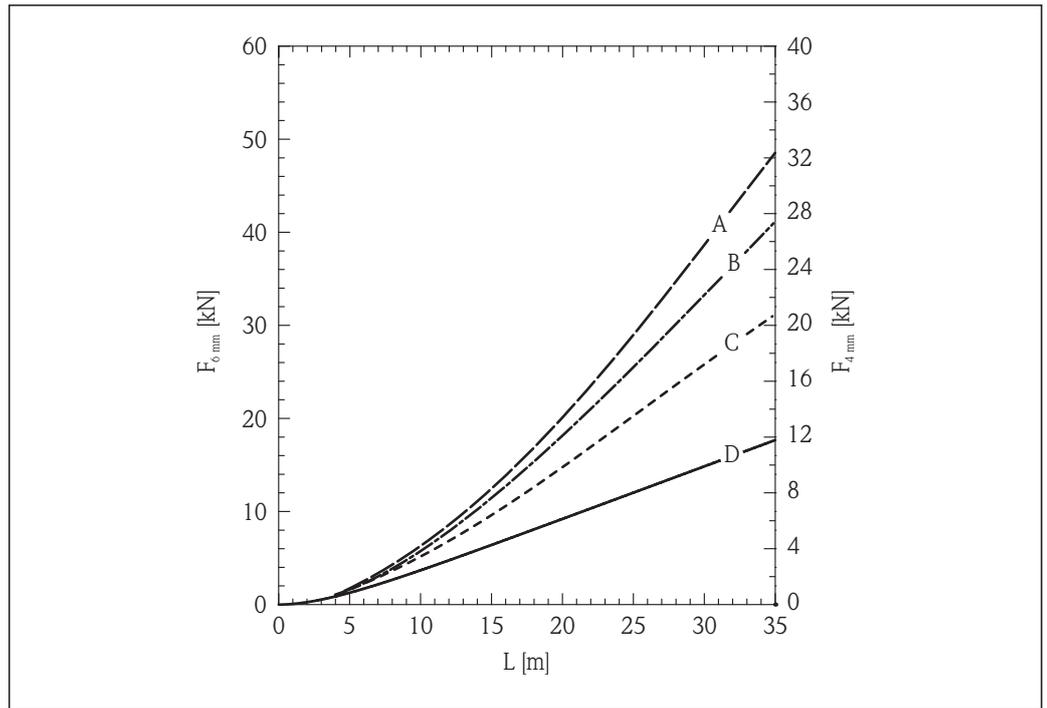
The same forces also act on the silo cover. On a fixed rope, the tensile forces are definitely greater, but this can not be calculated. Observe the tensile strength of the probes.

Options for reducing the tensile forces:

- Shorten the probe.
- If the maximum tensile load is exceeded, check whether it would be possible to use a non-contact Ultrasonic or Level-Radar device.

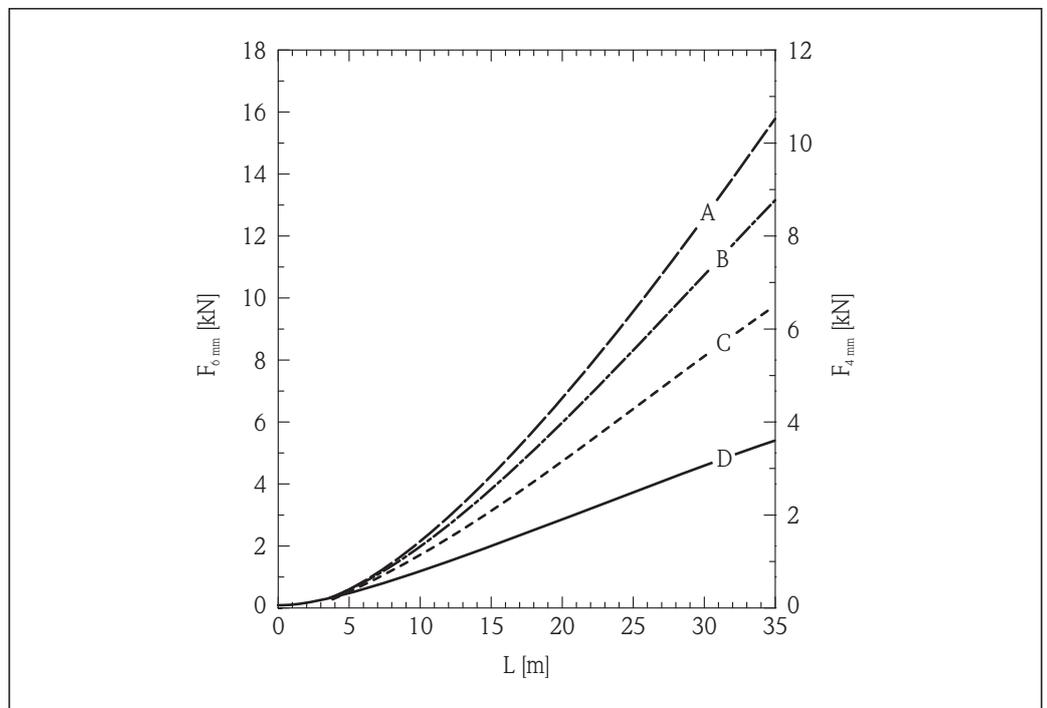
The following diagrams show typical loads for frequently occurring bulk solids as reference values. The calculation is performed for the following conditions:

- Calculation according to DIN 1055, Part 6 for the cylindrical part of the silo.
- Suspended probe (probe end not fixed at the bottom)
- Free-flowing bulk solid, i.e. mass flow. A calculation for core flow is not possible. In the event of collapsing cornices, considerably higher loads can occur.
- The specification for tensile forces contains the safety factor 2 (in addition to the safety factors already taken into account by DIN 1055), which compensates for the normal fluctuation range in pourable bulk solids.



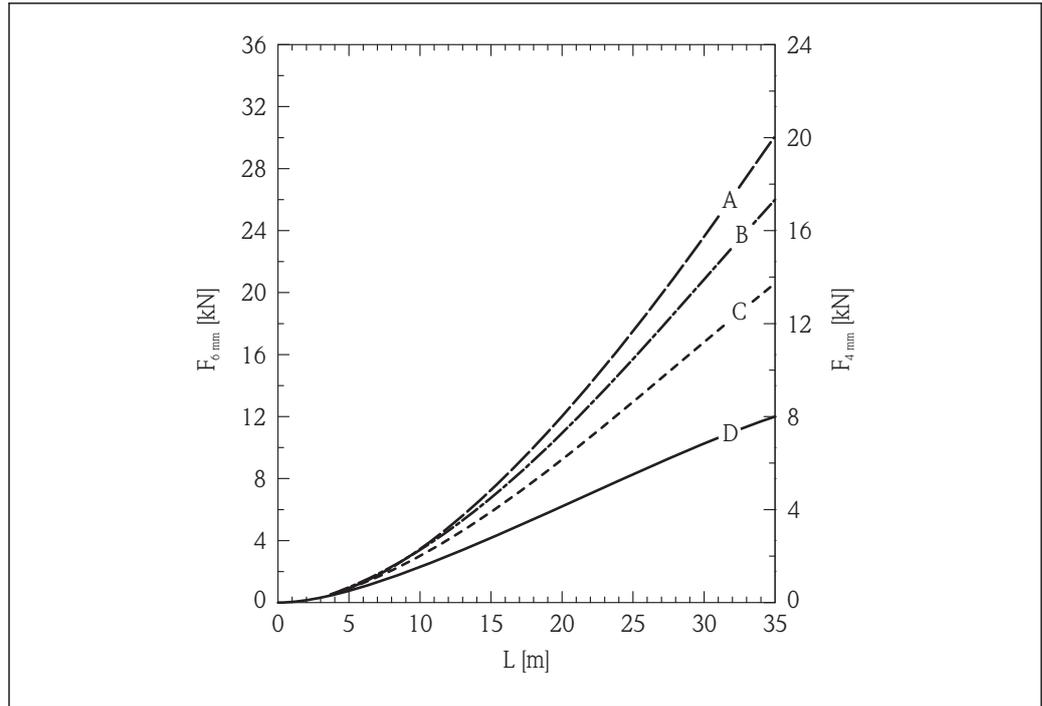
5 Silica sand in silo with smooth metallic walls; tensile load as a function of level L for rope diameters 6mm (0,24 in) and 4mm (0,16 in)

- A Silo diameter 12 m (40 ft)
- B Silo diameter 9 m (30 ft)
- C Silo diameter 6 m (20 ft)
- D Silo diameter 3 m (10 ft)



6 Polyethylene pellets in silo with smooth metallic walls; tensile load as a function of level L for rope diameters 6mm (0,24 in) and 4mm (0,16 in)

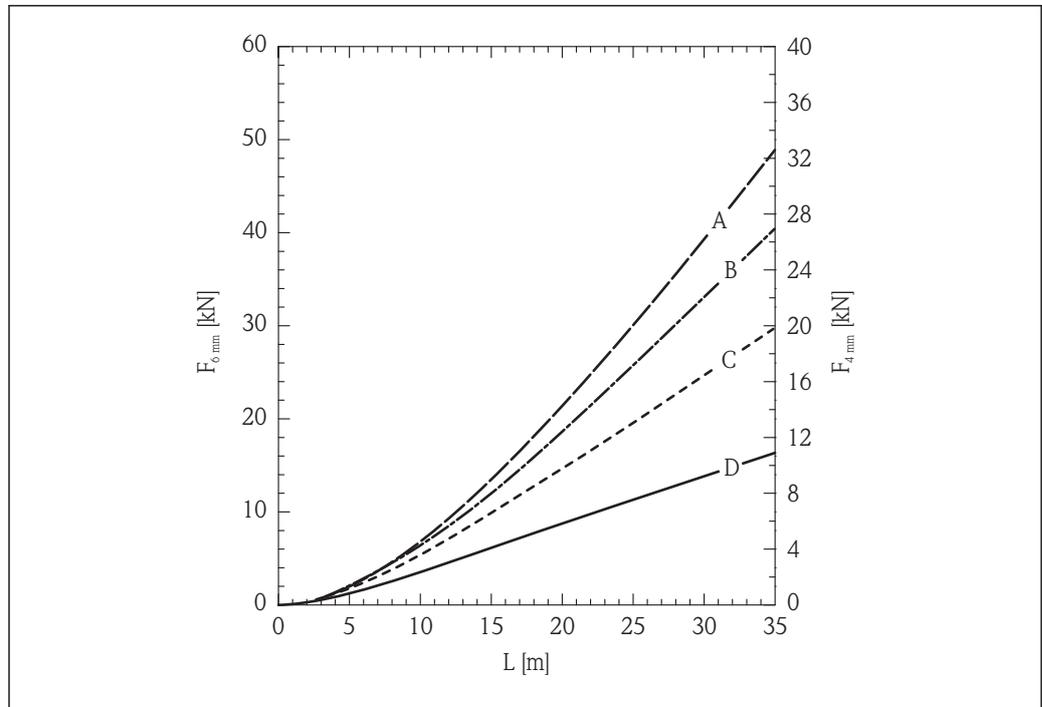
- A Silo diameter 12 m (40 ft)
- B Silo diameter 9 m (30 ft)
- C Silo diameter 6 m (20 ft)
- D Silo diameter 3 m (10 ft)



A0017172

7 Wheat in silo with smooth metallic walls; tensile load as a function of level L for rope diameters 6mm (0,24 in) and 4mm (0,16 in)

- A Silo diameter 12 m (40 ft)
- B Silo diameter 9 m (30 ft)
- C Silo diameter 6 m (20 ft)
- D Silo diameter 3 m (10 ft)



A0017173

8 Cement in silo with smooth metallic walls; tensile load as a function of level L for rope diameters 6mm (0,24 in) and 4mm (0,16 in)

- A Tank diameter 12 m (40 ft)
- B Tank diameter 9 m (30 ft)
- C Tank diameter 6 m (20 ft)
- D Tank diameter 3 m (10 ft)

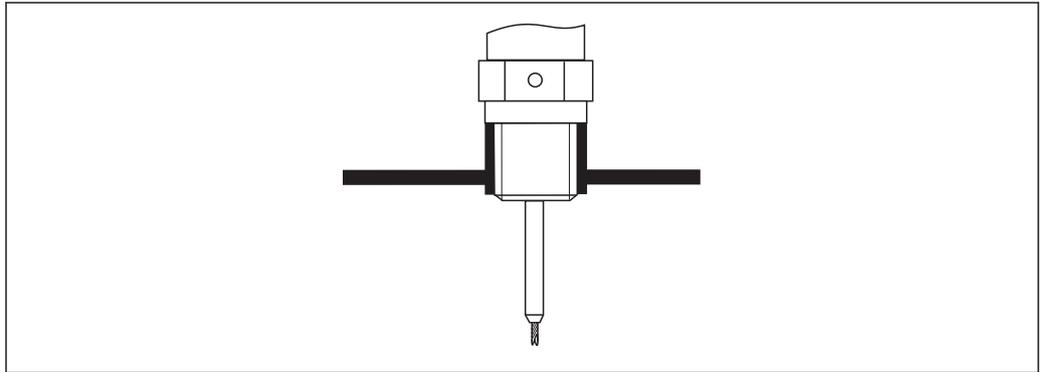
Bending strength of rod probes

| Sensor | Feature 060 | Probe | Bending strength [Nm] |
|--------|-------------|-----------------------|-----------------------|
| FMP57 | AE, AF | Rod 16mm (0.63") 316L | 30 |

6.1.4 Notes on the process connection

Probes are mounted to the process connection with threaded connections or flanges. If during this installation there is the danger that the probe end moves so much that it touches the tank floor or cone at times, the probe must, if necessary, be shortened and fixed down →  32.

Threaded connection



 9 *Mounting with threaded connection; flush with the container ceiling*

A0015121

Seal

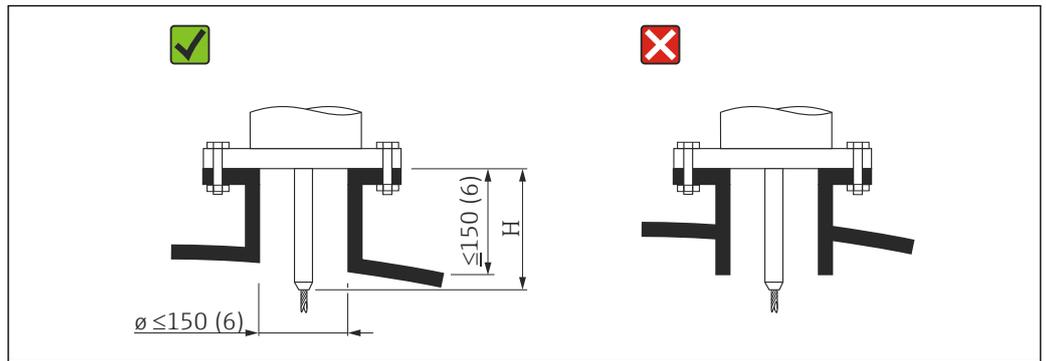
The thread as well as the type of seal comply to DIN 3852 Part 1, screwed plug form A.

They can be sealed with the following types of sealing rings:

- Thread G3/4": According to DIN 7603 with the dimensions 27 x 32 mm
- Thread G1-1/2": According to DIN 7603 with the dimensions 48 x 55 mm

Please use a sealing ring according to this standard in the form A, C or D and of a material that is resistant to the application.

Nozzle mounting



A0015122

H Length of the center rod or the rigid part of the rope probe

Length H of the rigid part of the rope probe

| Probe | H |
|-----------------------------------|-----------------|
| FMP56, ϕ rope 4 mm (0.16 in) | 94 mm (3.7 in) |
| FMP57, ϕ rope 4 mm (0.16 in) | 120 mm (4.7 in) |
| FMP57, ϕ rope 6 mm (0.24 in) | 135 mm (5.3 in) |

- Permissible nozzle diameter: ≤ 150 mm (6 in).
 For larger diameters the near range measuring capability may be reduced.
 For nozzles $\geq DN300$: \rightarrow 31.
 - Permissible nozzle height ²⁾: ≤ 150 mm (6 in).
 For a larger height the near range measuring capability may be reduced.
 Larger nozzle heights may be possible in special cases (see section "Rod extension/ centering HMP40 for FMP57").
 - The end of the nozzle should be flush with the tank ceiling in order to avoid ringing effects.
- i** With thermally insulated vessels the nozzle should also be insulated in order to prevent condensate formation.

2) Larger nozzle heights on request

Rod extension/centering HMP40 for FMP57

For FMP57 with rope probes the rod extension/centering HMP 40 is available as an accessory →  100. It has to be used if otherwise the probe rope comes into contact with the lower edge of the nozzle.

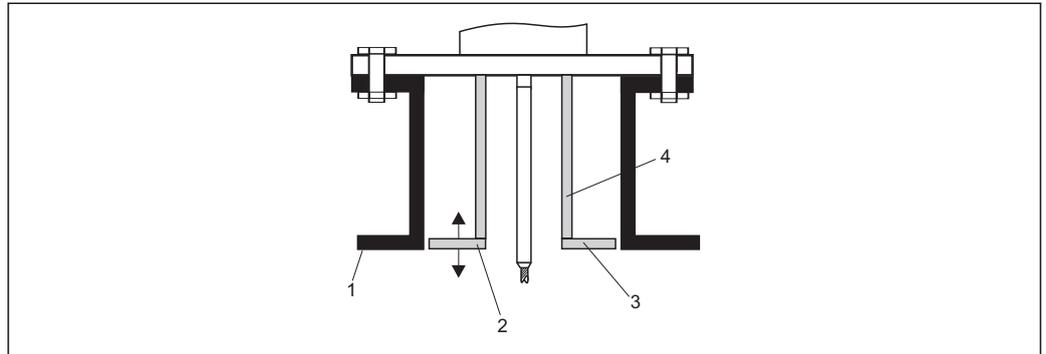
For FMP57 with rope probes the rod extension/centering HMP 40 is available as an accessory. It has to be used if otherwise the probe rope comes into contact with the lower edge of the nozzle.

 This accessory consists of the extension rod corresponding to the nozzle height, on which a centering disk is also mounted if the nozzles are narrow or when working in bulk solids. This component is delivered separately from the device. Please order the probe length correspondingly shorter.

Centering disks with small diameters (DN40 and DN50) may only be used if there is no significant build-up in the nozzle above the disk. The nozzle must not become clogged by the product.

Installation in nozzles \geq DN300

If installation in $\geq 300\text{mm}/12\text{"}$ nozzles is unavoidable, installation must be carried out in accordance with the following sketch.



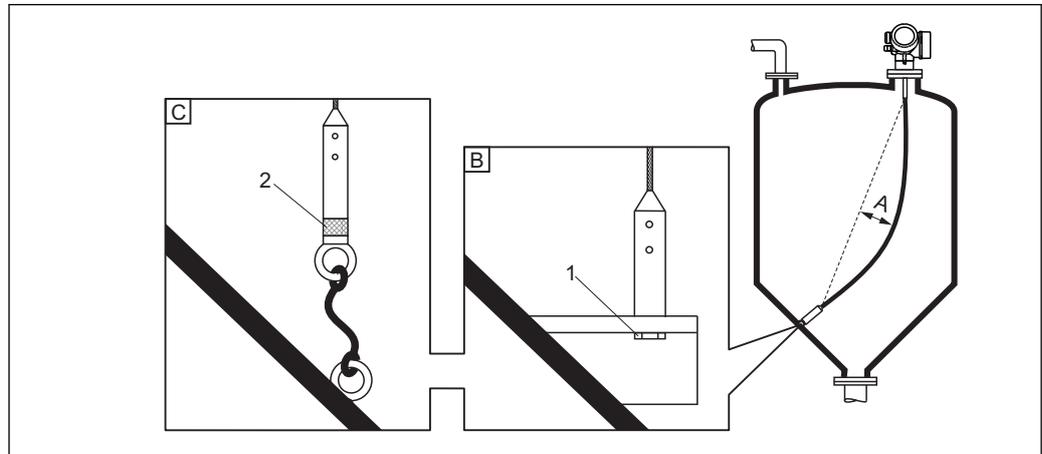
A0014199

- 1 Lower edge of the nozzle
- 2 Approx. flush with the lower edge of the nozzle ($\pm 50\text{ mm}/2\text{"}$)
- 3 Plate
- 4 Pipe ϕ 150 to 180 mm (6 to 7 inch)

| Nozzle diameter | Plate diameter |
|----------------------------|----------------------------|
| 300 mm (12") | 280 mm (11") |
| $\geq 400\text{ mm}$ (16") | $\geq 350\text{ mm}$ (14") |

6.1.5 Securing the probe

Securing rope probes

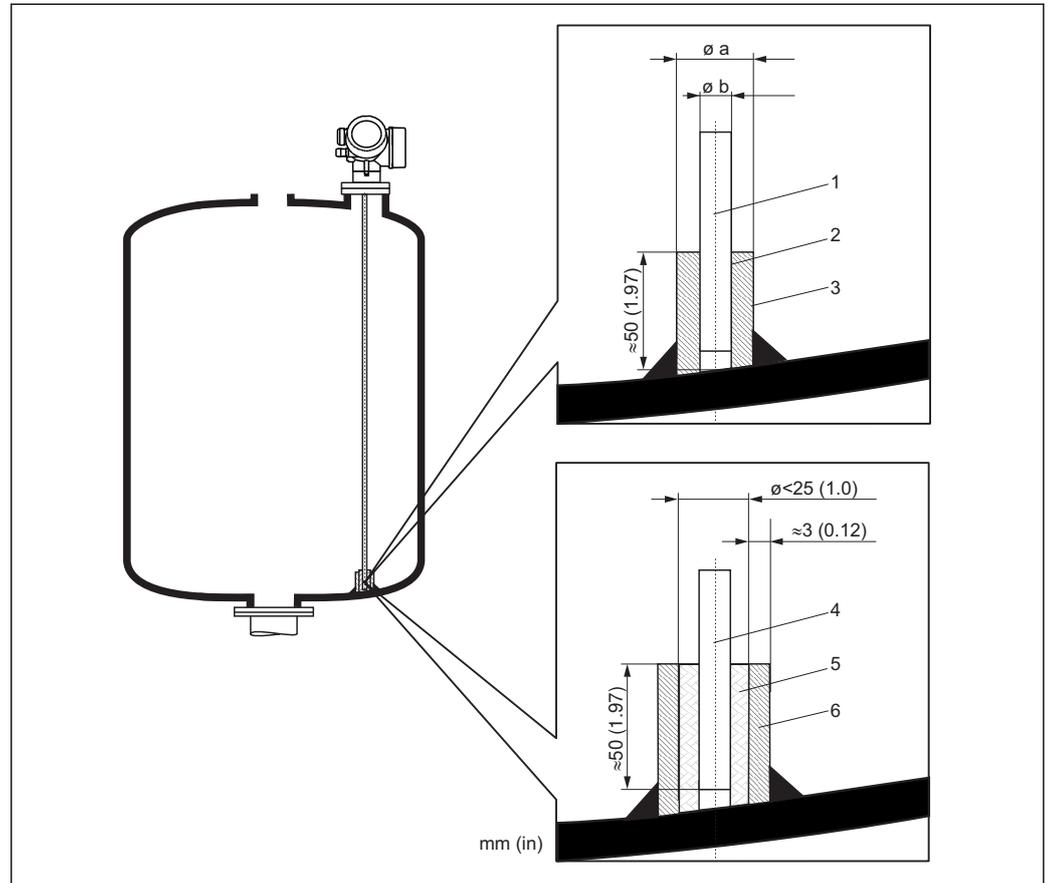


- A Sag of the rope: ≥ 1 cm per 1m of the probe length (0.12 inch per 1 ft of the probe length)
 B Reliably grounded end of probe
 C Reliably isolated end of probe
 1: Mounting and contact with a bolt
 2 Mounting kit isolated

- The end of the probe needs to be secured under the following conditions:
 - if otherwise the probe sporadically comes into contact with the wall of the vessel, the outlet cone, internal fittings or other parts of the installation.
 - if otherwise the probe sporadically gets close to a concrete wall (minimum distance 0.5 m / 20 inch).
- The end of probe can be secured at its internal thread
 - rope 4 mm (1/6"), 316: M 14
 - rope 6 mm (1/4"), 316: M 20
 - rope 6mm (1/4"), PA>steel: M14
 - rope 8mm (1/3"), PA>steel: M20
- Preferably use the 6 mm (1/4") rope probe due to the higher tensile strength when fixing a rope probe.
- The fixing must be either reliably grounded or reliably insulated. If it is not possible to mount the probe weight with a reliably insulated connection, it can be secured using an isolated eyelet, which is available as an accessory.
- In the case of a grounded fixing the search for a positive end-of-probe signal must be activated. Otherwise an automatic probe length correction is impossible.
 Navigation: Expert → Sensor → EOP evaluation → EOP search mode
 Setting: **Positive EOP** option
- In order to prevent an extremely high tensile load (e.g. due to thermal expansion) and the risk of rope crack, the rope has to be slack. Make the rope longer than the required measuring range such that there is a sag in the middle of the rope that is ≥ 1 cm/(1 m rope length) [0.12 inch/(1 ft rope length)].
 Tensile load limit of rope probes: → 24

Securing rod probes

- For WHG approvals: For probe lengths ≥ 3 m (10 ft) a support is required.
- In general, rod probes must be supported if there is a horizontal flow (e.g. from an agitator) or in the case of strong vibrations.
- Rod probes may only be supported at the end of the probe.



A0012607

- 1 Probe rod, uncoated
- 2 Sleeve bored tight to ensure electrical contact between the rod and sleeve!
- 3 Short metal pipe, e.g. welded in place
- 4 Probe rod, coated
- 5 Plastic sleeve, e.g. PTFE, PEEK or PPS
- 6 Short metal pipe, e.g. welded in place

NOTICE

Poor grounding of the end of probe may cause measuring errors.

- ▶ Apply a narrow sleeve which has good electrical contact to the probe.

NOTICE

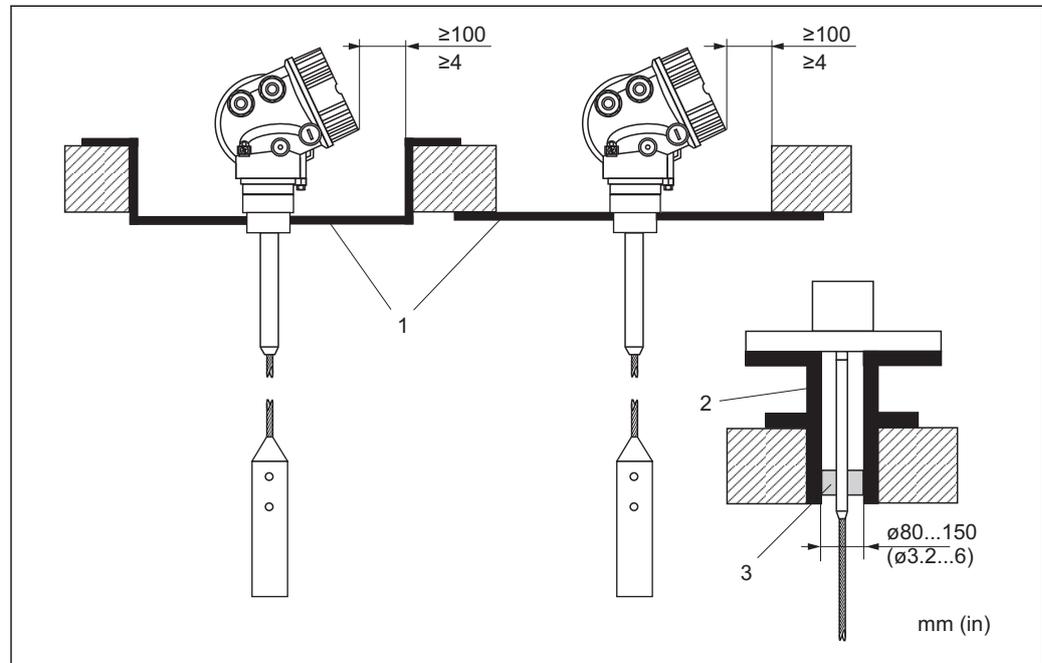
Welding may damage the main electronics module.

- ▶ Before welding: Ground the probe and dismount electronics.

6.1.6 Special mounting conditions

Concrete silos

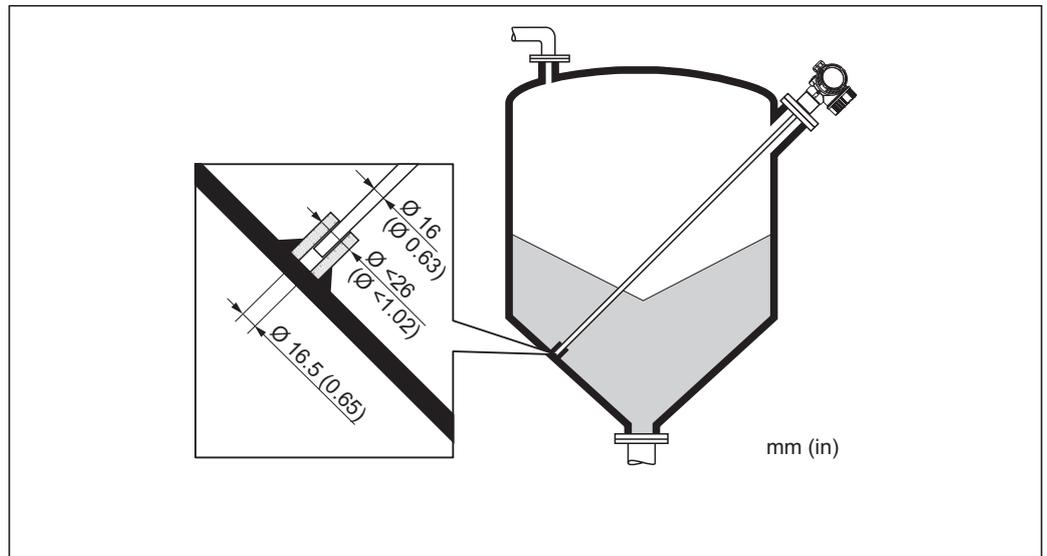
Installation, for example, into a thick concrete ceiling should be made flush with the lower edge. Alternatively, the probe can also be installed into a pipe that must not protrude over the lower edge of the silo ceiling. The pipe should be kept at a minimum length. Installation suggestions see diagram.



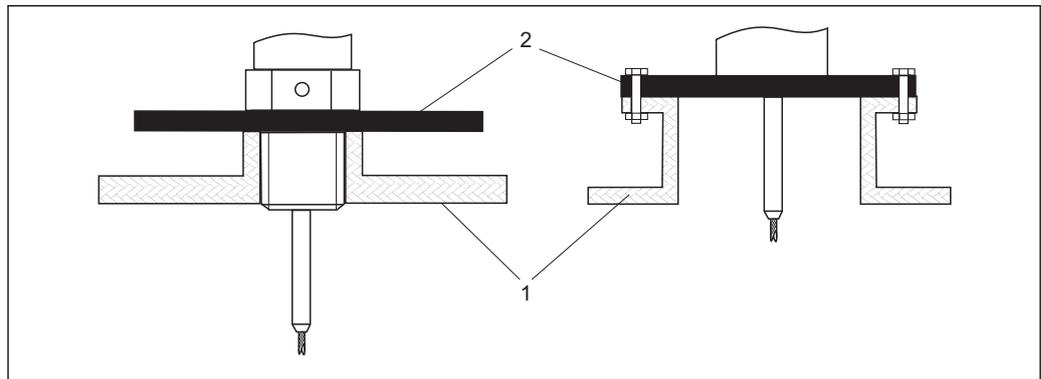
A0014138

- 1 Metal sheet
- 2 Metal tube
- 3 Extension rod / Centering HMP40 (see "Accessories")

Note for installations with rod extension/center washer (accessories): Strong dust generation can lead to build-up behind the center washer. This can cause an interference signal. For other installation possibilities please contact Endress+Hauser.

Installation from the side

- If installation from above is not possible, the Levelflex can also be mounted from the side.
- In this case, always fix the rope probe → 32 .
- Support rod probe if the lateral loadbearing capacity is exceeded → 27. Only fix rod probes at the probe end → 32.

Non-metallic vessels

A0012527

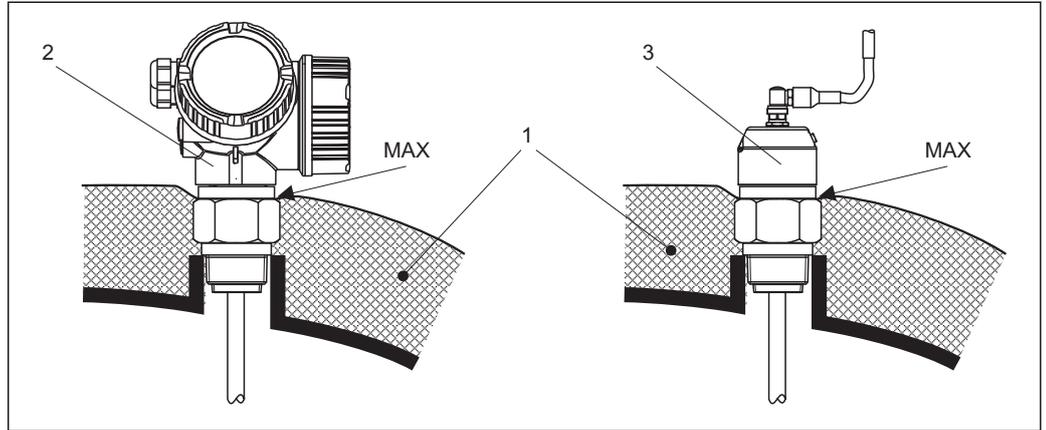
- 1 *Non-metallic vessel*
2 *Metal sheet or metal flange*

To ensure reliable measurements in non-metallic vessels:

- Select an instrument version with metal flange (minimum size DN50/2").
- Or: mount a metal sheet with a diameter of at least 200 mm (8 in) to the probe at the process connection. Its orientation must be perpendicular to the probe.

Vessels with heat insulation

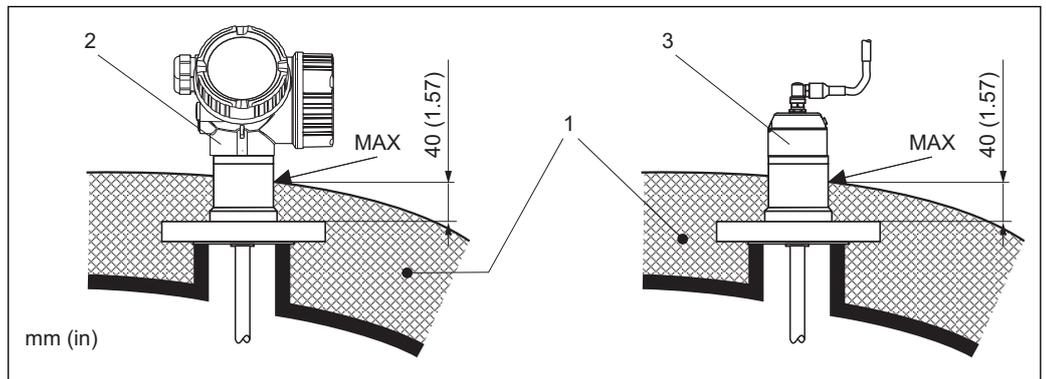
i If process temperatures are high, the device must be included in normal tank insulation to prevent the electronics heating up as a result of heat radiation or convection. The insulation may not exceed beyond the points labeled "MAX" in the drawings.



A0014653

10 Process connection with thread - FMP56, FMP57

- 1 Tank insulation
- 2 Compact device
- 3 Sensor remote (feature 600)



A0014654

11 Process connection with flange - FMP57

- 1 Tank insulation
- 2 Compact device
- 3 Sensor remote (feature 600)

6.2 Mounting the device

6.2.1 Required mounting tools

- For mounting thread 3/4": Hexagonal wrench 36 mm
- For mounting thread 1-1/2": Hexagonal wrench 55 mm
- To shorten rod or coax probes: Saw
- To shorten rope probes:
 - Allen key AF 3 mm (for 4mm ropes) or AF 4 mm (for 6 mm ropes)
 - Saw or bolt cutter
- For flanges and other process connections: appropriate mounting tools
- To turn the housing: Hexagonal wrench 8 mm

6.2.2 Shortening the probe

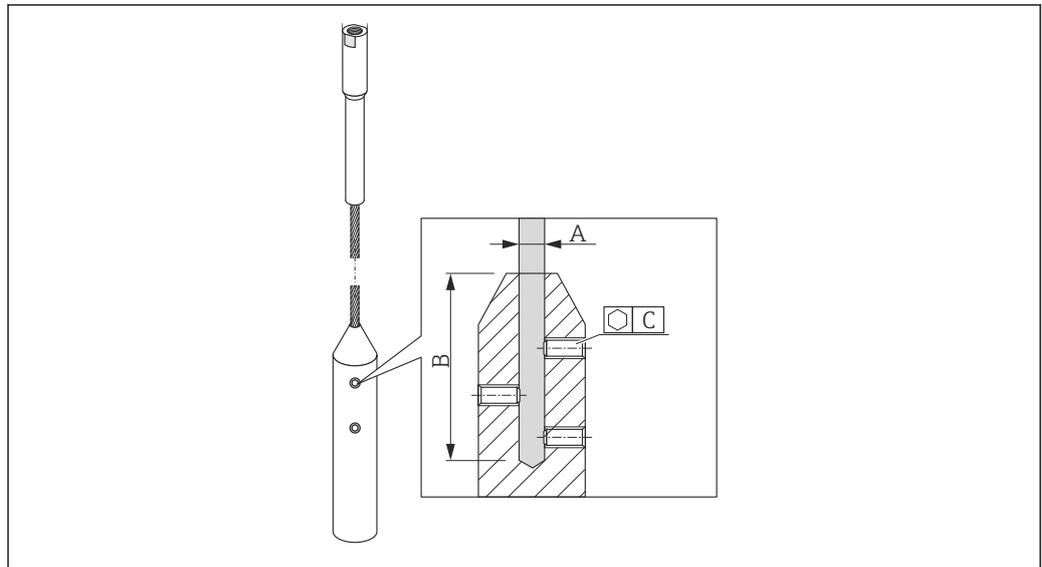
Shortening rod probes

Rod probes must be shortened if the distance to the container floor or outlet cone is less than 10 mm (0.4 in). The rods of a rod probe are shortened by sawing at the bottom end.

 Rod probes of FMP52 can **not** be shortened as they are coated.

Shortening rope probes

Rope probes must be shortened if the distance to the container floor or outlet cone is less than 150 mm (6 in).



A0021693

| Rope material | A | B | C | Torque for set screws |
|---------------|----------------|----------------|------|-----------------------|
| 316 | 4 mm (0.16 in) | 40 mm (1.6 in) | 3 mm | 5 Nm (3.69 lbf ft) |
| 316 | 6 mm (0.24 in) | 55 mm (2.2 in) | 4 mm | 15 Nm (11.06 lbf ft) |
| PA > steel | 6 mm (0.24 in) | 40 mm (1.6 in) | 3 mm | 5 Nm (3.69 lbf ft) |
| PA > steel | 8 mm (0.31 in) | 55 mm (2.2 in) | 4 mm | 15 Nm (11.06 lbf ft) |

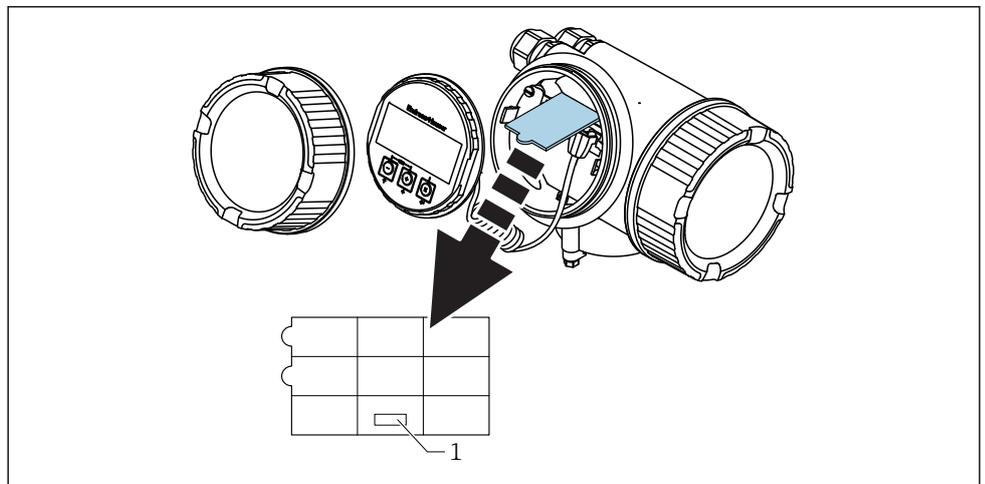
1. Using an Allen key, loosen the set screws at the end-of-probe weight. Note: The set screws have got a clamping coating in order to prevent accidental loosening. Thus an increased torque might be necessary to loosen them.

2. Remove released rope from the weight.
3. Measure off new rope length.
4. Wrap adhesive tape around the rope at the point to be shortened to prevent it from fanning out.
5. Saw off the rope at a right angle or cut it off with a bolt cutter.
6. Insert the rope completely into the weight.
7. Screw the set screws into place. Due to the clamping coating of the setscrews application of a screw locking fluid is not necessary.

Entering the new probe length

After shortening the probe:

1. Go to the **Probe settings** submenu and perform a probe length correction.
- 2.



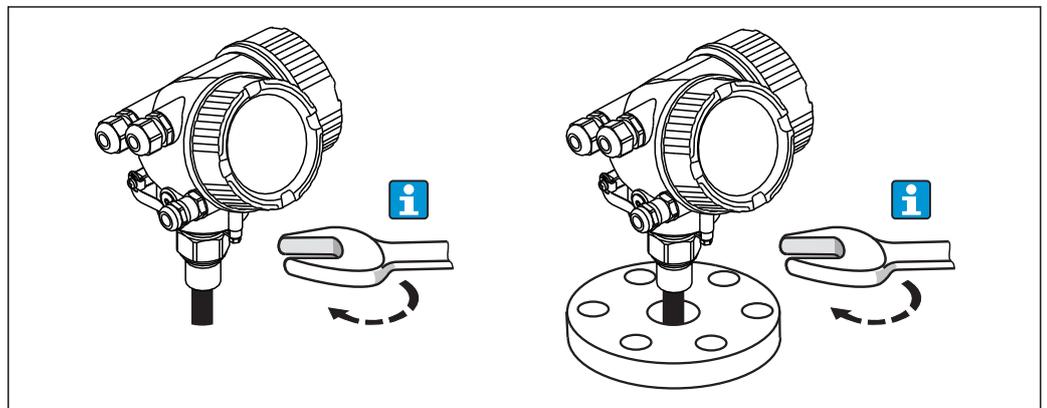
A0014241

1 Field for the new probe length

For documentation purposes, enter the new probe length into the Quick Setup which can be found in the electronics housing behind the display module.

6.2.3 Mounting the device

Mounting devices with thread



A0012528

Devices with mounting thread are screwed into a welding boss or a flange and are usually also secured with these.

- i** ■ Tighten with the hexagonal nut only:
 - Thread 3/4": Hexagonal wrench 36 mm
 - Thread 1-1/2": Hexagonal wrench 55 mm
- Maximum permissible torque:
 - Thread 3/4": 45 Nm
 - Thread 1-1/2": 450 Nm
- Recommended torque when using the supplied aramid fibre seal and a process pressure of 40 bar (580 psi):
 - Thread 3/4": 25 Nm
 - Thread 1-1/2": 140 Nm
- When installing in metal containers, take care to ensure good metallic contact between the process connection and container.

Flange mounting

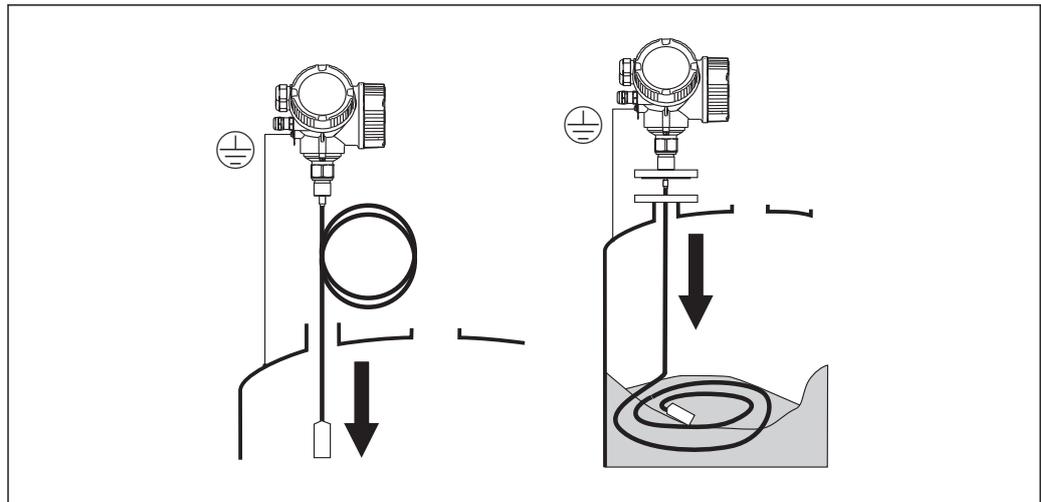
If a seal is used, be sure to use unpainted metal bolts to ensure good electrical contact between probe flange and process flange.

Mounting rope probes

NOTICE

Electrostatic discharges may damage the electronics.

- ▶ Earth the housing before lowering the rope into the vessel.



A0012529

When lowering the rope probe into the vessel, observe the following:

- Uncoil rope and lower it slowly and carefully into the vessel.
- Do not kink the rope.
- Avoid any backlash, since this might damage the probe or the vessel fittings.

i Mounting rope probes in a partially full silo

It is not always possible to empty a silo which is already in operation. If a minimum of 2/3 of the silo is empty, it is possible to install the probe into the partially filled silo. If possible, make a visual check after the installation to see that the rope has not tangled or is lying such that it can knot when the level falls. Before full accuracy is obtained the probe rope must hang fully extended.

6.2.4 Mounting the "Sensor remote" version

i This section is only valid for devices of the version "Probe Design" = "Sensor remote" (feature 600, option MB/MC/MD).

For the version "Probe design" = "Sensor remote" the following is supplied:

- The probe with the process connection
- The electronics housing
- The mounting bracket for wall or pipe mounting of the electronics housing
- The connection cable (length as ordered). The cable has got one straight and one angled plug (90°). Depending on the local conditions the angled plug can be connected at the probe or at the electronics housing.

⚠ CAUTION

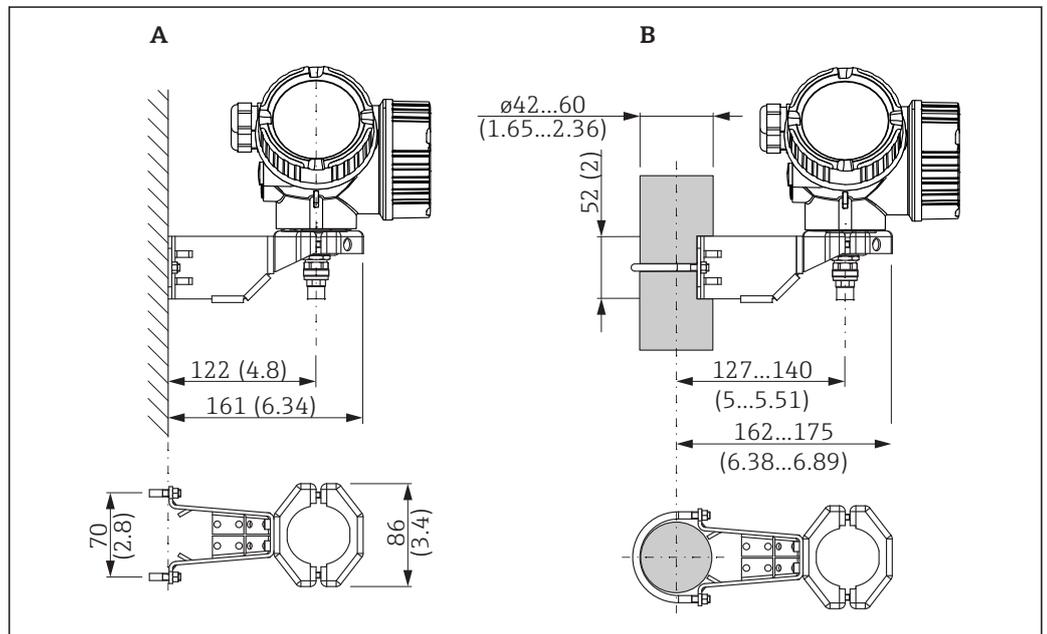
The plugs of the connection cable may be damaged by mechanical stress.

- ▶ Mount the probe and the electronics housing tightly before connecting the cable.
- ▶ Lay the cable such that it is not exposed to mechanical stress. Minimum bending radius: 100 mm (4").
- ▶ When connecting the cable: Connect the straight plug before the angled one. Torque for both coupling nuts: 6 Nm.

i Probe, electronics and connection cable are adjusted to match each other. They are marked by a common serial number. Only components with the same serial number shall be connected to each other.

i If the measuring point is exposed to strong vibrations, an additional locking compound (e.g. Loctite 243) can be applied at the plug connectors.

Mounting the electronics housing

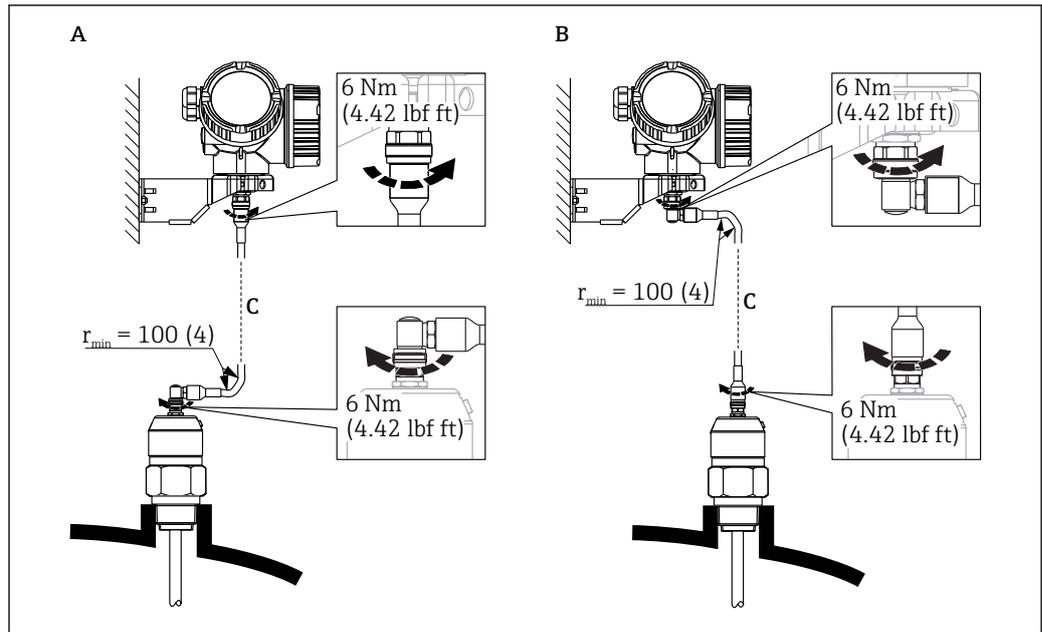


12 Mounting the electronics housing using the mounting bracket; dimensions: mm (in)

- A Wall mounting
- B Pipe mounting

Connecting the cable

Required tools:
Open-end wrench 18AF



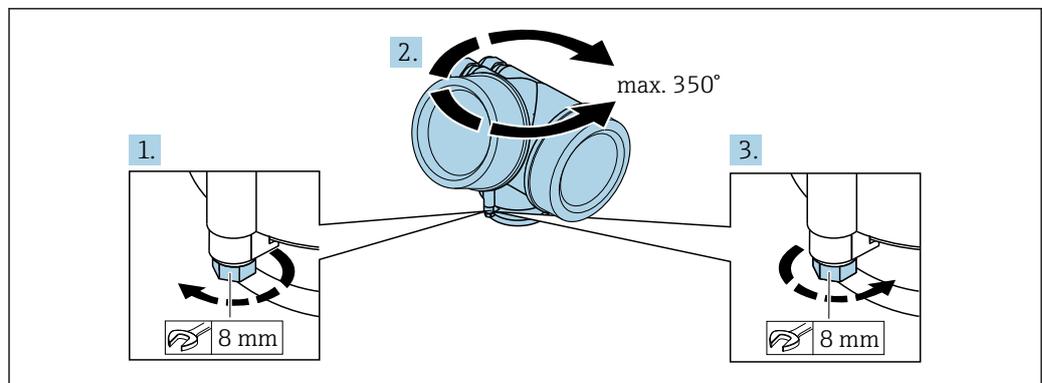
A0014794

13 Connecting the cable. There are the following possibilities:

- A Angled plug at the probe
- B Angled plug at the electronics housing
- C Length of the remote cable as ordered

6.2.5 Turning the transmitter housing

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

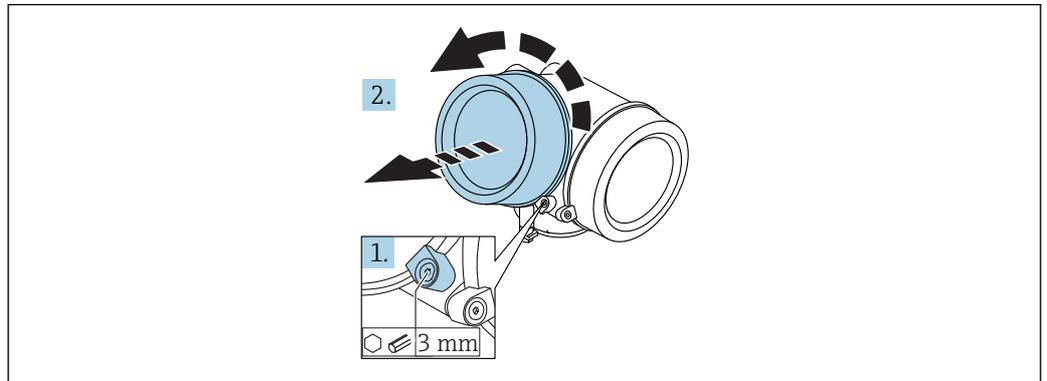


A0032242

1. Unscrew the securing screw using an open-ended wrench.
2. Rotate the housing in the desired direction.
3. Tighten the securing screw (1.5 Nm for plastic housing; 2.5 Nm for aluminum or stainless steel housing).

6.2.6 Turning the display

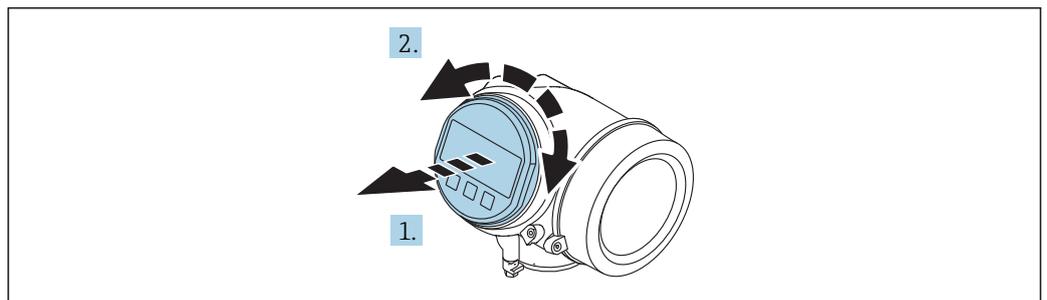
Opening cover



A0021430

1. Loosen the screw of the securing clamp of the electronics compartment cover using an Allen key (3 mm) and turn the clamp 90 ° counterclockwise.
2. Unscrew cover and check lid gasket, replace if necessary.

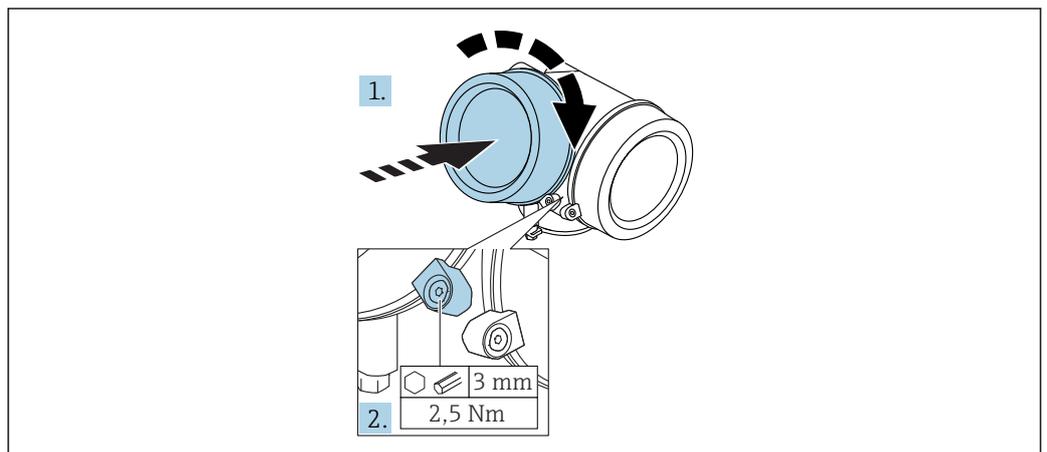
Turning the display module



A0036401

1. Pull out the display module with a gentle rotational movement.
2. Rotate the display module to the desired position: max. $8 \times 45^\circ$ in each direction.
3. Feed the coiled cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment until it engages.

Closing electronics compartment cover



A0021451

1. Screw back firmly electronics compartment cover.
2. Turning securing clamp 90 ° clockwise and tighten the clamp with 2.5 Nm using the Allen key (3 mm).

6.3 Post-installation check

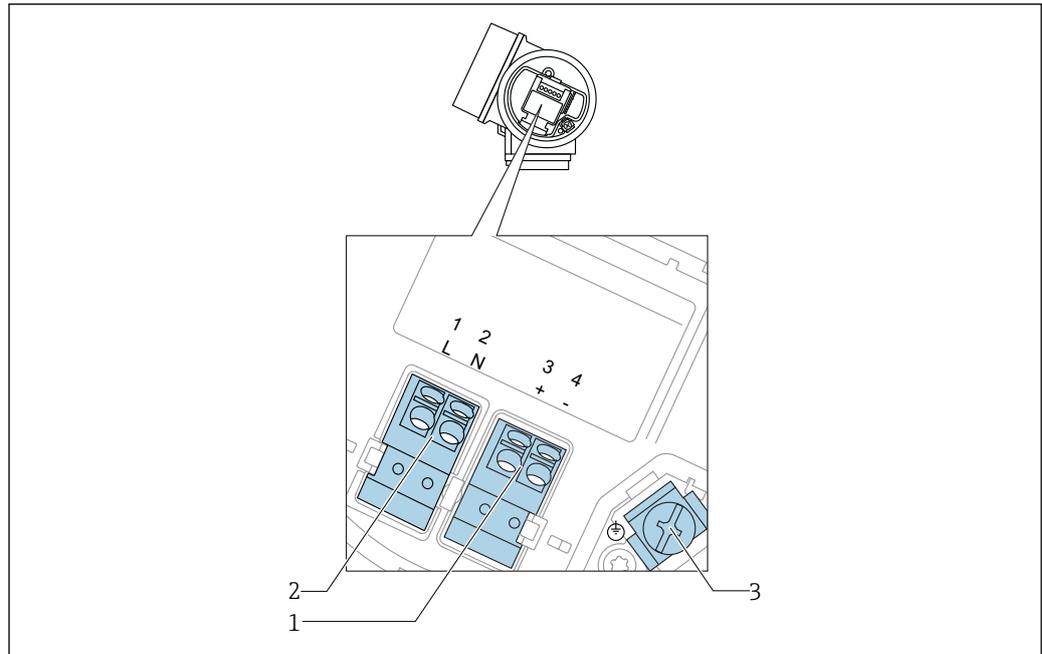
| | |
|-----------------------|--|
| <input type="radio"/> | Is the device undamaged (visual inspection)? |
| <input type="radio"/> | Does the device conform to the measuring point specifications? For example: <ul style="list-style-type: none">■ Process temperature■ Process pressure (refer to the chapter on "Material load curves" of the "Technical Information" document)■ Ambient temperature range■ Measuring range |
| <input type="radio"/> | Are the measuring point identification and labeling correct (visual inspection)? |
| <input type="radio"/> | Is the device adequately protected from precipitation and direct sunlight? |
| <input type="radio"/> | Are the securing screw and securing clamp tightened securely? |

7 Electrical connection

7.1 Connection conditions

7.1.1 Terminal assignment

Terminal assignment 4-wire: 4-20 mA HART (90 to 253 V_{AC})



14 Terminal assignment 4-wire: 4-20 mA HART (90 to 253 V_{AC})

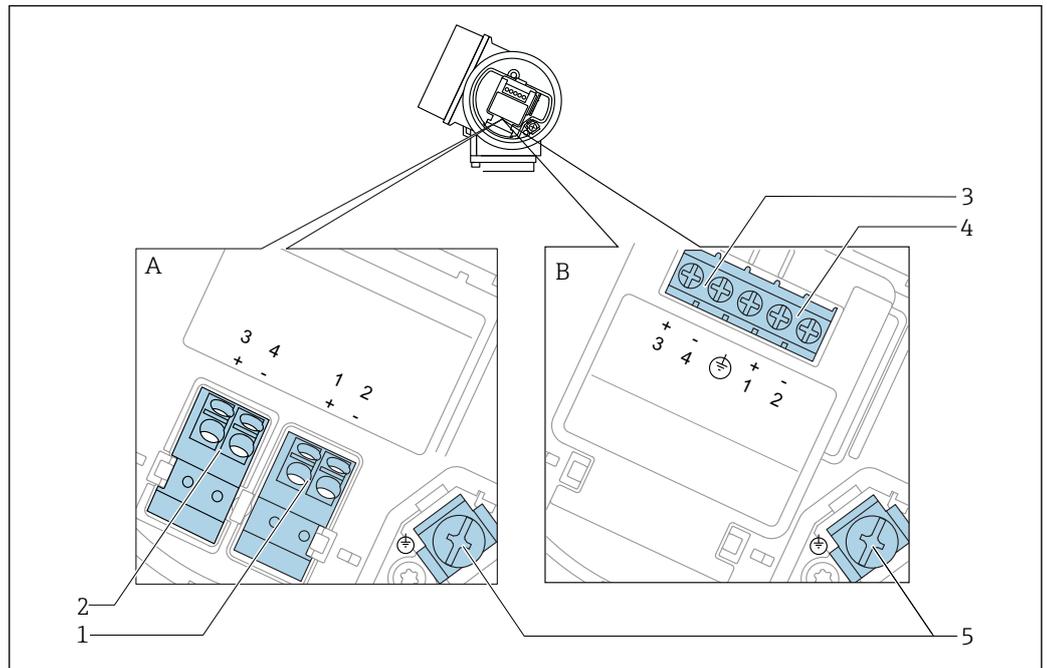
- 1 Connection 4-20 mA HART (active): terminals 3 and 4
- 2 Connection supply voltage: terminals 1 and 2
- 3 Terminal for cable screen

⚠ CAUTION

To ensure electrical safety:

- ▶ Do not disconnect the protective connection.
 - ▶ Disconnect the supply voltage before disconnecting the protective earth.
- i** Connect protective earth to the internal ground terminal (3) before connecting the supply voltage. If necessary, connect the potential matching line to the external ground terminal.
 - i** In order to ensure electromagnetic compatibility (EMC): Do **not** only ground the device via the protective earth conductor of the supply cable. Instead, the functional grounding must also be connected to the process connection (flange or threaded connection) or to the external ground terminal.
 - i** An easily accessible power switch must be installed in the proximity of the device. The power switch must be marked as a disconnecter for the device (IEC/EN61010).

Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus



A0036500

15 Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus

A Without integrated overvoltage protection

B With integrated overvoltage protection

1 Connection PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, without integrated overvoltage protection

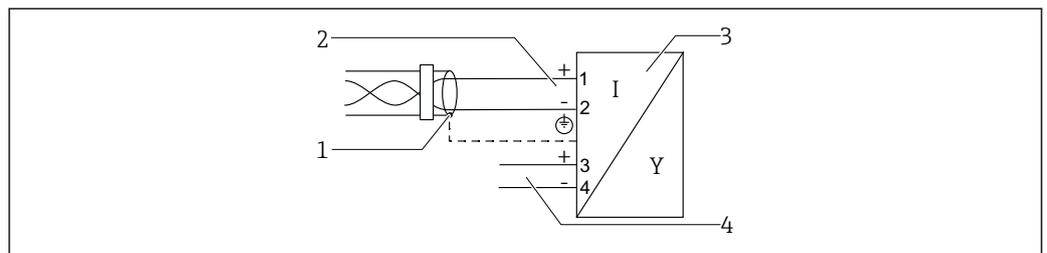
2 Connection switch output (Open Collector): terminals 3 and 4, without integrated overvoltage protection

3 Connection switch output (Open Collector): terminals 3 and 4, with integrated overvoltage protection

4 Connection PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, with integrated overvoltage protection

5 Terminal for cable screen

Block diagram PROFIBUS PA / FOUNDATION Fieldbus



A0036530

16 Block diagram PROFIBUS PA / FOUNDATION Fieldbus

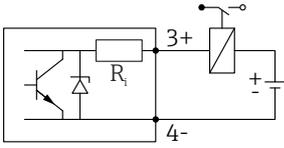
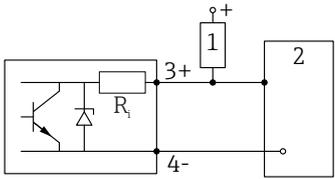
1 Cable screen; observe cable specifications

2 Connection PROFIBUS PA / FOUNDATION Fieldbus

3 Measuring device

4 Switch output (open collector)

Connection examples for the switch output

| | |
|--|--|
|  <p>17 Connection of a relay</p> <p>Suitable relays (examples):</p> <ul style="list-style-type: none"> ▪ Solid-state relay: Phoenix Contact OV-24DC/480AC/5 with mounting rail connector UMK-1 OM-R/AMS ▪ Electromechanical relay: Phoenix Contact PLC-RSC-12DC/21 |  <p>18 Connection of a digital input</p> <p>1 Pull-up resistor 2 Digital input</p> |
|--|--|

i For optimum interference immunity we recommend to connect an external resistor (internal resistance of the relay or Pull-up resistor) of $< 1\,000\ \Omega$.

7.1.2 Cable specification

- **Devices without integrated overvoltage protection**
Pluggable spring-force terminals for wire cross-sections 0.5 to $2.5\ \text{mm}^2$ (20 to 14 AWG)
- **Devices with integrated overvoltage protection**
Screw terminals for wire cross-sections 0.2 to $2.5\ \text{mm}^2$ (24 to 14 AWG)
- For ambient temperature $T_U \geq 60\ ^\circ\text{C}$ ($140\ ^\circ\text{F}$): use cable for temperature $T_U + 20\ \text{K}$.

PROFIBUS

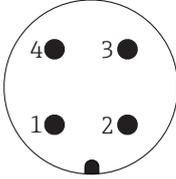
Use a twisted, screened two-wire cable, preferably cable type A.

i For further information on the cable specifications, see Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning", PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

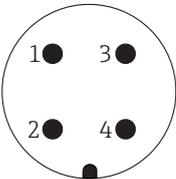
7.1.3 Device plug connectors

i For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.

Pin assignment of the M12 plug connector

|  <p style="text-align: right; font-size: small;">A0011175</p> | Pin | Meaning |
|--|-----|---------------|
| | 1 | Signal + |
| | 2 | not connected |
| | 3 | Signal - |
| | 4 | Ground |

Pin assignment of the 7/8" plug connector

|  <p style="text-align: right; font-size: small;">A0011176</p> | Pin | Meaning |
|--|-----|---------------|
| | 1 | Signal - |
| | 2 | Signal + |
| | 3 | Not connected |
| | 4 | Screen |

7.1.4 Power supply

PROFIBUS PA, FOUNDATION Fieldbus

| "Power supply; Output" ¹⁾ | "Approval" ²⁾ | Terminal voltage |
|--|--|-------------------------|
| E: 2-wire; FOUNDATION Fieldbus, switch output G: 2-wire; PROFIBUS PA, switch output | <ul style="list-style-type: none"> ▪ Non-Ex ▪ Ex nA ▪ Ex nA[ia] ▪ Ex ic ▪ Ex ic[ia] ▪ Ex d[ia] / XP ▪ Ex ta / DIP ▪ CSA GP | 9 to 32 V ³⁾ |
| | <ul style="list-style-type: none"> ▪ Ex ia / IS ▪ Ex ia + Ex d[ia] / IS + XP | 9 to 30 V ³⁾ |

- 1) Feature 020 of the product structure
- 2) Feature 010 of the product structure
- 3) Input voltages up to 35 V will not spoil the device.

| | |
|--|-----|
| Polarity sensitive | No |
| FISCO/FNICO compliant according to IEC 60079-27 | Yes |

7.1.5 Overvoltage protection

If the measuring device is used for level measurement in flammable liquids which requires the use of overvoltage protection according to DIN EN 60079-14, standard for test procedures 60060-1 (10 kA, pulse 8/20 μ s), an overvoltage protection module has to be installed.

Integrated overvoltage protection module

An integrated overvoltage protection module is available for 2-wire HART as well as PROFIBUS PA and FOUNDATION Fieldbus devices.

Product structure: Feature 610 "Accessory mounted", option NA "Overvoltage protection".

| Technical data | |
|---|-----------------------|
| Resistance per channel | 2 × 0.5 Ω max. |
| Threshold DC voltage | 400 to 700 V |
| Threshold impulse voltage | < 800 V |
| Capacitance at 1 MHz | < 1.5 pF |
| Nominal arrest impulse voltage (8/20 μ s) | 10 kA |

External overvoltage protection module

HAW562 or HAW569 from Endress+Hauser are suited as external overvoltage protection.



For detailed information please refer to the following documents:

- HAW562: TI01012K
- HAW569: TI01013K

7.2 Connecting the measuring device

⚠ WARNING

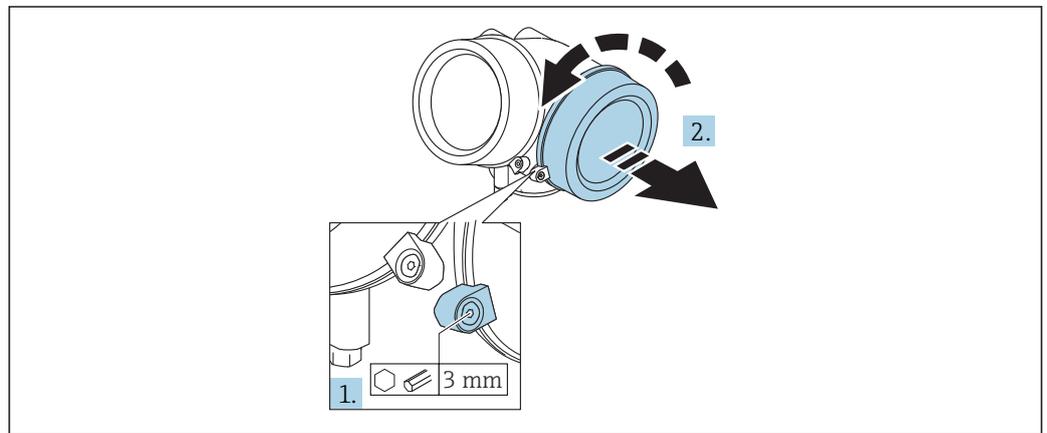
Risk of explosion!

- ▶ Observe applicable national standards.
- ▶ Comply with the specifications in the Safety Instructions (XA).
- ▶ Use specified cable glands only.
- ▶ Check to ensure that the power supply matches the information on the nameplate.
- ▶ Switch off the power supply before connecting the device.
- ▶ Connect the potential matching line to the outer ground terminal before applying the power supply.

Required tools/accessories:

- For devices with a cover lock: Allen key AF3
- Wire stripper
- When using stranded cables: One ferrule for every wire to be connected.

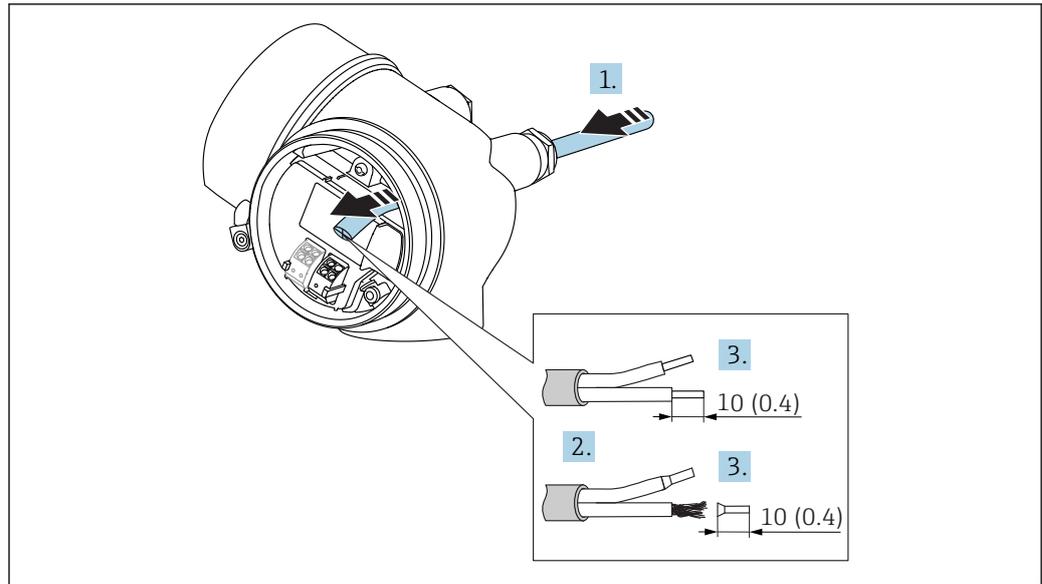
7.2.1 Opening connection compartment cover



A0021490

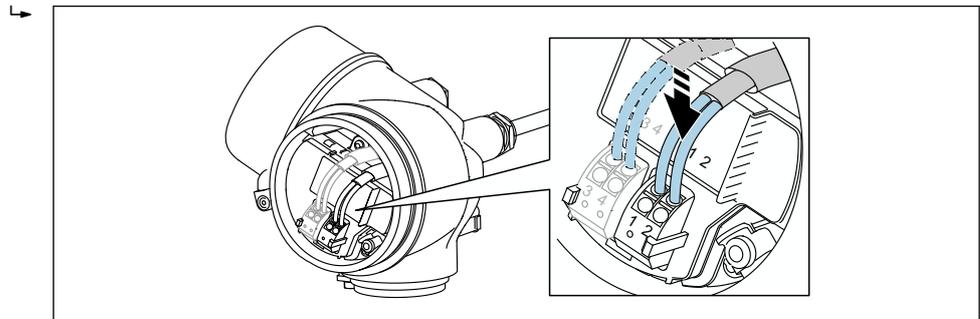
1. Loosen the screw of the securing clamp of the connection compartment cover using an Allen key (3 mm) and turn the clamp 90 ° clockwise.
2. Afterwards unscrew connection compartment cover and check lid gasket, replace if necessary.

7.2.2 Connecting



19 Dimensions: mm (in)

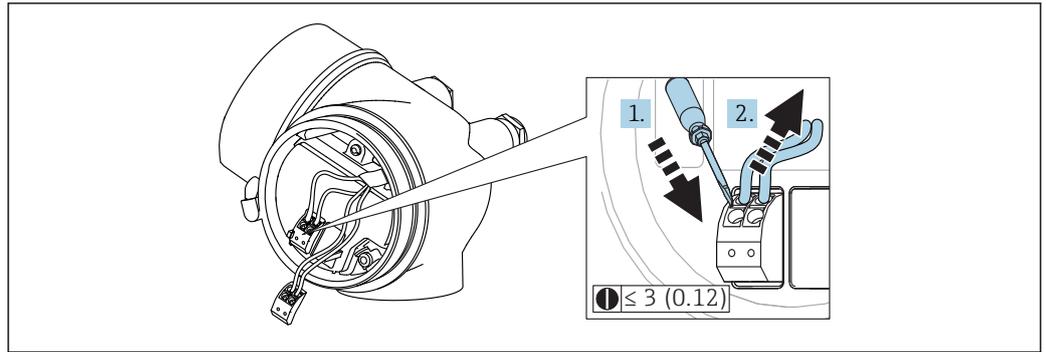
1. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
2. Remove the cable sheath.
3. Strip the cable ends over a length of 10 mm (0.4 in). In the case of stranded cables, also fit ferrules.
4. Firmly tighten the cable glands.
5. Connect the cable in accordance with the terminal assignment.



6. If using shielded cables: Connect the cable shield to the ground terminal.

7.2.3 Plug-in spring-force terminals

In the case of devices without integrated overvoltage protection, electrical connection is via plug-in spring-force terminals. Rigid conductors or flexible conductors with ferrules can be inserted directly into the terminal without using the lever, and create a contact automatically.



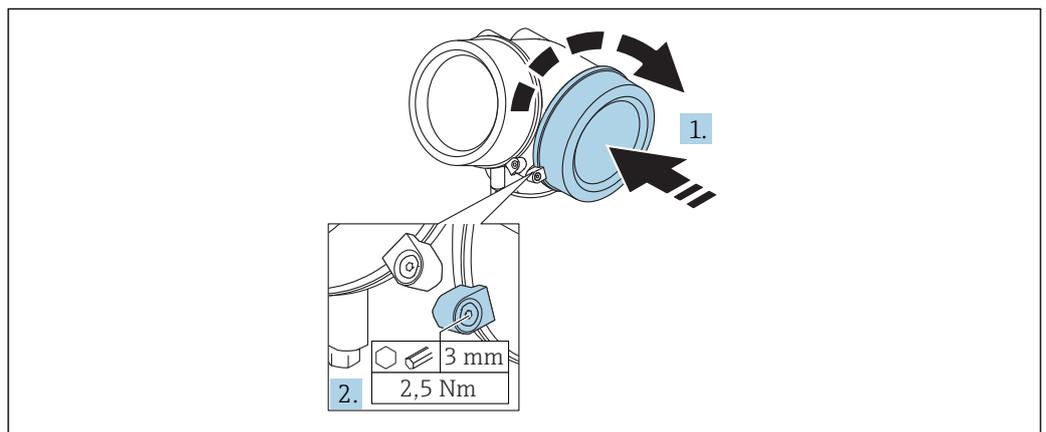
A0013661

20 Dimensions: mm (in)

To remove cables from the terminal:

1. Using a flat-blade screwdriver ≤ 3 mm, press down on the slot between the two terminal holes
2. while simultaneously pulling the cable end out of the terminal.

7.2.4 Closing connection compartment cover



A0021491

1. Screw back firmly connection compartment cover.
2. Turning securing clamp 90° counterclockwise and tighten the clamp with 2.5 Nm (1.84 lbf ft) again using the Allen key (3 mm).

7.3 Post-connection check

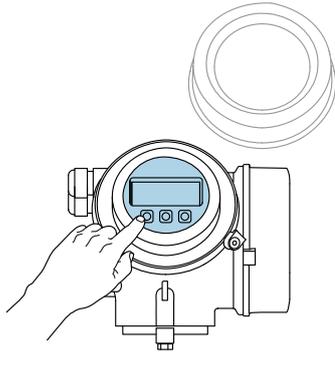
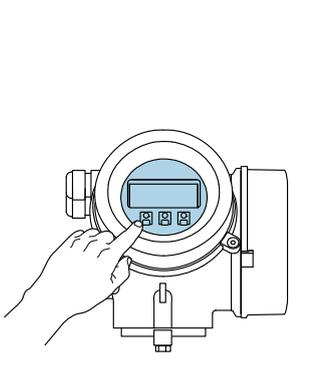
| | |
|--------------------------|--|
| <input type="checkbox"/> | Is the device or cable undamaged (visual check)? |
| <input type="checkbox"/> | Do the cables comply with the requirements ? |
| <input type="checkbox"/> | Do the cables have adequate strain relief? |
| <input type="checkbox"/> | Are all cable glands installed, securely tightened and leak-tight? |
| <input type="checkbox"/> | Does the supply voltage match the specifications on the nameplate? |
| <input type="checkbox"/> | Is the terminal assignment correct? |

| | |
|--------------------------|---|
| <input type="checkbox"/> | If required: Has protective ground connection been established ? |
| <input type="checkbox"/> | If supply voltage is present, is the device ready for operation and do values appear on the display module? |
| <input type="checkbox"/> | Are all housing covers installed and securely tightened? |
| <input type="checkbox"/> | Is the securing clamp tightened correctly? |

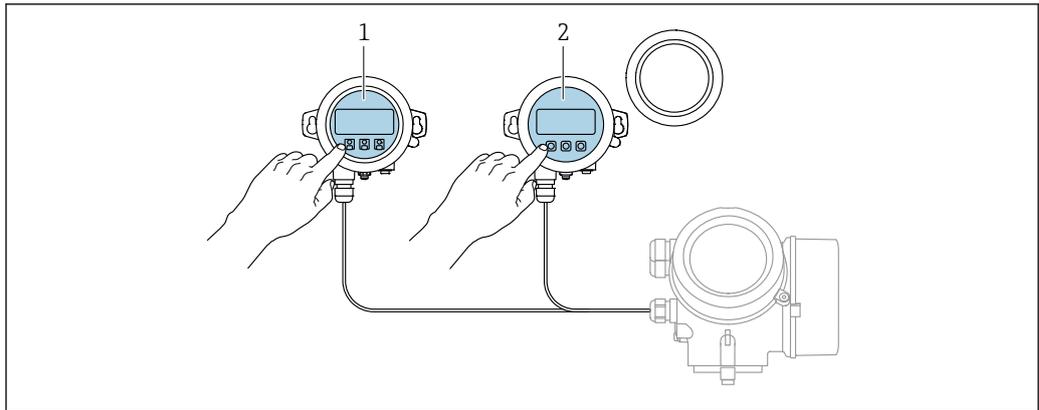
8 Operation options

8.1 Overview

8.1.1 Local operation

| Operation with | Pushbuttons | Touch Control |
|-------------------------------------|---|---|
| Order code for "Display; Operation" | Option C "SD02" | Option E "SD03" |
| |  <p style="text-align: right; font-size: small;">A0036312</p> |  <p style="text-align: right; font-size: small;">A0036313</p> |
| Display elements | 4-line display | 4-line display white background lighting; switches to red in event of device error |
| | Format for displaying measured variables and status variables can be individually configured | |
| | Permitted ambient temperature for the display: -20 to +70 °C (-4 to +158 °F) The readability of the display may be impaired at temperatures outside the temperature range. | |
| Operating elements | local operation with 3 push buttons (⊕, ⊖, ⊞) | external operation via touch control; 3 optical keys: ⊕, ⊖, ⊞ |
| | Operating elements also accessible in various hazardous areas | |
| Additional functionality | Data backup function The device configuration can be saved in the display module. | |
| | Data comparison function The device configuration saved in the display module can be compared to the current device configuration. | |
| | Data transfer function The transmitter configuration can be transmitted to another device using the display module. | |

8.1.2 Operation with remote display and operating module FHX50



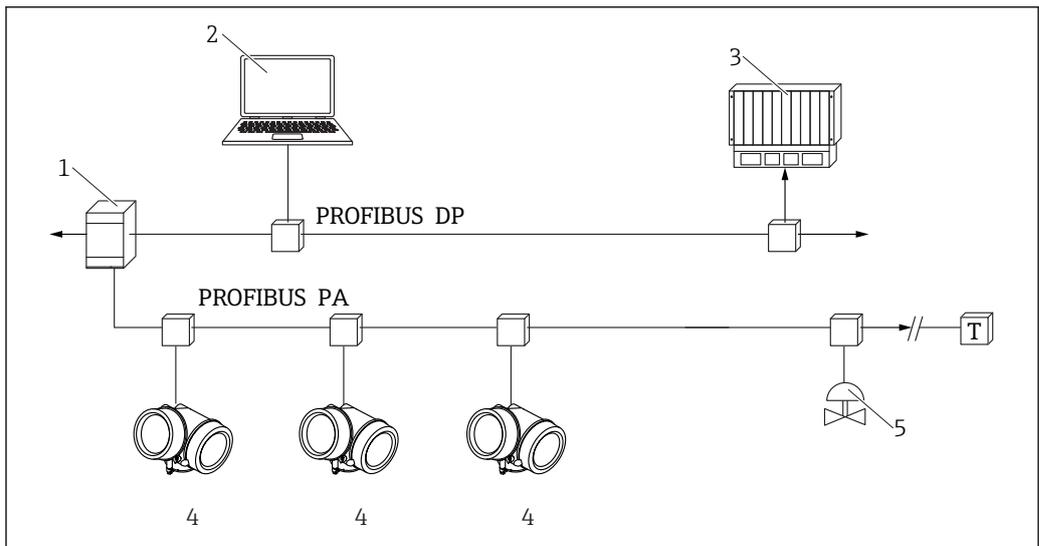
A0036314

21 FHX50 operating options

- 1 Display and operating module SD03, optical keys; can be operated through the glass of the cover
- 2 Display and operating module SD02, push buttons; cover must be removed

8.1.3 Remote operation

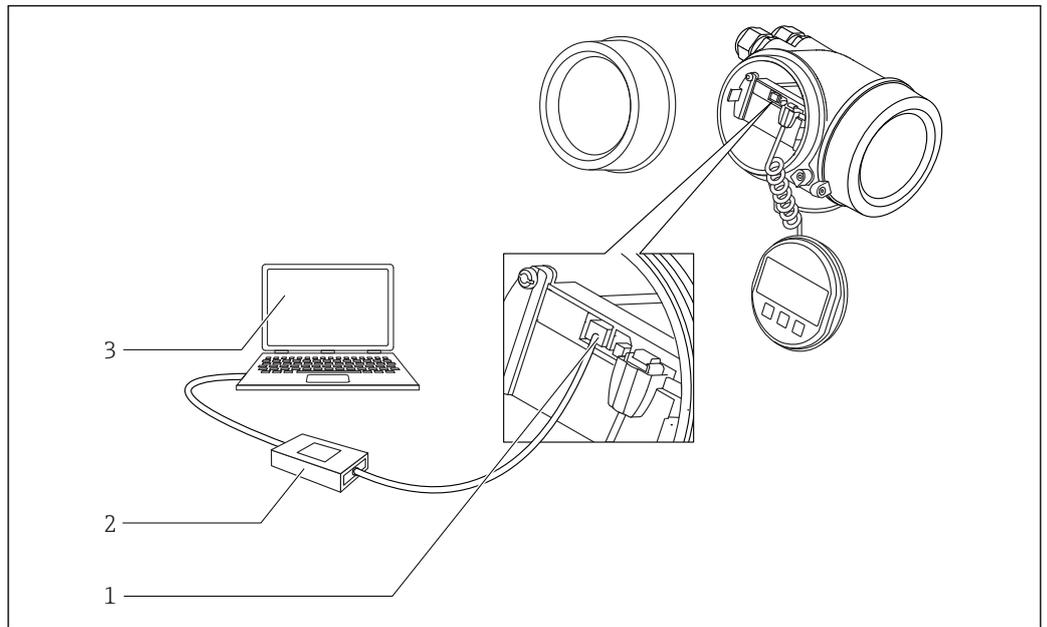
Via PROFIBUS PA protocol



A0036301

22 Options for remote operation via PROFIBUS PA protocol

- 1 Segment coupler
- 2 Computer with Profiboard/Proficard and operating tool (e.g. DeviceCare/FieldCare)
- 3 PLC (Programmable Logic Controller)
- 4 Transmitter
- 5 Additional functions (valves etc.)

DeviceCare/FieldCare via service interface (CDI)

A0032466

23 DeviceCare/FieldCare via service interface (CDI)

- 1 Service interface (CDI) of the instrument (= Endress+Hauser Common Data Interface)
- 2 Commubox FXA291
- 3 Computer with DeviceCare/FieldCare operating tool

8.2 Structure and function of the operating menu

8.2.1 Structure of the operating menu

| Menu | Submenu / parameter | Meaning |
|---|------------------------------------|---|
| | Language ¹⁾ | Defines the operating language of the on-site display |
| Commissioning ²⁾ | | Launches the interactive wizard for guided commissioning. Additional settings generally do not need to be made in the other menus when the wizard is finished. |
| Setup | Parameter 1 ... Parameter N | Once values have been set for these parameters, the measurement should generally be completely configured. |
| | Advanced setup | Contains additional submenus and parameters: <ul style="list-style-type: none"> ▪ to adapt the device to special measuring conditions. ▪ to process the measured value (scaling, linearization). ▪ to configure the signal output. |
| Diagnostics | Diagnostic list | Contains up to 5 currently active error messages. |
| | Event logbook ³⁾ | Contains the last 20 messages (which are no longer active). |
| | Device information | Contains information for identifying the device. |
| | Measured values | Contains all current measured values. |
| | Data logging | Contains the history of the individual measuring values. |
| | Simulation | Is used to simulate measured values or output values. |
| | Device check | Contains all parameters needed to check the measurement capability of the device. |
| Expert ⁵⁾ Contains all parameters of the device (including those that are already in one of the other menus). This menu is organized according to the function blocks of the device. The parameters of the Expert menu are described in: GP01001F (PROFIBUS PA) | System | Contains all higher-order device parameters that do not concern the measurement or measured value communication. |
| | Sensor | Contains all parameters needed to configure the measurement. |
| | Output | Contains all parameters needed to configure the switch output (PFS). |

| Menu | Submenu / parameter | Meaning |
|------|----------------------|--|
| | Communication | Contains all parameters needed to configure the digital communication interface. |
| | Diagnostics | Contains all parameters needed to detect and analyze operational errors. |

- 1) If operating via operating tools (e.g. FieldCare), the "Language" parameter is located under "Setup → Advanced setup → Display"
- 2) Only if operating via an FDT/DTM system
- 3) only available with local operation
- 4) only available if operating via DeviceCare or FieldCare
- 5) On entering the "Expert" menu, an access code is always requested. If a customer specific access code has not been defined, "0000" has to be entered.

8.2.2 User roles and related access authorization

The two user roles **Operator** and **Maintenance** have different write access to the parameters if a device-specific access code has been defined. This protects the device configuration via the local display from unauthorized access → 60.

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 | ✓ | ✓ | ✓ | -- |
| Maintenance | ✓ | ✓ | ✓ | ✓ |

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

The user role with which the user is currently logged on is indicated by the **Access status display** parameter (for display operation) or **Access status tooling** parameter (for tool operation).

8.2.3 Data access - Security

Write protection via access code

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

Define access code via local display

1. Navigate to: Setup → Advanced setup → Administration → Define access code → Define access code
2. Define a max. 4-digit numeric code as an access code.
3. Repeat the same code in **Confirm access code** parameter.
 - ↳ The -symbol appears in front of all write-protected parameters.

Define access code via operating tool (e.g. FieldCare)

1. Navigate to: Setup → Advanced setup → Administration → Define access code
2. Define a max. 4-digit numeric code as an access code.
 - ↳ Write protection is active.

Parameters that can always be changed

The write protection does not include certain parameters that do not affect the measurement. Despite the defined access code, they can always be modified, even if the other parameters are locked.

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 measured value 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 → 61.
- In the "Description of Device Parameters" documents, each write-protected parameter is identified with the -symbol.

Disabling write protection via access code

If the -symbol appears on the local display in front of a parameter, the parameter is write-protected by a device-specific access code and its value cannot be changed at the moment using the local display →  60.

The locking of the write access via local operation can be disabled by entering the device-specific access code.

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

Deactivation of the write protection via access code

Via local display

1. Navigate to: Setup → Advanced setup → Administration → Define access code → Define access code
2. Enter **0000**.
3. Repeat **0000** in **Confirm access code** parameter.
 - ↳ The write protection is deactivated. Parameters can be changed without entering an access code.

Via an operating tool (e.g. FieldCare)

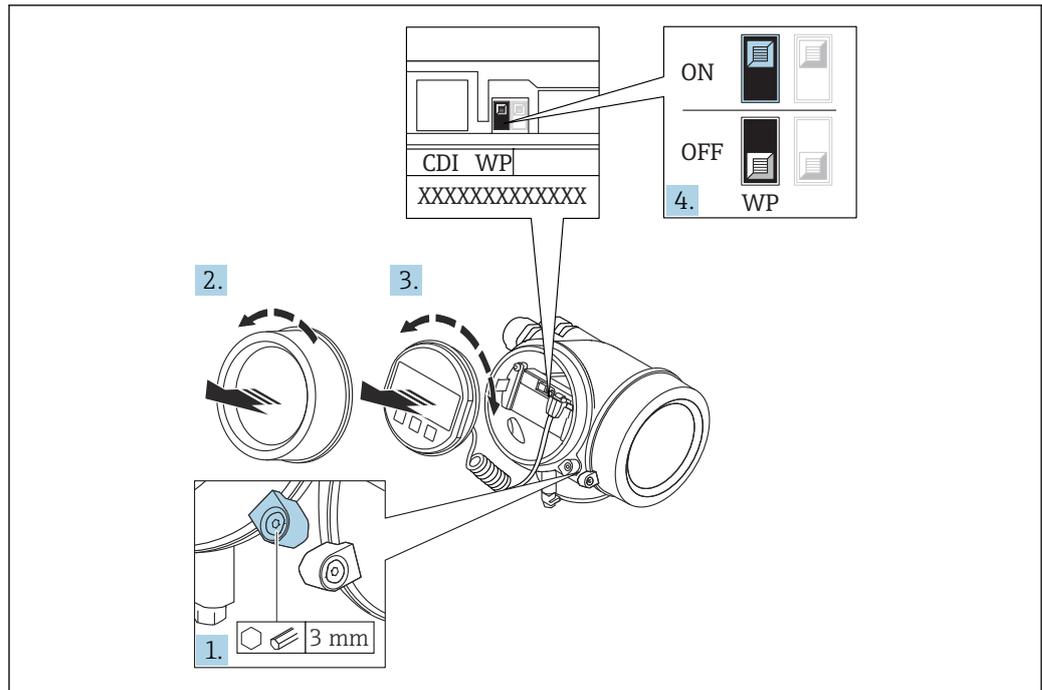
1. Navigate to: Setup → Advanced setup → Administration → Define access code
2. Enter **0000**.
 - ↳ The write protection is deactivated. Parameters can be changed without entering an access code.

Write protection via write protection switch

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

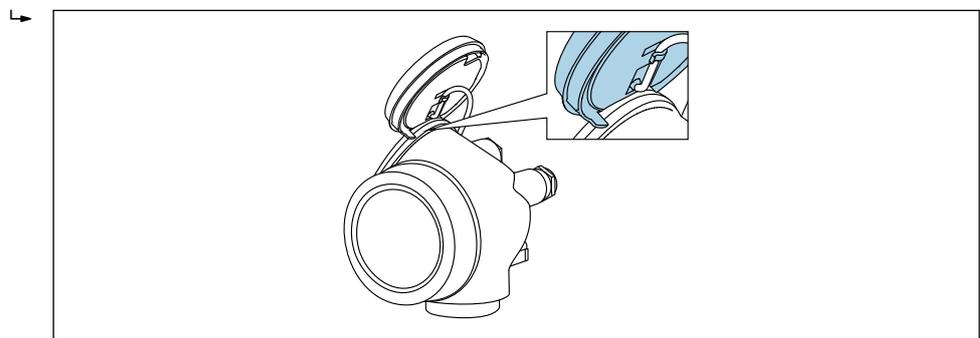
The parameter values are now read only and cannot be edited any more (exception **"Contrast display" parameter**):

- Via local display
- Via PROFIBUS PA protocol
- Via PROFIBUS DP protocol



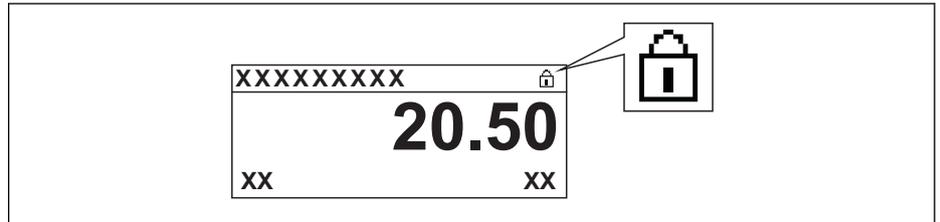
A0026157

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



A0036086

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



A0015870

If the 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 view.

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

Enabling and disabling the keypad lock

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

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

Switching on the keypad lock

For the SD03 display only

The keypad lock is switched on automatically:

- If the device has not been operated via the display for > 1 minute.
- Each time the device is restarted.

To activate the keylock manually:

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

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

Switching off the keypad lock

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

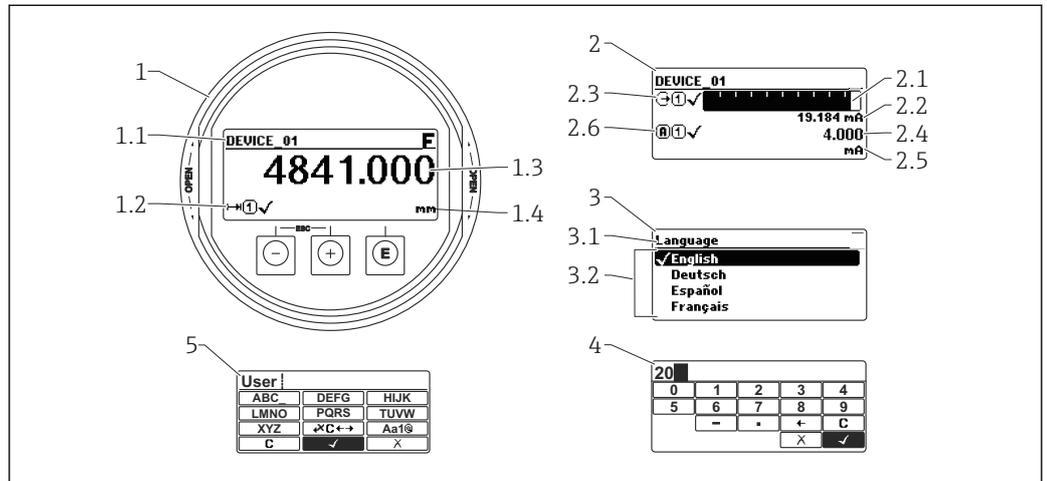
Bluetooth® wireless technology

Signal transmission via Bluetooth® wireless technology uses a cryptographic technique tested by the Fraunhofer Institute

- The device is not visible via *Bluetooth*® wireless technology without the SmartBlue app
- Only one point-to-point connection between **one** sensor and **one** smartphone or tablet is established

8.3 Display and operating module

8.3.1 Display appearance



A0012635

24 Appearance of the display and operation module for on-site operation

- 1 Measured value display (1 value max. size)
- 1.1 Header containing tag and error symbol (if an error is active)
- 1.2 Measured value symbols
- 1.3 Measured value
- 1.4 Unit
- 2 Measured value display (1 bargraph + 1 value)
- 2.1 Bargraph for measured value 1
- 2.2 Measured value 1 (including unit)
- 2.3 Measured value symbols for measured value 1
- 2.4 Measured value 2
- 2.5 Unit for measured value 2
- 2.6 Measured value symbols for measured value 2
- 3 Representation of a parameter (here: a parameter with selection list)
- 3.1 Header containing parameter name and error symbol (if an error is active)
- 3.2 Selection list; marks the current parameter value.
- 4 Input matrix for numbers
- 5 Input matrix for alphanumeric and special characters

Display symbols for the submenus

| Symbol | Meaning |
|--|---|
|  <small>A0018367</small> | Display/operation Is displayed: <ul style="list-style-type: none"> in the main menu next to the selection "Display/operation" in the header, if you are in the "Display/operation" menu |
|  <small>A0018364</small> | Setup Is displayed: <ul style="list-style-type: none"> in the main menu next to the selection "Setup" in the header, if you are in the "Setup" menu |
|  <small>A0018365</small> | Expert Is displayed: <ul style="list-style-type: none"> in the main menu next to the selection "Expert" in the header, if you are in the "Expert" menu |
|  <small>A0018366</small> | Diagnostics Is displayed: <ul style="list-style-type: none"> in the main menu next to the selection "Diagnostics" in the header, if you are in the "Diagnostics" menu |

Status signals

| | |
|-------------------------------------|---|
| F <small>A0032902</small> | "Failure" A device error is present. The measured value is no longer valid. |
| C <small>A0032903</small> | "Function check" The device is in service mode (e.g. during a simulation). |
| S <small>A0032904</small> | "Out of specification" The device is operated: <ul style="list-style-type: none"> Outside of its technical specifications (e.g. during startup or a cleaning) Outside of the configuration carried out by the user (e.g. level outside configured span) |
| M <small>A0032905</small> | "Maintenance required" Maintenance is required. The measured value is still valid. |

Display symbols for the locking state

| Symbol | Meaning |
|--|---|
|  <small>A0013148</small> | Display parameter Marks display-only parameters which can not be edited. |
|  <small>A0013150</small> | Device locked <ul style="list-style-type: none"> In front of a parameter name: The device is locked via software and/or hardware. In the header of the measured value screen: The device is locked via hardware. |

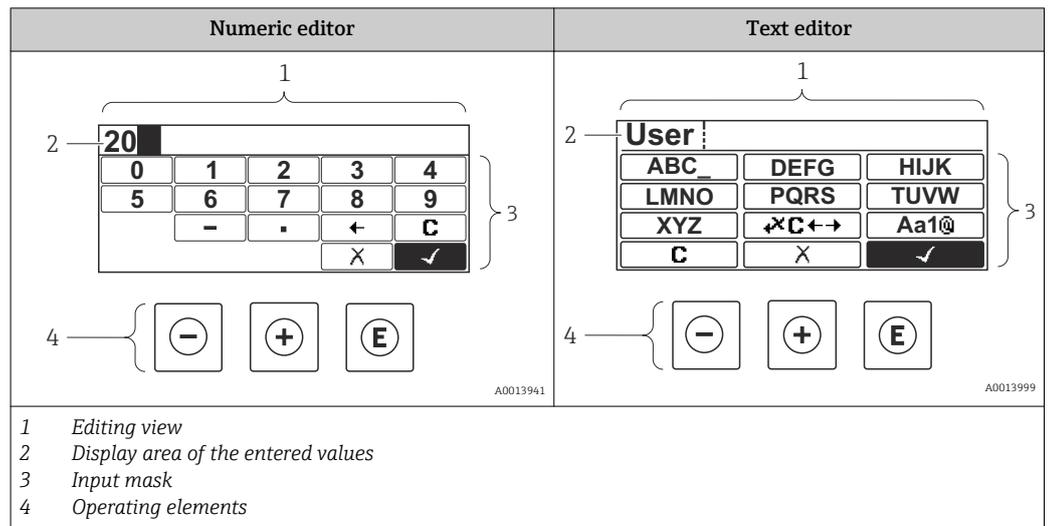
Measured value symbols

| Symbol | Meaning |
|---|---|
| Measured values | |
|  A0032892 | Level |
|  A0032893 | Distance |
|  A0032908 | Current output |
|  A0032894 | Measured current |
|  A0032895 | Terminal voltage |
|  A0032896 | Temperature of the electronics or the sensor |
| Measuring channels | |
|  A0032897 | Measuring channel 1 |
|  A0032898 | Measuring channel 2 |
| Status of the measured value | |
|  A0018361 | Status "Alarm" The measurement is interrupted. The output assumes the defined alarm value. A diagnostic message is generated. |
|  A0018360 | Status "Warning" The device continues measuring. A diagnostic message is generated. |

8.3.2 Operating elements

| Key | Meaning |
|--|--|
|  <small>A0018330</small> | <p>Minus key</p> <p><i>For menu, submenu</i> Moves the selection bar upwards in a picklist.</p> <p><i>For text and numeric editor</i> In the input mask, moves the selection bar to the left (backwards).</p> |
|  <small>A0018329</small> | <p>Plus key</p> <p><i>For menu, submenu</i> Moves the selection bar downwards in a picklist.</p> <p><i>For text and numeric editor</i> In the input mask, moves the selection bar to the right (forwards).</p> |
|  <small>A0018328</small> | <p>Enter key</p> <p><i>For measured value display</i></p> <ul style="list-style-type: none"> ▪ Pressing the key briefly opens the operating menu. ▪ Pressing the key for 2 s opens the context menu. <p><i>For menu, submenu</i></p> <ul style="list-style-type: none"> ▪ Pressing the key briefly Opens the selected menu, submenu or parameter. ▪ Pressing the key for 2 s for parameter: If present, opens the help text for the function of the parameter. <p><i>For text and numeric editor</i></p> <ul style="list-style-type: none"> ▪ Pressing the key briefly <ul style="list-style-type: none"> - Opens the selected group. - Carries out the selected action. ▪ Pressing the key for 2 s confirms the edited parameter value. |
|  <small>A0032909</small> | <p>Escape key combination (press keys simultaneously)</p> <p><i>For menu, submenu</i></p> <ul style="list-style-type: none"> ▪ Pressing the key briefly <ul style="list-style-type: none"> - Exits the current menu level and takes you to the next higher level. - If help text is open, closes the help text of the parameter. ▪ Pressing the key for 2 s returns you to the measured value display ("home position"). <p><i>For text and numeric editor</i> Closes the text or numeric editor without applying changes.</p> |
|  <small>A0032910</small> | <p>Minus/Enter key combination (press and hold down the keys simultaneously)</p> <p>Reduces the contrast (brighter setting).</p> |
|  <small>A0032911</small> | <p>Plus/Enter key combination (press and hold down the keys simultaneously)</p> <p>Increases the contrast (darker setting).</p> |

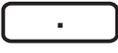
8.3.3 Entering numbers and text



Input mask

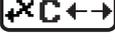
The following input symbols are available in the input mask of the numeric and text editor:

Numeric editor symbols

| Symbol | Meaning |
|--|--|
|  <small>A0013998</small> | Selection of numbers from 0 to 9. |
|  <small>A0016619</small> | Inserts decimal separator at the input position. |
|  <small>A0016620</small> | Inserts minus sign at the input position. |
|  <small>A0013985</small> | Confirms selection. |
|  <small>A0016621</small> | Moves the input position one position to the left. |
|  <small>A0013986</small> | Exits the input without applying the changes. |
|  <small>A0014040</small> | Clears all entered characters. |

Text editor symbols

| Symbol | Meaning |
|--|---|
|  <small>A0013997</small> | Selection of letters from A to Z |
|  <small>A0013981</small> | Toggle <ul style="list-style-type: none"> Between upper-case and lower-case letters For entering numbers For entering special characters |

| | |
|--|--|
|  <small>A0013985</small> | Confirms selection. |
|  <small>A0013987</small> | Switches to the selection of the correction tools. |
|  <small>A0013986</small> | Exits the input without applying the changes. |
|  <small>A0014040</small> | Clears all entered characters. |

Correction symbols under 

| Symbol | Meaning |
|---|--|
|  <small>A0032907</small> | Clears all entered characters. |
|  <small>A0018324</small> | Moves the input position one position to the right. |
|  <small>A0018326</small> | Moves the input position one position to the left. |
|  <small>A0032906</small> | Deletes one character immediately to the left of the input position. |

8.3.4 Opening the context menu

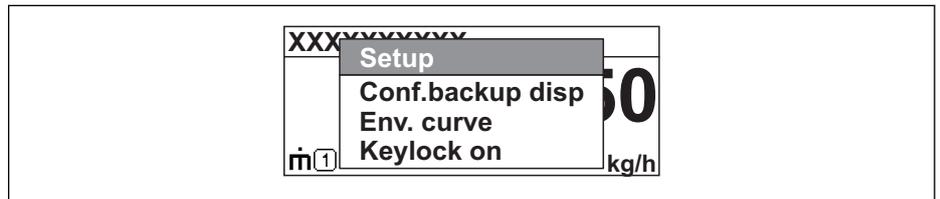
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Conf. backup disp.
- Env. curve
- Keylock on

Opening and closing the context menu

The user is in the operational display.

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



A003110-EN

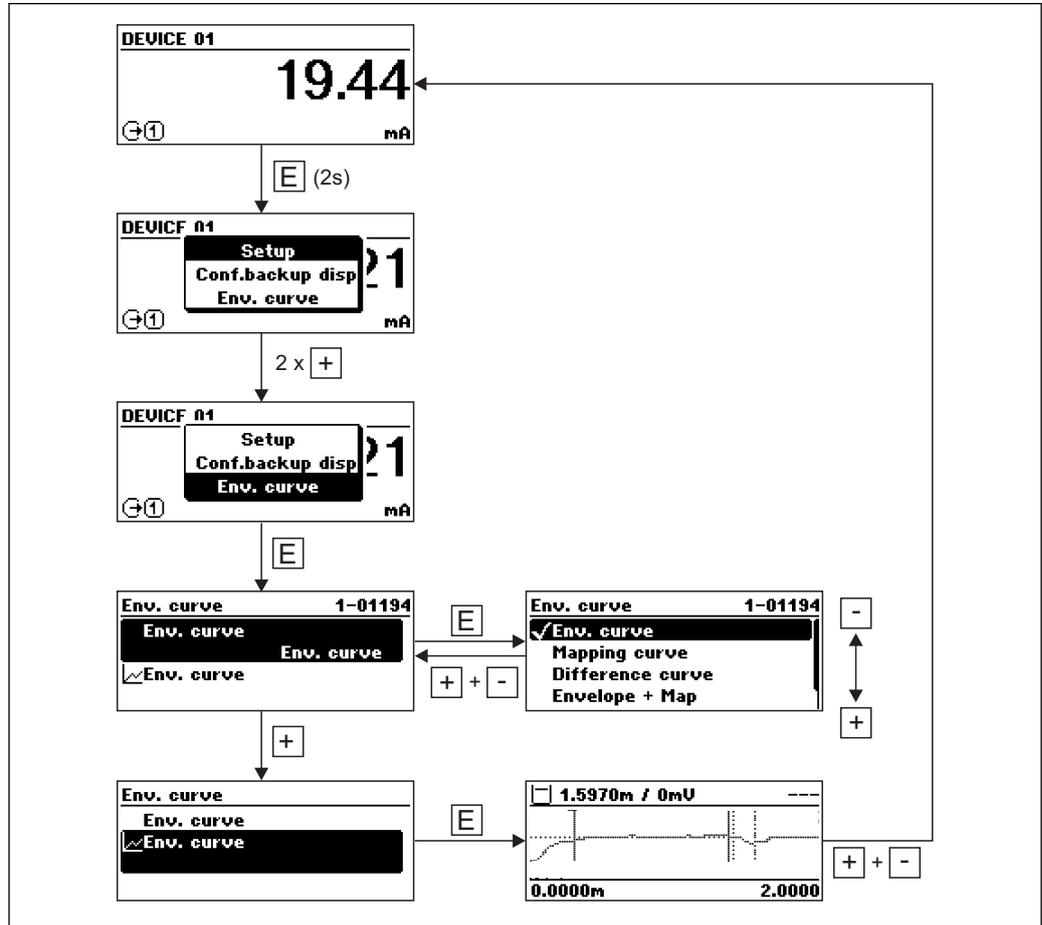
2. Press  +  simultaneously.
 - ↳ The context menu is closed and the operational display appears.

Calling up the menu via the context menu

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

8.3.5 Envelope curve on the display and operating module

In order to assess the measuring signal, the envelope curve and - if a mapping has been recorded - the mapping curve can be displayed:



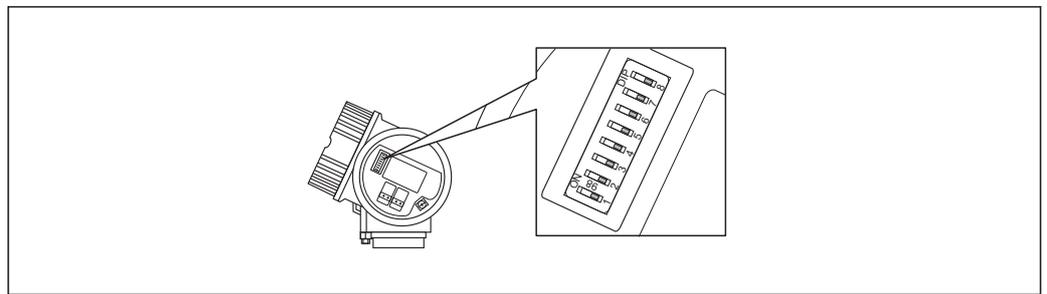
A0014277

9 Integration into a PROFIBUS network

9.1 Overview of the device database files (GSD)

| | |
|------------------|--|
| Manufacturer ID | 17 (0x11) |
| Ident number | 0x1558 |
| Profile version | 3.02 |
| GSD file | Information and files under: |
| GSD file version | <ul style="list-style-type: none"> ▪ www.endress.com ▪ www.profibus.org |

9.2 Set device address



A0015686

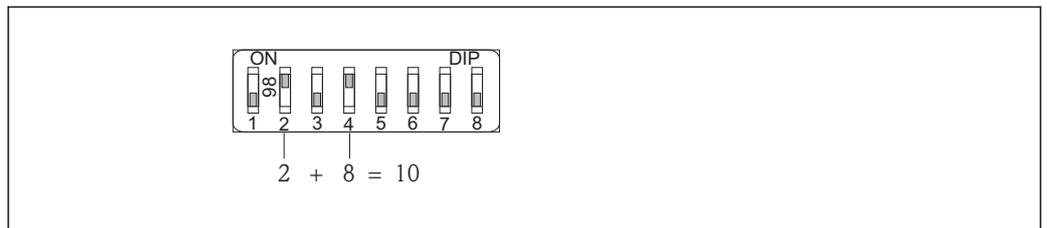
25 Address switches in terminal compartment

9.2.1 Hardware addressing

1. Set switch 8 to "OFF".
2. Define the address with switches 1 to 7 according to the table below.

The address change becomes effective after 10 seconds. The device restarts automatically.

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

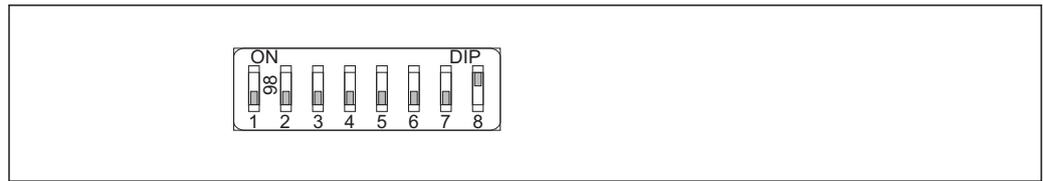


A0015902

26 Example of hardware addressing: switch 8 is in position "OFF"; switches 1 to 7 define the address.

9.2.2 Software addressing

1. Set switch 8 to "ON".
2. The device restarts automatically. The address remains the same as before (factory setting: 126).
3. Set the required address via the operating menu: Setup → Device address



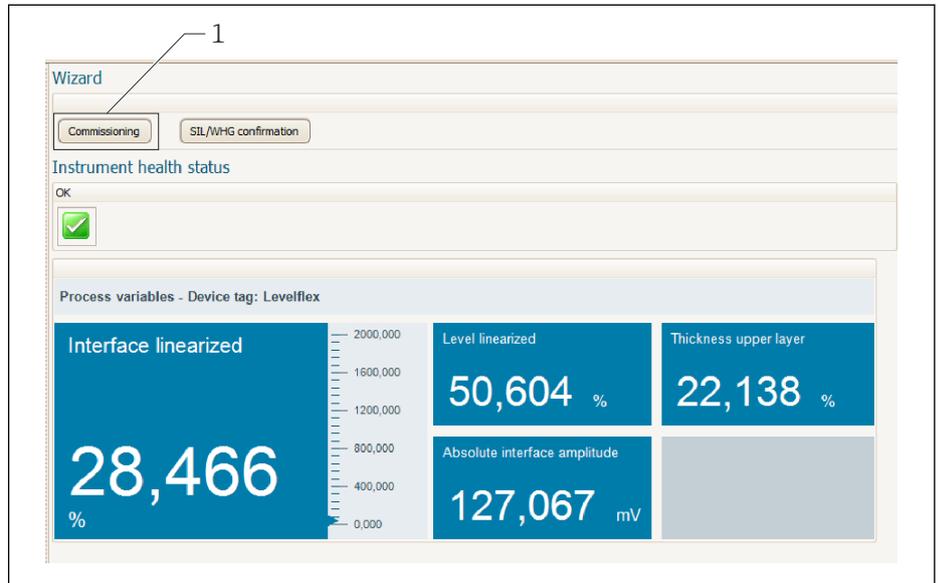
A0015903

- 27 *Example of software addressing; switch 8 is in position "ON"; the address is defined in the operating menu (Setup → Device address)*

10 Commissioning via wizard

A wizard guiding the user through the initial setup is available in FieldCare and DeviceCare ³⁾.

1. Connect the device to FieldCare or DeviceCare → 56.
2. Open the device in FieldCare or DeviceCare.
 - ↳ The dashboard (home page) of the device appears:



1 "Commissioning" button calls up the wizard.

3. Click on "Commissioning" to call up the wizard.
4. Enter or select the appropriate value for each parameter. These values are immediately written to the device.
5. Click "Next" to switch to the next page.
6. After finishing the last page, click "End of sequence" to close the wizard.

i If the wizard is cancelled before all necessary parameters have been set, the device may be in an undefined state. A reset to the default settings is recommended in this case.

3) DeviceCare is available for download at www.software-products.endress.com. The download requires a registration in the Endress+Hauser software portal.

11 Commissioning via operating menu

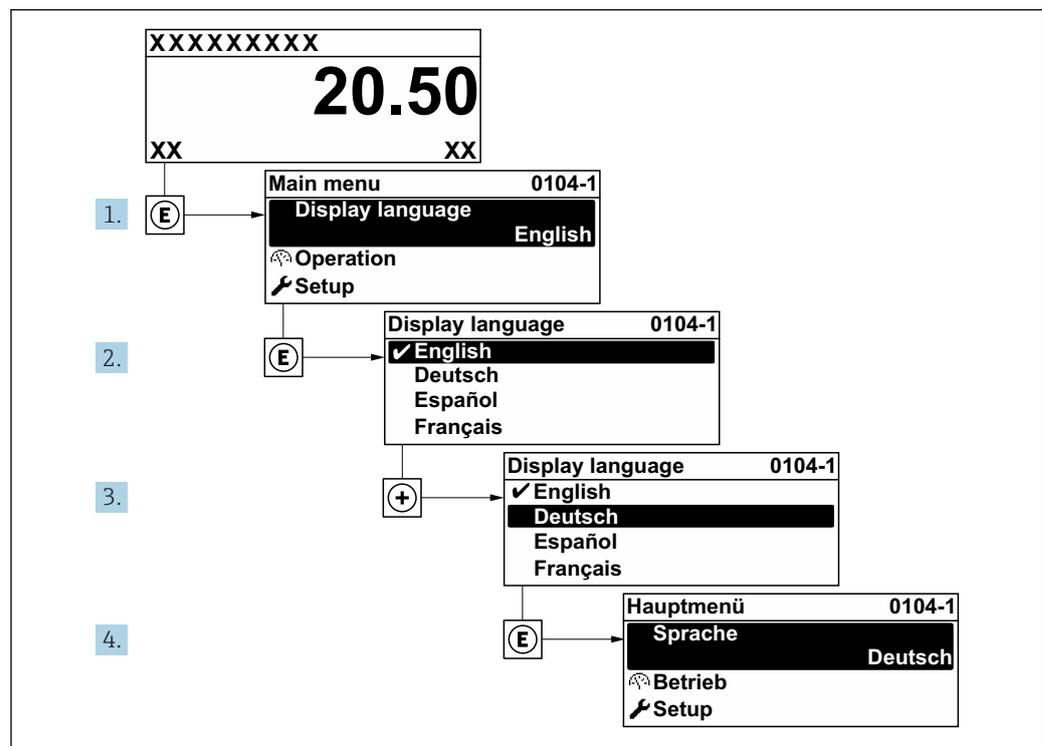
11.1 Installation and function check

Make sure that all final checks have been completed before you start up your measuring point:

- Checklist "Post-installation check" → 45
- Checklist "Post-connection check" → 53

11.2 Setting the operating language

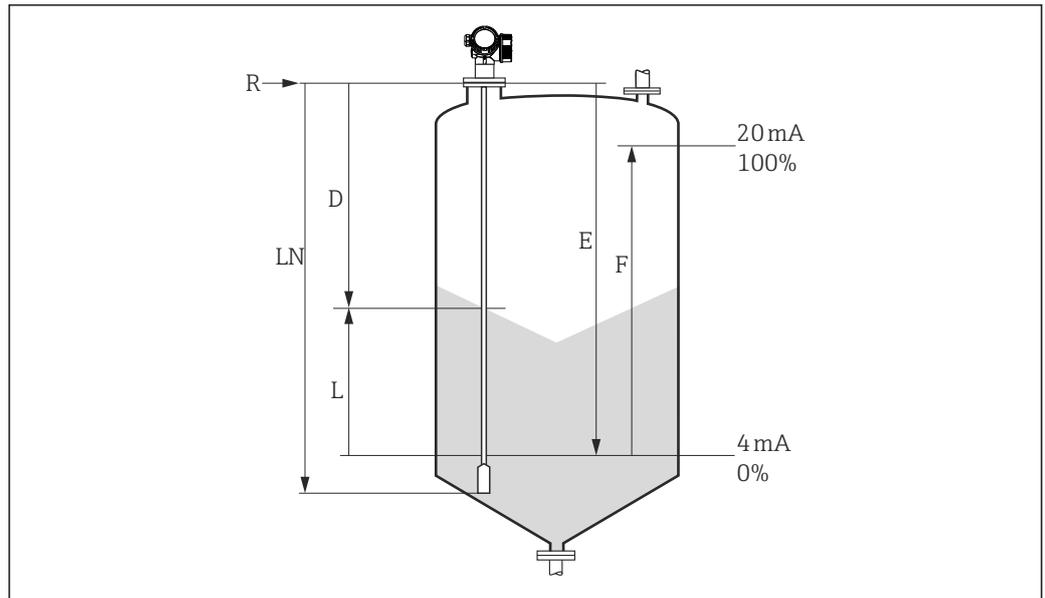
Factory setting: English or ordered local language



A0029420

28 Using the example of the local display

11.3 Configuration of a level measurement



A0012838

29 Configuration parameters for level measurements in solids

- LN Length of probe
 R Reference point of the measurement
 D Distance
 L Level
 E Empty calibration (= Zero point)
 F Full calibration (= Span)

i If for rope probes the DC value is less than 7, then measurement is not possible in the area of the straining weight. In these cases, the maximum recommended value for the empty calibration E is $LN - 250 \text{ mm}$ ($LN - 10 \text{ in}$).

1. Setup → Device tag
 - ↳ Enter tag for measuring point.
2. Navigate to: Setup → Device address
 - ↳ Enter bus address of the device (only in case of software addressing).
3. Navigate to: Setup → Distance unit
 - ↳ Select distance unit.
4. Navigate to: Setup → Bin type
 - ↳ Select bin type.
5. Navigate to: Setup → Empty calibration
 - ↳ Enter the distance E between the reference point R and the minimum level (0%).
6. Navigate to: Setup → Full calibration
 - ↳ Enter distance F between the minimum (0%) and maximum (100%) level.
7. Navigate to: Setup → Level
 - ↳ Displays the measured level L.
8. Navigate to: Setup → Distance
 - ↳ Displays the distance D between the reference point R and the level L.
9. Navigate to: Setup → Signal quality
 - ↳ Displays the signal quality of the level echo.

10. For operation via local display:
Navigate to: Setup → Mapping → Confirm distance
 - ↳ Compare the displayed distance to the real distance in order to start the recording of the mapping curve if required.
11. For operation via operating tool:
Navigate to: Setup → Confirm distance
 - ↳ Compare the displayed distance to the real distance in order to start the recording of the mapping curve if required.

11.4 Recording the reference curve

After the configuration of the measurement it is recommended to record the current envelope curve as a reference curve. The reference curve can be used later on in the process for diagnostic purposes. To record the reference curve use the **Save reference curve** parameter.

Navigation in the menu

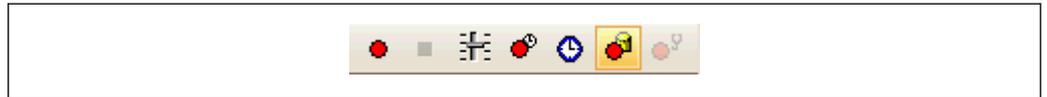
Expert → Diagnostics → Envelope diagnostics → Save reference curve

Meaning of the options

- No
No action
- Yes
The current envelope curve is saved as reference curve.

 In devices which have been delivered with software version 01.00.zz, this submenu is only visible for the "Service" user role.

 The reference curve can only be displayed in the envelope curve diagram of FieldCare after it has been loaded from the device into FieldCare. This is performed by the "Load Reference Curve" function in FieldCare:



 30 The "Load Reference Curve" function

11.5 Configuration of the on-site display

11.5.1 Factory settings of the on-site display for level measurements

| Parameter | Factory setting for devices with 1 current output | Factory setting for devices with 2 current outputs |
|-----------------|---|--|
| Format display | 1 value, max. size | 1 value, max. size |
| Value 1 display | Level linearized | Level linearized |
| Value 2 display | Distance | Distance |
| Value 3 display | Current output 1 | Current output 1 |
| Value 4 display | None | Current output 2 |

11.5.2 Adjustment of the on-site display

The on-site display can be adjusted in the following menu:
Setup → Advanced setup → Display

11.6 Configuration management

After commissioning, you can save the current device configuration, copy it to another measuring point or restore the previous device configuration. You can do so using the **Configuration management** parameter and its options.

Navigation path in the operating menu

Setup → Advanced setup → Configuration backup display → Configuration management

Meaning of the options

- **Cancel**

No action is executed and the user exits the parameter.

- **Execute backup**

A backup copy of the current device configuration in the HistoROM (built-in in the device) is saved to the display module of the device. The backup copy comprises the transmitter and sensor data of the device.

- **Restore**

The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. The backup copy comprises the transmitter and sensor data of the device.

- **Duplicate**

The transmitter configuration is duplicated to another device using the transmitter display module. The following parameters, which characterize the individual measuring point are **not** included in the transmitted configuration:

Medium type

- **Compare**

The device configuration saved in the display module is compared to the current device configuration of the HistoROM. The result of this comparison is displayed in the **Comparison result** parameter.

- **Clear backup data**

The backup copy of the device configuration is deleted from the display module of the device.



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.



If an existing backup is restored to a different device using the **Restore** option, it may occur that some device functionalities are no longer available. In some cases even a device reset → 169 will not restore the original status..

In order to transmit a configuration to a different device, the **Duplicate** option should always be used.

11.7 Protection of the settings against unauthorized changes

There are two ways to protect the settings against unauthorized changes:

- Via parameter settings (software locking) →  60
- Via locking switch (hardware locking) →  61

12 Diagnostics and troubleshooting

12.1 General trouble shooting

12.1.1 General errors

| Error | Possible cause | Remedial action |
|---|--|--|
| Device does not respond. | Supply voltage not connected. | Connect the correct voltage. |
| | The cables do not contact the terminals properly. | Ensure electrical contact between the cable and the terminal. |
| Values on the display invisible | Contrast setting is too weak or too strong. | <ul style="list-style-type: none"> ▪ Increase contrast by pressing  and  simultaneously. ▪ Decrease contrast by pressing  and  simultaneously. |
| | The plug of the display cable is not connected correctly. | Connect the plug correctly. |
| | Display is defective. | Replace display. |
| "Communication error" is indicated on the display when starting the device or connecting the display | Electromagnetic interference | Check grounding of the device. |
| | Broken display cable or display plug. | Exchange display. |
| Duplicating of the parameters from one device to another via the display doesn't work. Only the "Save" and "Abort" options are available. | Display with backup is not recognized if no data backup has been performed at the device before. | Connect display (with the backup) and restart the device. |
| CDI communication does not work. | Wrong setting of the COM port on the computer. | Check the setting of the COM port on the computer and change it if necessary. |
| Device measures incorrectly. | Parametrization error | Check and adjust parameterization. |

12.1.2 Parametrization errors

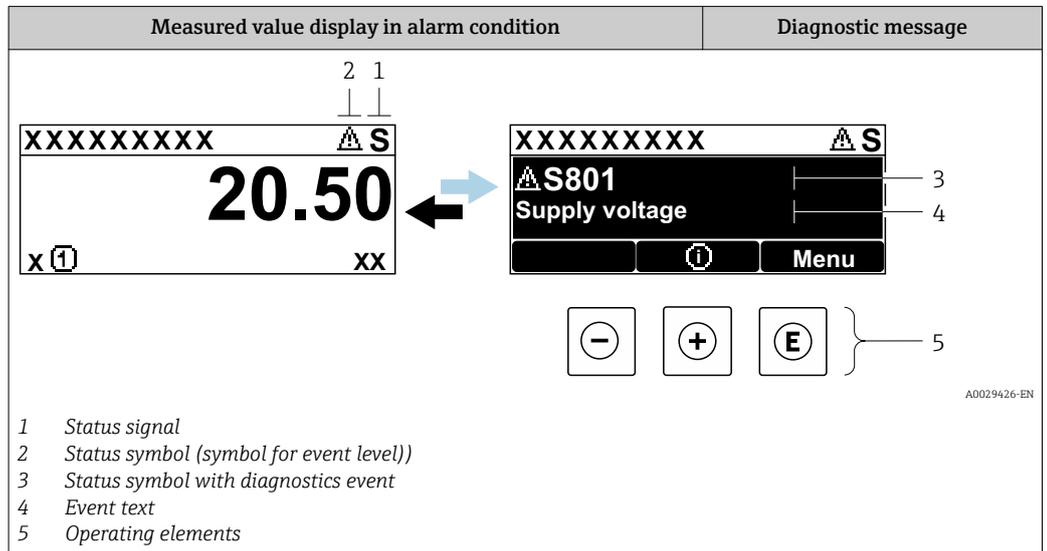
Parametrization errors for level measurements

| Error | Possible cause | Remedial action |
|--|--|--|
| Measured value wrong | If measured distance (Setup → Distance) matches the real distance: Calibration error | <ul style="list-style-type: none"> ▪ Check and adjust the Empty calibration parameter (→ ☰ 120) if necessary. ▪ Check and adjust the Full calibration parameter (→ ☰ 121) if necessary. ▪ Check and adjust linearization if necessary (Linearization submenu (→ ☰ 137)). |
| | If measured distance (Setup → Distance) does not match the real distance: An interference echo affects the measurement. | Perform mapping (Confirm distance parameter (→ ☰ 123)). |
| No change of the measured value when emptying/filling the tank | An interference echo affects the measurement. | Perform mapping (Confirm distance parameter (→ ☰ 123)). |
| | Build-up at the probe. | Clean the probe. |
| | Error in the echo tracking | Deactivate echo tracking (Expert → Sensor → Echo tracking → Evaluation mode = History off). |
| The diagnostic message Echo lost appears after switching on the supply voltage. | Noise level too high during initialization phase. | Enter Empty calibration parameter (→ ☰ 120) again. |
| Device displays a level when the tank is empty. | Incorrect probe length | <ul style="list-style-type: none"> ▪ Carry out probe length correction (Confirm probe length parameter (→ ☰ 152)). ▪ Carry out mapping over entire probe while the tank is empty (Confirm distance parameter (→ ☰ 123)). |
| Wrong slope of the level in the entire measuring range | Wrong bin property selected. | Set Bin type parameter (→ ☰ 120) correctly. |

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 measured value display.



Status signals

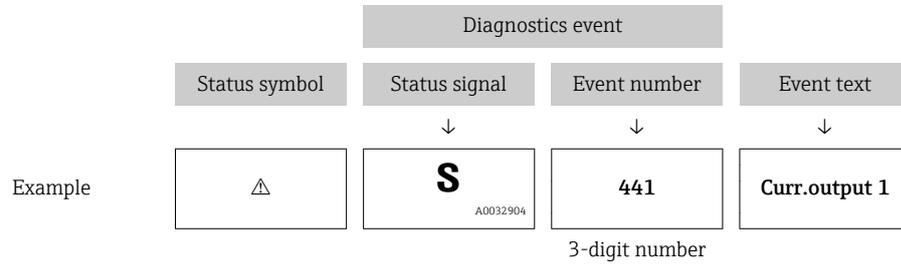
| | |
|-------------------------------------|--|
| F <small>A0032902</small> | "Failure (F)" option A device error is present. The measured value is no longer valid. |
| C <small>A0032903</small> | "Function check (C)" option The device is in service mode (e.g. during a simulation). |
| S <small>A0032904</small> | "Out of specification (S)" option The device is operated: <ul style="list-style-type: none"> ▪ Outside of its technical specifications (e.g. during startup or a cleaning) ▪ Outside of the configuration carried out by the user (e.g. level outside configured span) |
| M <small>A0032905</small> | "Maintenance required (M)" option Maintenance is required. The measured value is still valid. |

Status symbol (symbol for event level)

| | |
|---|---|
| ⊗ | "Alarm" status The measurement is interrupted. The signal outputs take on the defined alarm condition. A diagnostic message is generated. |
| ⚠ | "Warning" status The device continues to measure. A diagnostic message is generated. |

Diagnostics event and event text

The fault can be identified using the diagnostics event. The event text helps you by providing information about the fault. In addition, the corresponding symbol is displayed before the diagnostics event.



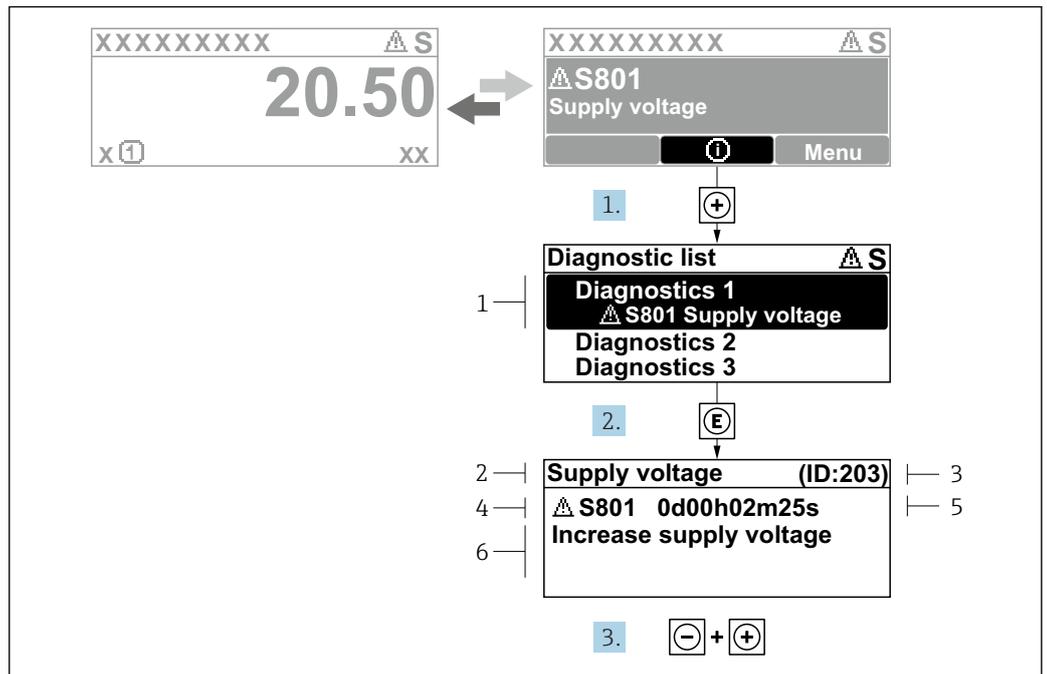
If two or more diagnostic messages are pending simultaneously, only the message with the highest priority is shown. Additional pending diagnostic messages can be shown in the **Diagnostic list** submenu.

-  Past diagnostic messages that are no longer pending are shown as follows:
- On the local display:
in the **Event logbook** submenu
 - In FieldCare:
via the "Event List /HistoROM" function.

Operating elements

| Operating functions in menu, submenu | |
|--------------------------------------|---|
| + | Plus key Opens the message about the remedial measures. |
| E | Enter key Opens the operating menu. |

12.2.2 Calling up remedial measures



A0029431-EN

31 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 + (⊕-Symbol).
 - ↳ **Diagnostic list** submenu opens.
2. Select the desired diagnostic event with + or - and press E.
 - ↳ The message for the remedial measures for the selected diagnostic event opens.
3. Press - + ⊕ 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 **Diagnostic list** submenu or in **Previous diagnostics**.

1. Press E.
 - ↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press - + ⊕ simultaneously.
 - ↳ The message for the remedial measures closes.

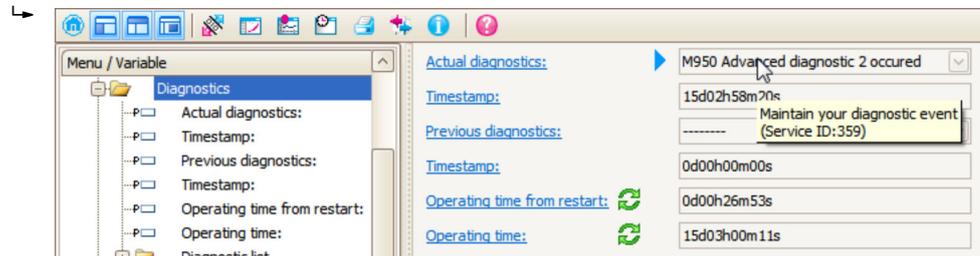
12.3 Diagnostic event in the operating tool

If a diagnostic event is present in the device, the status signal appears in the top left status in the operating tool along with the corresponding symbol for event level in accordance with NAMUR NE 107:

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

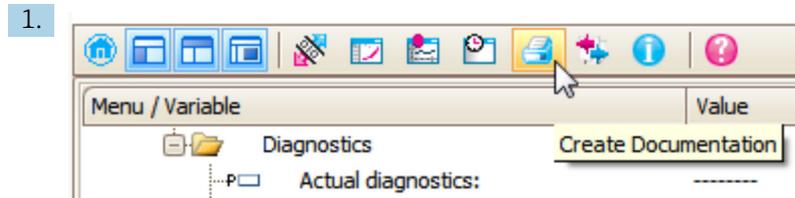
A: Via the operating menu

1. Navigate to the **Diagnostics** menu.
 - ↳ In the **Actual diagnostics** parameter, the diagnostic event is shown with event text.
2. On the right in the display range, hover the cursor over the **Actual diagnostics** parameter.

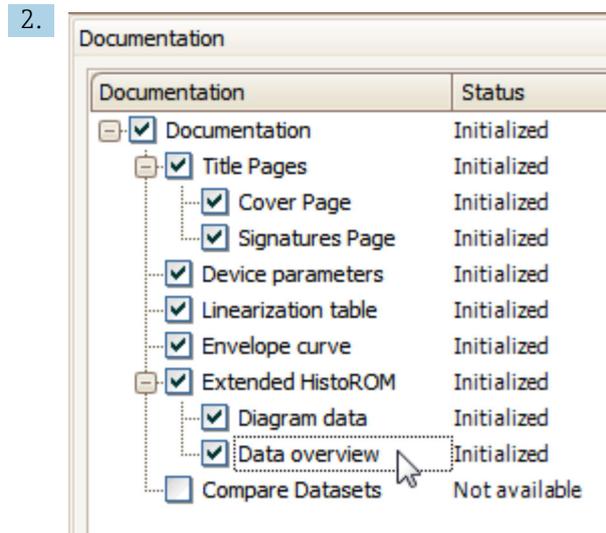


A tool tip with remedial measures for the diagnostic event appears.

B: Via the "Create documentation" function



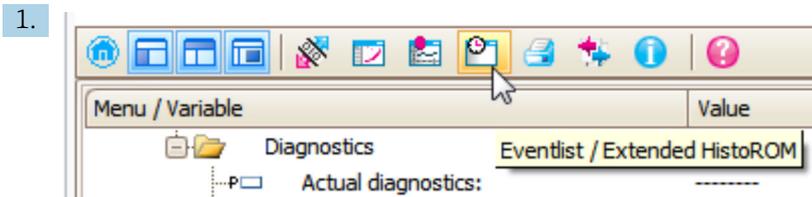
Select the "Create documentation" function.



Make sure "Data overview" is marked.

3. Click "Save as ..." and save a PDF of the protocol.
 - ↳ The protocol contains the diagnostic messages and remedy information.

C: Via the "Eventlist / Extended HistoROM" function



Select the "Eventlist / Extended HistoROM" function.



Select the "Load Eventlist" function.

- ↳ The list of events, including remedy information, is shown in the "Data overview" window.

12.4 Diagnostic list

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

Navigation path

Diagnostics → Diagnostic list

Calling up and closing the remedial measures

1. Press \square .
 - ↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press \square + \oplus simultaneously.
 - ↳ The message about the remedial measures closes.

12.5 List of diagnostic events

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|------------------------------------|-------------------------|---|----------------------------------|--|
| Diagnostic of sensor | | | | |
| 003 | Broken probe detected | 1. Check map 2. Check sensor | F | Alarm |
| 046 | Build-up detected | Clean sensor | F | Alarm |
| 104 | HF cable | and check sealing 1. Dry HF cable connection 2. Change HF cable | F | Alarm |
| 105 | HF cable | 1. Tighten HF cable connection 2. Check sensor 3. Change HF cable | F | Alarm |
| 106 | Sensor | 1. Check sensor 2. Check HF cable 3. Contact service | F | Alarm |
| Diagnostic of electronic | | | | |
| 242 | Software incompatible | 1. Check software 2. Flash or change main electronics module | F | Alarm |
| 252 | Modules incompatible | 1. Check electronic modules 2. Change I/O or main electronic module | F | Alarm |
| 261 | Electronic modules | 1. Restart device 2. Check electronic modules 3. Change I/O Modul or main electronics | F | Alarm |
| 262 | Module connection | 1. Check module connections 2. Change electronic modules | F | Alarm |
| 270 | Main electronic failure | Change main electronic module | F | Alarm |
| 271 | Main electronic failure | 1. Restart device 2. Change main electronic module | F | Alarm |
| 272 | Main electronic failure | 1. Restart device 2. Contact service | F | Alarm |
| 273 | Main electronic failure | 1. Emergency operation via display 2. Change main electronics | F | Alarm |
| 275 | I/O module failure | Change I/O module | F | Alarm |
| 276 | I/O module failure | 1. Restart device 2. Change I/O module | F | Alarm |
| 282 | Data storage | 1. Restart device 2. Contact service | F | Alarm |
| 283 | Memory content | 1. Transfer data or reset device 2. Contact service | F | Alarm |
| 311 | Electronic failure | 1. Transfer data or reset device 2. Contact service | F | Alarm |
| 311 | Electronic failure | Maintenance required! 1. Do not perform reset 2. Contact service | M | Warning |
| Diagnostic of configuration | | | | |
| 410 | Data transfer | 1. Check connection 2. Retry data transfer | F | Alarm |
| 412 | Processing Download | Download active, please wait | C | Warning |

| Diagnostic number | Short text | Remedy instructions | Status signal [from the factory] | Diagnostic behavior [from the factory] |
|------------------------------|-------------------------------------|--|----------------------------------|--|
| 435 | Linearization | Check linearization table | F | Alarm |
| 437 | Configuration incompatible | 1. Restart device 2. Contact service | F | Alarm |
| 438 | Dataset | 1. Check data set file 2. Check device configuration 3. Up- and download new configuration | M | Warning |
| 482 | Block in OOS | Set Block in AUTO mode | F | Alarm |
| 484 | Simulation failure mode | Deactivate simulation | C | Alarm |
| 485 | Simulation measured value | Deactivate simulation | C | Warning |
| 494 | Switch output simulation | Deactivate simulation switch output | C | Warning |
| 495 | Simulation diagnostic event | Deactivate simulation | C | Warning |
| 497 | Simulation block output | Deactivate simulation | C | Warning |
| 585 | Simulation distance | Deactivate simulation | C | Warning |
| Diagnostic of process | | | | |
| 801 | Energy too low | Increase supply voltage | S | Warning |
| 825 | Operating temperature | 1. Check ambient temperature 2. Check process temperature | S | Warning |
| 825 | Operating temperature | | F | Alarm |
| 921 | Change of reference | 1. Check reference configuration 2. Check pressure 3. Check sensor | S | Warning |
| 936 | EMC interference | Check installation on EMC | F | Alarm |
| 941 | Echo lost | Check parameter 'DC value' | F | Alarm ¹⁾ |
| 942 | In safety distance | 1. Check level 2. Check safety distance 3. Reset self holding | S | Alarm ¹⁾ |
| 943 | In blocking distance | Reduced accuracy Check level | S | Warning |
| 944 | Level range | Reduced accuracy Level at process connection | S | Warning |
| 950 | Advanced diagnostic 1 to 2 occurred | Maintain your diagnostic event | M | Warning ¹⁾ |

1) Diagnostic behavior can be changed.

12.6 Event logbook

12.6.1 Event history

A chronological overview of the event messages that have occurred is provided in the **Event list** submenu ⁴⁾.

4) This submenu is only available for operation via local display. In the case of operation via FieldCare, the event list can be displayed with the "Event List / HistoROM" functionality of FieldCare.

Navigation path

Diagnostics → Event logbook → Event list

A maximum of 100 event messages can be displayed in chronological order.

Die Ereignishistorie umfasst Einträge zu:

- Diagnostic events
- Information events

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

- Diagnostic event
 - ☹: Event has occurred
 - ☺: Event has ended
- Information event
 - ☹: Event has occurred

Calling up and closing the remedial measures

1. Press 
 - ↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press  +  simultaneously.
 - ↳ The message about the remedial measures closes.

12.6.2 Filtering the event logbook

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

Navigation path

Diagnostics → Event logbook → Filter options

Filter categories

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

12.6.3 Overview of information events

| Info number | Info name |
|-------------|---------------------------------|
| I1000 | ----- (Device ok) |
| 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 |
| I1256 | Display: access status changed |
| I1264 | Safety sequence aborted |
| I1335 | Firmware changed |
| I1397 | Fieldbus: access status changed |
| I1398 | CDI: access status changed |
| I1512 | Download started |
| I1513 | Download finished |
| I1514 | Upload started |
| I1515 | Upload finished |

12.7 Firmware history

| Date | Firmware version | Modifications | Documentation (FMP56, FMP57, PROFIBUS) | | |
|---------|------------------|--|--|---------------------------|--|
| | | | Operating Instructions | Description of Parameters | Technical Information |
| 07.2011 | 01.00.zz | Original software | BA01009F/00/EN/10.10 | GP01001F/00/EN/10.10 | TI01004F/00/EN/13.11 |
| 02.2015 | 01.01.zz | <ul style="list-style-type: none"> ▪ Support of SD03 ▪ additional languages ▪ HistoROM functionality enhanced ▪ "Advanced Diagnostic" function block integrated ▪ Improvements and bugfixes | BA01009F/00/EN/14.14 BA01009F/00/EN/15.16 ¹⁾ | GP01001F/00/EN/13.14 | TI01004F/00/EN/17.14 TI01004F/00/EN/20.16 ¹⁾ |

1) Contains information on the Heartbeat wizards which are available in the latest DTM version for DeviceCare and FieldCare.



The firmware version can explicitly be ordered via the product structure. In this way it is possible to ensure compatibility of the firmware version with an existing or planned system integration.

13 Maintenance

The measuring device requires no special maintenance.

13.1 Exterior cleaning

When exterior-cleaning the device, always use cleaning agents that do not attack the surface of the housing and the seals.

14 Repairs

14.1 General information on repairs

14.1.1 Repair concept

The Endress+Hauser repair concept assumes that the devices have a modular design and that repairs can be done by the Endress+Hauser service or specially trained customers.

Spare parts are contained in suitable kits. They contain the related replacement instructions.

For more information on service and spare parts, contact the Service Department at Endress+Hauser.

14.1.2 Repairs to Ex-approved devices

When carrying out repairs to Ex-approved devices, please note the following:

- Repairs to Ex-approved devices may only be carried out by trained personnel or by the Endress+Hauser Service.
- Comply with the prevailing standards, national Ex-area regulations, safety instructions (XA) and certificates.
- Only use original spare parts from Endress+Hauser.
- When ordering a spare part, please note the device designation on the nameplate. Only replace parts with identical parts.
- Carry out repairs according to the instructions. On completion of repairs, carry out the specified routine test on the device.
- Only Endress+Hauser Service may convert a certified device into a different certified variant.
- Document all repair work and conversions.

14.1.3 Replacement of an electronics module

If an electronics module has been replaced, it is not necessary to perform a new basic setup as the calibration parameters are stored in the HistoROM which is located in the housing. However, after exchanging the main electronics module it may be necessary to record a new mapping (interference echo suppression).

14.1.4 Replacement of a device

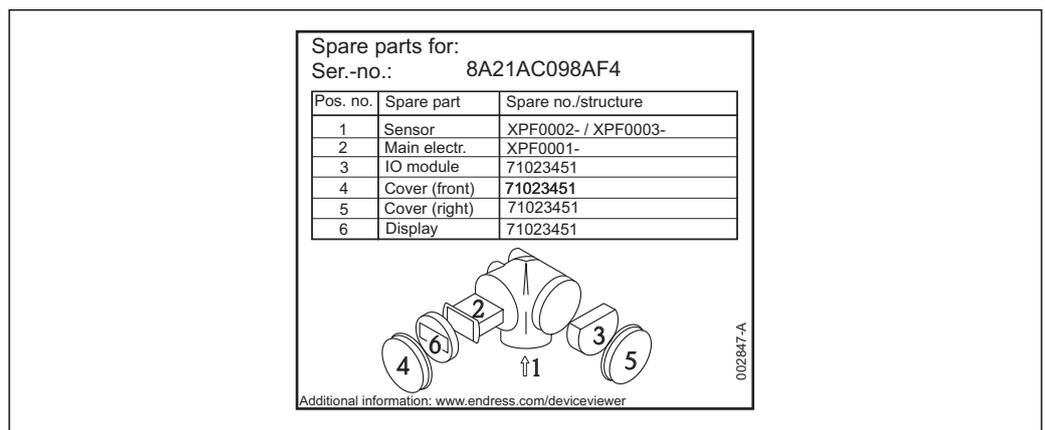
After a complete device or electronic module has been replaced, the parameters can be downloaded into the instrument again in one of the following ways:

- Via the display module
Condition: The configuration of the old device has been saved in the display module
→  166.
- Via FieldCare
Condition: The configuration of the old device has been saved to the computer via FieldCare.

You can continue to measure without carrying out a new setup. Only a linearization and a tank map (interference echo suppression) have to be recorded again.

14.2 Spare parts

- A few interchangeable measuring device components are identified by a spare part nameplate. This contains information about the spare part.
- The connection compartment cover of the device contains a spare part nameplate that includes 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): There, all spare parts for the measuring device are listed, including the order code, and can be ordered. If available, the corresponding Installation Instructions can also be downloaded there.



32 Example for spare part nameplate in connection compartment cover

- i** Measuring device serial number:
 - Is located on the device and spare part nameplate.
 - Can be read out via the "Serial number" parameter in the "Device information" submenu.

14.3 Return

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

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

14.4 Disposal

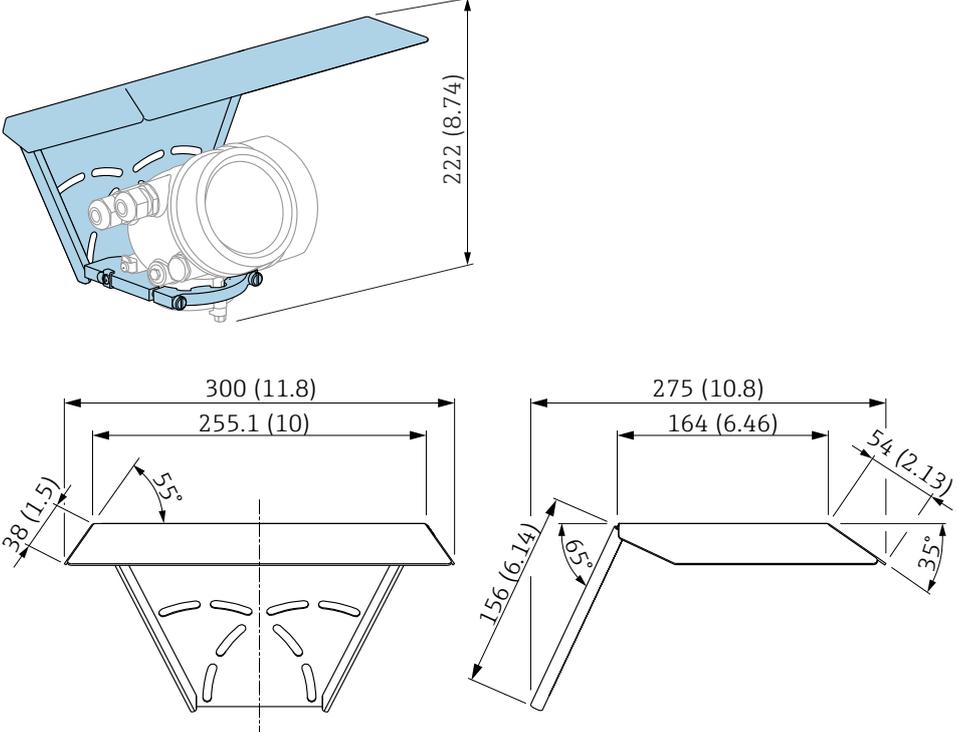
Observe the following notes during disposal:

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

15 Accessories

15.1 Device-specific accessories

15.1.1 Weather protection cover

| Accessory | Description |
|--------------------------|---|
| Weather protection cover |  <p data-bbox="1380 869 1436 884">A0015466</p> <p data-bbox="1380 1281 1436 1296">A0015472</p> <p data-bbox="327 1303 837 1332">  33 Weather protection cover; Dimensions: mm (in) </p> <p data-bbox="327 1355 1404 1435">  The weather protection cover can be ordered together with the device (product structure, feature 620 "Accessory Enclosed", option PB "Weather Protection Cover"). Alternatively, it can be separately ordered as an accessory; order code 71162242. </p> |

15.1.2 Mounting bracket for the electronics housing

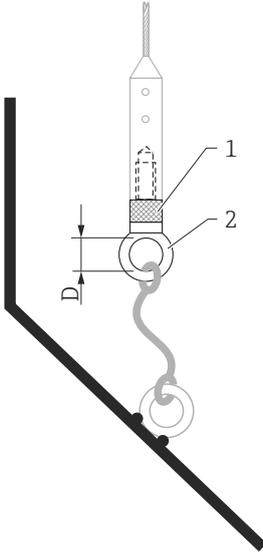
| Accessory | Description |
|--|---|
| Mounting bracket for the electronics housing | <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>A</p> </div> <div style="text-align: center;"> <p>B</p> </div> </div> <p> 34 Mounting bracket for the electronics housing; Dimensions: mm (in) </p> <p> A Wall mounting B Pipe mounting </p> <p> For the "Sensor remote" device version (see feature 060 of the product structure), the mounting bracket is part of the delivery. If required, it can also be ordered as an accessory (order code 71102216). </p> |

A0014793

15.1.3 Extension rod / centering HMP40

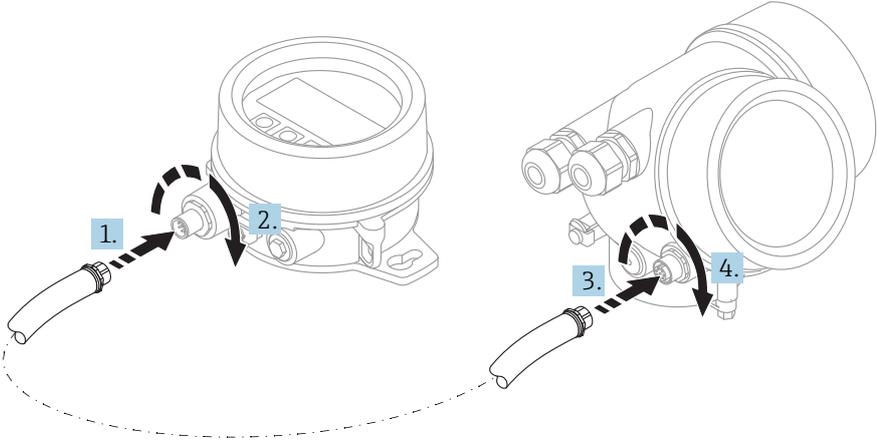
| Accessory | Description |
|---|---|
| Extension rod / centering HMP40 <ul style="list-style-type: none"> ■ can be used for: FMP57 ■ Admissible temperature at lower nozzle edge: <ul style="list-style-type: none"> - without center washer: no limitation - with center washer: -40 to 150 °C (-40 to 302 °F) ■ Additional information: SD01002F | |
| | <p style="text-align: right; font-size: small;">A0013597</p> <p>1 Nozzle height 2 Extension rod 3 Center washer</p> |
| 010 | Approval: |
| A | A: Non-hazardous area |
| M | M: FM DIP Cl.II Div.1 Gr.E-G N.I., zone 2,1,2,2 |
| P | P: CSA DIP Cl.II Div.1 Gr.G + coal dust N.I. |
| S | S: FM Cl.I, II, III Div.1 Gr.A-G N.I., zone 0,1,2,20,21,22 |
| U | U: CSA Cl.I, II, III Div.1 Gr.A-G N.I., zone 0,1,2 |
| 1 | 1: ATEX II 1G |
| 2 | 2: ATEX II 1D |
| 020 | Extension rod; nozzle height: |
| 1 | 115mm; 150-250mm / 6-10" |
| 2 | 215mm; 250-350mm / 10-14" |
| 3 | 315mm; 350-450mm / 14-18" |
| 4 | 415mm; 450-550mm / 18-22" |
| 9 | Special version, TSP-no. to be spec. |
| 030 | Center washer: |
| A | Not selected |
| B | DN40 / 1-1/2", inside-d. = 40-45mm, PPS |
| C | DN50 / 2", inside-d. = 50-57mm, PPS |
| D | DN80 / 3", inside-d. = 80-85mm, PPS |
| E | DN80 / 3", inside-d. = 76-78mm, PPS |
| G | DN100 / 4", inside-d. = 100-110mm, PPS |
| H | DN150 / 6", inside-d. = 152-164mm, PPS |
| J | DN200 / 8", inside-d. = 210-215mm, PPS |
| K | DN250 / 10", inside-d. = 253-269mm, PPS |
| Y | Special version, TSP-no. to be spec. |

15.1.4 Mounting kit, isolated

| Accessory | Description |
|--|--|
| <p>Mounting kit, isolated can be used for</p> <ul style="list-style-type: none"> ■ FMP56 ■ FMP57 | <div style="text-align: center;">  </div> <p>☑ 35 Scope of supply of the mounting kit:</p> <p>1 Insulating sleeve 2 Eye-bolt</p> <p>For reliably insulated fixing of the probe. Maximum process temperature: 150 °C (300 °F)</p> <p>For rope probes 4 mm (1/6 in) or 6 mm (1/4 in) with PA>steel:</p> <ul style="list-style-type: none"> ■ Diameter D = 20 mm (0.8 in) ■ Order-No.: 52014249 <p>For rope probes 6 mm (1/4 in) or 8 mm (1/3 in) with PA>steel:</p> <ul style="list-style-type: none"> ■ Diameter D = 25 mm (1 in) ■ Order-No.: 52014250 <p>Due to the risk of electrostatic charge, the insulating sleeve is not suitable for use in hazardous areas. In these cases the fixing must be reliably grounded.</p> <p>i The mounting kit can also be ordered directly with the device (see the Levelflex product structure, feature 620 "Accessory Enclosed", option PG "Mounting kit, isolated, rope").</p> |

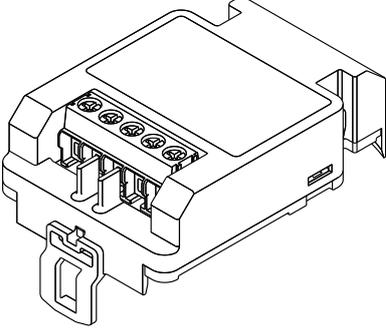
A0013586

15.1.5 Remote display FHX50

| Accessories | Description |
|----------------------|---|
| Remote display FHX50 | <div style="text-align: center;">  </div> <p style="text-align: right;">A0019128</p> <ul style="list-style-type: none"> ▪ Material: <ul style="list-style-type: none"> – Plastic PBT – 316L/1.4404 – Aluminum ▪ Degree of protection: IP68 / NEMA 6P and IP66 / NEMA 4x ▪ Suitable for display modules: <ul style="list-style-type: none"> – SD02 (push buttons) – SD03 (touch control) ▪ Connecting cable: <ul style="list-style-type: none"> – Cable supplied with device up to 30 m (98 ft) – Standard cable supplied by customer up to 60 m (196 ft) ▪ Ambient temperature range: –40 to 80 °C (–40 to 176 °F) ▪ Ambient temperature range (option): –50 to 80 °C (–58 to 176 °F) ¹⁾ <p>i ▪ If the remote display should be used, order the device version "Prepared for display FHX50" (feature 030, version L, M or N). For the FHX50, you must select option A: "Prepared for display FHX50" under feature 050 "Measuring device version".</p> <p>▪ If the device version "Prepared for display FHX50" was not originally ordered and a FHX50 display is to be retrofitted, you must select version B "Not prepared for display FHX50" under feature 050: "Measuring device version" when ordering the FHX50. In this case, a retrofit kit for the device is supplied with the FHX50. The kit can be used to prepare the device so that the FHX50 can be used.</p> <p>i Use of the FHX50 may be restricted for transmitters with an approval. A device can only be retrofitted with the FHX50 if the option L, M or N ("Prepared for FHX50") is listed under <i>Basic specifications</i>, item 4 "Display, operation" in the Safety Instructions (XA) for the device. Also pay attention to the Safety Instructions (XA) of the FHX50.</p> <p>i Retrofitting is not possible on transmitters with:</p> <ul style="list-style-type: none"> ▪ An approval for use in areas with flammable dust (dust ignition-proof approval) ▪ Ex nA type of protection <p>i For details, see document SD01007F.</p> |

1) This range is valid if option JN "Ambient temperature transmitter –50 °C (–58 °F)" has been selected in ordering feature 580 "Test, Certificate". If the temperature is permanently below –40 °C (–40 °F), failure rates may be increased.

15.1.6 Overvoltage protection

| Accessory | Description |
|--|---|
| <p>Overvoltage protection for 2-wire-devices OVP10 (1 channel) OVP20 (2 channel)</p> | <div style="text-align: right; margin-bottom: 10px;">A0021734</div>  <p>Technical data</p> <ul style="list-style-type: none"> ▪ Resistance per channel: $2 * 0.5 \Omega_{max}$ ▪ Threshold DC voltage: 400 to 700 V ▪ Threshold impulse voltage: < 800 V ▪ Capacitance at 1 MHz: < 1.5 pF ▪ Nominal arrest impulse voltage (8/20 μs): 10 kA ▪ Suited for wire cross-sections: 0.2 to 2.5 mm² (24 to 14 AWG) <p>i Ordering with device The overvoltage protection module is preferably ordered with the device. See product structure, feature 610 "Accessory mounted", option NA "Overvoltage protection". Separate ordering of the module is only necessary if a device is to be retrofitted with the overvoltage protection.</p> <p>i Order code for retrofitting</p> <ul style="list-style-type: none"> ▪ For 1-channel devices (feature 020, option A) OVP10: 71128617 ▪ For 2-channel devices (feature 020, option B, C, E or G) OVP20 : 71128619 <p>Housing lid for retrofitting In order to keep the necessary safety distances, the housing lid needs to be replaced if the device is retrofitted with the overvoltage protection. Depending on the housing type, the order code of the suitable lid is as follows:</p> <ul style="list-style-type: none"> ▪ GT18 housing: Lid 71185516 ▪ GT19 housing: Lid 71185518 ▪ GT20 housing: Lid 71185516 <p>i Restrictions for retrofitting Depending on the approval of the transmitter the usage of the OVP module may be restricted. A device may only be retrofitted with an OVP module if the option NA (overvoltage protection) is quoted under <i>Optional Specifications</i> in the Safety Instructions (XA) pertaining to the device.</p> <p>i For details refer to SD01090F.</p> |

15.1.7 Bluetooth module for HART devices

| Accessory | Description |
|------------------|--|
| Bluetooth module | <div data-bbox="327 324 973 772" style="text-align: center;"> </div> <div data-bbox="1380 779 1436 795" style="text-align: right; font-size: small;">A0036493</div> <ul style="list-style-type: none"> ▪ Quick and easy commissioning via SmartBlue (app) ▪ No additional tools or adapters required ▪ Signal curve via SmartBlue (app) ▪ Encrypted single point-to-point data transmission (tested by Fraunhofer institute) and password protected communication via Bluetooth® wireless technology ▪ Range under reference conditions: > 10 m (33 ft) <p>i When using the Bluetooth module the minimum supply voltage increases by up to 3 V.</p> <p>i Ordering with device The Bluetooth module is preferably ordered with the device. See product structure, feature 610 "Accessory Mounted", option NF "Bluetooth". A separate order is only necessary in case of retrofitting.</p> <p>i Order code for retrofitting Bluetooth module (BT10): 71377355</p> <p>i Restrictions in case of retrofitting Depending on the approval of the transmitter, application of the Bluetooth module may be restricted. A device may only be retrofitted with a Bluetooth module if the option <i>NF</i> (Bluetooth) is listed in the associated Safety Instructions (XA) under <i>Optional specifications</i>.</p> <p>i For details refer to SD02252F.</p> |

15.2 Communication-specific accessories

| Accessory | Description |
|-----------------|--|
| Commubox FXA291 | <p>Connects Endress+Hauser field devices with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a computer. Order code: 51516983</p> <p> For details refer to Technical Information TI00405C</p> |

15.3 Service-specific accessories

| Accessory | Description |
|-------------------|---|
| DeviceCare SFE100 | <p>Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus devices</p> <p> Technical Information TI01134S</p> <p> <ul style="list-style-type: none"> ▪ DeviceCare is available for download at www.software-products.endress.com. The download requires a registration in the Endress+Hauser software portal. ▪ Alternatively, a DeviceCare DVD can be ordered with the device. Product structure: Feature 570 "Service", Option IV "Tooling DVD (DeviceCare Setup)". </p> |
| FieldCare SFE500 | <p>FDT-based Plant Asset Management tool. Helps to configure and maintain all field devices of your plant. By supplying status information it also supports the diagnosis of the devices.</p> <p> Technical Information TI00028S</p> |

15.4 System components

| Accessory | Description |
|-------------------------------------|---|
| Graphic Data Manager Memograph M | <p>The graphic data manager Memograph M provides information on all the relevant process 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 an SD card or USB stick.</p> <p> For details refer to Technical Information TI00133R and Operating Instructions BA00247R</p> |

16 Operating menu

16.1 Overview of the operating menu (display module)

Navigation  Operating menu

| | |
|----------------------------|---|
| Language | →  160 |
| Setup | →  119 |
| Device tag | →  119 |
| Device address | →  119 |
| Distance unit | →  119 |
| Bin type | →  120 |
| Empty calibration | →  120 |
| Full calibration | →  121 |
| Level | →  121 |
| Distance | →  122 |
| Signal quality | →  122 |
| Mapping | →  126 |
| Confirm distance | →  126 |
| Mapping end point | →  126 |
| Record map | →  126 |
| Distance | →  126 |
| Analog inputs | |
| Analog input 1 to 6 | →  127 |
| Channel | →  127 |
| PV filter time | →  127 |

| | |
|-----------------------------|---|
| Fail safe type | →  128 |
| Fail safe value | →  128 |
| ► Advanced setup | →  129 |
| Locking status | →  129 |
| Access status display | →  130 |
| Enter access code | →  130 |
| ► Level | →  131 |
| Medium type | →  131 |
| Medium property | →  131 |
| Process property | →  132 |
| Advanced process conditions | →  133 |
| Level unit | →  134 |
| Blocking distance | →  134 |
| Level correction | →  135 |
| ► Linearization | →  137 |
| Linearization type | →  139 |
| Unit after linearization | →  140 |
| Free text | →  141 |
| Maximum value | →  142 |
| Diameter | →  142 |
| Intermediate height | →  142 |
| Table mode | →  143 |

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|--------------------|----------------------------|-------|
| ▶ Edit table | | |
| | Level | → 144 |
| | Customer value | → 145 |
| | Activate table | → 145 |
| ▶ Safety settings | | → 146 |
| | Output echo lost | → 146 |
| | Value echo lost | → 146 |
| | Ramp at echo lost | → 147 |
| | Blocking distance | → 134 |
| ▶ WHG confirmation | | → 149 |
| ▶ Deactivate WHG | | → 150 |
| | Reset write protection | → 150 |
| | Code incorrect | → 150 |
| ▶ Probe settings | | → 151 |
| | Probe grounded | → 151 |
| | ▶ Probe length correction | → 153 |
| | | |
| | Confirm probe length | → 153 |
| | | |
| | Present probe length | → 153 |
| ▶ Switch output | | → 154 |
| | Switch output function | → 154 |
| | Assign status | → 154 |
| | Assign limit | → 155 |
| | Assign diagnostic behavior | → 155 |
| | Switch-on value | → 156 |
| | Switch-on delay | → 157 |

| | |
|---------------------------------------|---|
| Switch-off value | →  157 |
| Switch-off delay | →  158 |
| Failure mode | →  158 |
| Switch status | →  158 |
| Invert output signal | →  158 |
| ► Display | →  160 |
| Language | →  160 |
| Format display | →  160 |
| Value 1 to 4 display | →  162 |
| Decimal places 1 to 4 | →  162 |
| Display interval | →  163 |
| Display damping | →  163 |
| Header | →  163 |
| Header text | →  164 |
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| Number format | →  164 |
| Decimal places menu | →  164 |
| Backlight | →  165 |
| Contrast display | →  165 |
| ► Configuration backup display | →  166 |
| Operating time | →  166 |
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| Configuration management | →  166 |
| Comparison result | →  167 |
| ▶ Administration | →  169 |
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| Define access code | →  171 |
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| Device reset | →  169 |
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| Previous diagnostics | →  172 |
| Operating time from restart | →  173 |
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| ▶ Diagnostic list | →  174 |
| Diagnostics 1 to 5 | →  174 |
| ▶ Event logbook | →  175 |
| Filter options | →  175 |
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| ▶ Device information | →  176 |
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| Serial number | →  176 |
| Firmware version | →  176 |
| Device name | →  176 |
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| | |
|---------------------------------|---|
| Status PROFIBUS Master Config | →  177 |
| PROFIBUS ident number | →  177 |
| ► Measured values | →  178 |
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| Level linearized | →  141 |
| Terminal voltage 1 | →  179 |
| Switch status | →  158 |
| ► Analog inputs | |
| ► Analog input 1 to 6 | →  180 |
| Channel | →  127 |
| Out value | →  180 |
| Out status | →  181 |
| Out status HEX | →  181 |
| ► Data logging | →  182 |
| Assign channel 1 to 4 | →  182 |
| Logging interval | →  183 |
| Clear logging data | →  183 |
| ► Display channel 1 to 4 | →  184 |
| ► Simulation | →  186 |
| Assign measurement variable | →  187 |
| Value process variable | →  187 |
| Switch output simulation | →  187 |
| Switch status | →  188 |
| Simulation device alarm | →  188 |

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|-----------------------------|-------|
| Diagnostic event category | |
| Simulation diagnostic event | → 188 |
| ▶ Device check | → 189 |
| Start device check | → 189 |
| Result device check | → 189 |
| Last check time | → 189 |
| Level signal | → 190 |
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16.2 Overview of the operating menu (operating tool)

Navigation



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| Device tag | → 119 |
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| Bin type | → 120 |
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| Distance | → 122 |
| Signal quality | → 122 |
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| Present mapping | → 124 |
| Mapping end point | → 124 |
| Record map | → 124 |
| ► Analog inputs | |
| ► Analog input 1 to 6 | → 127 |
| Channel | → 127 |
| PV filter time | → 127 |
| Fail safe type | → 128 |
| Fail safe value | → 128 |
| ► Advanced setup | → 129 |
| Locking status | → 129 |
| Access status tooling | → 129 |

| | |
|-----------------------------|---|
| Enter access code | →  130 |
| ► Level | →  131 |
| Medium type | →  131 |
| Medium property | →  131 |
| Process property | →  132 |
| Advanced process conditions | →  133 |
| Level unit | →  134 |
| Blocking distance | →  134 |
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| ► Linearization | →  137 |
| Linearization type | →  139 |
| Unit after linearization | →  140 |
| Free text | →  141 |
| Level linearized | →  141 |
| Maximum value | →  142 |
| Diameter | →  142 |
| Intermediate height | →  142 |
| Table mode | →  143 |
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| Level | →  144 |
| Level | →  145 |
| Customer value | →  145 |
| Activate table | →  145 |
| ► Safety settings | →  146 |
| Output echo lost | →  146 |

| | |
|----------------------------|-------|
| Value echo lost | → 146 |
| Ramp at echo lost | → 147 |
| Blocking distance | → 134 |
| ▶ WHG confirmation | → 149 |
| ▶ Deactivate WHG | → 150 |
| Reset write protection | → 150 |
| Code incorrect | → 150 |
| ▶ Probe settings | → 151 |
| Probe grounded | → 151 |
| Present probe length | → 151 |
| Confirm probe length | → 152 |
| ▶ Switch output | → 154 |
| Switch output function | → 154 |
| Assign status | → 154 |
| Assign limit | → 155 |
| Assign diagnostic behavior | → 155 |
| Switch-on value | → 156 |
| Switch-on delay | → 157 |
| Switch-off value | → 157 |
| Switch-off delay | → 158 |
| Failure mode | → 158 |
| Switch status | → 158 |
| Invert output signal | → 158 |
| ▶ Display | → 160 |
| Language | → 160 |

| | |
|---|---|
| Format display | →  160 |
| Value 1 to 4 display | →  162 |
| Decimal places 1 to 4 | →  162 |
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| Display damping | →  163 |
| Header | →  163 |
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| Number format | →  164 |
| Decimal places menu | →  164 |
| Backlight | →  165 |
| Contrast display | →  165 |
| ► Configuration backup display | →  166 |
| Operating time | →  166 |
| Last backup | →  166 |
| Configuration management | →  166 |
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| Comparison result | →  167 |
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| Define access code | →  171 |
| Device reset | →  169 |
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| Timestamp | →  173 |
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| ▶ Diagnostic list | →  174 |
| Diagnostics 1 to 5 | →  174 |
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| ▶ Device information | →  176 |
| Device tag | →  176 |
| Serial number | →  176 |
| Firmware version | →  176 |
| Device name | →  176 |
| Order code | →  177 |
| Extended order code 1 to 3 | →  177 |
| Status PROFIBUS Master Config | →  177 |
| PROFIBUS ident number | →  177 |
| ▶ Measured values | →  178 |
| Distance | →  122 |
| Level linearized | →  141 |
| Terminal voltage 1 | →  179 |
| Switch status | →  158 |
| ▶ Analog inputs | |
| ▶ Analog input 1 to 6 | →  180 |
| Channel | →  127 |
| Out value | →  180 |

| | |
|-----------------------------|---|
| Out status | →  181 |
| Out status HEX | →  181 |
| ▶ Data logging | →  182 |
| Assign channel 1 to 4 | →  182 |
| Logging interval | →  183 |
| Clear logging data | →  183 |
| ▶ Simulation | →  186 |
| Assign measurement variable | →  187 |
| Value process variable | →  187 |
| Switch output simulation | →  187 |
| Switch status | →  188 |
| Simulation device alarm | →  188 |
| Simulation diagnostic event | →  188 |
| ▶ Device check | →  189 |
| Start device check | →  189 |
| Result device check | →  189 |
| Last check time | →  189 |
| Level signal | →  190 |
| Launch signal | →  190 |
| ▶ Heartbeat | →  191 |

16.3 "Setup" menu

- 
 -  : Marks the navigation path to the parameter via the display and operating module.
 -  : Marks the navigation path to the parameter via an operating tool (e.g. FieldCare).
 -  : Marks parameters which can be locked via the software locking.

Navigation  Setup

| | | |
|------------------------|---|---|
| Device tag | |  |
| Navigation |  Setup → Device tag | |
| Description | Enter tag for measuring point. | |
| User entry | Up to 32 alphanumerical characters | |
| Factory setting | FMP5x | |
| Device address | |  |
| Navigation |  Setup → Device address | |
| Description | <ul style="list-style-type: none"> ▪ for Address mode = Software: Enter bus address. ▪ for Address mode = Hardware: Displays bus address. | |
| User entry | 0 to 126 | |
| Factory setting | 126 | |
| Distance unit | |  |
| Navigation |  Setup → Distance unit | |
| Description | Length unit for distance calculation. | |
| Selection | <i>SI units</i> <ul style="list-style-type: none"> ▪ mm ▪ m | <i>US units</i> <ul style="list-style-type: none"> ▪ ft ▪ in |
| Factory setting | m | |

Bin type



Navigation

Setup → Bin type

Prerequisite

Medium type (→ 131) = **Solid**

Description

Specify bin type.

Selection

- Concrete
- Plastic wood
- Metallic
- Aluminium
- Buffer silo (fast)
- Bin / Pile
- Crusher / belt
- Silo
- Workbench test

Factory setting

Metallic

Empty calibration



Navigation

Setup → Empty calibration

Description

Distance process connection to min. level.

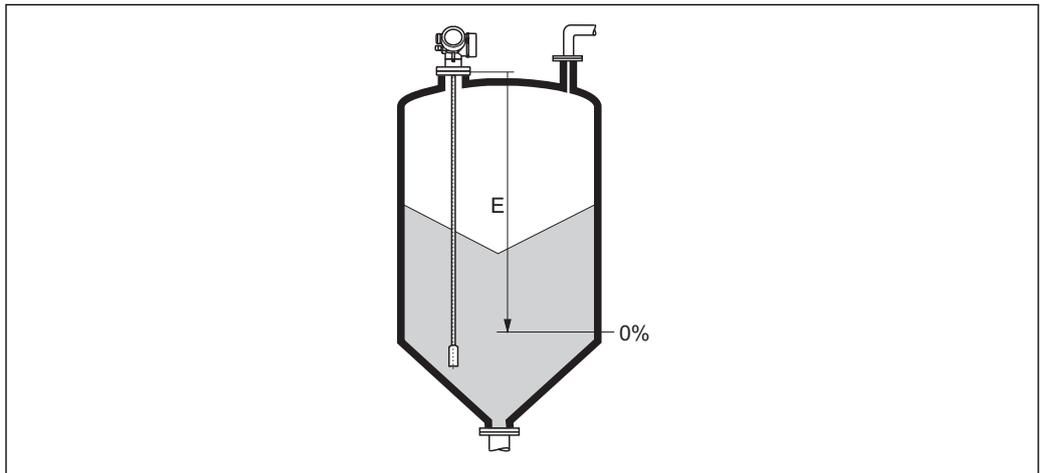
User entry

Depending on the probe

Factory setting

Depending on the probe

Additional information



A0013180

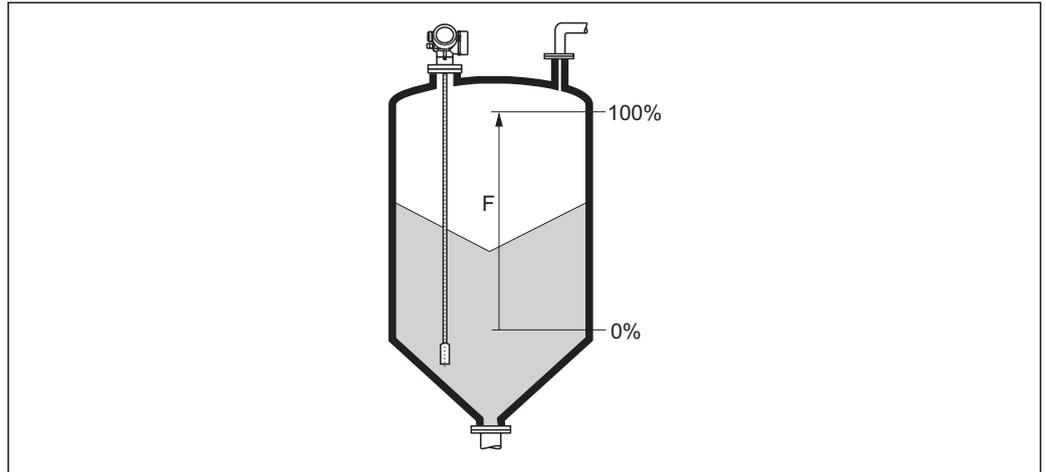
36 Empty calibration (E) for level measurements in bulk solids.

Full calibration



| | |
|------------------------|-------------------------------|
| Navigation | Setup → Full calibration |
| Description | Span: max. level - min level. |
| User entry | Depending on the probe |
| Factory setting | Depending on the probe |

Additional information



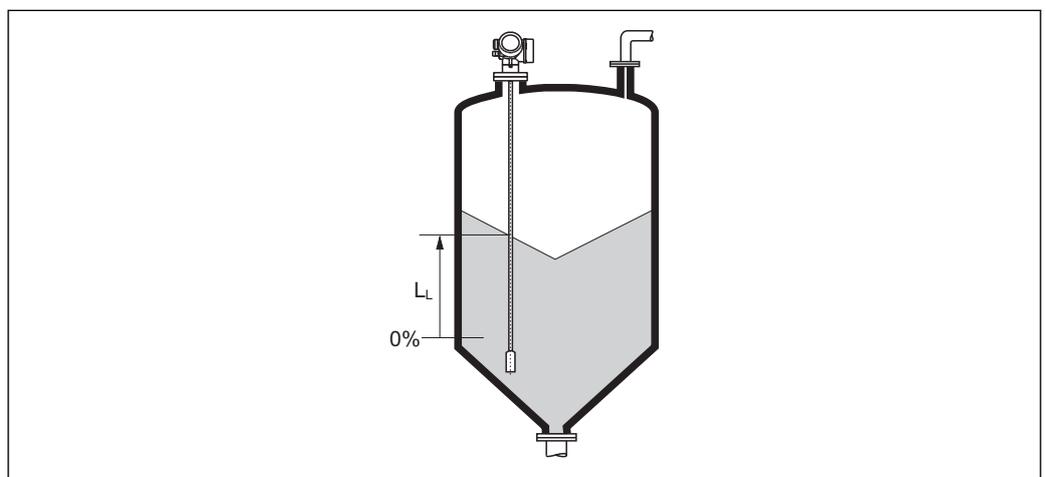
A0013191

37 Full calibration (F) for level measurements in bulk solids

Level

| | |
|--------------------|---|
| Navigation | Setup → Level |
| Description | Displays measured level L_L (before linearization). |

Additional information



A0013196

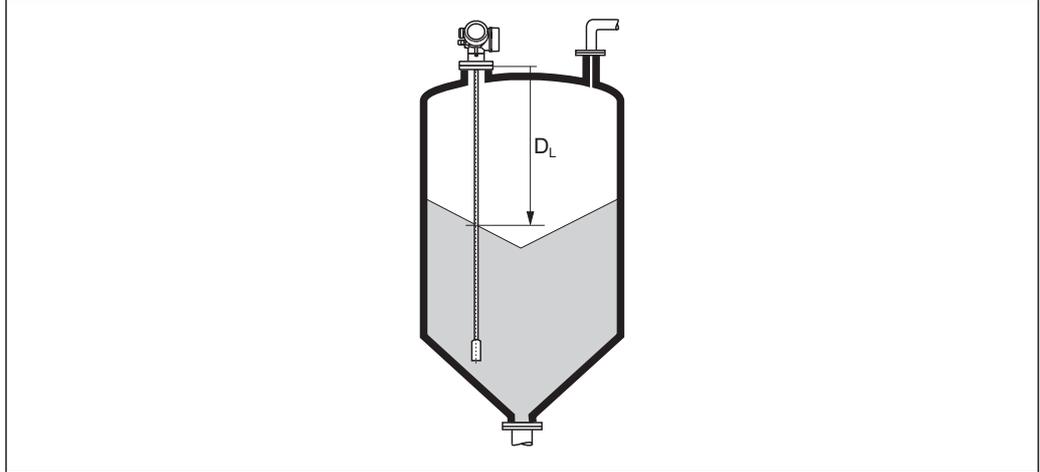
38 Level in case of bulk solid measurements

The unit is defined in the **Level unit** parameter (→ 134).

Distance

Navigation
  Setup → Distance
Description

Displays the measured distance D_L between the reference point (lower edge of the flange or threaded connection) and the level.

Additional information

A0013201

 39 Distance for bulk solid measurements

 The unit is defined in the **Distance unit** parameter (→  119).

Signal quality

Navigation
  Setup → Signal quality
Description

Displays the signal quality of the evaluated echo.

Additional information**Meaning of the display options**

- **Strong**
The evaluated echo exceeds the threshold by at least 10 mV.
- **Medium**
The evaluated echo exceeds the threshold by at least 5 mV.
- **Weak**
The evaluated echo exceeds the threshold by less than 5 mV.
- **No signal**
The device does not find a usable echo.

The signal quality indicated in this parameter always refers to the currently evaluated echo: either the level/interface echo⁵⁾ or the end-of-probe echo. To differentiate between these two, the quality of the end-of-probe echo is always displayed in brackets.

 In case of a lost echo (**Signal quality = No signal**) the device generates the following error message:

- F941, for **Output echo lost** (→  146) = Alarm.
- S941, if another option has been selected in **Output echo lost** (→  146).

5) Of these two echos the one with the lower quality is indicated.

| Confirm distance  | |
|--|---|
| Navigation |  Setup → Confirm distance |
| Description | Specify, whether the measured distance matches the real distance. Depending on the selection the device automatically sets the range of mapping. |
| Selection | <ul style="list-style-type: none"> ■ Manual map ■ Distance ok ■ Distance unknown ■ Distance too small[*] ■ Distance too big[*] ■ Tank empty ■ Delete map |
| Factory setting | Distance unknown |
| Additional information | <p>Meaning of the options</p> <ul style="list-style-type: none"> ■ Manual map To be selected if the range of mapping is to be defined manually in the Mapping end point parameter (→  124). In this case it is not necessary to confirm the distance. ■ Distance ok To be selected if the measured distance matches the actual distance. The device performs a mapping. ■ Distance unknown To be selected if the actual distance is unknown. A mapping can not be performed in this case. ■ Distance too small To be selected if the measured distance is smaller than the actual distance. The device searches for the next echo and returns to the Confirm distance parameter. The distance is recalculated and displayed. The comparison must be repeated until the displayed distance matches the actual distance. After this, the recording of the map can be started by selecting Distance ok. ■ Distance too big⁶⁾ To be selected if the measured distance exceeds the actual distance. The device adjusts the signal evaluation and returns to the Confirm distance parameter. The distance is recalculated and displayed. The comparison must be repeated until the displayed distance matches the actual distance. After this, the recording of the map can be started by selecting Distance ok. ■ Tank empty To be selected if the tank is completely empty. The device records a mapping covering the complete measuring range. To be selected if the tank is completely empty. The device records a mapping covering the complete measuring range minus Map gap to LN. ■ Factory map To be selected if the present mapping curve (if one exists) is to be deleted. The device returns to the Confirm distance parameter and a new mapping can be recorded. <p> When operating via the display module, the measured distance is displayed together with this parameter for reference purposes.</p> <p> If the teaching procedure with the Distance too small option or the Distance too big option is quit before the distance has been confirmed, a map is not recorded and the teaching procedure is reset after 60 s.</p> |

* Visibility depends on order options or device settings

6) Only available for "Expert → Sensor → Echo tracking → **Evaluation mode** parameter" = "Short time history" or "Long time history"

Present mapping

| | |
|--------------------|---|
| Navigation |  Setup → Present mapping |
| Description | Indicates up to which distance a mapping has already been recorded. |

Mapping end point

| | |
|-------------------------------|---|
| Navigation |  Setup → Mapping end point |
| Prerequisite | Confirm distance (→  123) = Manual map or Distance too small |
| Description | Specify new end of the mapping. |
| User entry | 0 to 200 000.0 m |
| Factory setting | 0.1 m |
| Additional information | <p>This parameter defines up to which distance the new mapping is to be recorded. The distance is measured from the reference point, i.e. from the lower edge of the mounting flange or the threaded connection.</p> <p> For reference purposes the Present mapping parameter (→  124) is displayed together with this parameter. It indicates up to which distance a mapping has already been recorded.</p> |

Record map

| | |
|------------------------|--|
| Navigation |  Setup → Record map |
| Prerequisite | Confirm distance (→  123) = Manual map or Distance too small |
| Description | Start recording of the map. |
| Selection | <ul style="list-style-type: none"> ■ No ■ Record map ■ Delete map |
| Factory setting | No |

Additional information**Meaning of the options****■ No**

The map is not recorded.

■ Record map

The map is recorded. After the recording is completed, the new measured distance and the new mapping range appear on the display. When operating via the local display, these values must be confirmed by pressing .

■ Delete map

The mapping (if one exists) is deleted and the device displays the recalculated measured distance and the mapping range. When operating via the local display, these values must be confirmed by pressing .

16.3.1 "Mapping" wizard

 The **Mapping** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the mapping are located directly in the **Setup** menu (→  119).

 In the **Mapping** wizard two parameters are displayed simultaneously on the display module at any one time. The upper parameter can be edited, whereas the lower parameter is displayed for reference purposes only.

Navigation  Setup → Mapping

Confirm distance

Navigation  Setup → Mapping → Confirm distance

Description →  123

Mapping end point

Navigation  Setup → Mapping → Mapping end point

Description →  124

Record map

Navigation  Setup → Mapping → Record map

Description →  124

Distance

Navigation  Setup → Mapping → Distance

Description →  122

16.3.2 "Analog input 1 to 6" submenu

 There is an **Analog input** submenu for each AI block of the device. The AI block is used to configure the measured value transmission to the bus.

Only the most basic properties of the AI blocks can be configured in this submenu. For a detailed configuration of the AI blocks refer to Expert → Analog inputs → Analog input 1 to 6.

Navigation  Expert → Analog inputs → Analog input 1 to 6

| Channel |  |
|-------------------------------|--|
| Navigation |  Expert → Analog inputs → Analog input 1 to 6 → Channel |
| Description | Standard parameter CHANNEL of the Analog Input Block according to the PROFIBUS Profile. |
| Selection | <ul style="list-style-type: none"> ■ Level linearized ■ Distance ■ Interface linearized * ■ Interface distance * ■ Thickness upper layer * ■ Terminal voltage ■ Electronic temperature ■ Measured capacitance * ■ Absolute echo amplitude ■ Relative echo amplitude ■ Absolute interface amplitude * ■ Relative interface amplitude * ■ Absolute EOP amplitude ■ Noise of signal ■ EOP shift ■ Calculated DC value * ■ Sensor debug ■ Analog output adv. diagnostics 1 ■ Analog output adv. diagnostics 2 |
| Factory setting | Level linearized |
| Additional information | Allocates a measured value to the AI block. |

| PV filter time |  |
|--------------------|---|
| Navigation |  Expert → Analog inputs → Analog input 1 to 6 → PV filter time |
| Description | Standard parameter PV_FTIME of the Analog Input Block according to the PROFIBUS profile. |

* Visibility depends on order options or device settings

| | |
|-------------------------------|---|
| User entry | Positive floating-point number |
| Factory setting | 0 |
| Additional information | This parameter defines the damping constant τ (in seconds) for the output of the Analog Input Block. |

Fail safe type


| | |
|-------------------------------|---|
| Navigation | Expert → Analog inputs → Analog input 1 to 6 → Fail safe type |
| Description | Standard parameter FSAFE_TYPE of the Analog Input Block according to the PROFIBUS profile. |
| Selection | <ul style="list-style-type: none"> ▪ Fail safe value ▪ Fallback value ▪ Off |
| Factory setting | Off |
| Additional information | <p>Meaning of the options</p> <p>This parameter specifies the output value of the Analog Input block in the event of an error.</p> <ul style="list-style-type: none"> ▪ Fail safe value The output value in the event of an error is defined in the Fail safe value parameter (→ 128). ▪ Fallback value The last output value that was valid before the error occurred is retained. ▪ Off The output value follows the current measured value. The status is set to BAD. |

Fail safe value


| | |
|-------------------------------|--|
| Navigation | Expert → Analog inputs → Analog input 1 to 6 → Fail safe value |
| Prerequisite | Fail safe type (→ 128) = Fail safe value |
| Description | Standard parameter FSAFE_VALUE of the Analog Input Block according to the PROFIBUS profile. |
| User entry | Signed floating-point number |
| Factory setting | 0 |
| Additional information | This parameter defines the output value of the Analog Input Block in case of an error. |

16.3.3 "Advanced setup" submenu

Navigation  Setup → Advanced setup

Locking status

| | |
|-------------------------------|--|
| Navigation |   Setup → Advanced setup → Locking status |
| Description | Indicates the write protection with the highest priority that is currently active. |
| User interface | <ul style="list-style-type: none"> ▪ Hardware locked ▪ SIL locked ▪ WHG locked ▪ Temporarily locked |
| Additional information | <p>Meaning and priorities of the types of write protection</p> <ul style="list-style-type: none"> ▪ Hardware locked (priority 1) The DIP switch for hardware locking is activated on the main electronics module. This locks write access to the parameters. ▪ SIL locked (priority 2) The SIL mode is activated. Writing access to the relevant parameters is denied. ▪ WHG locked (priority 3) The WHG mode is activated. Writing access to the relevant parameters is denied. ▪ Temporarily locked (priority 4) Write access to the parameters is temporarily locked on account of internal processes in progress in the device (e.g. data upload/download, reset etc.). The parameters can be modified as soon as the processes are complete. <p> On the display module, the -symbol appears in front of parameters that cannot be modified since they are write-protected.</p> |

Access status tooling

| | |
|-------------------------------|--|
| Navigation |  Setup → Advanced setup → Access status tooling |
| Description | Shows the access authorization to the parameters via the operating tool. |
| Additional information | <p> The access authorization can be changed via the Enter access code parameter (→  130).</p> <p> If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the Locking status parameter (→  129).</p> |

Access status display

| | |
|-------------------------------|--|
| Navigation |  Setup → Advanced setup → Access status display |
| Prerequisite | The device has a local display. |
| Description | Indicates access authorization to parameters via local display. |
| Additional information | <p> The access authorization can be changed via the Enter access code parameter (→  130).</p> <p> If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the Locking status parameter (→  129).</p> |

Enter access code

| | |
|-------------------------------|---|
| Navigation |  Setup → Advanced setup → Enter access code |
| Description | Enter access code to disable write protection of parameters. |
| User entry | 0 to 9999 |
| Additional information | <ul style="list-style-type: none"> ▪ For local operation, the customer-specific access code, which has been defined in the Define access code parameter (→  169), has to be entered. ▪ If an incorrect access code is entered, the user retains his current access authorization. ▪ The write protection affects all parameters marked with the -symbol in this document. On the local display, the -symbol in front of a parameter indicates that the parameter is write-protected. ▪ If no key is pressed for 10 min, or the user switches from the navigation and editing mode back to the measured value display mode, the device automatically locks the write-protected parameters after another 60 s. <p> Please contact your Endress+Hauser Sales Center if you lose your access code.</p> |

"Level" submenu

Navigation  Setup → Advanced setup → Level

Medium type 

| | |
|-------------------------------|---|
| Navigation |  Setup → Advanced setup → Level → Medium type |
| Description | Specify type of medium. |
| User interface | <ul style="list-style-type: none"> ■ Liquid ■ Solid |
| Factory setting | FMP56, FMP57: Solid |
| Additional information |  This parameter determines the value of several other parameters and strongly influences the complete signal evaluation. Therefore, it is strongly recommended not to change the factory setting. |

Medium property 

| | |
|------------------------|--|
| Navigation |  Setup → Advanced setup → Level → Medium property |
| Prerequisite | EOP level evaluation ≠ Fix DC |
| Description | Specify relative dielectric constant ϵ_r of the medium. |
| Selection | <ul style="list-style-type: none"> ■ Unknown ■ DC 1.4 ... 1.6 ■ DC 1.6 ... 1.9 ■ DC 1.9 ... 2.5 ■ DC 2.5 ... 4 ■ DC 4 ... 7 ■ DC 7 ... 15 ■ DC > 15 |
| Factory setting | Dependent on Medium type (→  131) and Medium group . |

Additional information

Dependency on "Medium type" and "Medium group"

| Medium type (→ ⓘ 131) | Medium group | Medium property |
|-----------------------|-----------------------|-----------------|
| Solid | | Unknown |
| Liquid | Water based (DC >= 4) | DC 4 ... 7 |
| | Others | Unknown |

- i** For dielectric constants (DC values) of many media commonly used in various industries refer to:
 - the Endress+Hauser DC manual (CP01076F)
 - the Endress+Hauser "DC Values App" (available for Android and iOS)

- i** For **EOP level evaluation = Fix DC**, the exact dielectric constant has to be entered into the **DC value** parameter. Therefore, the **Medium property** parameter is not available in this case.

Process property



Navigation

☰☰ Setup → Advanced setup → Level → Process property

Description

Specify typical rate of level change.

Selection

For "Medium type" = "Liquid"

- Very fast > 10 m (400 in)/min
- Fast > 1 m (40 in)/min
- Standard < 1 m (40in) /min
- Medium < 10 cm (4in) /min
- Slow < 1 cm (0.4in) /min
- No filter / test

For "Medium type" = "Solid"

- Very fast > 100 m (333 ft) /h
- Fast > 10 m (33 ft) /h
- Standard < 10 m (33 ft) /h
- Medium < 1 m (3ft) /h
- Slow < 0.1 m (0.3ft) /h
- No filter / test

Factory setting

Standard < 1 m (40in) /min

Additional information

The device adjusts the signal evaluation filters and the damping of the output signal to the typical rate of level change defined in this parameter:

For "Operating mode" = "Level" and "Medium type" = "Liquid"

| Process property | Step response time / s |
|-------------------------------|------------------------|
| Very fast > 10 m (400 in)/min | 5 |
| Fast > 1 m (40 in)/min | 5 |
| Standard < 1 m (40in) /min | 14 |
| Medium < 10 cm (4in) /min | 39 |
| Slow < 1 cm (0.4in) /min | 76 |
| No filter / test | < 1 |

For "Operating mode" = "Level" and "Medium type" = "Solid"

| Process property | Step response time / s |
|-------------------------------|------------------------|
| Very fast > 100 m (333 ft) /h | 37 |
| Fast > 10 m (33 ft) /h | 37 |
| Standard < 10 m (33 ft) /h | 74 |
| Medium < 1 m (3ft) /h | 146 |
| Slow < 0.1 m (0.3ft) /h | 290 |
| No filter / test | < 1 |

For "Operating mode" = "Interface" or "Interface with capacitance"

| Process property | Step response time / s |
|-------------------------------|------------------------|
| Very fast > 10 m (400 in)/min | 5 |
| Fast > 1 m (40 in)/min | 5 |
| Standard < 1 m (40in) /min | 23 |
| Medium < 10 cm (4in) /min | 47 |
| Slow < 1 cm (0.4in) /min | 81 |
| No filter / test | 2.2 |

Advanced process conditions



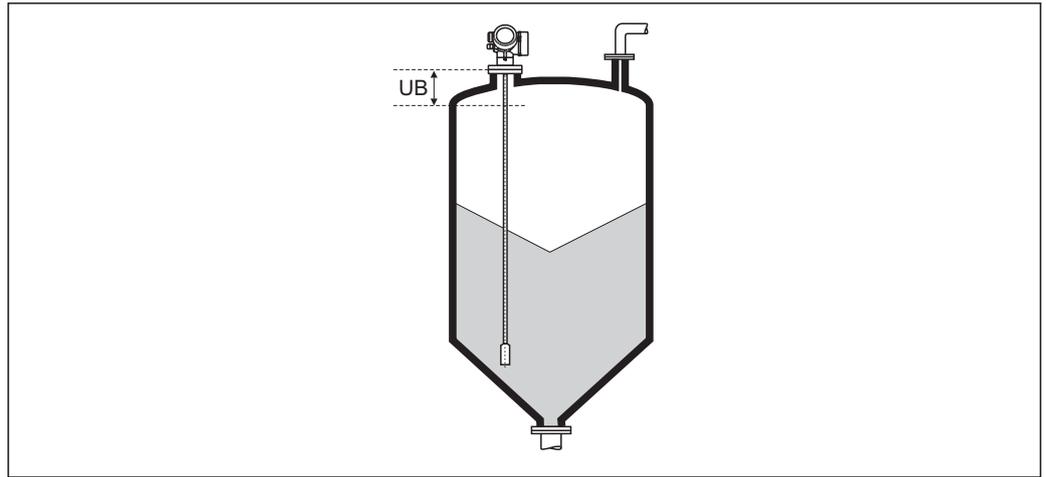
| | |
|-------------------------------|---|
| Navigation | Setup → Advanced setup → Level → Advanced process conditions |
| Description | Specify additional process conditions (if required). |
| Selection | <ul style="list-style-type: none"> ■ None ■ Oil/Water condensate ■ Probe near tank bottom ■ Build up ■ Foam (>5cm/0,16ft) |
| Factory setting | None |
| Additional information | <p>Meaning of the options</p> <ul style="list-style-type: none"> ■ Oil/Water condensate (only Medium type = Liquid) Makes sure that in the case of two-phase media only the total level is detected (example: oil/condensate application). ■ Probe near tank bottom (only for Medium type = Liquid) Improves the empty detection, especially if the probe is mounted close to the tank bottom. ■ Build up Increases EOP range upper area in order to ensure a safe empty-detection even if the end-of-probe signal has shifted due to build-up. Enables a safe empty-detection even if the end-of-probe signal has shifted due to build-up. ■ Foam (>5cm/0,16ft) (only for Medium type = Liquid) Optimizes the signal evaluation in applications with foam formation. |

Level unit


| | | |
|-------------------------------|---|--|
| Navigation | Setup → Advanced setup → Level → Level unit | |
| Description | Select level unit. | |
| Selection | <i>SI units</i> <ul style="list-style-type: none"> ■ % ■ m ■ mm | <i>US units</i> <ul style="list-style-type: none"> ■ ft ■ in |
| Factory setting | % | |
| Additional information | <p>The level unit may differ from the distance unit defined in the Distance unit parameter (→ 119):</p> <ul style="list-style-type: none"> ■ The unit defined in the Distance unit parameter is used for the basic calibration (Empty calibration (→ 120) and Full calibration (→ 121)). ■ The unit defined in the Level unit parameter is used to display the (nonlinearized) level. | |

Blocking distance


| | | |
|-------------------------------|--|--|
| Navigation | Setup → Advanced setup → Level → Blocking distance | |
| Description | Specify upper blocking distance UB. | |
| User entry | 0 to 200 m | |
| Factory setting | <ul style="list-style-type: none"> ■ For rod and rope probes up to 8 m (26 ft): 200 mm (8 in) ■ For rod and rope probes above 8 m (26 ft): 0.025 * Sondenlänge | |
| Additional information | <p>Signals in the upper blocking distance are only evaluated if they have been outside the blocking distance when the device was switched on and move into the blocking distance due to a level change during operation. Signals which are already in the blocking distance when the device is switched on, are ignored.</p> <p> This behavior is only valid if the following two conditions are met:</p> <ul style="list-style-type: none"> ■ Expert → Sensor → Echo tracking → Evaluation mode = Short time history or Long time history) ■ Expert → Sensor → Gas phase compensation → GPC mode= On, Without correction or External correction <p>If one of these conditions is not met, signals in the blocking distance will always be ignored.</p> <p> A different behavior for signals in the blocking distance can be defined in the Blocking distance evaluation mode parameter.</p> <p> If required, a different behavior for signals in the blocking distance can be defined by the Endress+Hauser service.</p> | |



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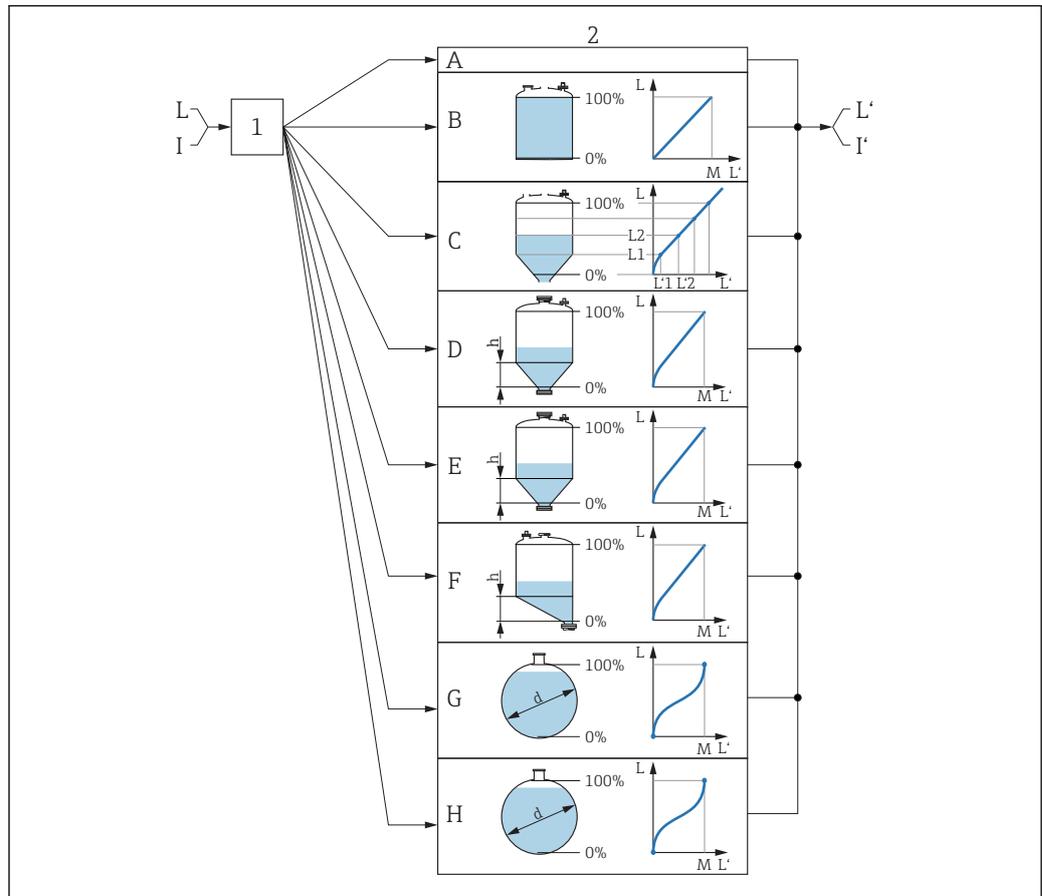
40 Blocking distance (UB) for bulk solid measurements

Level correction



| | |
|-------------------------------|--|
| Navigation | Setup → Advanced setup → Level → Level correction |
| Description | Specify level correction (if required). |
| User entry | -200 000.0 to 200 000.0 % |
| Factory setting | 0.0 % |
| Additional information | The value specified in this parameter is added to the measured level (before linearization). |

"Linearization" submenu



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41 Linearization: Transformation of the level and (if relevant) the interface height into a volume or weight; the transformation is dependent on the shape of the vessel.

- 1 Selection of linearization type and unit
- 2 Configuration of the linearization
- A Linearization type (→ 139) = None
- B Linearization type (→ 139) = Linear
- C Linearization type (→ 139) = Table
- D Linearization type (→ 139) = Pyramid bottom
- E Linearization type (→ 139) = Conical bottom
- F Linearization type (→ 139) = Angled bottom
- G Linearization type (→ 139) = Horizontal cylinder
- H Linearization type (→ 139) = Sphere
- I For "Operating mode" = "Interface" or "Interface with capacitance": Interface before linearization (measured in distance units)
- I' For "Operating mode" = "Interface" or "Interface with capacitance": Interface after linearization (corresponds to volume or weight)
- L Level before linearization (measured in distance units)
- L' Level linearized (→ 141) (corresponds to volume or weight)
- M Maximum value (→ 142)
- d Diameter (→ 142)
- h Intermediate height (→ 142)

Structure of the submenu on the display module

Navigation  Setup → Advanced setup → Linearization

| | |
|--------------------------|---|
| ► Linearization | |
| Linearization type | →  139 |
| Unit after linearization | →  140 |
| Free text | →  141 |
| Maximum value | →  142 |
| Diameter | →  142 |
| Intermediate height | →  142 |
| Table mode | →  143 |
| ► Edit table | |
| Level | →  144 |
| Customer value | →  145 |
| Activate table | →  145 |

Structure of the submenu in an operating tool (e.g. FieldCare)

Navigation  Setup → Advanced setup → Linearization

| ► Linearization | |
|--------------------------|---|
| Linearization type | →  139 |
| Unit after linearization | →  140 |
| Free text | →  141 |
| Level linearized | →  141 |
| Maximum value | →  142 |
| Diameter | →  142 |
| Intermediate height | →  142 |
| Table mode | →  143 |
| Table number | →  144 |
| Level | →  144 |
| Level | →  145 |
| Customer value | →  145 |
| Activate table | →  145 |

Description of parameters

Navigation  Setup → Advanced setup → Linearization

Linearization type 

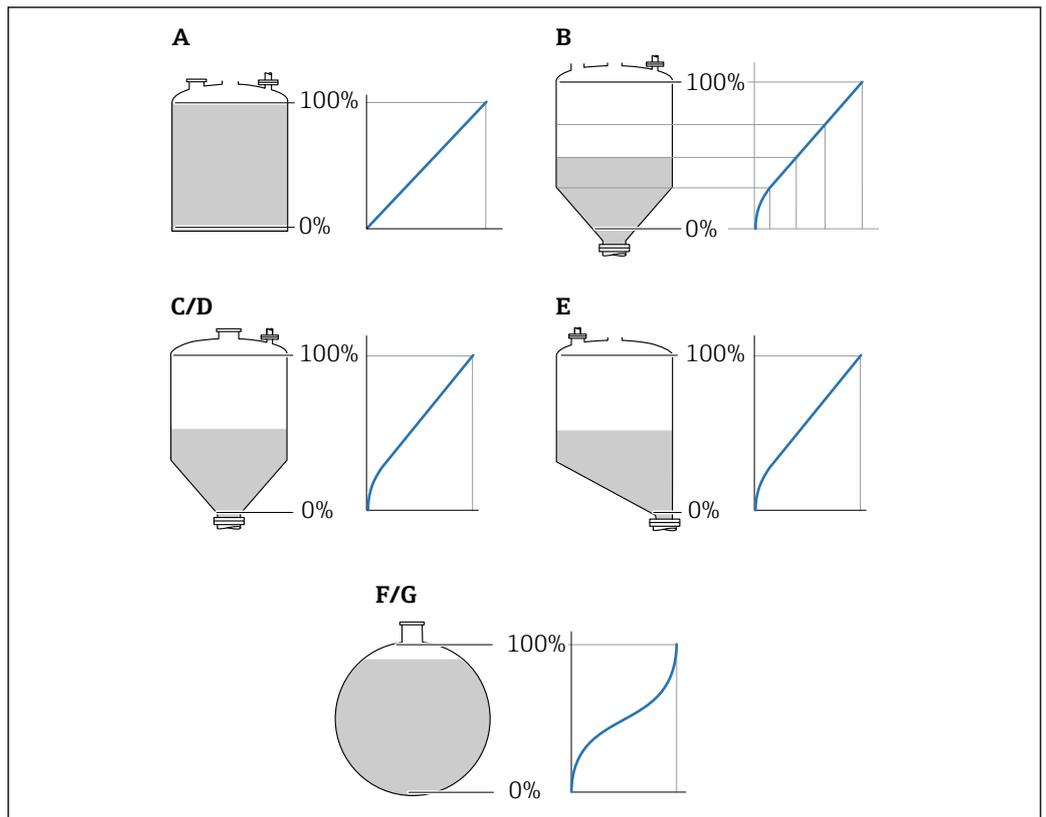
Navigation  Setup → Advanced setup → Linearization → Linearization type

Description Select linearization type.

- Selection**
- None
 - Linear
 - Table
 - Pyramid bottom
 - Conical bottom
 - Angled bottom
 - Horizontal cylinder
 - Sphere

Factory setting None

Additional information



 42 *Linearization types*

- A None
- B Table
- C Pyramid bottom
- D Conical bottom
- E Angled bottom
- F Sphere
- G Horizontal cylinder

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Meaning of the options**■ None**

The level is transmitted in the level unit without linearization.

■ Linear

The output value (volume/weight) is directly proportional to the level L. This is valid, for example, for vertical cylinders. The following additional parameters have to be specified:

- **Unit after linearization** (→  140)
- **Maximum value** (→  142): Maximum volume or weight

■ Table

The relationship between the measured level L and the output value (volume/weight) is given by a linearization table consisting of up to 32 pairs of values "level - volume" or "level - weight", respectively. The following additional parameters have to be specified:

- **Unit after linearization** (→  140)
- **Table mode** (→  143)
- For each table point: **Level** (→  144)
- For each table point: **Customer value** (→  145)
- **Activate table** (→  145)

■ Pyramid bottom

The output value corresponds to the volume or weight in a silo with pyramid bottom. The following additional parameters have to be specified:

- **Unit after linearization** (→  140)
- **Maximum value** (→  142): Maximum volume or weight
- **Intermediate height** (→  142): The height of the pyramid

■ Conical bottom

The output value corresponds to the volume or weight in a tank with conical bottom. The following additional parameters have to be specified:

- **Unit after linearization** (→  140)
- **Maximum value** (→  142): Maximum volume or weight
- **Intermediate height** (→  142): The height of the conical part of the tank

■ Angled bottom

The output value corresponds to the volume or weight in a silo with an angled bottom. The following additional parameters have to be specified:

- **Unit after linearization** (→  140)
- **Maximum value** (→  142): Maximum volume or weight
- **Intermediate height** (→  142): Height of the angled bottom

■ Horizontal cylinder

The output value corresponds to the volume or weight in a horizontal cylinder. The following additional parameters have to be specified:

- **Unit after linearization** (→  140)
- **Maximum value** (→  142): Maximum volume or weight
- **Diameter** (→  142)

■ Sphere

The output value corresponds to the volume or weight in a spherical tank. The following additional parameters have to be specified:

- **Unit after linearization** (→  140)
- **Maximum value** (→  142): Maximum volume or weight
- **Diameter** (→  142)

Unit after linearization**Navigation**

  Setup → Advanced setup → Linearization → Unit after linearization

Prerequisite

Linearization type (→  139) ≠ None

Description

Select unit of the linearized value.

| | | | |
|-------------------------------|---|---|---------------------------------|
| Selection | <i>SI units</i> <ul style="list-style-type: none"> ■ STon ■ t ■ kg ■ cm³ ■ dm³ ■ m³ ■ hl ■ l ■ % <i>Custom-specific units</i> Free text | <i>US units</i> <ul style="list-style-type: none"> ■ lb ■ UsGal ■ ft³ | <i>Imperial units</i> impGal |
| Factory setting | % | | |
| Additional information | <p>The selected unit is only used to be indicated on the display. The measured value is not transformed according to the selected unit.</p> <p> It is also possible to configure a distance-to-distance linearization, i.e. a transformation from the level unit to a different distance unit. To do so, select the Linear linearization mode. In order to define the new level unit, select the Free text option in the Unit after linearization parameter and enter the required unit into the Free text parameter (→  141).</p> | | |

Free text


| | |
|------------------------|--|
| Navigation |   Setup → Advanced setup → Linearization → Free text |
| Prerequisite | Unit after linearization (→  140) = Free text |
| Description | Enter unit symbol. |
| User entry | Up to 32 alphanumeric characters (letters, numbers, special characters) |
| Factory setting | Free text |

Level linearized

| | |
|-------------------------------|---|
| Navigation |  Setup → Advanced setup → Linearization → Level linearized |
| Description | Displays linearized level. |
| Additional information |  The unit is defined by the Unit after linearization parameter →  140. |

Maximum value

**Navigation**  Setup → Advanced setup → Linearization → Maximum value**Prerequisite****Linearization type** (→  139) has one of the following values:

- Linear
- Pyramid bottom
- Conical bottom
- Angled bottom
- Horizontal cylinder
- Sphere

User entry

-50 000.0 to 50 000.0 %

Factory setting

100.0 %

Diameter

**Navigation**  Setup → Advanced setup → Linearization → Diameter**Prerequisite****Linearization type** (→  139) has one of the following values:

- Horizontal cylinder
- Sphere

User entry

0 to 9 999.999 m

Factory setting

2 m

Additional informationThe unit is defined in the **Distance unit** parameter (→  119).

Intermediate height

**Navigation**  Setup → Advanced setup → Linearization → Intermediate height**Prerequisite****Linearization type** (→  139) has one of the following values:

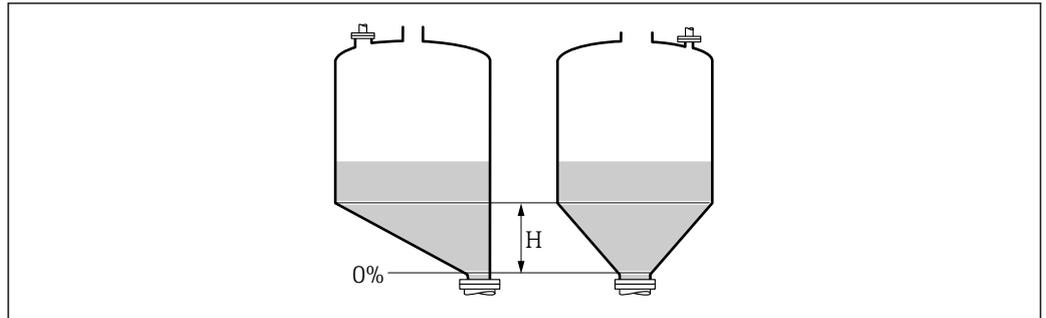
- Pyramid bottom
- Conical bottom
- Angled bottom

User entry

0 to 200 m

Factory setting

0 m

Additional information

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H Intermediate height

The unit is defined in the **Distance unit** parameter (→  119).

Table mode**Navigation**

  Setup → Advanced setup → Linearization → Table mode

Prerequisite

Linearization type (→  139) = Table

Description

Select editing mode of the linearization table.

Selection

- Manual
- Semiautomatic *
- Clear table
- Sort table

Factory setting

Manual

Additional information**Meaning of the options**

- **Manual**
The level and the associated linearized value are entered manually for each linearization point.
- **Semiautomatic**
The level is measured by the device for each linearization point. The associated linearized value is entered manually.
- **Clear table**
Deletes the existing linearization table.
- **Sort table**
Rearranges the linearization points into an ascending order.

* Visibility depends on order options or device settings

Conditions the linearization table must meet:

- The table may consist of up to 32 pairs of values "Level - Linearized Value".
- The table must be monotonic (monotonically increasing or decreasing).
- The first linearization point must refer to the minimum level.
- The last linearization point must refer to the maximum level.

 Before entering a linearization table, the values for **Empty calibration** (→  120) and **Full calibration** (→  121) must be set correctly.

If values of the table need to be changed after the full or empty calibration have been changed, a correct evaluation is only ensured if the existing table is deleted and the complete table is entered again. To do so delete the existing table (**Table mode** (→  143) = **Clear table**). Then enter a new table.

How to enter the table

- Via FieldCare
The table points can be entered via the **Table number** (→  144), **Level** (→  144) and **Customer value** (→  145) parameters. As an alternative, the graphic table editor may be used: Device Operation → Device Functions → Additional Functions → Linearization (Online/Offline)
- Via local display
Select the **Edit table** submenu to call up the graphic table editor. The table is displayed and can be edited line by line.

 The factory setting for the level unit is "%". If you want to enter the linearization table in physical units, you must select the appropriate unit in the **Level unit** parameter (→  134) beforehand.

| | |
|---------------------|---|
| Table number |  |
|---------------------|---|

| | |
|------------------------|---|
| Navigation |  Setup → Advanced setup → Linearization → Table number |
| Prerequisite | Linearization type (→  139) = Table |
| Description | Select table point you are going to enter or change. |
| User entry | 1 to 32 |
| Factory setting | 1 |

| | |
|-----------------------|---|
| Level (Manual) |  |
|-----------------------|---|

| | |
|---------------------|---|
| Navigation |  Setup → Advanced setup → Linearization → Level |
| Prerequisite | <ul style="list-style-type: none"> ■ Linearization type (→  139) = Table ■ Table mode (→  143) = Manual |
| Description | Enter level value of the table point (value before linearization). |
| User entry | Signed floating-point number |

Factory setting 0 %

Level (Semiautomatic)

Navigation  Setup → Advanced setup → Linearization → Level

Prerequisite

- **Linearization type** (→  139) = **Table**
- **Table mode** (→  143) = **Semiautomatic**

Description Displays measured level (value before linearization). This value is transmitted to the table.

Customer value

Navigation  Setup → Advanced setup → Linearization → Customer value

Prerequisite **Linearization type** (→  139) = **Table**

Description Enter linearized value for the table point.

User entry Signed floating-point number

Factory setting 0 %

Activate table

Navigation   Setup → Advanced setup → Linearization → Activate table

Prerequisite **Linearization type** (→  139) = **Table**

Description Activate (enable) or deactivate (disable) the linearization table.

Selection

- **Disable**
- **Enable**

Factory setting Disable

Additional information **Meaning of the options**

- **Disable**
The measured level is not linearized.
If **Linearization type** (→  139) = **Table** at the same time, the device issues error message F435.
- **Enable**
The measured level is linearized according to the table.

 When editing the table, the **Activate table** parameter is automatically reset to **Disable** and must be reset to **Enable** after the table has been entered.

"Safety settings" submenu

Navigation  Setup → Advanced setup → Safety settings

Output echo lost 

| | |
|-------------------------------|--|
| Navigation |  Setup → Advanced setup → Safety settings → Output echo lost |
| Description | Output signal in case of a lost echo. |
| Selection | <ul style="list-style-type: none"> ■ Last valid value ■ Ramp at echo lost ■ Value echo lost ■ Alarm |
| Factory setting | Last valid value |
| Additional information | <p>Meaning of the options</p> <ul style="list-style-type: none"> ■ Last valid value The last valid value is kept in the case of a lost echo. ■ Ramp at echo lost⁷⁾ In the case of a lost echo the output value is continuously shifted towards 0% or 100%. The slope of the ramp is defined in the Ramp at echo lost parameter (→  147). ■ Value echo lost⁷⁾ In the case of a lost echo the output assumes the value defined in the Value echo lost parameter (→  146). ■ Alarm In the case of a lost echo the device generates an alarm; see the Failure mode parameter |

Value echo lost 

| | |
|-------------------------------|--|
| Navigation |  Setup → Advanced setup → Safety settings → Value echo lost |
| Prerequisite | Output echo lost (→  146) = Value echo lost |
| Description | Output value in case of a lost echo |
| User entry | 0 to 200 000.0 % |
| Factory setting | 0.0 % |
| Additional information | <p>Use the unit which has been defined for the measured value output:</p> <ul style="list-style-type: none"> ■ without linearization: Level unit (→  134) ■ with linearization: Unit after linearization (→  140) |

7) Only visible if "Linearization type" (→  139) = "None"

Ramp at echo lost



Navigation Setup → Advanced setup → Safety settings → Ramp at echo lost

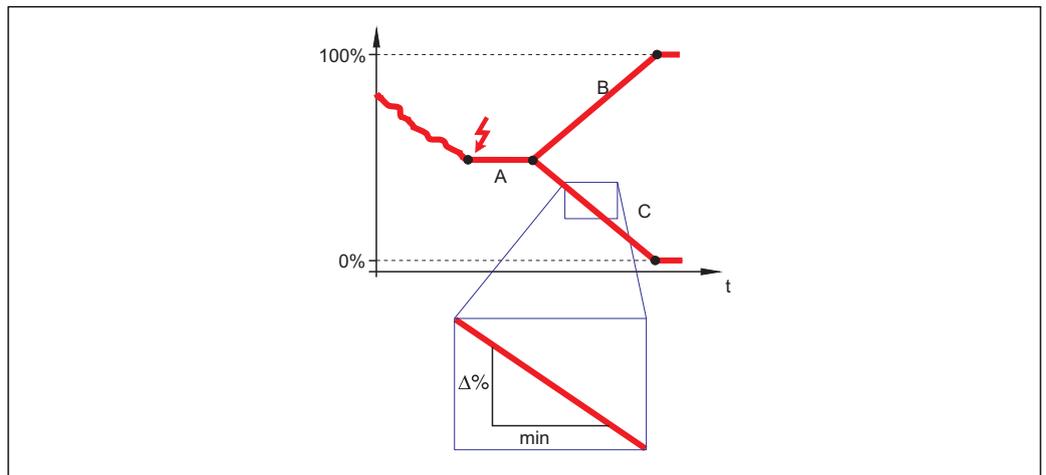
Prerequisite **Output echo lost (→ 146) = Ramp at echo lost**

Description Slope of the ramp in the case of a lost echo

User entry Signed floating-point number

Factory setting 0.0 %/min

Additional information



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- A Delay time echo lost
 B Ramp at echo lost (→ 147) (positive value)
 C Ramp at echo lost (→ 147) (negative value)

- The unit for the slope of the ramp is "percentage of the measuring range per minute" (%/min).
- For a negative slope of the ramp: The measured value is continuously decreased until it reaches 0%.
- For a positive slope of the ramp: The measured value is continuously increased until it reaches 100%.

Blocking distance



Navigation Setup → Advanced setup → Safety settings → Blocking distance

Description Specify upper blocking distance UB.

User entry 0 to 200 m

Factory setting

- For rod and rope probes up to 8 m (26 ft): 200 mm (8 in)
- For rod and rope probes above 8 m (26 ft): 0.025 * Sondenlänge

Additional information Signals in the upper blocking distance are only evaluated if they have been outside the blocking distance when the device was switched on and move into the blocking distance

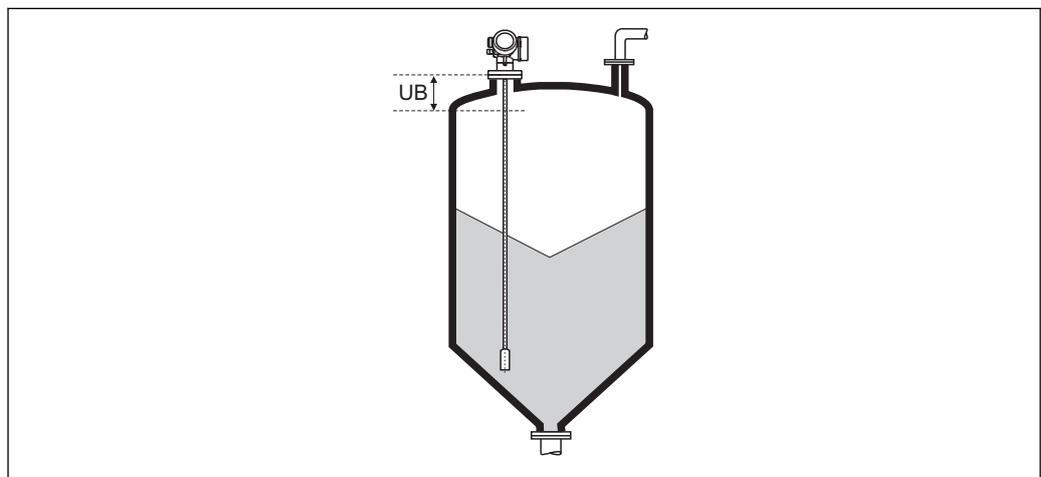
due to a level change during operation. Signals which are already in the blocking distance when the device is switched on, are ignored.

- i** This behavior is only valid if the following two conditions are met:
- Expert → Sensor → Echo tracking → Evaluation mode = **Short time history** or **Long time history**)
 - Expert → Sensor → Gas phase compensation → GPC mode= **On, Without correction** or **External correction**

If one of these conditions is not met, signals in the blocking distance will always be ignored.

- i** A different behavior for signals in the blocking distance can be defined in the **Blocking distance evaluation mode** parameter.

- i** If required, a different behavior for signals in the blocking distance can be defined by the Endress+Hauser service.



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43 Blocking distance (UB) for bulk solid measurements

"WHG confirmation" wizard

 The **WHG confirmation** wizard is only available for devices with WHG approval (Feature 590: "Additional Approval", option LC: "WHG overfill prevention") which are currently not in the WHG-locked state.

The **WHG confirmation** wizard is used to lock the device according to WHG. For details refer to the "Functional Safety Manual" of the respective device, which describes the locking procedure and the parameters of the sequence.

Navigation  Setup → Advanced setup → WHG confirmation

"Deactivate WHG" wizard

 The **Deactivate WHG** wizard (→  150) is only visible if the device is WHG-locked. For details refer to the "Functional Safety Manual" of the respective device.

Navigation  Setup → Advanced setup → Deactivate WHG

Reset write protection 

Navigation  Setup → Advanced setup → Deactivate WHG → Reset write protection

Description Enter unlocking code.

User entry 0 to 65 535

Factory setting 0

Code incorrect 

Navigation  Setup → Advanced setup → Deactivate WHG → Code incorrect

Description Indicates that a wrong unlocking code has been entered. Select procedure.

Selection

- Reenter code
- Abort sequence

Factory setting Reenter code

"Probe settings" submenu

The **Probe settings** submenu helps to ensure that the end of probe signal within the envelope curve is correctly assigned by the evaluation algorithm. The assignment is correct if the length of probe indicated by the device matches the actual length of the probe. The automatic probe length correction can only be performed if the probe is installed in the vessel and is completely uncovered (no medium). For partially filled vessels and if the probe length is known, select **Confirm probe length** (→  152) = **Manual input** in order to enter the value manually.

-  If a mapping (interference echo suppression) has been recorded after shortening the probe, it is no longer possible to perform an automatic probe length correction. In this case there are two options:
 - Delete the map using the **Record map** parameter (→  124) before performing the automatic probe length correction. After the probe length correction, a new map can be recorded using the **Record map** parameter (→  124).
 - Alternative: Select **Confirm probe length** (→  152) = **Manual input** and enter the probe length manually into the **Present probe length** parameter →  151.
-  An automatic probe length correction is only possible after the correct option has been selected in the **Probe grounded** parameter (→  151).

Navigation   Setup → Advanced setup → Probe settings

Probe grounded 

| | |
|------------------------|--|
| Navigation |   Setup → Advanced setup → Probe settings → Probe grounded |
| Prerequisite | Operating mode = Level |
| Description | Specify whether the probe is grounded. |
| Selection | <ul style="list-style-type: none"> ▪ No ▪ Yes |
| Factory setting | No |

Present probe length 

| | |
|------------------------|--|
| Navigation |  Setup → Advanced setup → Probe settings → Present probe length |
| Description | <ul style="list-style-type: none"> ▪ In most cases: Displays the length of the probe according to the currently measured end-of-probe signal. ▪ For Confirm probe length (→  152) = Manual input: Enter actual length of probe. |
| User entry | 0 to 200 m |
| Factory setting | 4 m |

Confirm probe length
**Navigation**

Setup → Advanced setup → Probe settings → Confirm probe length

Description

Select, whether the value displayed in the **Present probe length** parameter → 151 matches the actual length of the probe. Based on this input, the device performs a probe length correction.

Selection

- Probe length OK
- Probe length too small
- Probe length too big
- Probe covered
- Manual input
- Probe length unknown

Factory setting

Probe length OK

Additional information**Meaning of the options**

- **Probe length OK**
To be selected if the indicated length is correct. An adjustment is not required. The device quits the sequence.
- **Probe length too small**
To be selected if the displayed length is smaller than the actual length of the probe. A different end of probe signal is allocated and the newly calculated length is displayed in the **Present probe length** parameter → 151. This procedure has to be repeated until the displayed value matches the actual length of the probe.
- **Probe length too big**
To be selected if the displayed length is bigger than the actual length of the probe. A different end of probe signal is allocated and the newly calculated length is indicated in the **Present probe length** parameter → 151. This procedure has to be repeated until the displayed value matches the actual length of the probe.
- **Probe covered**
To be selected if the probe is (partially or completely) covered. A probe length correction is impossible in this case. The device quits the sequence.
- **Manual input**
To be selected if no automatic probe length correction is to be performed. Instead, the actual length of the probe must be entered manually into the **Present probe length** parameter → 151 ⁸⁾.
- **Probe length unknown**
To be selected if the actual length of the probe is unknown. A probe length correction is impossible in this case and the device quits the sequence.

8) When operated via FieldCare, the **Manual input** option needs not to be selected explicitly. In FieldCare the length of the probe can always be edited.

"Probe length correction" wizard

 The **Probe length correction** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the probe length correction are located directly in the **Probe settings** submenu (→  151).

Navigation   Setup → Advanced setup → Probe settings → Probe length correction

Confirm probe length 

Navigation  Setup → Advanced setup → Probe settings → Probe length correction → Confirm probe length

Description →  152

Present probe length 

Navigation   Setup → Advanced setup → Probe settings → Probe length correction → Present probe length

Description →  151

"Switch output" submenu

 The **Switch output** submenu (→  154) is only visible for devices with switch output.⁹⁾

Navigation  Setup → Advanced setup → Switch output

Switch output function **Navigation**

 Setup → Advanced setup → Switch output → Switch output function

Description

Select function for switch output.

Selection

- Off
- On
- Diagnostic behavior
- Limit
- Digital Output

Factory setting

Off

Additional information**Meaning of the options**

- **Off**
The output is always open (non-conductive).
- **On**
The output is always closed (conductive).
- **Diagnostic behavior**
The output is normally closed and is only opened if a diagnostic event is present. The **Assign diagnostic behavior** parameter (→  155) determines for which type of event the output is opened.
- **Limit**
The output is normally closed and is only opened if a measured variable exceeds or falls below a defined limit. The limit values are defined by the following parameters:
 - **Assign limit** (→  155)
 - **Switch-on value** (→  156)
 - **Switch-off value** (→  157)
- **Digital Output**
The switching state of the output tracks the output value of a DI function block. The function block is selected in the **Assign status** parameter (→  154).

 The **Off** and **On** options can be used to simulate the switch output.

Assign status **Navigation**

 Setup → Advanced setup → Switch output → Assign status

Prerequisite

Switch output function (→  154) = **Digital Output**

Description

Select device status for switch output.

9) Ordering feature 020 "Power supply; Output", option B, E or G

| | |
|-------------------------------|---|
| Selection | <ul style="list-style-type: none"> ▪ Off ▪ Digital output AD 1 ▪ Digital output AD 2 ▪ Digital output 1 ▪ Digital output 2 ▪ Digital output 3 ▪ Digital output 4 |
| Factory setting | Off |
| Additional information | The Digital output AD 1 and Digital output AD 2 options refer to the Advanced Diagnostic Blocks. A switch signal generated in these blocks can be transmitted via the switch output. |

Assign limit

| | |
|------------------------|--|
| Navigation |   Setup → Advanced setup → Switch output → Assign limit |
| Prerequisite | Switch output function (→  154) = Limit |
| Selection | <ul style="list-style-type: none"> ▪ Off ▪ Level linearized ▪ Distance ▪ Interface linearized * ▪ Interface distance * ▪ Thickness upper layer * ▪ Terminal voltage ▪ Electronic temperature ▪ Measured capacitance * ▪ Relative echo amplitude ▪ Relative interface amplitude * ▪ Absolute echo amplitude ▪ Absolute interface amplitude * |
| Factory setting | Off |

Assign diagnostic behavior

| | |
|---------------------|---|
| Navigation |   Setup → Advanced setup → Switch output → Assign diagnostic behavior |
| Prerequisite | Switch output function (→  154) = Diagnostic behavior |
| Description | Select diagnostic behavior for switch output. |
| Selection | <ul style="list-style-type: none"> ▪ Alarm ▪ Alarm or warning ▪ Warning |

* Visibility depends on order options or device settings

Factory setting Alarm

Switch-on value



Navigation Setup → Advanced setup → Switch output → Switch-on value

Prerequisite **Switch output function** (→ 154) = **Limit**

Description Enter measured value for the switch-on point.

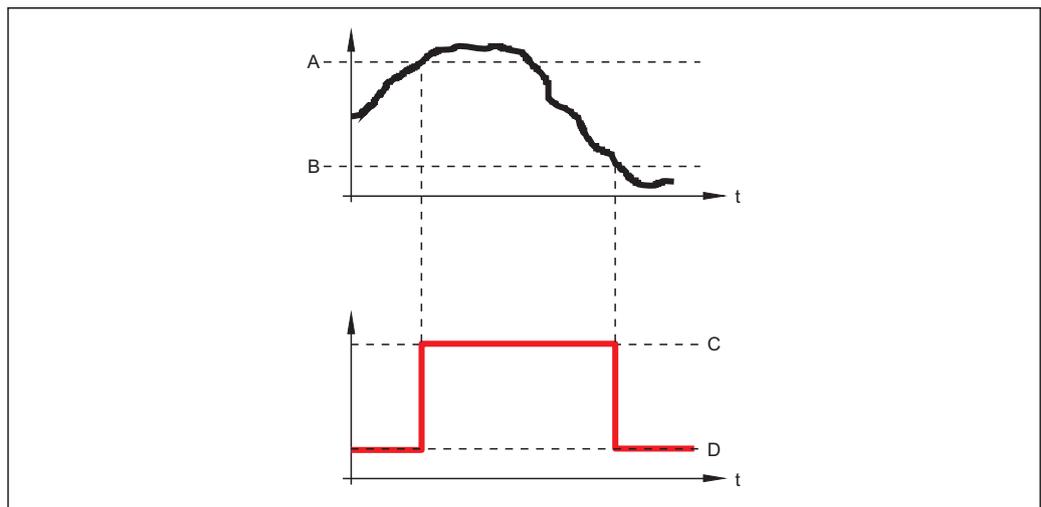
User entry Signed floating-point number

Factory setting 0

Additional information The switching behavior depends on the relative position of the **Switch-on value** and **Switch-off value** parameters:

Switch-on value > Switch-off value

- The output is closed if the measured value is larger than **Switch-on value**.
- The output is opened if the measured value is smaller than **Switch-off value**.

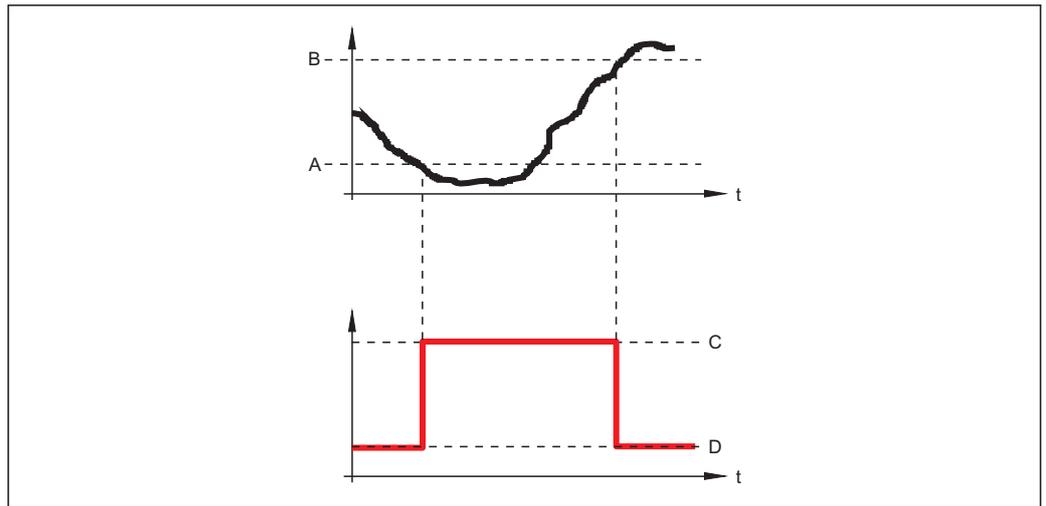


A0015585

- A *Switch-on value*
- B *Switch-off value*
- C *Output closed (conductive)*
- D *Output opened (non-conductive)*

Switch-on value < Switch-off value

- The output is closed if the measured value is smaller than **Switch-on value**.
- The output is opened if the measured value is larger than **Switch-off value**.



A0015586

- A Switch-on value
- B Switch-off value
- C Output closed (conductive)
- D Output opened (non-conductive)

Switch-on delay



| | |
|------------------------|--|
| Navigation | Setup → Advanced setup → Switch output → Switch-on delay |
| Prerequisite | <ul style="list-style-type: none"> ▪ Switch output function (→ 154) = Limit ▪ Assign limit (→ 155) ≠ Off |
| Description | Define delay for the switch-on of status output. |
| User entry | 0.0 to 100.0 s |
| Factory setting | 0.0 s |

Switch-off value



| | |
|-------------------------------|---|
| Navigation | Setup → Advanced setup → Switch output → Switch-off value |
| Prerequisite | Switch output function (→ 154) = Limit |
| Description | Enter measured value for the switch-off point. |
| User entry | Signed floating-point number |
| Factory setting | 0 |
| Additional information | The switching behavior depends on the relative position of the Switch-on value and Switch-off value parameters; description: see the Switch-on value parameter (→ 156). |

Switch-off delay



| | |
|------------------------|--|
| Navigation | Setup → Advanced setup → Switch output → Switch-off delay |
| Prerequisite | <ul style="list-style-type: none"> ▪ Switch output function (→ 154) = Limit ▪ Assign limit (→ 155) ≠ Off |
| Description | Define delay for the switch-off of status output. |
| User entry | 0.0 to 100.0 s |
| Factory setting | 0.0 s |

Failure mode



| | |
|------------------------|---|
| Navigation | Setup → Advanced setup → Switch output → Failure mode |
| Prerequisite | Switch output function (→ 154) = Limit or Digital Output |
| Description | Define output behavior in alarm condition. |
| Selection | <ul style="list-style-type: none"> ▪ Actual status ▪ Open ▪ Closed |
| Factory setting | Open |

Additional information

Switch status

| | |
|--------------------|--|
| Navigation | Setup → Advanced setup → Switch output → Switch status |
| Description | Shows the current switch output status. |

Invert output signal



| | |
|------------------------|---|
| Navigation | Setup → Advanced setup → Switch output → Invert output signal |
| Description | Invert the output signal. |
| Selection | <ul style="list-style-type: none"> ▪ No ▪ Yes |
| Factory setting | No |

Additional information**Meaning of the options**

- **No**
The behavior of the switch output is as described above.
- **Yes**
The states **Open** and **Closed** are inverted as compared to the description above.

"Display" submenu

 The **Display** submenu is only visible if a display module is connected to the device.

Navigation  Setup → Advanced setup → Display

Language**Navigation**

 Setup → Advanced setup → Display → Language

Description

Set display language.

Selection

- English
- Deutsch *
- Français *
- Español *
- Italiano *
- Nederlands *
- Portuguesa *
- Polski *
- русский язык (Russian) *
- Svenska *
- Türkçe *
- 中文 (Chinese) *
- 日本語 (Japanese) *
- 한국어 (Korean) *
- Bahasa Indonesia *
- tiếng Việt (Vietnamese) *
- čeština (Czech) *

Factory setting

The language selected in feature 500 of the product structure.
If no language has been selected: **English**

Additional information**Format display****Navigation**

 Setup → Advanced setup → Display → Format display

Description

Select how measured values are shown on the display.

Selection

- 1 value, max. size
- 1 bargraph + 1 value
- 2 values
- 1 value large + 2 values
- 4 values

Factory setting

1 value, max. size

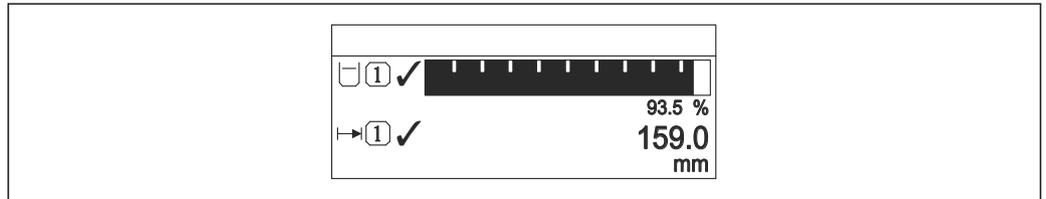
* Visibility depends on order options or device settings

Additional information



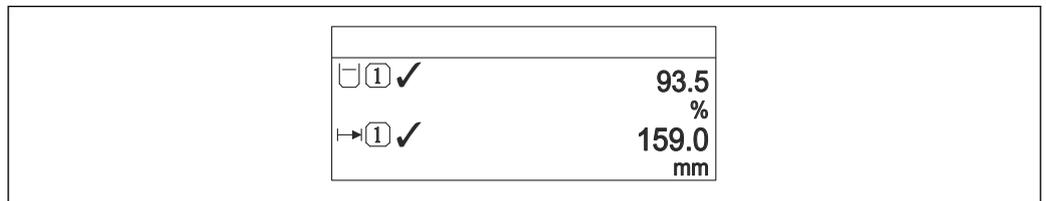
A0019963

44 "Format display" = "1 value, max. size"



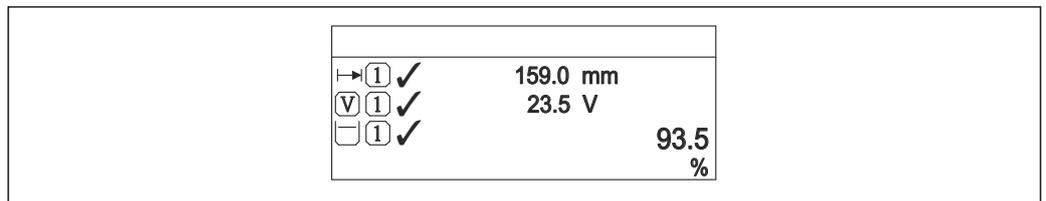
A0019964

45 "Format display" = "1 bargraph + 1 value"



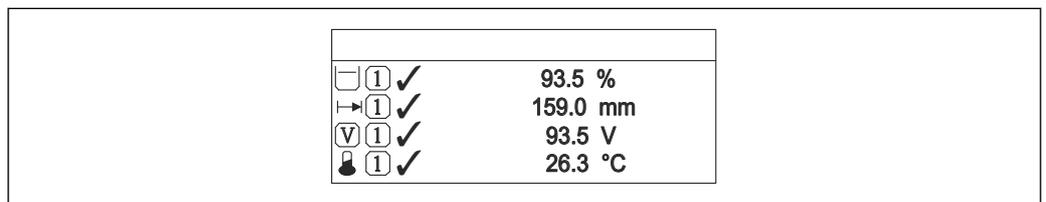
A0019965

46 "Format display" = "2 values"



A0019966

47 "Format display" = "1 value large + 2 values"



A0019968

48 "Format display" = "4 values"

- i
■
The Value 1 to 4 display → 162 parameters specify which measured values are shown on the display and in which order.
- If more measured values are specified than the current display mode permits, the values alternate on the device display. The display time until the next change is configured in the **Display interval** parameter (→ 163).

Value 1 to 4 display


Navigation  Setup → Advanced setup → Display → Value 1 display

Description Select the measured value that is shown on the local display.

Selection

- Level linearized
- Distance
- Interface linearized *
- Interface distance *
- Thickness upper layer *
- Terminal voltage
- Electronic temperature
- Measured capacitance *
- Analog output 1
- Analog output 2
- Analog output 3
- Analog output 4
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2

Factory setting

For level measurements

- Value 1 display: Level linearized
- Value 2 display: Distance
- Value 3 display: Current output 1
- Value 4 display: None

Decimal places 1 to 4


Navigation  Setup → Advanced setup → Display → Decimal places 1

Description Select the number of decimal places for the display value.

Selection

- x
- x.x
- x.xx
- x.xxx
- x.xxxx

Factory setting x.xx

Additional information The setting does not affect the measuring or computational accuracy of the device.

* Visibility depends on order options or device settings

Display interval

| | |
|-------------------------------|---|
| Navigation | ☰☰ Setup → Advanced setup → Display → Display interval |
| Description | Set time measured values are shown on display if display alternates between values. |
| User entry | 1 to 10 s |
| Factory setting | 5 s |
| Additional information | This parameter is only relevant if the number of selected measuring values exceeds the number of values the selected display format can display simultaneously. |

Display damping



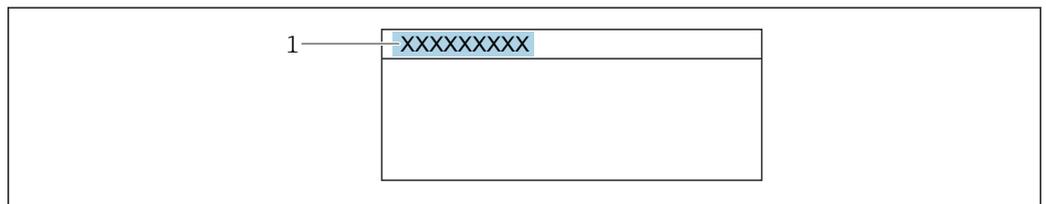
| | |
|------------------------|--|
| Navigation | ☰☰ Setup → Advanced setup → Display → Display damping |
| Description | Set display reaction time to fluctuations in the measured value. |
| User entry | 0.0 to 999.9 s |
| Factory setting | 0.0 s |

Header



| | |
|------------------------|---|
| Navigation | ☰☰ Setup → Advanced setup → Display → Header |
| Description | Select header contents on local display. |
| Selection | <ul style="list-style-type: none"> ■ Device tag ■ Free text |
| Factory setting | Device tag |

Additional information



A0029422

1 Position of the header text on the display

Meaning of the options

- **Device tag**
Is defined in the **Device tag** parameter
- **Free text**
Is defined in the **Header text** parameter (→ ☰ 164)

Header text


Navigation   Setup → Advanced setup → Display → Header text

Prerequisite **Header (→  163) = Free text**

Description Enter display header text.

Factory setting -----

Additional information The number of characters which can be displayed depends on the characters used.

Separator


Navigation   Setup → Advanced setup → Display → Separator

Description Select decimal separator for displaying numerical values.

Selection

- .
- ,

Factory setting .

Number format


Navigation   Setup → Advanced setup → Display → Number format

Description Choose number format for the display.

Selection

- Decimal
- ft-in-1/16"

Factory setting Decimal

Additional information The **ft-in-1/16"** option is only valid for distance units.

Decimal places menu


Navigation   Setup → Advanced setup → Display → Decimal places menu

Description Select number of decimal places for the representation of numbers within the operating menu.

| | |
|-------------------------------|---|
| Selection | <ul style="list-style-type: none"> ■ X ■ X.X ■ X.XX ■ X.XXX ■ X.XXXX |
| Factory setting | x.xxxx |
| Additional information | <ul style="list-style-type: none"> ■ Is only valid for numbers in the operating menu (e.g. Empty calibration, Full calibration), but not for the measured value display. The number of decimal places for the measured value display is defined in the Decimal places 1 to 4 →  162 parameters. ■ The setting does not affect the accuracy of the measurement or the calculations. |

Backlight

| | |
|-------------------------------|--|
| Navigation |   Setup → Advanced setup → Display → Backlight |
| Prerequisite | The device has the SD03 local display (with optical keys). |
| Description | Switch the local display backlight on and off. |
| Selection | <ul style="list-style-type: none"> ■ Disable ■ Enable |
| Factory setting | Disable |
| Additional information | <p>Meaning of the options</p> <ul style="list-style-type: none"> ■ Disable Switches the backlight off. ■ Enable Switches the backlight on. <p> Regardless of the setting in this parameter the backlight may be automatically switched off by the device if the supply voltage is too low.</p> |

Contrast display

| | |
|-------------------------------|--|
| Navigation |   Setup → Advanced setup → Display → Contrast display |
| Description | Adjust local display contrast setting to ambient conditions (e.g. lighting or reading angle). |
| User entry | 20 to 80 % |
| Factory setting | Dependent on the display. |
| Additional information | <p> Setting the contrast via push-buttons:</p> <ul style="list-style-type: none"> ■ Darker: press the   buttons simultaneously. ■ Brighter: press the   buttons simultaneously. |

"Configuration backup display" submenu

 This submenu is only visible if a display module is connected to the device.

The configuration of the device can be saved to the display module at a certain point of time (backup). The saved configuration can be restored to the device if required, e.g. in order to bring the device back into a defined state. The configuration can also be transferred to a different device of the same type using the display module.

Navigation  Setup → Advanced setup → Configuration backup display

Operating time

| | |
|-------------------------------|--|
| Navigation |  Setup → Advanced setup → Configuration backup display → Operating time |
| Description | Indicates how long the device has been in operation. |
| Additional information | <i>Maximum time</i> 9999 d (≈ 27 years) |

Last backup

| | |
|--------------------|---|
| Navigation |  Setup → Advanced setup → Configuration backup display → Last backup |
| Description | Indicates when the last data backup was saved to the display module. |

Configuration management

| | |
|------------------------|--|
| Navigation |  Setup → Advanced setup → Configuration backup display → Configuration management |
| Description | Select action for managing the device data in the display module. |
| Selection | <ul style="list-style-type: none"> ■ Cancel ■ Execute backup ■ Restore ■ Duplicate ■ Compare ■ Clear backup data |
| Factory setting | Cancel |

| | |
|-------------------------------|--|
| Additional information | <p>Meaning of the options</p> <ul style="list-style-type: none"> ▪ Cancel No action is executed and the user exits the parameter. ▪ Execute backup A backup copy of the current device configuration in the HistoROM (built-in in the device) is saved to the display module of the device. ▪ Restore The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. ▪ Duplicate The transmitter configuration is duplicated to another device using the transmitter display module. The following parameters, which characterize the individual measuring point are not included in the transmitted configuration: Medium type ▪ Compare The device configuration saved in the display module is compared to the current device configuration of the HistoROM. The result of this comparison is displayed in the Comparison result parameter (→  167). ▪ Clear backup data The backup copy of the device configuration is deleted from the display module of the device. <p> 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.</p> <p> If an existing backup is restored to a different device using the Restore option, it may occur that some device functionalities are no longer available. In some cases even a device reset will not restore the original status.</p> <p>In order to transmit a configuration to a different device, the Duplicate option should always be used.</p> |
|-------------------------------|--|

Backup state

| | |
|--------------------|--|
| Navigation |  Setup → Advanced setup → Configuration backup display → Backup state |
| Description | Displays which backup action is currently in progress. |

Comparison result

| | |
|--------------------|---|
| Navigation |   Setup → Advanced setup → Configuration backup display → Comparison result |
| Description | Comparison between present device data and display backup. |

Additional information**Meaning of the display options****■ Settings identical**

The current device configuration of the HistoROM is identical to the backup copy in the display module.

■ Settings not identical

The current device configuration of the HistoROM is not identical to the backup copy in the display module.

■ No backup available

There is no backup copy of the device configuration of the HistoROM in the display module.

■ Backup settings corrupt

The current device configuration of the HistoROM is corrupt or not compatible with the backup copy in the display module.

■ Check not done

The device configuration of the HistoROM has not yet been compared to the backup copy in the display module.

■ Dataset incompatible

The data sets are incompatible and can not be compared.



To start the comparison, set **Configuration management** (→  166) = **Compare**.



If the transmitter configuration has been duplicated from a different device by **Configuration management** (→  166) = **Duplicate**, the new device configuration in the HistoROM is only partially identical to the configuration stored in the display module: Sensor specific properties (e.g. the mapping curve) are not duplicated. Thus, the result of the comparison will be **Settings not identical**.

"Administration" submenu

Navigation  Setup → Advanced setup → Administration

Define access code 

| | |
|-------------------------------|--|
| Navigation |  Setup → Advanced setup → Administration → Define access code |
| Description | Define release code for write access to parameters. |
| User entry | 0 to 9999 |
| Factory setting | 0 |
| Additional information | <p> If the factory setting is not changed or 0 is defined as the access code, the parameters are not write-protected and the configuration data of the device can then always be modified. The user is logged on in the <i>Maintenance</i> role.</p> <p> The write protection affects all parameters marked with the  symbol in this document. On the local display, the  symbol in front of a parameter indicates that the parameter is write-protected.</p> <p> Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the Enter access code parameter (→  130).</p> <p> Please contact your Endress+Hauser Sales Center if you lose your access code.</p> <p> For display operation: The new access code is only valid after it has been confirmed in the Confirm access code parameter (→  171).</p> |

Device reset 

| | |
|------------------------|--|
| Navigation |   Setup → Advanced setup → Administration → Device reset |
| Description | Reset the device configuration - either entirely or in part - to a defined state. |
| Selection | <ul style="list-style-type: none"> ■ Cancel ■ To factory defaults ■ To delivery settings ■ Of customer settings ■ To transducer defaults ■ Restart device |
| Factory setting | Cancel |

Additional information**Meaning of the options****■ Cancel**

No action

■ To factory defaults

All parameters are reset to the order-code specific factory setting.

■ To delivery settings

All parameters are reset to the delivery setting. The delivery setting may differ from the factory default if customer specific settings have been ordered.

This option is only visible if customer specific settings have been ordered.

■ Of customer settings

All customer parameters are reset to their factory setting. Service parameters, however, remain unchanged.

■ To transducer defaults

Every measurment-related parameter is reset to its factory setting. Service parameters and communication-related parameters, however, remain unchanged.

■ Restart device

The restart resets every parameter which is stored in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

"Define access code" wizard

 The **Define access code** wizard is only available when operating via the local display. When operating via an operating tool, the **Define access code** parameter is located directly in the **Administration** submenu. The **Confirm access code** parameter is not available for operation via operating tool.

Navigation  Setup → Advanced setup → Administration → Define access code

Define access code 

Navigation  Setup → Advanced setup → Administration → Define access code → Define access code

Description →  169

Confirm access code 

Navigation  Setup → Advanced setup → Administration → Define access code → Confirm access code

Description Confirm the entered access code.

User entry 0 to 9999

Factory setting 0

16.4 "Diagnostics" menu

Navigation  Diagnostics

Actual diagnostics

Navigation  Diagnostics → Actual diagnostics

Description Displays current diagnostic message.

Additional information The display consists of:

- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

 If several messages are active at the same time, the messages with the highest priority is displayed.

 Information on what is causing the message, and remedy measures, can be viewed via the  symbol on the display.

Timestamp

Navigation  Diagnostics → Timestamp

Previous diagnostics

Navigation  Diagnostics → Previous diagnostics

Description Displays the last diagnostic message which has been active before the current message.

Additional information The display consists of:

- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

 The condition displayed may still apply. Information on what is causing the message, and remedy measures, can be viewed via the  symbol on the display.

Timestamp

Navigation  Diagnostics → Timestamp

Operating time from restart

Navigation   Diagnostics → Operating time from restart

Description Displays the time the device has been in operation since the last device restart.

Operating time

Navigation   Diagnostics → Operating time

Description Indicates how long the device has been in operation.

Additional information *Maximum time*
9 999 d (≈ 27 years)

16.4.1 "Diagnostic list" submenu

Navigation  Diagnostics → Diagnostic list

Diagnostics 1 to 5

Navigation

 Diagnostics → Diagnostic list → Diagnostics 1

Description

Display the current diagnostics messages with the highest to fifth-highest priority.

Additional information

The display consists of:

- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

Timestamp 1 to 5

Navigation

 Diagnostics → Diagnostic list → Timestamp

16.4.2 "Event logbook" submenu

 The **Event logbook** submenu is only available when operating via the local display. When operating via FieldCare, the event list can be displayed in the FieldCare function "Event List / HistoROM".

Navigation  Diagnostics → Event logbook

Filter options

Navigation  Diagnostics → Event logbook → Filter options

Selection

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

Factory setting All

Additional information 

- This parameter is only used for operation via the local display.
- The status signals are categorized according to NAMUR NE 107.

"Event list" submenu

The **Event list** submenu displays the history of past events of the category selected in the **Filter options** parameter (→  175). A maximum of 100 events are displayed in chronological order.

The following symbols indicate whether an event has occurred or has ended:

- : Event has occurred
- : Event has ended

 Information on what is causing the message, and remedy instructions, can be viewed via the -button.

Display format

- For event messages in category I: information event, event text, "recording event" symbol and time the event occurred
- For event messages in category F, M, C, S (status signal): diagnostics event, event text, "recording event" symbol and time the event occurred

Navigation  Diagnostics → Event logbook → Event list

16.4.3 "Device information" submenu

Navigation  Diagnostics → Device information

Device tag

Navigation  Diagnostics → Device information → Device tag

Description Enter the name for the measuring point.

Factory setting FMP5x

Serial number

Navigation  Diagnostics → Device information → Serial number

Description Shows the serial number of the measuring device.

Additional information  **Uses of the serial number**

- To identify the device quickly, e.g. when contacting Endress+Hauser.
- To obtain specific information on the device using the Device Viewer:
www.endress.com/deviceviewer

 The serial number is also indicated on the nameplate.

Firmware version

Navigation  Diagnostics → Device information → Firmware version

Description Shows the device firmware version installed.

User interface xx.yy.zz

Additional information  For firmware versions differing only in the last two digits ("zz") there is no difference concerning functionality or operation.

Device name

Navigation  Diagnostics → Device information → Device name

Description Shows the name of the transmitter.

Order code

**Navigation**

Diagnostics → Device information → Order code

Description

Shows the device order code.

Additional information

The order code is generated from the extended order code, which defines all device features of the product structure. In contrast, the device features can not be read directly from the order code.

Extended order code 1 to 3

**Navigation**

Diagnostics → Device information → Extended order code 1

Description

Display the three parts of the extended order code.

Additional information

The extended order code indicates the version of all the features of the product structure and thus uniquely identifies the device.

Status PROFIBUS Master Config

Navigation

Diagnostics → Device information → Status PROFIBUS Master Config

Description

Indicates whether the cyclic data exchange with the master is currently active.

User interface

- Active
- Not active

PROFIBUS ident number

Navigation

Diagnostics → Device information → PROFIBUS ident number

Description

Indicates the ident number of the device.

Additional information

The **Ident number selector** parameter can be used to define which ident number is used.

16.4.4 "Measured values" submenu

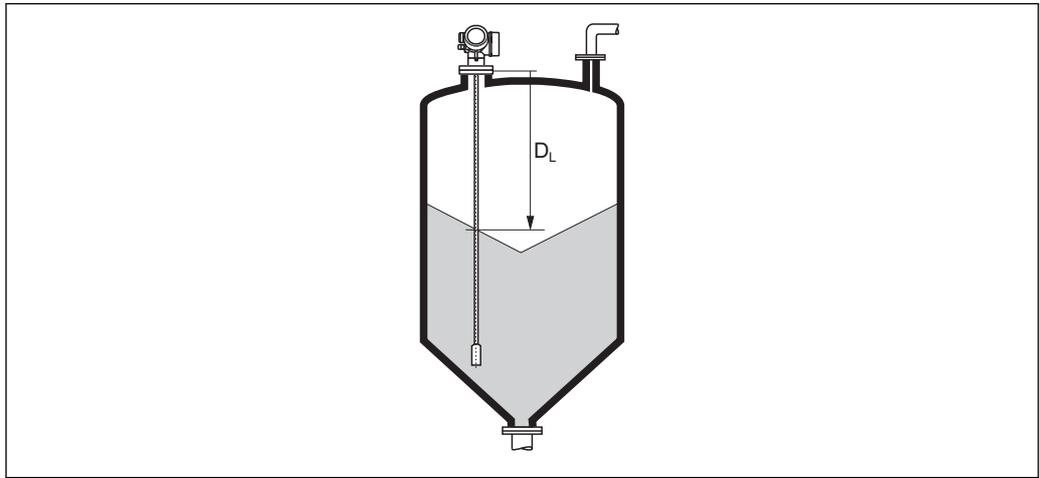
Navigation  Diagnostics → Measured values

Distance

Navigation  Diagnostics → Measured values → Distance

Description Displays the measured distance D_L between the reference point (lower edge of the flange or threaded connection) and the level.

Additional information



A0013201

 49 Distance for bulk solid measurements

 The unit is defined in the **Distance unit** parameter (→  119).

Level linearized

Navigation  Diagnostics → Measured values → Level linearized

Description Displays linearized level.

Additional information  The unit is defined by the **Unit after linearization** parameter →  140.

Terminal voltage 1

Navigation Diagnostics → Measured values → Terminal voltage 1**Switch status**

Navigation Diagnostics → Measured values → Switch status**Description**

Shows the current switch output status.

16.4.5 "Analog input 1 to 6" submenu

 There is an **Analog input** submenu for each Analog Input Block of the device. Only the most important parameters of the respective block are available at this position of the operating menu. For a complete list of the block parameters refer to: Diagnostics → Analog inputs → Analog input 1 to 6

Navigation  Diagnostics → Analog inputs → Analog input 1 to 6

| Channel |  |
|-------------------------------|--|
| Navigation |  Diagnostics → Analog inputs → Analog input 1 to 6 → Channel |
| Description | Standard parameter CHANNEL of the Analog Input Block according to the PROFIBUS Profile. |
| Selection | <ul style="list-style-type: none"> ■ Level linearized ■ Distance ■ Interface linearized * ■ Interface distance * ■ Thickness upper layer * ■ Terminal voltage ■ Electronic temperature ■ Measured capacitance * ■ Absolute echo amplitude ■ Relative echo amplitude ■ Absolute interface amplitude * ■ Relative interface amplitude * ■ Absolute EOP amplitude ■ Noise of signal ■ EOP shift ■ Calculated DC value * ■ Sensor debug ■ Analog output adv. diagnostics 1 ■ Analog output adv. diagnostics 2 |
| Factory setting | Level linearized |
| Additional information | Allocates a measured value to the AI block. |

| Out value | |
|--------------------|---|
| Navigation |  Diagnostics → Analog inputs → Analog input 1 to 6 → Out value |
| Description | Element Value of the standard parameter OUT in the Analog Input Block according to the PROFIBUS Profile. |
| User entry | Signed floating-point number |

* Visibility depends on order options or device settings

Factory setting 0

Additional information

- For **Mode block actual = Man**:
Enter the output value of the Analog Input Block.
- Else:
Displays the output value of the Analog Input Block.

Out status

Navigation  Diagnostics → Analog inputs → Analog input 1 to 6 → Out status

Description Element **Status** of the standard parameter **OUT** in the Analog Input Block according to the PROFIBUS Profile.

User interface

- Good
- Uncertain
- Bad

Additional information Only the two quality bits are evaluated in this parameter.

Out status HEX

Navigation  Diagnostics → Analog inputs → Analog input 1 to 6 → Out status HEX

Description Element **Status** of the standard parameter **OUT** in the Analog Input Block according to the PROFIBUS Profile.

User entry 0 to 255

Factory setting 128

Additional information The complete status byte is displayed in the form of a two-digit hexadecimal number in this parameter.

16.4.6 "Data logging" submenu

Navigation  Diagnostics → Data logging

Assign channel 1 to 4

Navigation  Diagnostics → Data logging → Assign channel 1 to 4

Selection

- Off
- Level linearized
- Distance
- Unfiltered distance
- Interface linearized *
- Interface distance *
- Unfiltered interface distance
- Thickness upper layer *
- Terminal voltage
- Electronic temperature
- Measured capacitance *
- Absolute echo amplitude
- Relative echo amplitude
- Absolute interface amplitude *
- Relative interface amplitude *
- Absolute EOP amplitude
- EOP shift
- Noise of signal
- Calculated DC value *
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2

Factory setting Off

Additional information A total of 1000 measured values can be logged. This means:

- 1000 data points if 1 logging channel is used
- 500 data points if 2 logging channels are used
- 333 data points if 3 logging channels are used
- 250 data points if 4 logging channels are used

If the maximum number of data points is reached, the oldest data points in the data log are cyclically overwritten in such a way that the last 1000, 500, 333 or 250 measured values are always in the log (ring memory principle).

 The logged data are deleted if a new option is selected in this parameter.

* Visibility depends on order options or device settings

Logging interval
**Navigation**

-  Diagnostics → Data logging → Logging interval
-  Diagnostics → Data logging → Logging interval

User entry

1.0 to 3 600.0 s

Factory setting

30.0 s

Additional information

This parameter defines the interval between the individual data points in the data log, and thus the maximum loggable process time T_{log} :

- If 1 logging channel is used: $T_{log} = 1000 \cdot t_{log}$
- If 2 logging channels are used: $T_{log} = 500 \cdot t_{log}$
- If 3 logging channels are used: $T_{log} = 333 \cdot t_{log}$
- If 4 logging channels are used: $T_{log} = 250 \cdot t_{log}$

Once this time elapses, the oldest data points in the data log are cyclically overwritten such that a time of T_{log} always remains in the memory (ring memory principle).

 The logged data are deleted if this parameter is changed.

*Example***When using 1 logging channel**

- $T_{log} = 1000 \cdot 1 \text{ s} = 1000 \text{ s} \approx 16.5 \text{ min}$
- $T_{log} = 1000 \cdot 10 \text{ s} = 10000 \text{ s} \approx 2.75 \text{ h}$
- $T_{log} = 1000 \cdot 80 \text{ s} = 80000 \text{ s} \approx 22 \text{ h}$
- $T_{log} = 1000 \cdot 3600 \text{ s} = 3600000 \text{ s} \approx 41 \text{ d}$

Clear logging data
**Navigation**

-  Diagnostics → Data logging → Clear logging data
-  Diagnostics → Data logging → Clear logging data

Selection

- Cancel
- Clear data

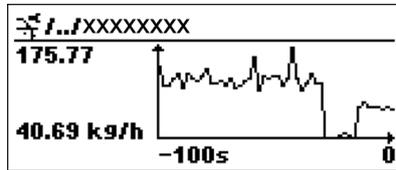
Factory setting

Cancel

"Display channel 1 to 4" submenu

i The **Display channel 1 to 4** submenus are only available for operation via the local display. When operating via FieldCare, the logging diagram can be displayed in the FieldCare function "Event List / HistoROM" .

The **Display channel 1 to 4** submenus invoke a diagram of the logging history of the respective channel.



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

i To return to the operating menu, press \oplus and \ominus simultaneously.

Navigation $\oplus \ominus$ Diagnostics → Data logging → Display channel 1 to 4

16.4.7 "Simulation" submenu

The **Simulation** submenu is used to simulate specific measuring values or other conditions. This helps to check the correct configuration of the device and connected control units.

Conditions which can be simulated

| Condition to be simulated | Associated parameters |
|--|---|
| Specific value of a process variable | <ul style="list-style-type: none"> ▪ Assign measurement variable (→  187) ▪ Value process variable (→  187) |
| Specific state of the switch output | <ul style="list-style-type: none"> ▪ Switch output simulation (→  187) ▪ Switch status (→  188) |
| Existence of an alarm | Simulation device alarm (→  188) |
| Existence of a specific diagnostic message | Simulation diagnostic event (→  188) |

Structure of the submenu

Navigation  Expert → Diagnostics → Simulation

| | |
|-----------------------------|---|
| ▶ Simulation | |
| Assign measurement variable | →  187 |
| Value process variable | →  187 |
| Switch output simulation | →  187 |
| Switch status | →  188 |
| Simulation device alarm | →  188 |
| Simulation diagnostic event | →  188 |

Description of parameters

Navigation  Expert → Diagnostics → Simulation

Assign measurement variable

| | |
|-------------------------------|--|
| Navigation |  Expert → Diagnostics → Simulation → Assign measurement variable |
| Selection | <ul style="list-style-type: none"> ■ Off ■ Level ■ Interface * ■ Level linearized ■ Interface linearized ■ Thickness linearized |
| Factory setting | Off |
| Additional information | <ul style="list-style-type: none"> ■ The value of the variable to be simulated is defined in the Value process variable parameter (→  187). ■ If Assign measurement variable ≠ Off, a simulation is active. This is indicated by a diagnostic message of the <i>Function check (C)</i> category. |

Value process variable

| | |
|-------------------------------|---|
| Navigation |  Expert → Diagnostics → Simulation → Value process variable |
| Prerequisite | Assign measurement variable (→  187) ≠ Off |
| User entry | Signed floating-point number |
| Factory setting | 0 |
| Additional information | Downstream measured value processing and the signal output use this simulation value. In this way, users can verify whether the measuring device has been configured correctly. |

Switch output simulation

| | |
|--------------------|--|
| Navigation |  Expert → Diagnostics → Simulation → Switch output simulation |
| Description | Switch the simulation of the switch output on and off. |
| Selection | <ul style="list-style-type: none"> ■ Off ■ On |

* Visibility depends on order options or device settings

Factory setting Off

Switch status

Navigation   Expert → Diagnostics → Simulation → Switch status

Prerequisite **Switch output simulation (→  187) = On**

Description Select the status of the status output for the simulation.

Selection

- Open
- Closed

Factory setting Open

Additional information The switch status assumes the value defined in this parameter. This helps to check correct operation of connected control units.

Simulation device alarm

Navigation   Expert → Diagnostics → Simulation → Simulation device alarm

Description Switch the device alarm on and off.

Selection

- Off
- On

Factory setting Off

Additional information When selecting the **On** option, the device generates an alarm. This helps to check the correct output behavior of the device in the case of an alarm.
An active simulation is indicated by the diagnostic message  **C484 Simulation failure mode**.

Simulation diagnostic event

Navigation   Expert → Diagnostics → Simulation → Simulation diagnostic event

Description Select a diagnostic event for the simulation process that is activated.

Factory setting Off

Additional information When operated via the local display, the selection list can be filtered according to the event categories (**Diagnostic event category** parameter).

16.4.8 "Device check" submenu

Navigation   Diagnostics → Device check

Start device check

| | |
|------------------------|---|
| Navigation |   Diagnostics → Device check → Start device check |
| Description | Start a device check. |
| Selection | <ul style="list-style-type: none"> ■ No ■ Yes |
| Factory setting | No |
| Additional information | In the case of a lost echo a device check can not be performed. |

Result device check

| | |
|------------------------|---|
| Navigation |   Diagnostics → Device check → Result device check |
| Description | Displays the result of the device check. |
| Additional information | <p>Meaning of the display options</p> <ul style="list-style-type: none"> ■ Installation ok Measurement possible without restrictions. ■ Accuracy reduced A measurement is possible. However, the measuring accuracy may be reduced due to the signal amplitudes. ■ Measurement capability reduced A measurement is currently possible. However, there is the risk of an echo loss. Check the mounting position of the device and the dielectric constant of the medium. ■ Check not done No device check has been performed. |

Last check time

| | |
|-------------|--|
| Navigation |   Diagnostics → Device check → Last check time |
| Description | Displays the operating time at which the last device check has been performed. |

Level signal

| | |
|-------------------------------|---|
| Navigation |   Diagnostics → Device check → Level signal |
| Prerequisite | Device check has been performed. |
| Description | Displays result of the device check for the level signal. |
| User interface | <ul style="list-style-type: none">▪ Check not done▪ Check not OK▪ Check OK |
| Additional information | For Level signal = Check not OK : Check the mounting position of the device and the dielectric constant of the medium. |

Launch signal

| | |
|-------------------------------|--|
| Navigation |   Diagnostics → Device check → Launch signal |
| Prerequisite | Device check has been performed. |
| Description | Displays result of the display check for the launch signal. |
| User interface | <ul style="list-style-type: none">▪ Check not done▪ Check not OK▪ Check OK |
| Additional information | For Launch signal = Check not OK : Check the mounting position of the device. In non-metallic vessels use a metal plate or a metal flange. |

16.4.9 "Heartbeat" submenu

 The **Heartbeat** submenu is only available via **FieldCare** or **DeviceCare**. It contains the wizards which are part of the **Heartbeat Verification** and **Heartbeat Monitoring** application packages.

Detailed description

SD01872F

Navigation  Diagnostics → Heartbeat

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