Operating Instructions
Levelflex FMP56, FMP57
FOUNDATION Fieldbus

Guided wave radar

Fieldbus ™
Foundation

Endress+Hauser

People for Process Automation

Serial number

www.endress.com/deviceviewer   Endress+Hauser Operations App
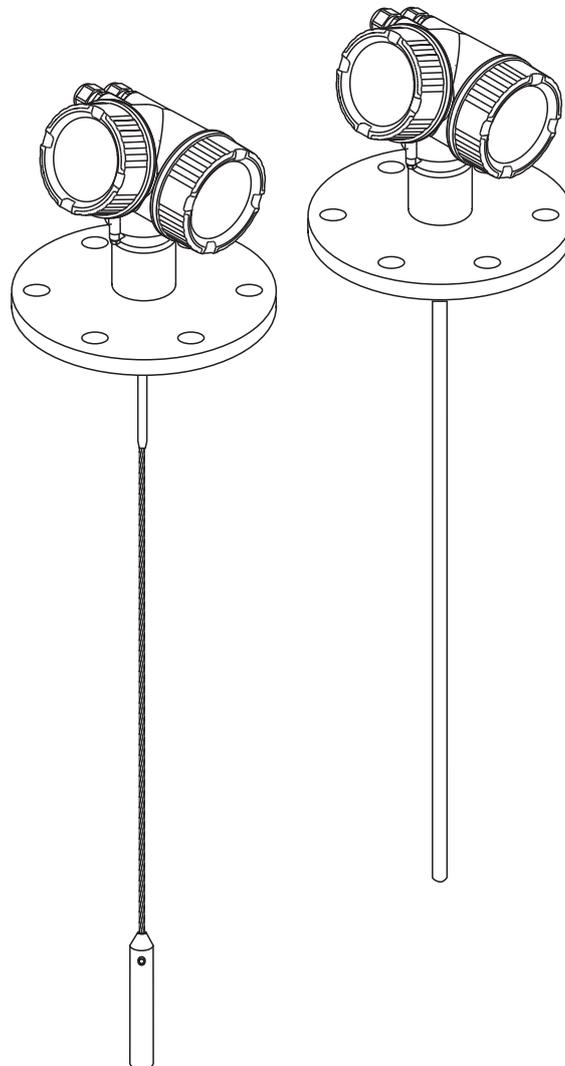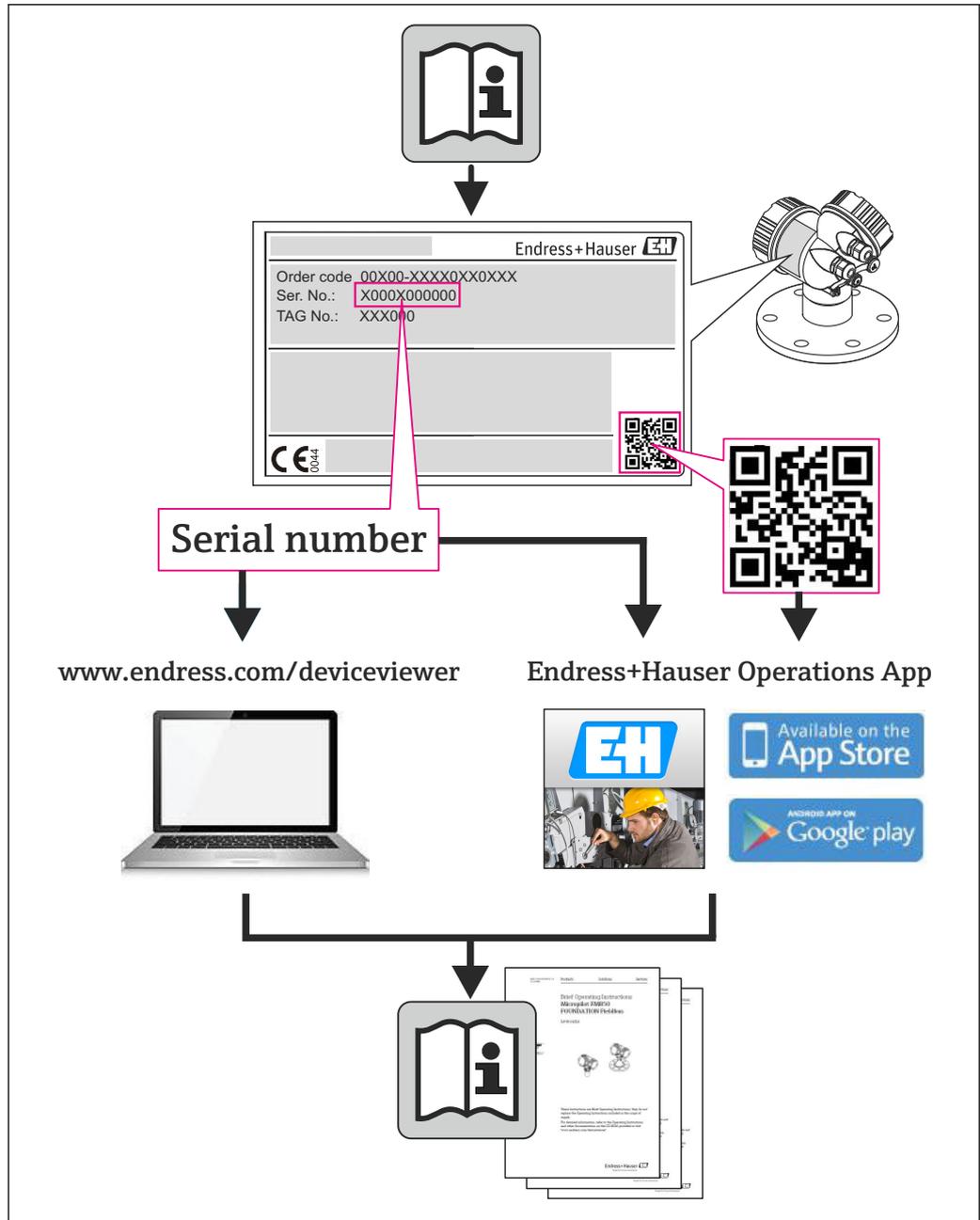
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Table of contents

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

1.2.2   Electrical symbols

Symbol	Meaning	Symbol	Meaning
⎓	Direct current	∿	Alternating current
⏦	Direct current and alternating current	⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
�	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.	▽	**Equipotential connection** A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

1.2.3   Tool symbols

Symbol	Meaning
✪ 🪛 A0013442	Torx screwdriver
◗ 🪛 A0011220	Flat blade screwdriver

Symbol	Meaning
A0011219	Cross-head screwdriver
A0011221	Allen key
A0011222	Hexagon wrench
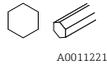
1.2.4 Symbols for certain types of information

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
1. , 2. , 3. ...	Series of steps
↳	Result of a sequence of actions
	Help in the event of a problem
	Visual inspection

1.2.5 Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
1. , 2. , 3. ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	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 KA01110F (FMP56/FMP57, FOUNDATION Fieldbus)	**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 GP01015F (FMP5x, FOUNDATION Fieldbus)	**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.

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.

1.3.1 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]/G [5]	K [6]/L [7]
BA	ATEX II 1G Ex ia IIC T6 Ga	FMP56 FMP57	XA00496F	XA01125F	XA01126F	XA00516F	-
BB	ATEX II 1/2G Ex ia IIC T6 Ga/Gb	FMP56 FMP57	XA00496F	XA01125F	XA01126F	XA00516F	-
BE	ATEX II 1D Ex t IIIC Da	FMP56 FMP57	XA00501F	XA00501F	XA00501F	XA00521F	XA00501F
BF	ATEX II 1/2D Ex t IIIC Da/Db	FMP56 FMP57	XA00501F	XA00501F	XA00501F	XA00521F	XA00501F
BG	ATEX II 3G Ex nA IIC T6 Gc	FMP56 FMP57	XA00498F	XA01130F	XA01131F	XA00518F	XA01132F
BH	ATEX II 3G Ex ic IIC T6 Gc	FMP56 FMP57	XA00498F	XA01130F	XA01131F	XA00518F	-
BL	ATEX II 1/3G Ex nA[ia] IIC T6 Ga/Gc	FMP56 FMP57	XA00497F	XA01127F	XA01128F	XA00517F	XA01129F
B2	ATEX II 1/2G Ex ia IIC T6 Ga/Gb, 1/2D Ex ia IIIC Da/Db	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	FMP56 FMP57	XA00503F	XA00503F	XA00503F	XA00523F	XA01136F
CD	CSA C/US DIP Cl.II,III Div.1 Gr.E-G	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	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	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	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	FMP56 FMP57	XA00532F	XA00532F	XA00532F	XA00572F	XA00532F
FE	FM DIP Cl.II,III Div.1 Gr.E-G	FMP56 FMP57	XA00532F	XA00532F	XA00532F	XA00572F	XA00532F
IA	IEC Ex ia IIC T6 Ga	FMP56 FMP57	XA00496F	XA01125F	XA01126F	XA00516F	-
IB	IEC Ex ia IIC T6 Ga/Gb	FMP56 FMP57	XA00496F	XA01125F	XA01126F	XA00516F	-
IE	IEC Ex t IIIC Da	FMP56 FMP57	XA00501F	XA00501F	XA00501F	XA00521F	XA00501F
IF	IEC Ex t IIIC Da/Db	FMP56 FMP57	XA00501F	XA00501F	XA00501F	XA00521F	XA00501F
IG	IEC Ex nA IIC T6 Gc	FMP56 FMP57	XA00498F	XA01130F	XA01131F	XA00518F	XA01132F
IH	IEC Ex ic IIC T6 Gc	FMP56 FMP57	XA00498F	XA01130F	XA01131F	XA00518F	-
IL	IEC Ex nA[ia] IIC T6 Ga/Gc	FMP56 FMP57	XA00497F	XA01127F	XA01128F	XA00517F	XA01129F
I2	IEC Ex ia IIC T6 Ga/Gb, Ex ia IIIC Da/Db	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	▪ FMP56 ▪ FMP57	XA00503F	XA00503F	XA00503F	XA00523F	XA01136F
KA	KC Ex ia IIC T6 Ga	▪ FMP56 ▪ FMP57	XA01169F	-	XA01169F	-	-
KB	KC Ex ia IIC T6 Ga/Gb	▪ FMP56 ▪ FMP57	XA01169F	-	XA01169F	-	-
MA	INMETRO Ex ia IIC T6 Ga	▪ FMP56 ▪ FMP57	XA01038F	XA01038F	XA01038F	-	XA01038F
ME	INMETRO Ex t IIIC Da	▪ FMP56 ▪ FMP57	XA01043F	XA01043F	XA01043F	-	XA01043F
MH	INMETRO Ex ic IIC T6 Gc	▪ FMP56 ▪ FMP57	XA01040F	XA01040F	XA01040F	-	XA01040F
NA	NEPSI Ex ia IIC T6 Ga	▪ FMP56 ▪ FMP57	XA00634F	XA00634F	XA00634F	XA00640F	XA00634F
NB	NEPSI Ex ia IIC T6 Ga/Gb	▪ FMP56 ▪ FMP57	XA00634F	XA00634F	XA00634F	XA00640F	XA00634F
NF	NEPSI DIP A20/21 T85…90oC IP66	▪ FMP56 ▪ FMP57	XA00637F	XA00637F	XA00637F	XA00643F	XA00637F
NG	NEPSI Ex nA II T6 Gc	▪ FMP56 ▪ FMP57	XA00635F	XA00635F	XA00635F	XA00641F	XA00635F
NH	NEPSI Ex ic IIC T6 Gc	▪ FMP56 ▪ FMP57	XA00635F	XA00635F	XA00635F	XA00641F	XA00635F
N2	NEPSI Ex ia IIC T6 Ga/Gb, Ex iaD 20/21 T85…90℃	▪ FMP56 ▪ FMP57	XA00638F	XA00638F	XA00638F	XA00644F	XA00638F
N3	NEPSI Ex d[ia] IIC T6 Ga/Gb, DIP A20/21 T85…90℃ IP66	▪ FMP56 ▪ FMP57	XA00639F	XA00639F	XA00639F	XA00645F	XA00639F
8A	FM/CSA IS+XP Cl.I,II,III Div.1 Gr.A-G	▪ 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.

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 or M	ATEX II 1D Ex ta [ia] IIIC T$_{500}$ xx°C Da
BF	L or M	ATEX II 1/2 D Ex ta [ia Db] IIIC Txx°C Da/Db
BG	L or M	ATEX II 3G Ex nA [ia Ga] IIC T6 Gc
BH	L or M	ATEX II 3G Ex ic [ia Ga] IIC T6 Gc
B3	L or M	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 or M	IECEx Ex ta [ia] IIIC T500 xx°C Da
IF	L or M	IECEx ta [ia Db] IIIC Txx°C Da/Db
IG	L or M	IECEx Ex nA [ia Ga] IIC T6 Gc
IH	L or M	IECEx Ex ic [ia Ga] IIC T6 Gc
I3	L or M	IECEx Ex d [ia] IIC T6 Ga/Gb, IECEx Ex ta [ia Db] IIIC Txx°C Da/Db

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

2   Basic safety instructions

2.1   Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:
▶ Trained, qualified specialists must have a relevant qualification for this specific function and task
▶ Are authorized by the plant owner/operator
▶ Are familiar with federal/national regulations
▶ Before beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
▶ Following instructions and basic conditions

The operating personnel must fulfill the following requirements:
▶ Being instructed and authorized according to the requirements of the task by the facility's owner-operator
▶ Following the instructions in these Operating Instructions

2.2   Designated use

Application and 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 ℃ (176 ℉) 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 they are safe to operate.

It meets general safety standards and legal requirements. It also complies with the EC directives listed in the device-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

3   Product description

3.1   Product design

3.1.1   Levelflex FMP56/FMP57
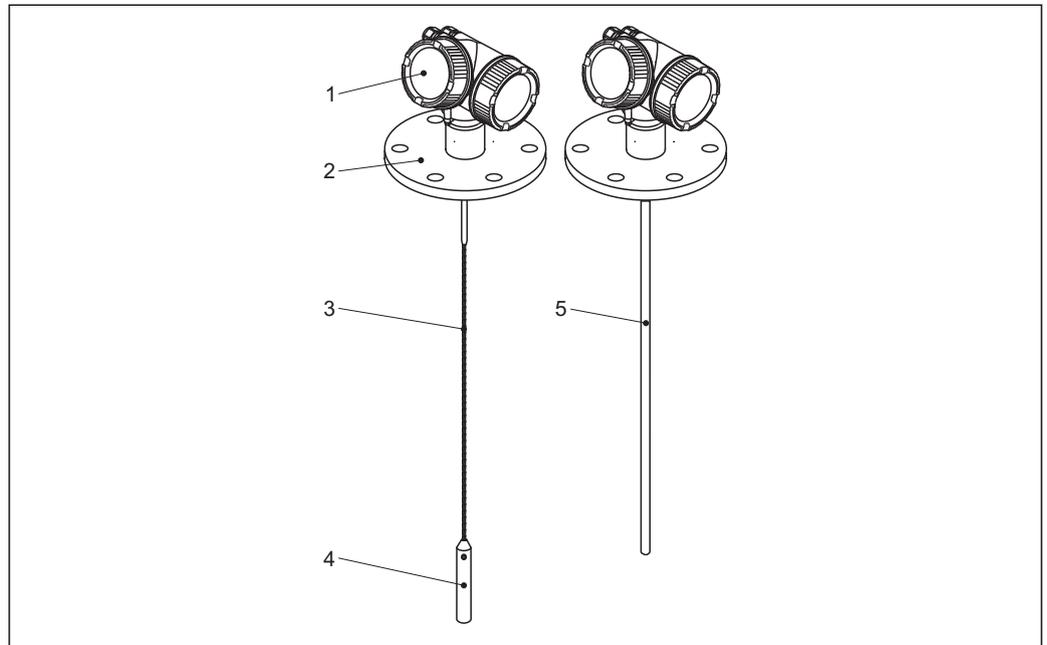
A0012470

🖼 *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
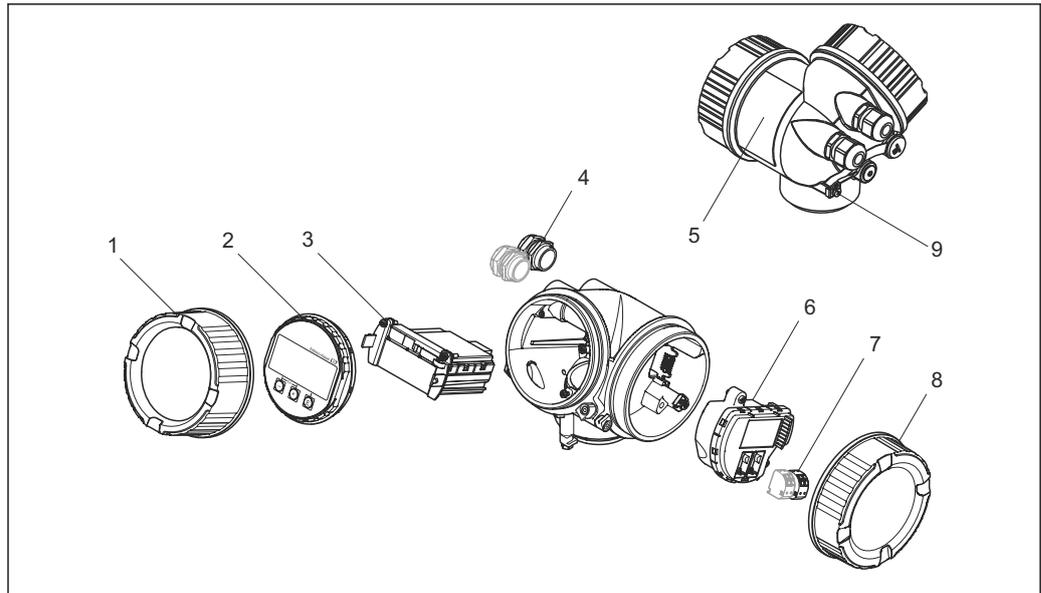
A0012422

⊡ *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

3.2   Registered trademarks

FOUNDATION^{TM} Fieldbus
Registered trademark of the Fieldbus Foundation, Austin, Texas, USA

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

4　Incoming acceptance and product identification

4.1　Incoming acceptance
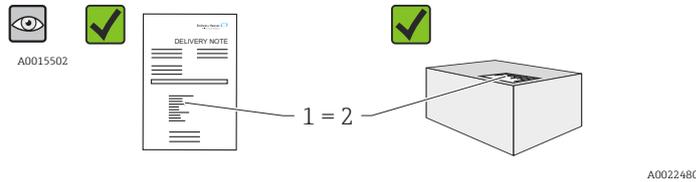
Is the order code on the delivery note (1) identical to the order code on the product sticker (2)?
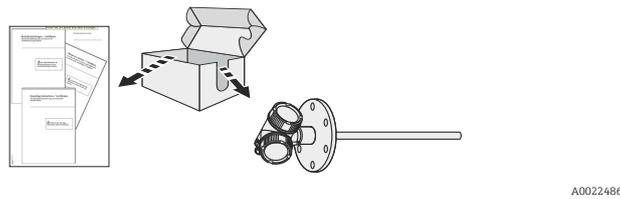
Are the goods undamaged?
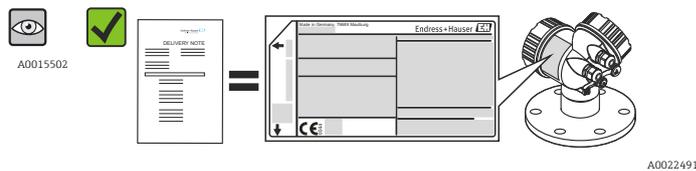
Do the nameplate data match the ordering information on the delivery note?
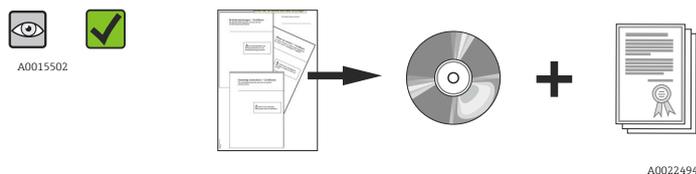
Is the DVD (operating tool) present?
If required (see nameplate): Are the Safety Instructions (XA) present?

If one of the conditions does not comply, contact your Endress+Hauser distributor.

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
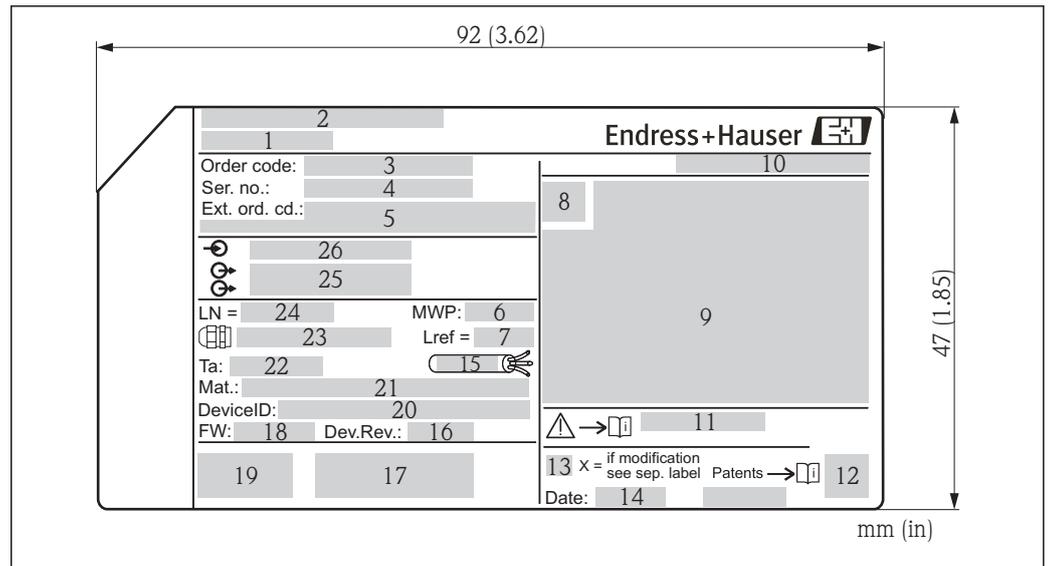
3   Nameplate of the Levelflex

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   Geräterevision (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

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 ℃ (−40 to +176 ℉)
- 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).
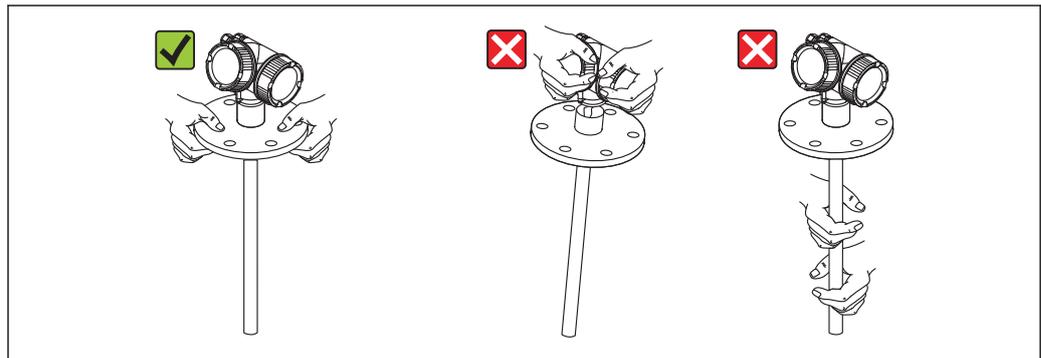
A0013920
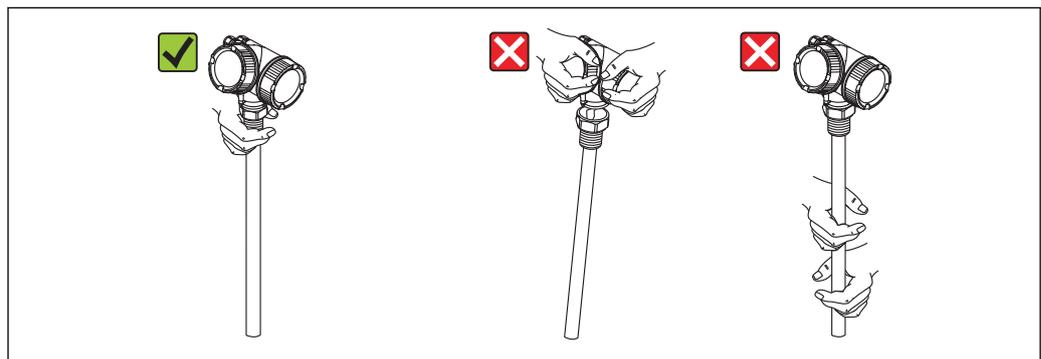
A0014264

6   Mounting

6.1   Mounting requirements

6.1.1   Suitable mounting position
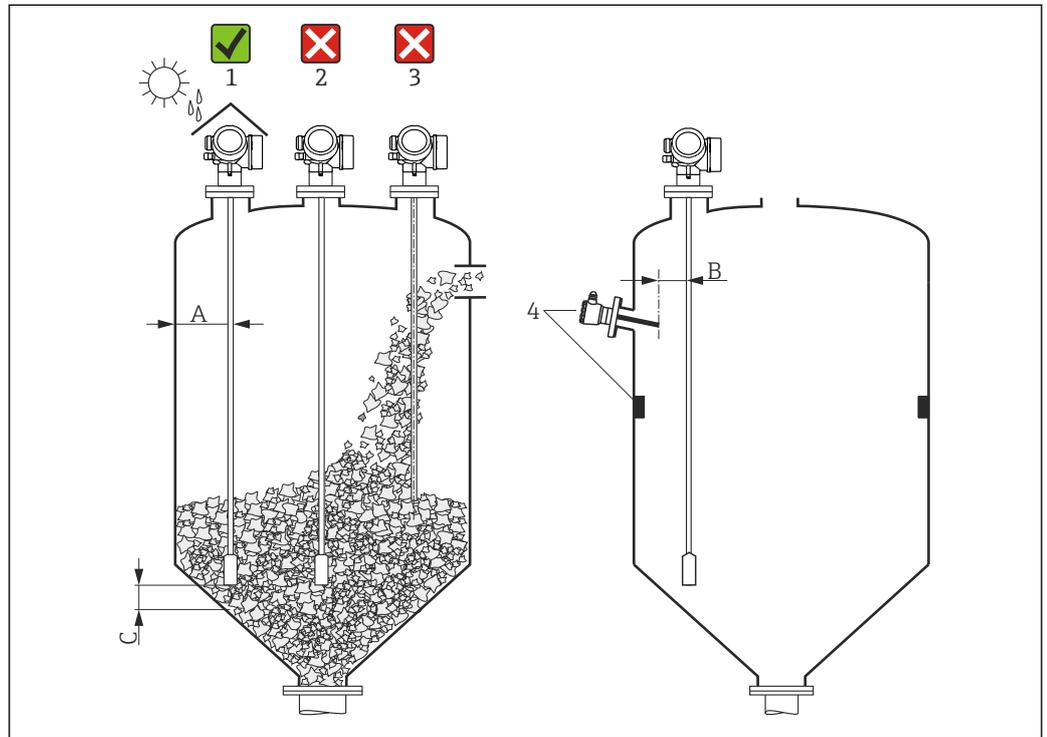
⊠ 4   *Mounting requirements for Levelflex*

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 suppresion(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.

ℹ 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.

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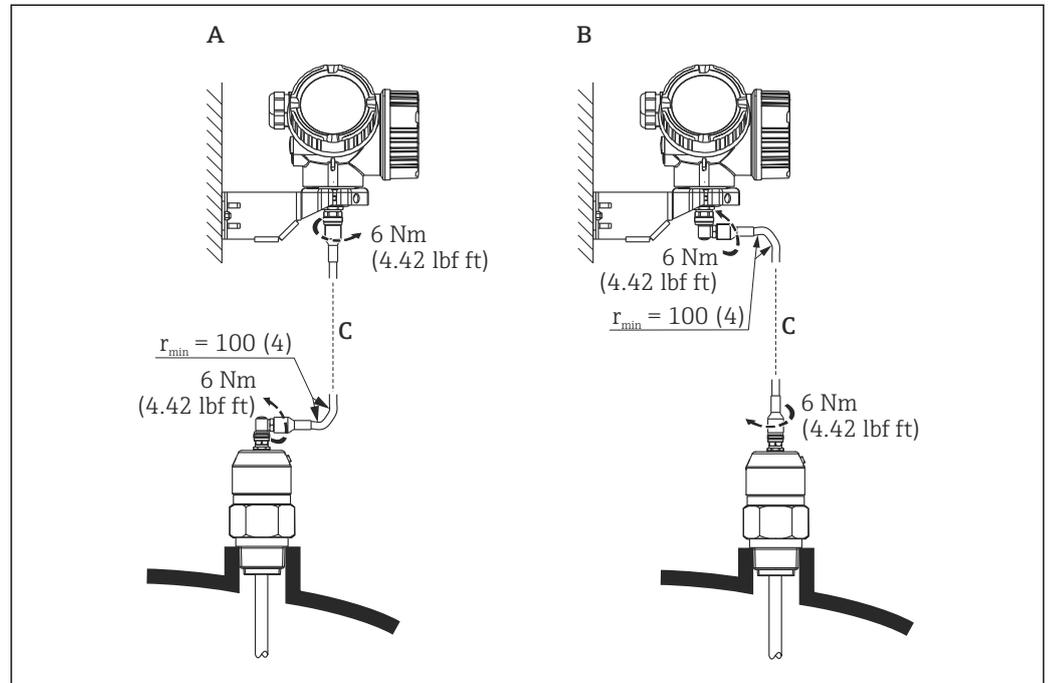
A   Angled plug at the probe
B   Angled plug at the electronics housing
C   Length of the remote cable as ordered

- 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.

A0017170
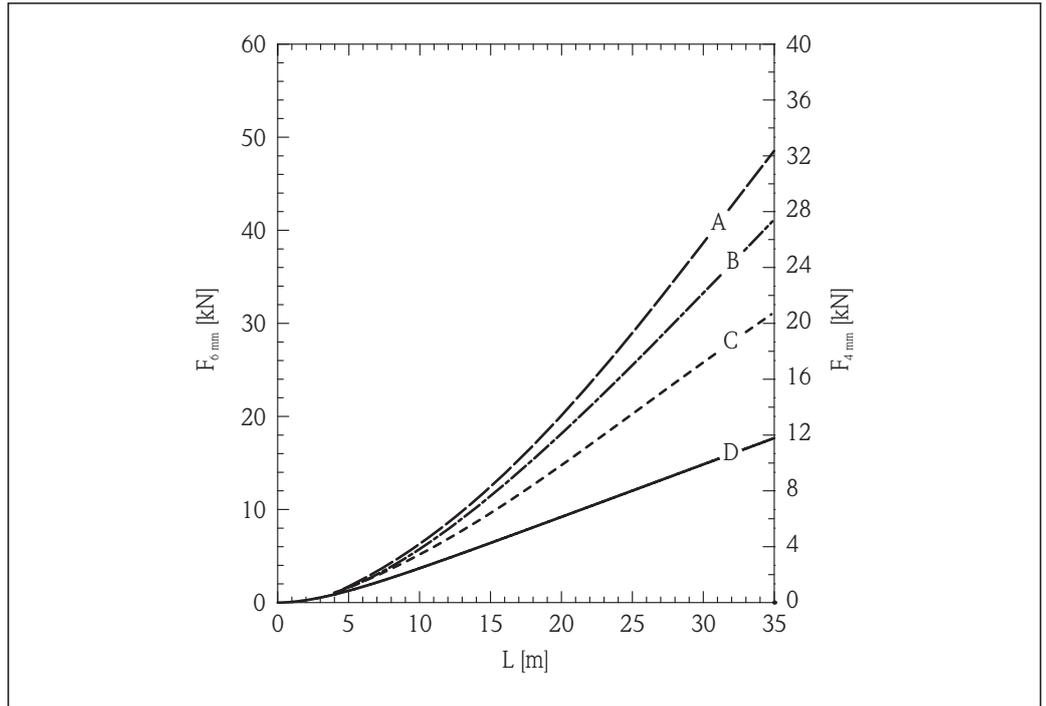
⊡ 5   *Silica sand in silo with smooth metallic walls; tensile load as a function of level L for rope diameters 6mm
(0,24 in) and 4mm (0,16 in)*

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)*
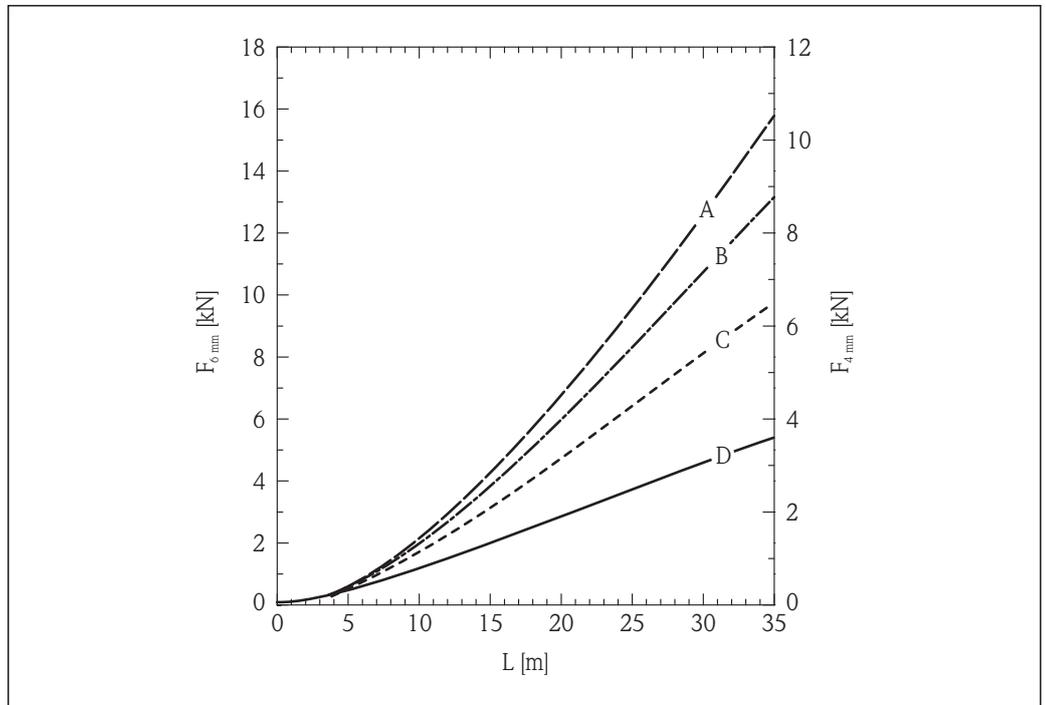
A0017171

⊡ 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)*
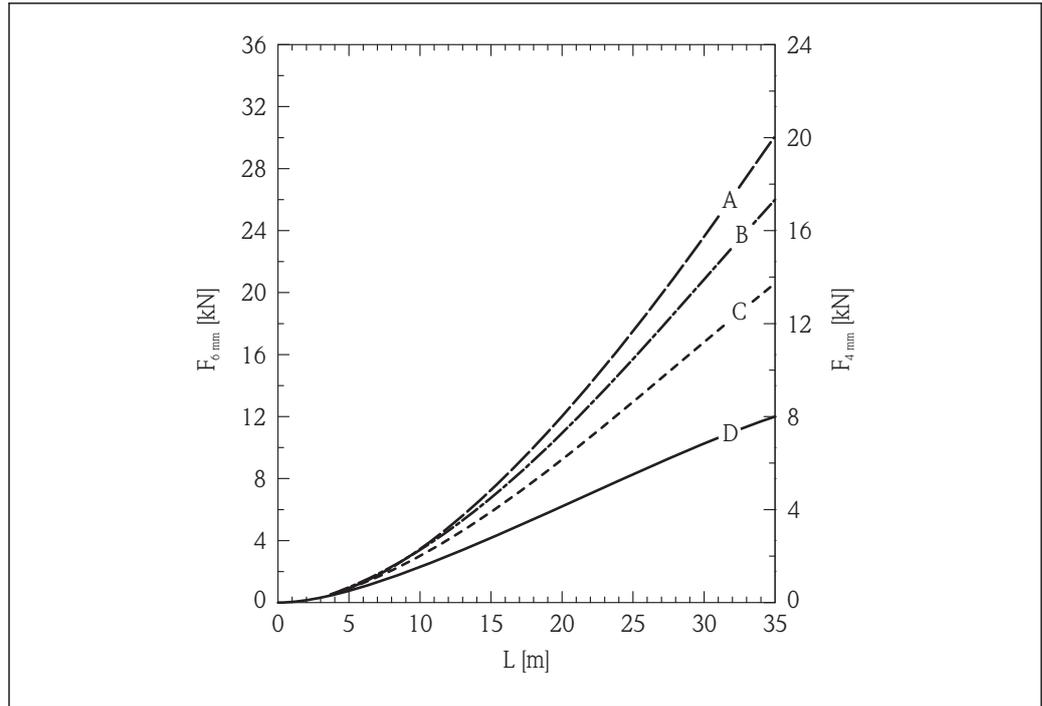
A0017172

🖼 *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)*
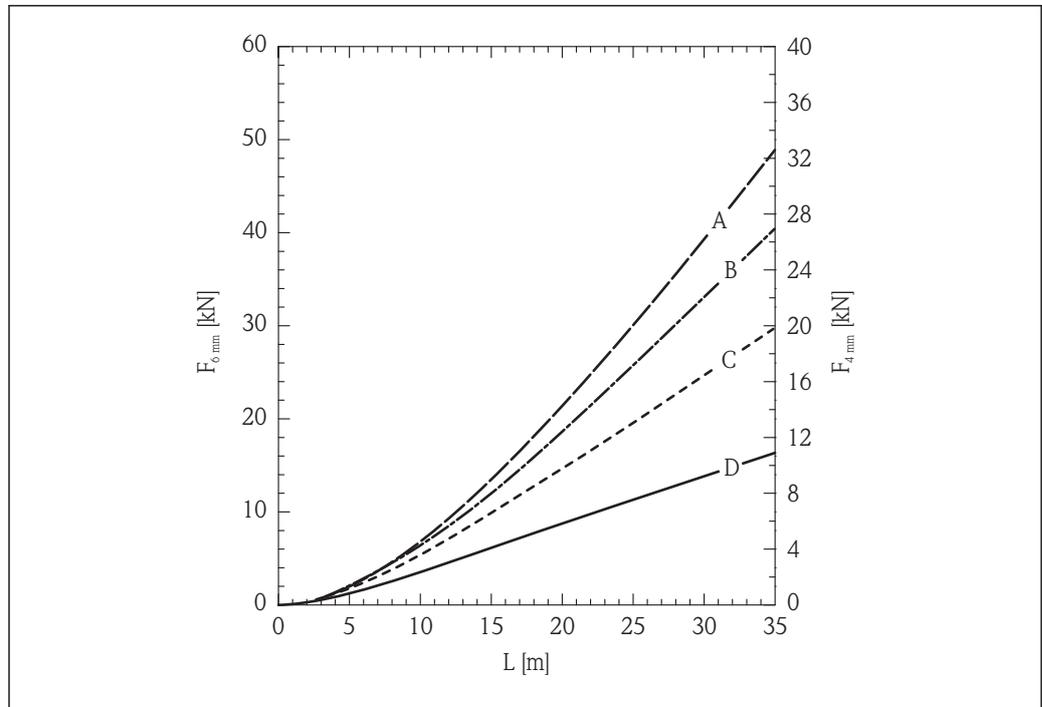
A0017173

🖼 *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
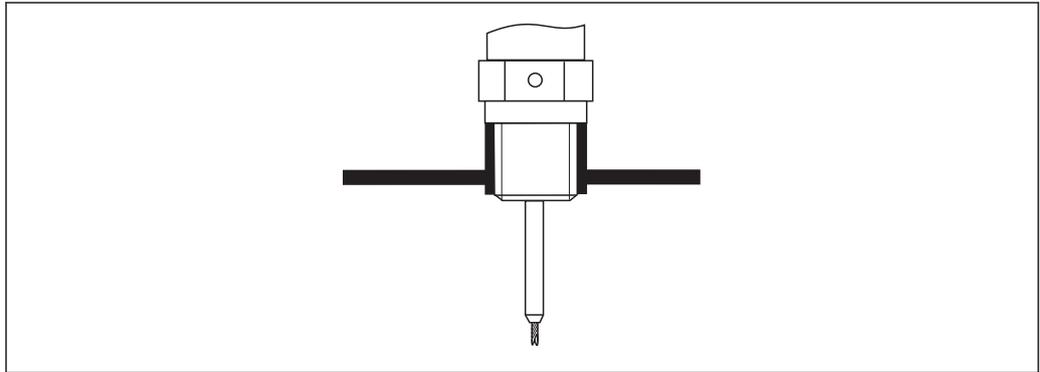
A0015121

 9   Mounting with threaded connection; flush with the container ceiling

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
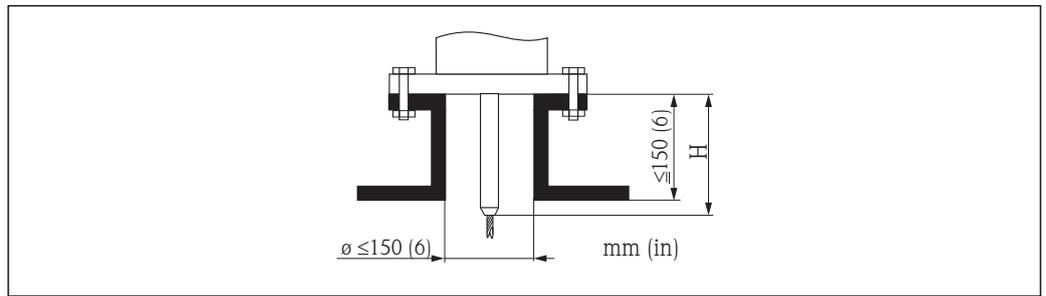
Length H of the rigid part of the rope probe

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 ≥ DN300: → 🖻 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").

ℹ️ 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 → 🖹 119. 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 ≥ DN300

If installation in ≥ 300mm/12" nozzles is unavoidable, installation must be carried out in accordance with the following sketch.
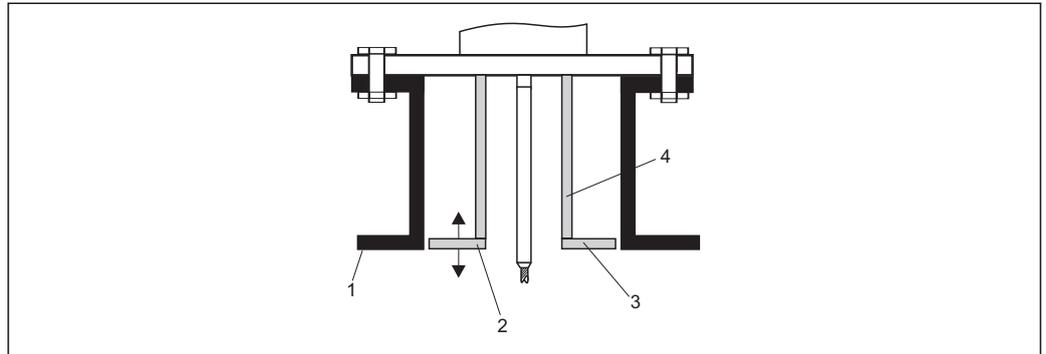
A0014199

1   Lower edge of the nozzle
2   Approx. flush with the lower edge of the nozzle (± 50 mm/2")
3   Plate
4   Pipe Φ 150 to 180 mm (6 to 7 inch)

Nozzle diameter	Plate diameter
300 mm (12")	280 mm (11")
≥ 400 mm (16")	≥ 350 mm (14")

6.1.5   Securing the probe

Securing rope probes

A0012609
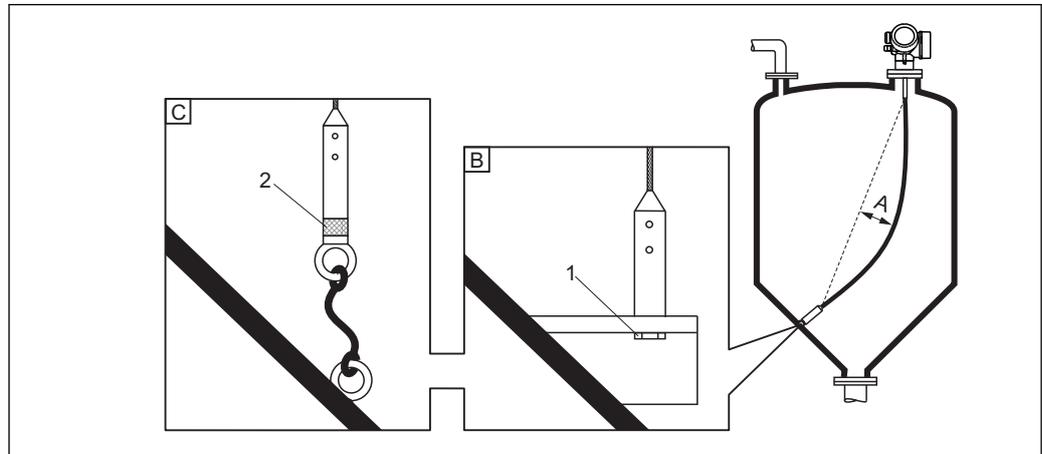
A   Sag of the rope: ≥ 1 cm per 1m of the probe length (0.12 inch per 1 ft of the probe length)
B   Reliably grounded end of probe
C   Reliably isolated end of probe
1:   Mounting and contact with a bolt
2   Mounting kit isolated

- 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 ≥ 1cm/(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.
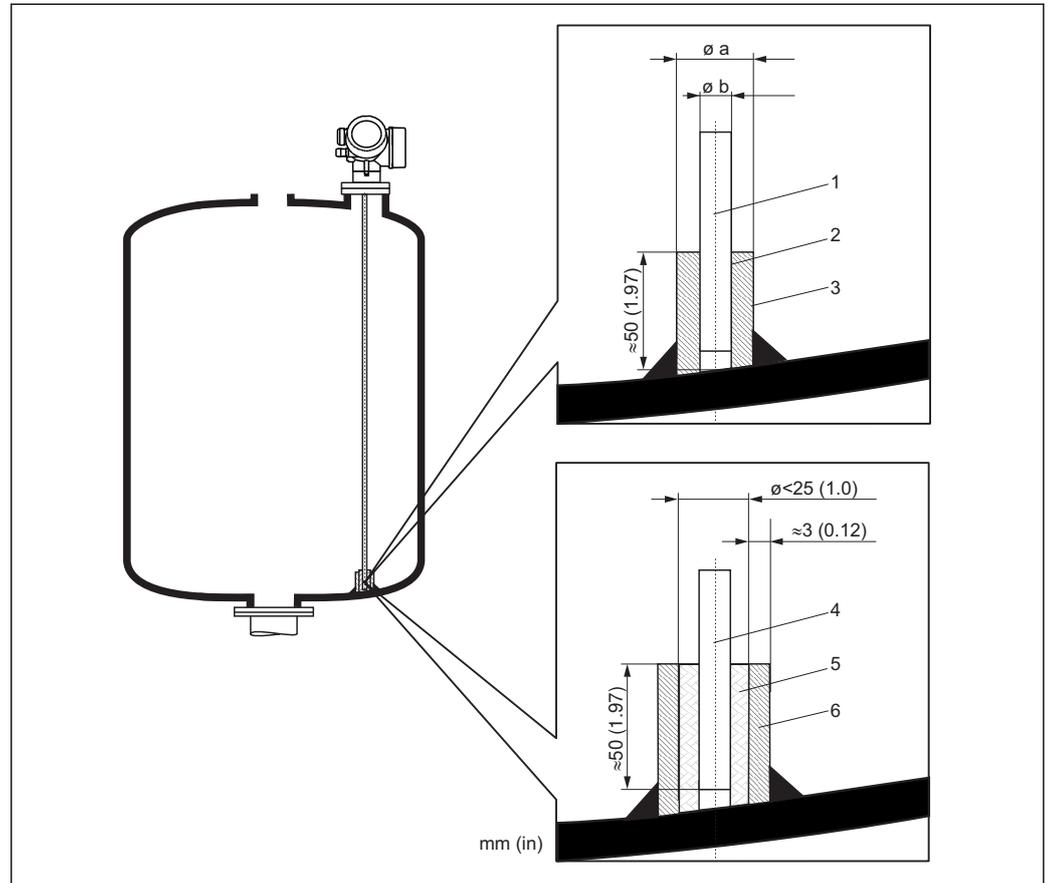
A0012607

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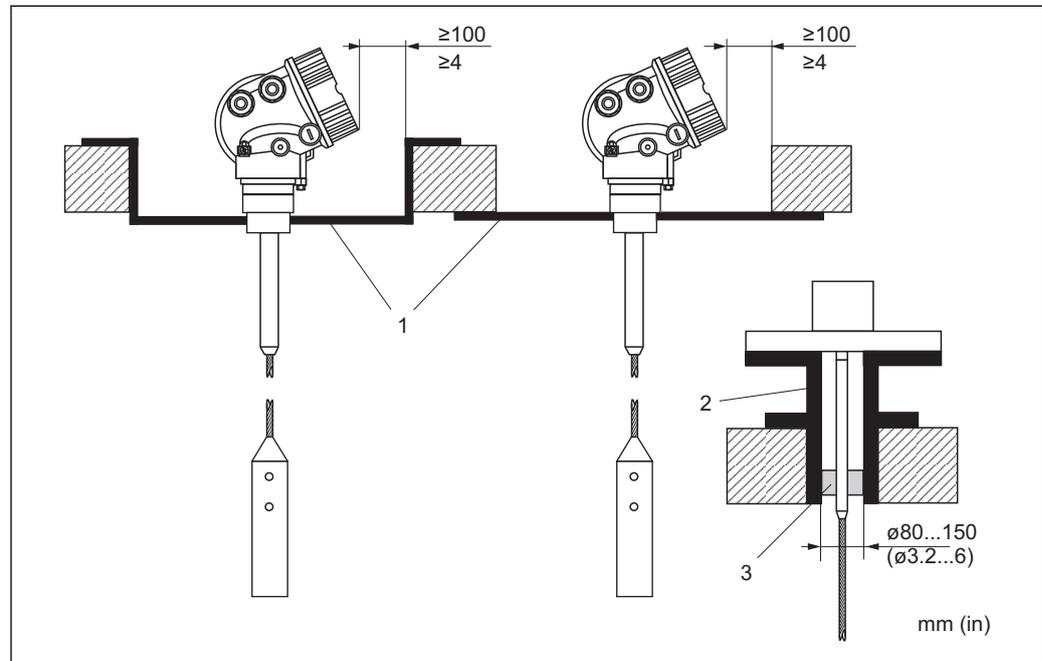
1   Metal sheet
2   Metal tube
3   Extension rod / Centering HMP40 (see "Accessories")

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

A0014140
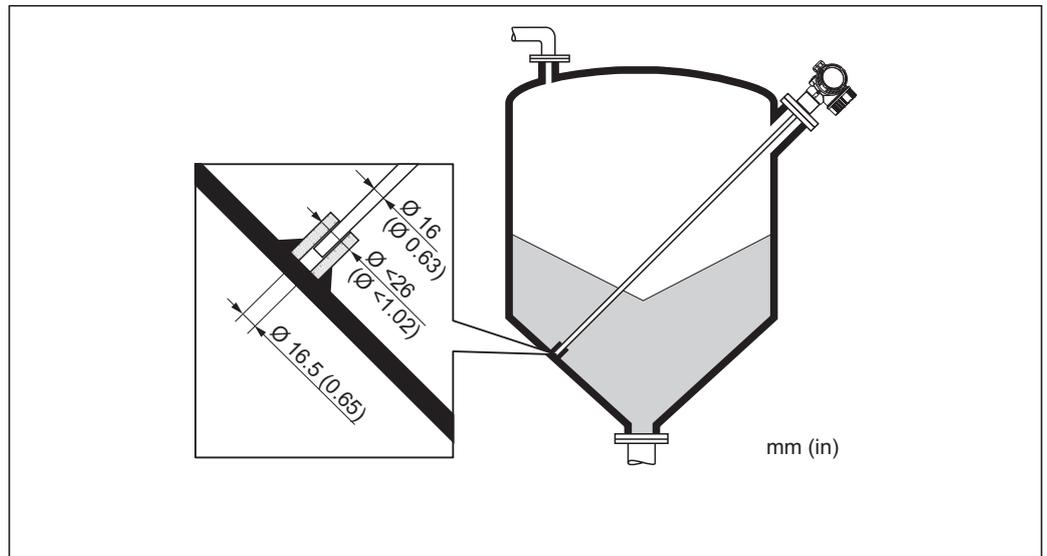
- If installation from above is not possible, the Levelflex can also be mounted from the side.
- In this case, always fix the rope probe → 🖺 32 .
- Support rod probe if the lateral loadbearing capacity is exceeded → 🖺 27. Only fix rod probes at the probe end → 🖺 32.

Non-metallic vessels

A0012527
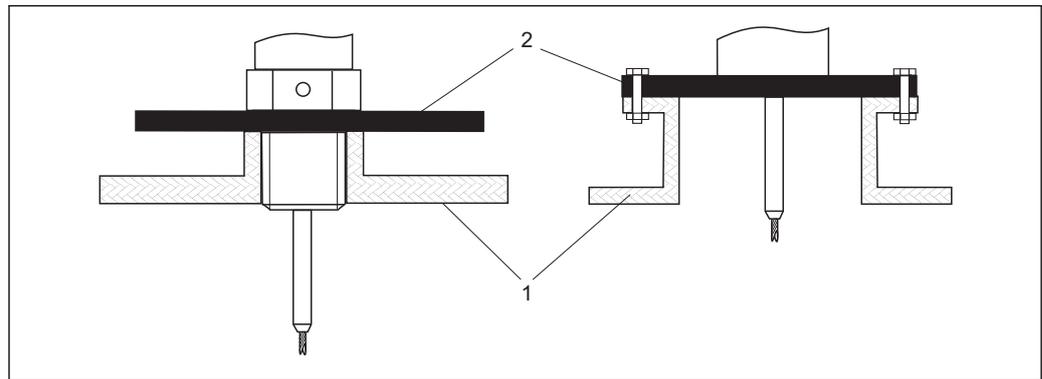
1   Non-metallic vessel
2   Metal sheet or metal flange

To measure, Levelflex with a rod probe needs a metallic surface at the process connection.
Therefore:

• 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") to the probe at the
  process connection. Its orientation must be perpendicular to the probe.

Vessels with heat insulation

ℹ️ 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.
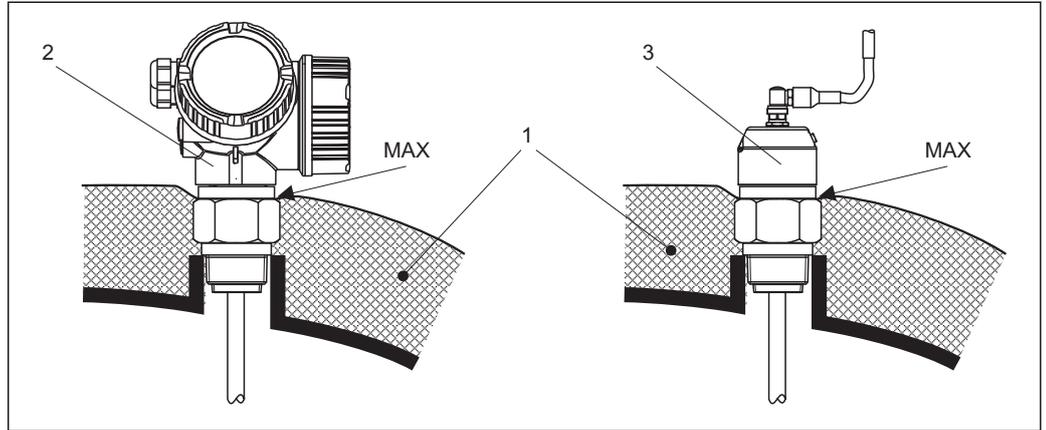
🖼 10   Process connection with thread - FMP56, FMP57

1   Tank insulation
2   Compact device
3   Sensor remote (feature 600)
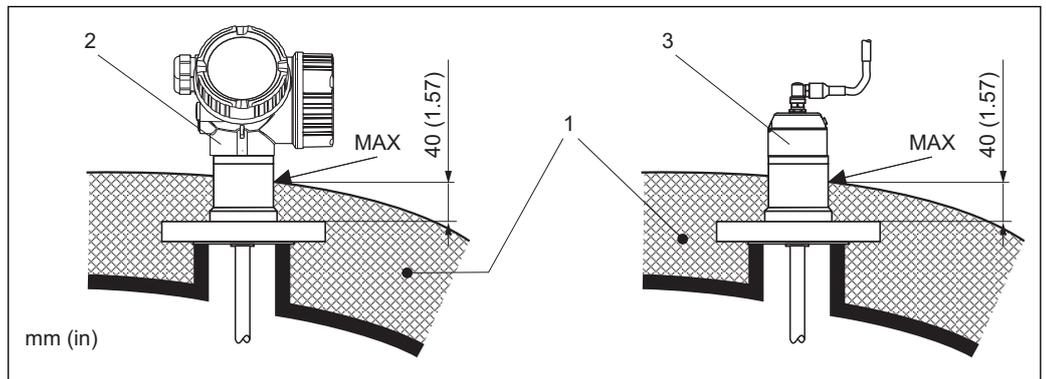
🖼 11   Process connection with flange - FMP57

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

When shortening the probe: Enter the new length of probe into the Quick Setup which can be found in the electronics housing behind the display module.
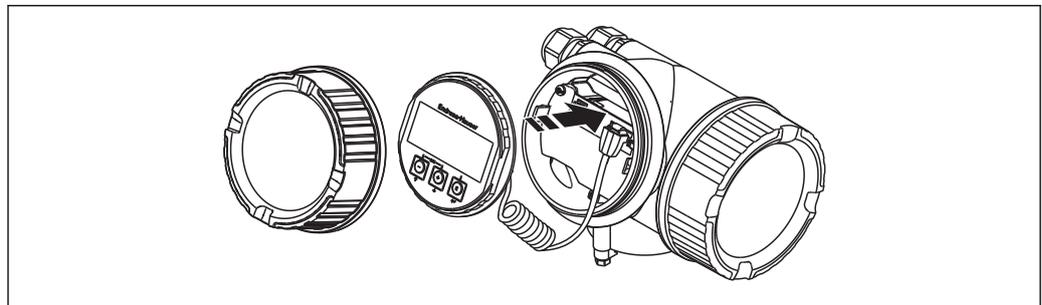
A0014241

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).
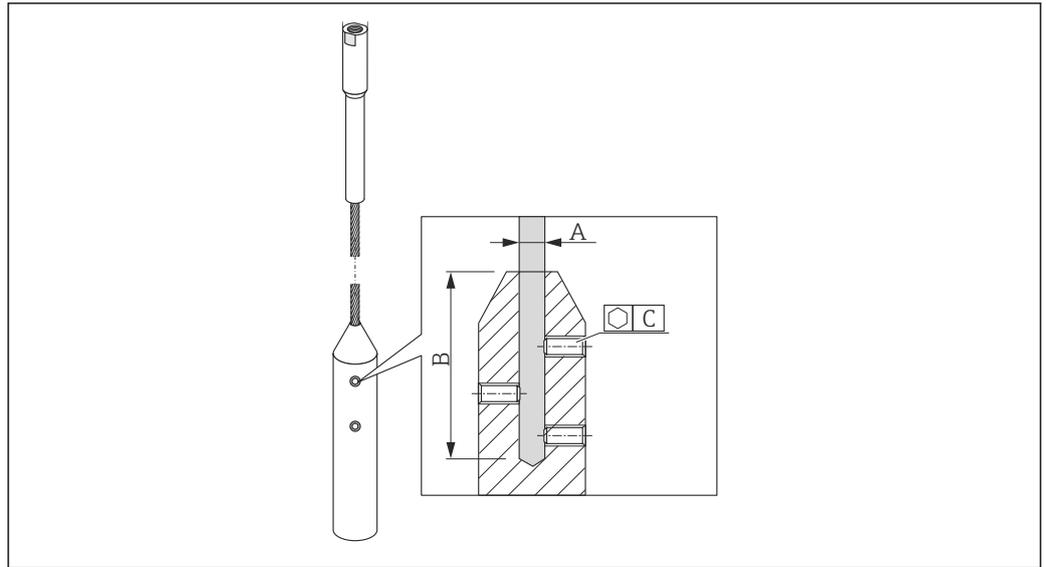
A0021693

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.

6.2.3   Mounting the device

Mounting devices with thread
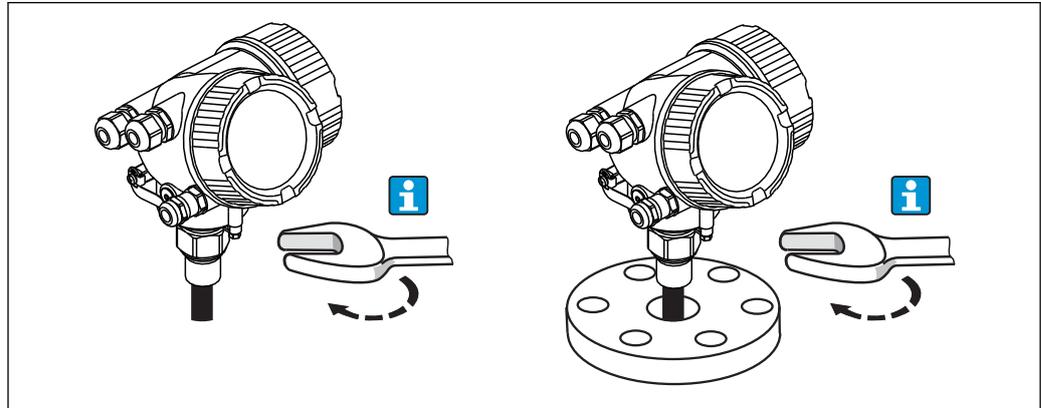
A0012528

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

- 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.
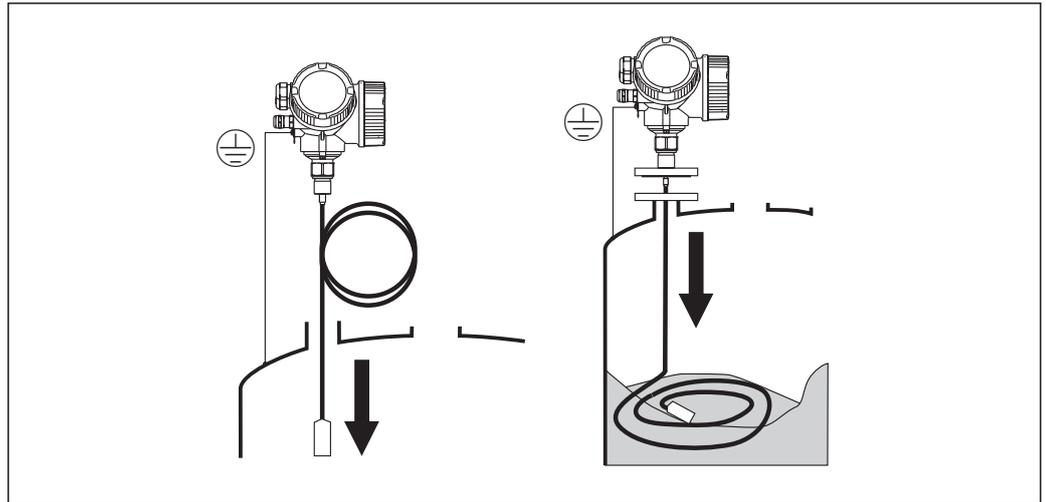
A0012529

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.

ℹ️ **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

ℹ️ 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.

ℹ️ 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.

ℹ️ If the meeasuring 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
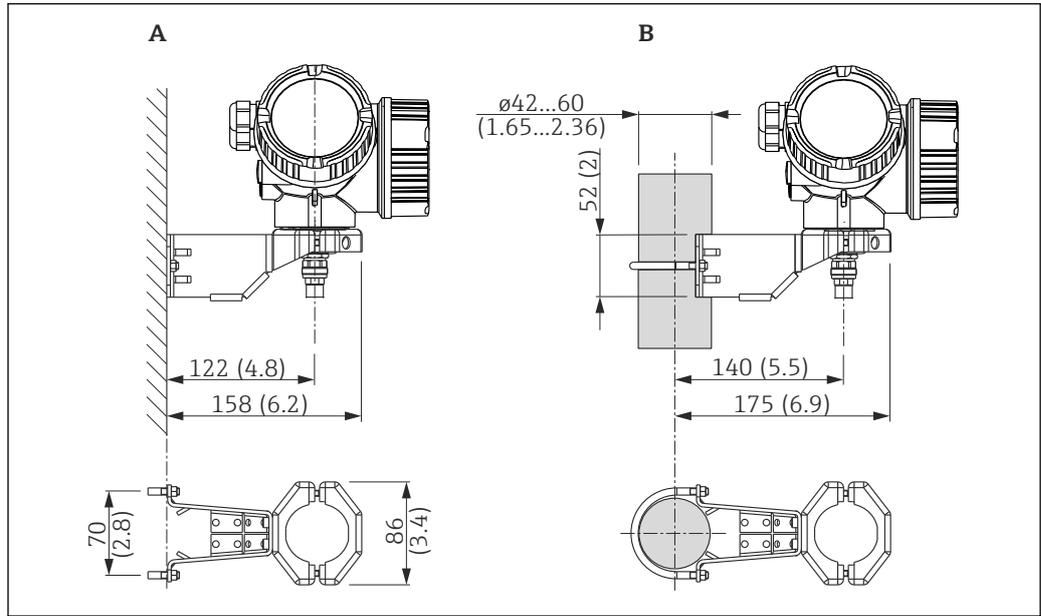
A0014793

⊡ *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
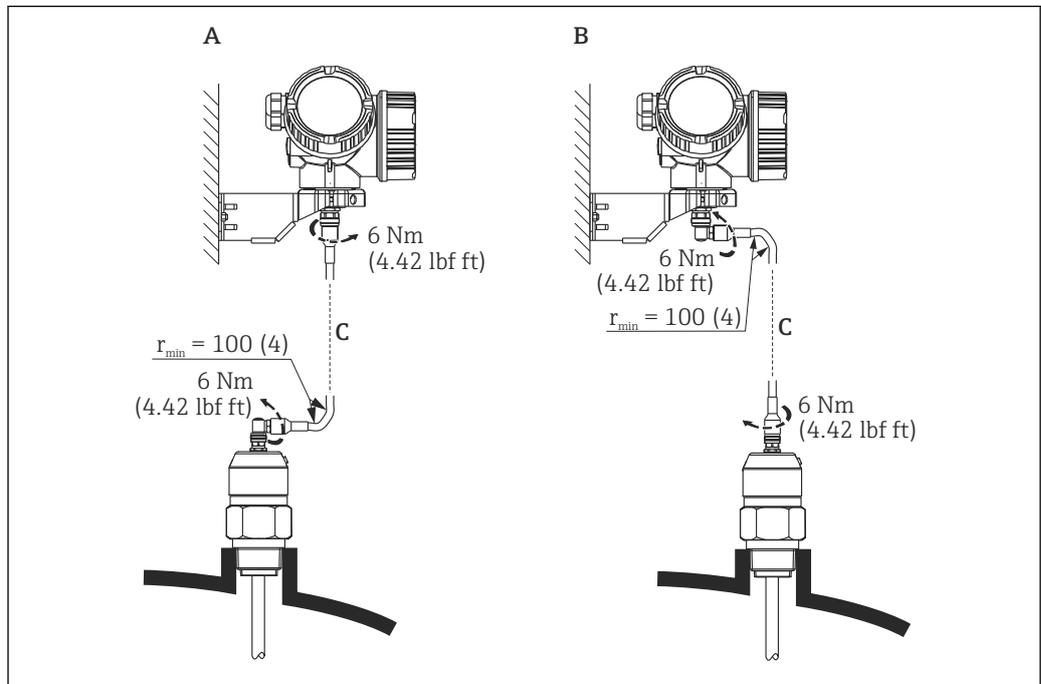
A0014794

⊡ *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:
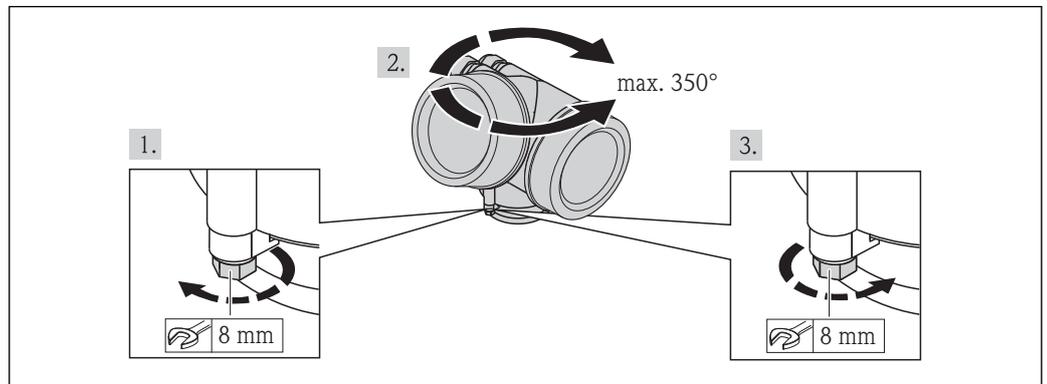
A0013713

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 plastics housing; 2,5 Nm for aluminium or stainless steel housing).

6.2.6 Turning the display module
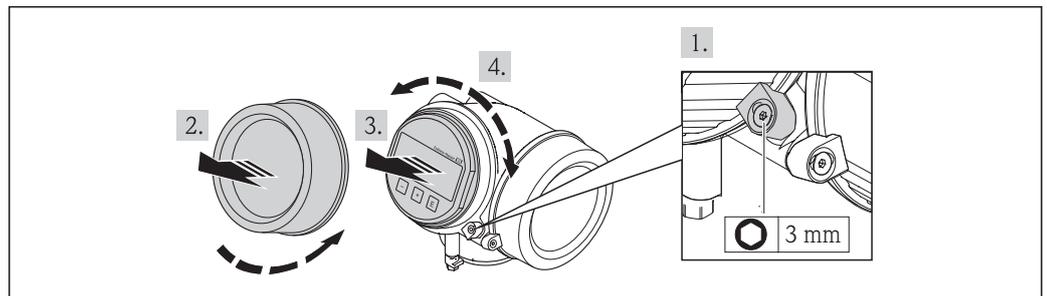
A0013905

1. If present: Loosen the screw of the securing clamp of the electronics compartment cover using an Allen key and turn the clamp 90˚ conterclockwise.

2. Unscrew cover of the electronics compartment from the transmitter housing.

3. Pull out the display module with a gentle rotation movement.

4. Rotate the display module into the desired position: Max. 8 × 45 ˚ in each direction.

5. Feed the spiral cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment until it engages.

6. Screw the cover of the electronics compartment firmly back onto the transmitter housing.

7. Tighten the securing clamp again using the Allen key (Torque: 2.5 Nm).

6.3   Post-installation check

❍	Is the device undamaged (visual inspection)?
❍	Does the device conform to the measuring point specifications? For example: • Process temperature • Process pressure (refer to the chapter on "Material load curves" of the "Technical Information" document) • Ambient temperature range • Measuring range
❍	Are the measuring point identification and labeling correct (visual inspection)?
❍	Is the device adequately protected from precipitation and direct sunlight?
❍	Are the securing screw and securing clamp tightened securely?

7   Electrical connection

7.1   Connection conditions

7.1.1   Terminal assignment

PROFIBUS PA / FOUNDATION Fieldbus
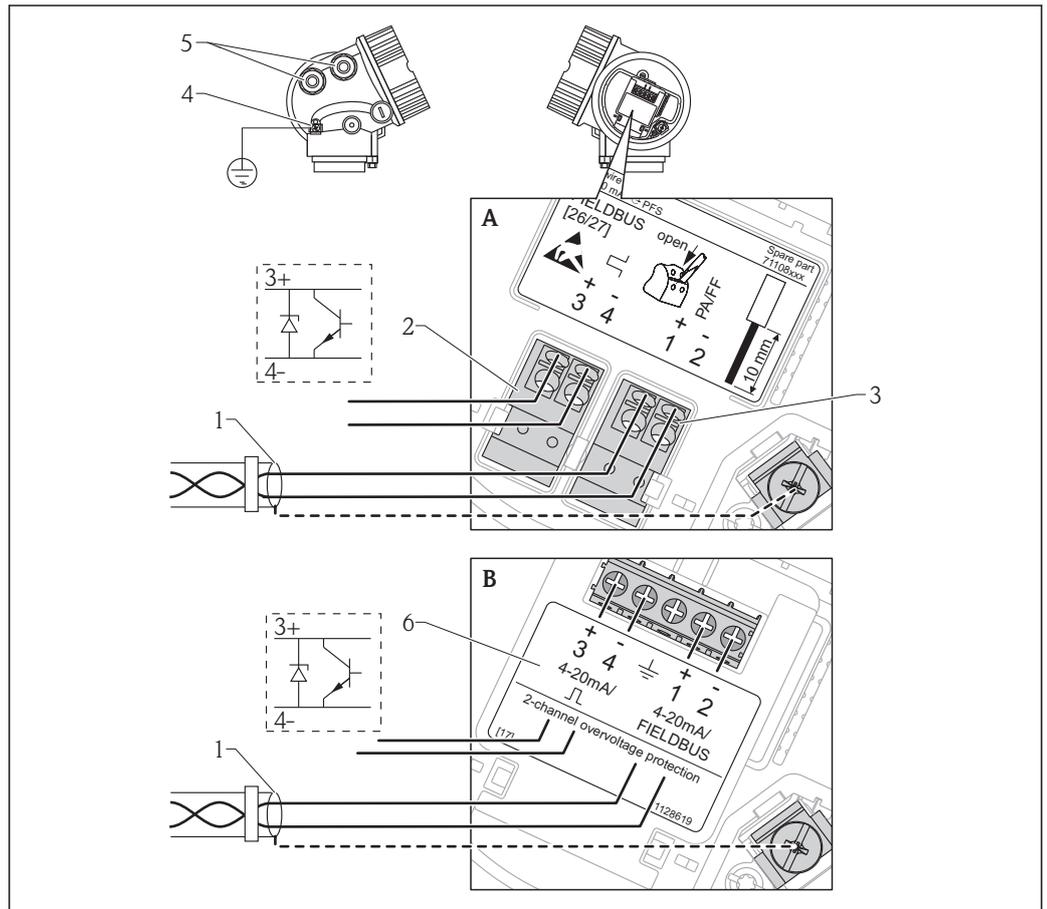
■ 14   *Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus*

A   Without integrated overvoltage protection
B   With integrated overvoltage protection
1   Cable screen: Observe cable specifications
2   Switch output (open collector): Terminals 3 and 4
3   PROFIBUS PA / FOUNDATION Fieldbus: Terminals 1 and 2
4   Terminal for potential equalization line
5   Cable entries
6   Overvoltage protection module

Connection examples for the switch output

15   Connection of a relay

Suitable relays (examples):
- 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

A0015909

16   Connection of a digital input

1   Pull-up resistor
2   Digital input

A0015910
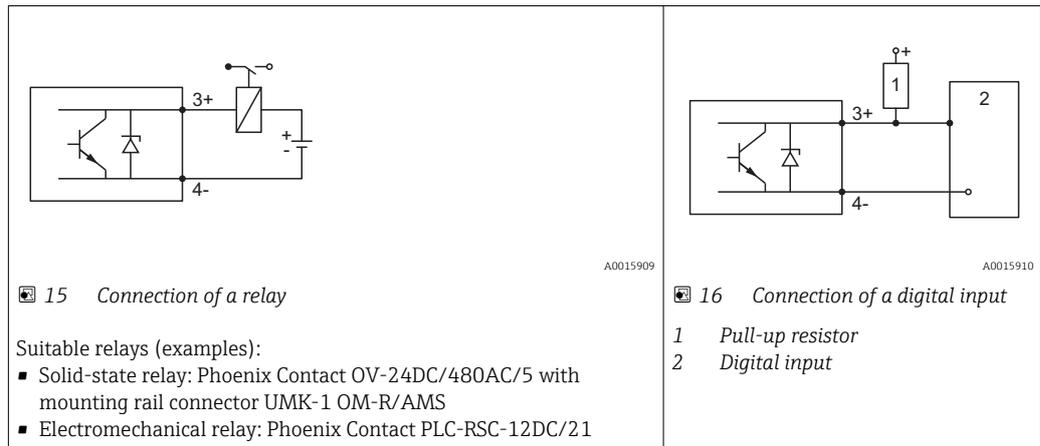
For optimum interference immunity we recommend to connect an external resistor (internal resistance of the relay or Pull-up resistor) of < 1 000 Ω.

7.1.2   Cable specification

- Minimum cross-section: See the "Terminal" specification in the Technical Information for the device.
- For ambient temperature $T_U \geq 60$ °C (140 °F): use cable for temperature T_U +20 K.

FOUNDATION Fieldbus

Endress+Hauser recommends using twisted, shielded two-wire cables.

For further information on the cable specifications, see Operating Instructions BA00013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).

7.1.3   Device plug connectors

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
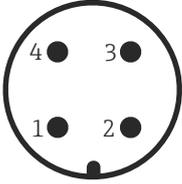
Pin	Meaning
1	Signal +
2	not connected
3	Signal -
4	Ground

A0011175

Pin assignment of the 7/8" plug connector
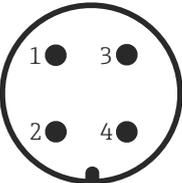
Pin	Meaning
1	Signal -
2	Signal +
3	Not connected
4	Screen

A0011176

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	• 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]
	• Ex ia / IS • Ex ia + Ex d[ia] / IS + XP	9 to 30 V

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 µs), overvoltage protection has to be ensured by an integrated or external overvoltage protection module.

Integrated overvoltage protection

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 µs)	10 kA

External overvoltage protection

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 device

⚠ WARNING

Explosion hazard!
▶ Comply with the relevant national standards.
▶ Observe the specifications in the Safety Instructions (XA).
▶ Only use the specified cable glands.
▶ Check whether the supply voltage matches the specifications on the nameplate.
▶ Before connecting the device: Switch the supply voltage off.
▶ Before switching on the supply voltage: Connect the potential bonding line to the exterior ground terminal.

Required tools and accessories:
• For instruments with safety pin for the lid: AF 3 Allen key
• Wire stripping pliers
• When using stranded wires: Wire end sleeves.
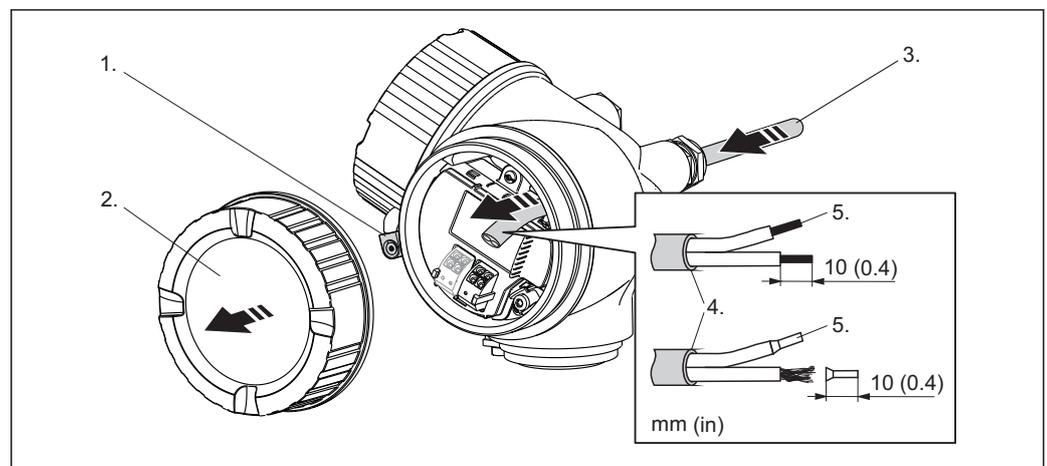
A0012619

1. Loosen the screw of the securing clamp of the connection compartment cover and turn the clamp 90° counterclockwise.

2. Unscrew the connection compartment cover.

3. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.

4. Strip the cable.

5. Strip the cable ends 10 mm (0.4 in). For stranded cables, also attach wire end ferrules.

6. Firmly tighten the cable glands.

7.
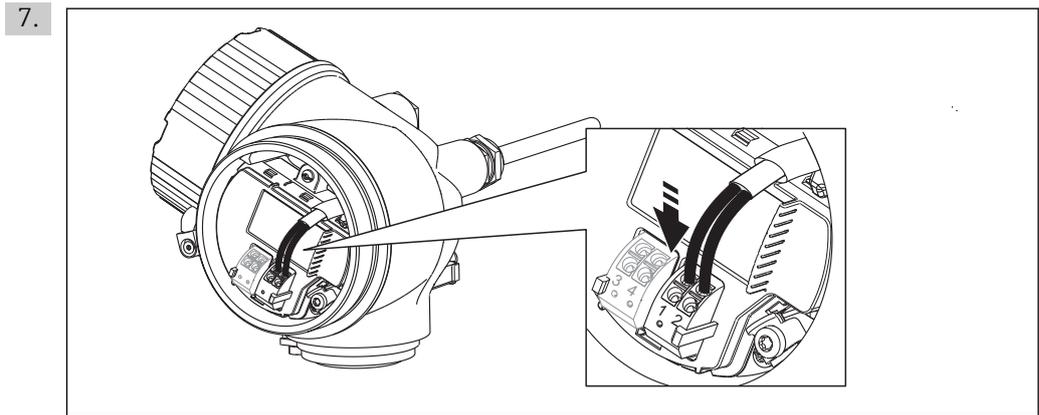
A0013837

Connect the cable in accordance with the terminal assignment → 🖺 45.

8. When using screened cable: Connect the cable screen to the ground terminal.

9. Screw the cover onto the connection compartment.

10. For instruments with safety pin for the lid: Adjust the safety pin so that its edge is over the edge of the display lid. Tighten the safety pin.

7.2.1 Pluggable spring-force terminals

Instruments without integrated overvoltage protection have pluggable spring-force terminals. Rigid conductors or flexible conductors with cable sleeve can directly be inserted and are contacted automatically.

To remove cables from the terminal: Press on the groove between the terminals using a flat-tip screwdriver ≤ 3 mm (0.12 inch) while pulling the cables out of the terminals.
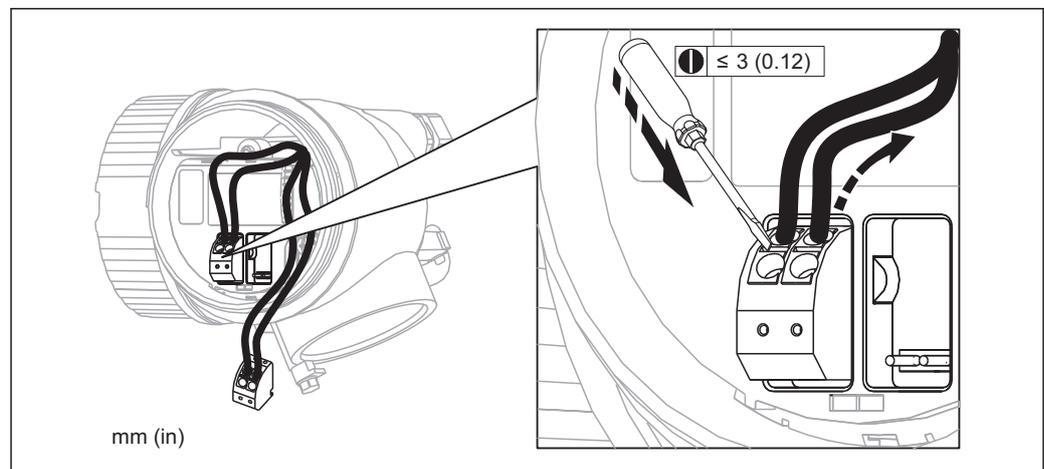
A0013661

7.3 Post-connection check

❍	Are cables or the device undamaged (visual inspection)?
❍	Do the cables comply with the requirements?
❍	Do the cables have adequate strain relief?
❍	Are all cable glands installed, firmly tightened and correctly sealed?
❍	Does the supply voltage match the specifications on the transmitter nameplate?
❍	Is the terminal assignment correct → 🖺 45?

Endress+Hauser

❍	If required: Is the protective earth connected correctly ?
❍	If supply voltage is present: Is the device ready for operation and do values appear on the display module?
❍	Are all housing covers installed and firmly tightened?
❍	Is the securing clamp tightened correctly?

8 Operation options

8.1 Overview

8.1.1 Local operation

Order code for "Display; Operation", option **C** "SD02"	Order code for "Display; Operation", option **E** "SD03"
A0015544	A0015546
1 Operation with pushbuttons	*1 Operation with touch control*
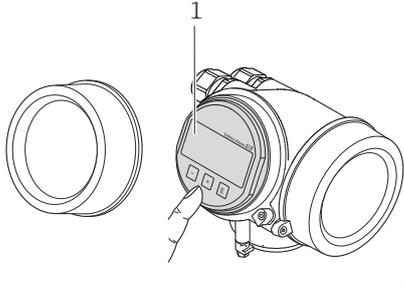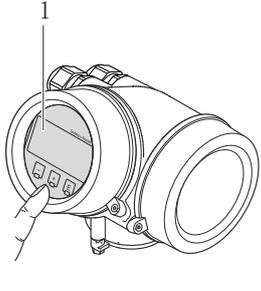
8.1.2 Operation with remote display and operating module FHX50

A0013137
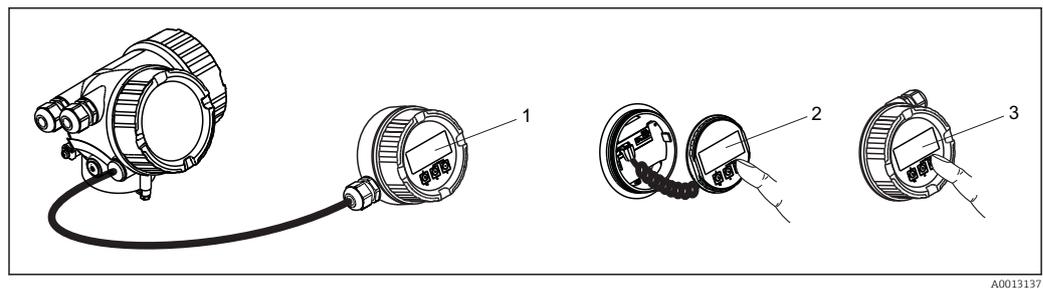
🖾 *17   FHX50 operating options*

1   Housing of the remote display and operating module FHX50
2   Display and operating module SD02, push buttons; cover must be removed
3   Display and operating module SD03, optical keys; can be operated through the glass of the cover

8.1.3   Remote operation

Via FOUNDATION Fieldbus
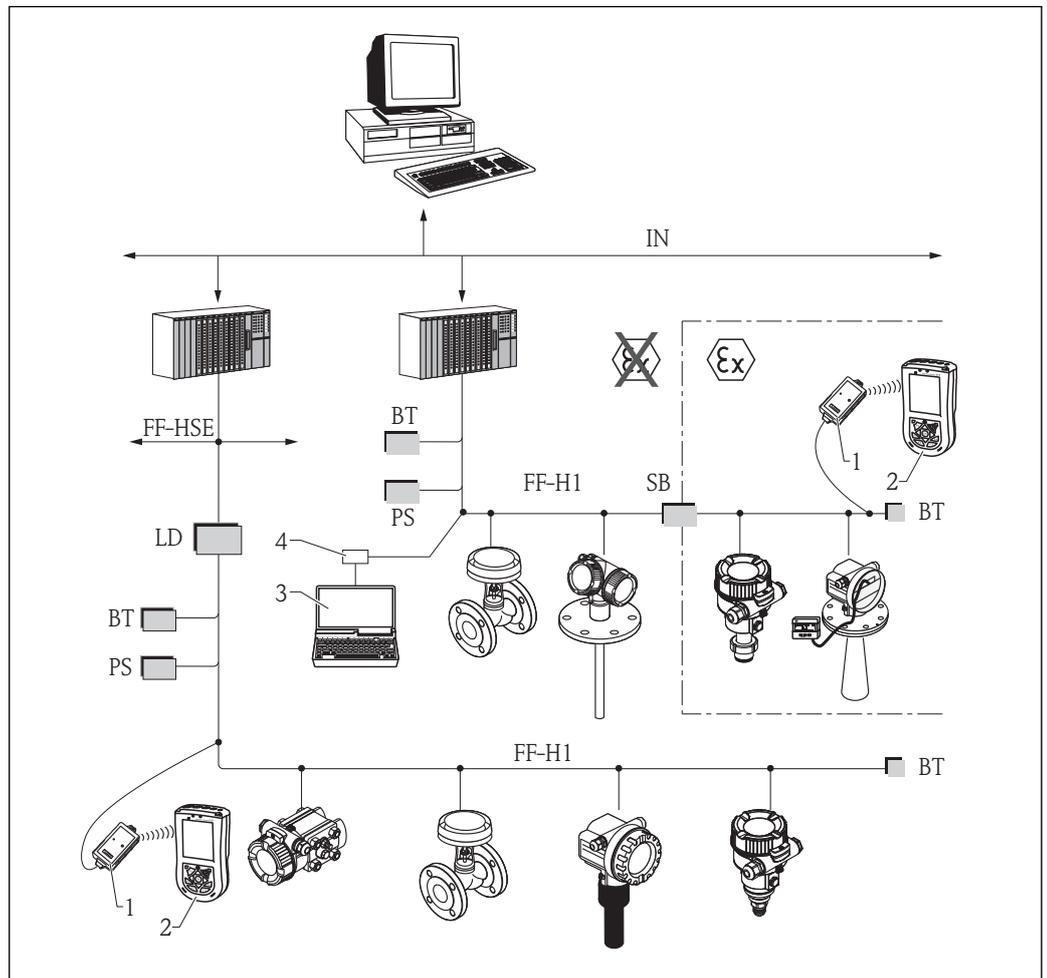
A0017188

⊡ *18   FOUNDATION Fieldbus system architecture with associated components*

1   FFblue Bluetooth modem
2   Field Xpert SFX350/SFX370
3   FieldCare
4   NI-FF interface card

IN	Industrial network
FF-HSE	High Speed Ethernet
FF-H1	FOUNDATION Fieldbus-H1
LD	Linking Device FF-HSE/FF-H1
PS	Bus Power Supply
SB	Safety Barrier
BT	Bus Terminator

Via service interface (CDI)

A0014019

1 Service interface (CDI) of the measuring device (= Endress+Hauser Common Data Interface)
2 Commubox FXA291
3 Computer with "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]		Opens the interactive wizard for a guided commissioning of the device. As a rule, no additional settings in the other menus are required after the completion of the wizard.
Setup	Parameter 1 ... Parameter N	When all these parameters have been assigned appropriate values, the measured should be completely configured in a standard application.
	Advanced setup	Contains further submenus and parameters: • 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 needed to identify the device.
	Measured values	Contains all current measured values.
	Data logging	Contains the history of the individual measuring values.
	Simulation	Used to simulate measured values or output values.
	Device check	Contains all parameters needed to check the measurement capability of the device.
Expert [4] Contains all parameters of the device (including those which are already contained in one of the above submenus). This menu is organized according to the function blocks of the device. The parameter of the **Expert** menu are described in: GP01017F (FOUNDATION Fieldbus)	System	Contains all general device parameters which do not affect the measurement or the communication interface.
	Sensor	Contains all parameters needed to configure the measurement.
	Output	Contains all parameters neeed to configure the switch output (PFS).
	Communication	Contains all parameters needed to configure the digital communication interface.
	Diagnostics	Contains all parameters needed to detect and analyze operational errors.

1)   In case of operation via operating tools (e.g. FieldCare), the "Language" parameter is located at "Setup → Advanced setup → Display"
2)   only for operation via a FDT/DTM system
3)   only available with local operation
4)   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 → 🗎 57.

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.

ℹ 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   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" menu → 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" menu → 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.

If no key is pressed for 10 minutes in the navigation and editing mode, the device automatically locks the write-protected parameters. If the user goes from the navigation and editing mode back to the measured value display mode, the device automatically locks the write-protected parameters after 60 s.

- If write access is activated via access code, it can be also be deactivated only via the access code → 🔲 58.
- In the "Description of Device Parameters" documents, each write-protected parameter is identified with the 🔒-symbol.

8.2.4 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 → 🔖 57.

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.

8.2.5 Deactivation of the write protection via access code

Via local display

1. Navigate to "Setup" menu → 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 operating tool (e.g. FieldCare)

1. Navigate to "Setup" menu → Advanced setup → Administration → Define access code

2. Enter **0000**.
   ↳ The write protection is deactivated. Parameters can be changed without entering an access code.

8.2.6 Write protection via write protection switch

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

The parameter values are now read only and cannot be edited any more (exception **"Contrast display" parameter**):
• Via local display
• Via FOUNDATION Fieldbus
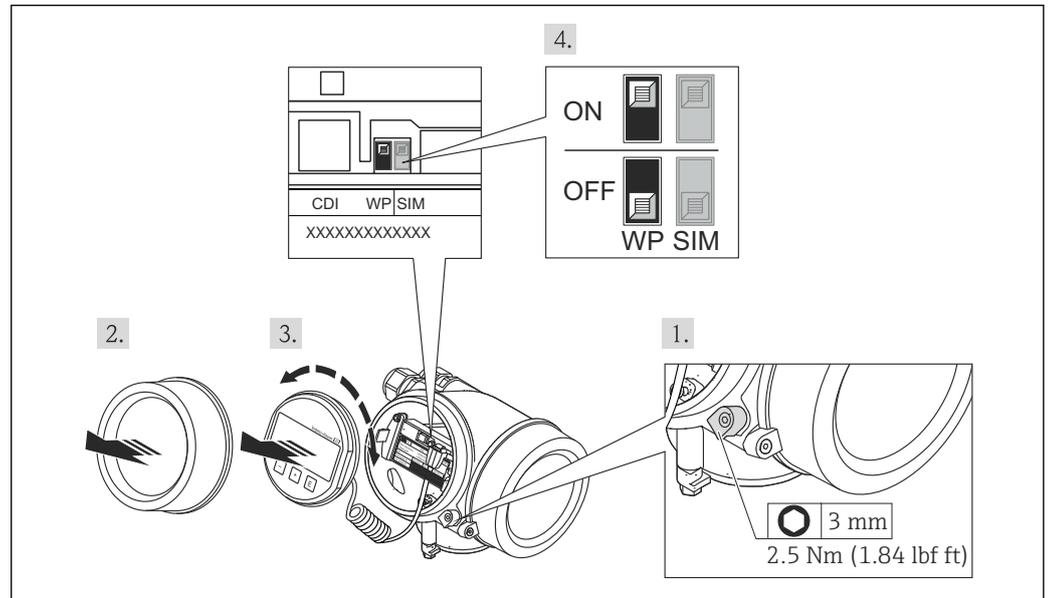
A0021474

1. Loosen the securing clamp.

2. Unscrew the housing cover.

3. Pull out the display module with a gentle rotation movement. To make it easier to access the lock switch, attach the display module to the edge of the electronics compartment.
   ↳ Display module is attached to the edge of the electronics compartment.
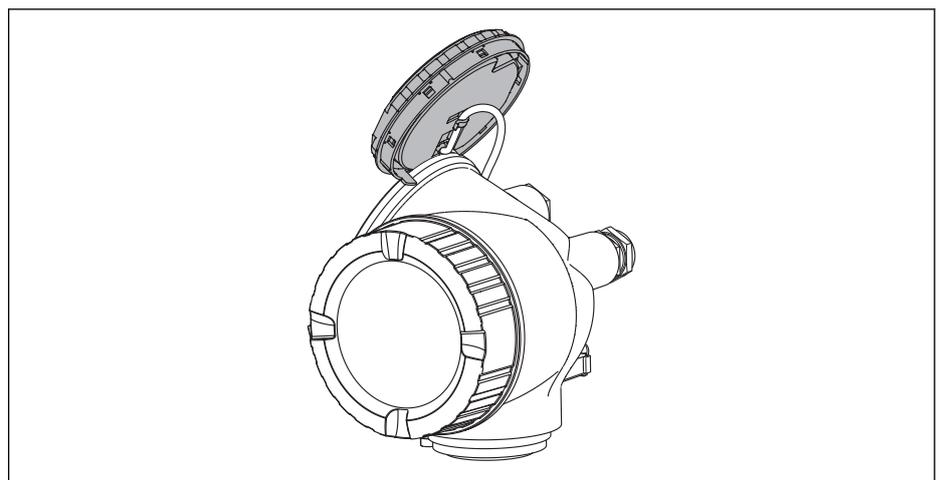
A0013909

4. Installing the lock switch (WP) on the main electronics module in the **ON** position enables the hardware write protection. Installing the lock switch (WP) on the main electronics module in the **OFF** position (factory setting) disables the hardware write protection.

↳ If the hardware write protection is enabled: The **Hardware locked** option is displayed in the **Locking status** parameter. In addition to this, the ⓐ-symbol appears in the header of the measured value display and in the navigation view in front of the parameters.

A0015870
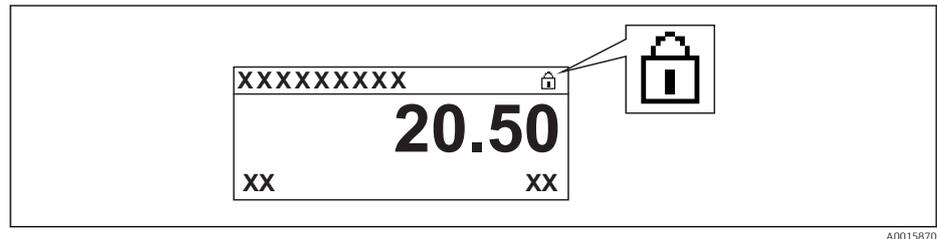
If the hardware write protection is disabled: No option is displayed in the **Locking status** parameter. The ⓐ-symbol disappears in the header of the measured value display and in the navigation view in front of the parameters.

5. Feed the spiral 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. Screw the electronics compartment cover closed and tighten the securing clamp.

8.2.7   Enabling and disabling the keypad lock

The keypad lock allows to disable access to the entire operating menu via local operation. Thus navigating through the operating menu or modifying the values of individual parameters is no longer possible. Only the measured values on the measured value display can be read off.

The keylock is enabled and disabled via a context menu.

Enabling the keylock

For the SD03 display:
The keylock is automatically activated:
• If the device has not been operated via the display for > 1 minute.
• After a restart of the device.

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. Select **Keylock on** from the context menu.
    ↳ The keylock is enabled.

When attempting to access the operating menu while the keylock is enabled, the **Keylock on** message appears.

Disabling the keylock

1. The keylock is enabled.
    Press Ⓔ for at least 2 seconds.
    ↳ A context menu appears.

2. Select **Keylock off** from the context menu.
    ↳ The keylock is disabled.

8.3 Display and operating module

8.3.1 Display appearance
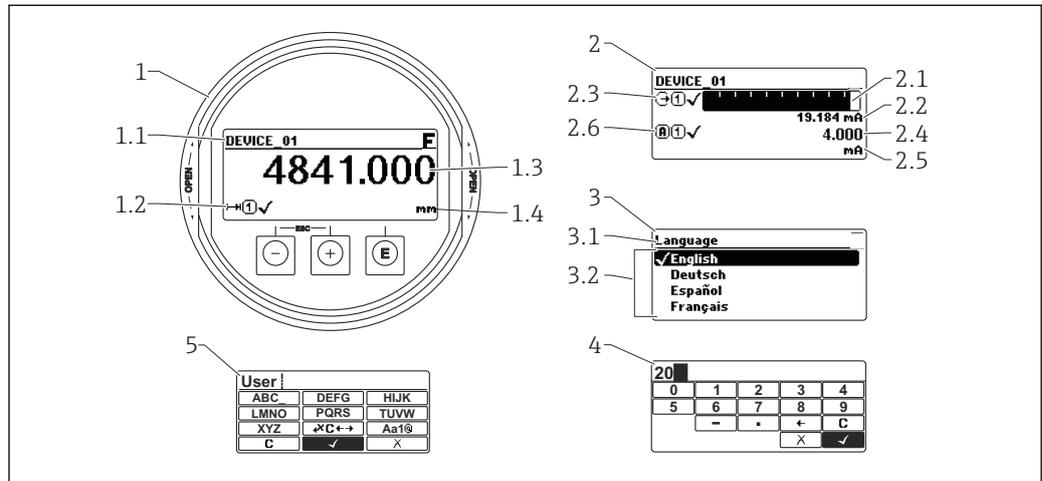
🖾 *19   Appearance of the display and operation module for on-site operation*

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
A0011975	**Display/operation** Is displayed: • in the main menu next to the selection "Display/operation" • in the header, if you are in the "Display/operation" menu
A0011974	**Setup** Is displayed: • in the main menu next to the selection "Setup" • in the header, if you are in the "Setup" menu
A0011976	**Expert** Is displayed: • in the main menu next to the selection "Expert" • in the header, if you are in the "Expert" menu
A0011977	**Diagnostics** Is displayed: • in the main menu next to the selection "Diagnostics" • in the header, if you are in the "Diagnostics" menu

Status signals

Symbol	Meaning
F A0013956	**"Failure"** A device error is present. The measured value is no longer valid.
C A0013959	**"Function check"** The device is in service mode (e.g. during a simulation).
S A0013958	**"Out of specification"** The device is operated: • 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 A0013957	**"Maintenance required"** Maintenance is required. The measured value is still valid.

Display symbols for the locking state

Symbol	Meaning
A0011978	**Display parameter** Marks display-only parameters which can not be edited.
A0011979	**Device locked** • 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	
A0011995	Level
A0011996	Distance
A0011998	Current output
A0011999	Measured current
A0012106	Terminal voltage
A0012104	Temperature of the electronics or the sensor
Measuring channels	
A0012000	Measuring channel 1
A0012107	Measuring channel 2
Status of the measured value	
A0012102	Status "Alarm" The measurment is interrupted. The output assumes the defined alarm value. A diagnostic message is generated.
A0012103	Status "Warning" The device continues measuring. A diagnostic message is generated.

8.3.2 Operating elements

Key	Meaning
⊖ A0013969	**Minus key** *For menu, submenu* Moves the selection bar upwards in a picklist. *For text and numeric editor* In the input mask, moves the selection bar to the left (backwards).
⊕ A0013970	**Plus key** *For menu, submenu* Moves the selection bar downwards in a picklist. *For text and numeric editor* In the input mask, moves the selection bar to the right (forwards).

Ⓔ
 	
 A0013952
	Enter key
	
	 For measured value display
	 • Pressing the key briefly opens the operating menu.
	 • Pressing the key for 2 s opens the context menu.
	
	 For menu, submenu
	 • 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.
	
	 For text and numeric editor
	 • Pressing the key briefly
	   – Opens the selected group.
	   – Carries out the selected action.
	 • Pressing the key for 2 s confirms the edited parameter value.

⊖+⊕
 	
 A0013971
	Escape key combination (press keys simultaneously)
	
	 For menu, submenu
	 • Pressing the key briefly
	   – 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").
	
	 For text and numeric editor
	 Closes the text or numeric editor without applying changes.

⊖+Ⓔ A0013953	**Minus/Enter key combination (press and hold down the keys simultaneously)** Reduces the contrast (brighter setting).
⊕+Ⓔ A0013954	**Plus/Enter key combination (press and hold down the keys simultaneously)** Increases the contrast (darker setting).
⊖+⊕+Ⓔ A0013955	**Minus/Plus/Enter key combination (press and hold down the keys simultaneously)** *For measured value display* Enables or disables the keypad lock.

8.3.3 Entering numbers and text

Numeric editor	Text editor

1 Editing view
2 Display area of the entered values
3 Input mask
4 Operating elements
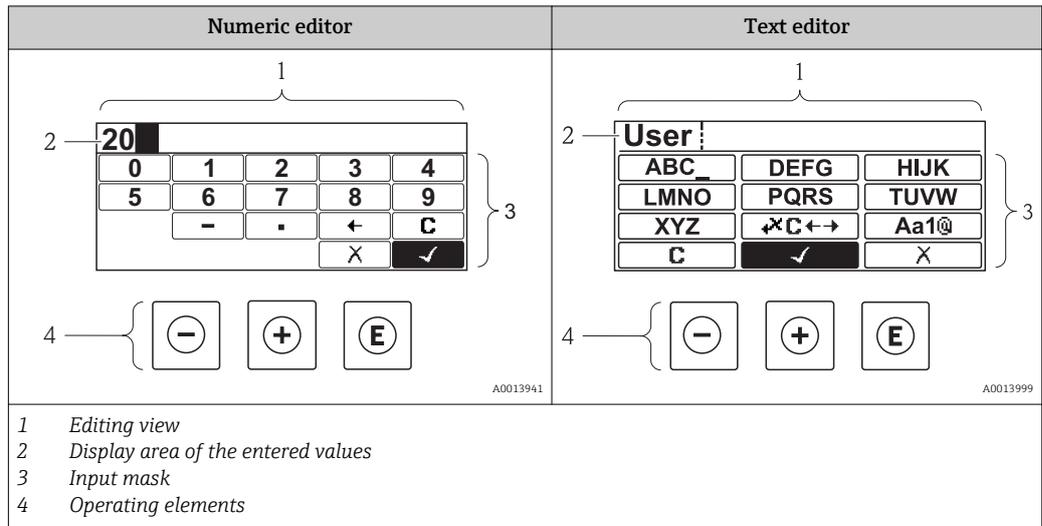
Input mask

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

Numeric editor symbols

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

Text editor symbols

Symbol	Meaning
	Selection of letters from A to Z
	Toggle • Between upper-case and lower-case letters • For entering numbers • For entering special characters

✓ A0013985	Confirms selection.
✗C←→ A0013987	Switches to the selection of the correction tools.
✗ A0013986	Exits the input without applying the changes.
C A0014040	Clears all entered characters.

Correction symbols under ✗C←→	
C A0013989	Clears all entered characters.
→ A0013991	Moves the input position one position to the right.
← A0013990	Moves the input position one position to the left.
✗ A0013988	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.
• Simulation

Calling up and closing the context menu

The user is in the operational display.

1. Press Ⓔ for 2 s.
    ↳ The context menu opens.
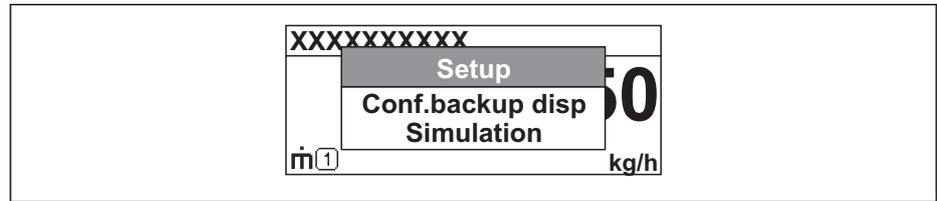
2. Press ⊟ + ⊞ simultaneously.
    ↳ The context menu is closed and the operational display appears.

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:
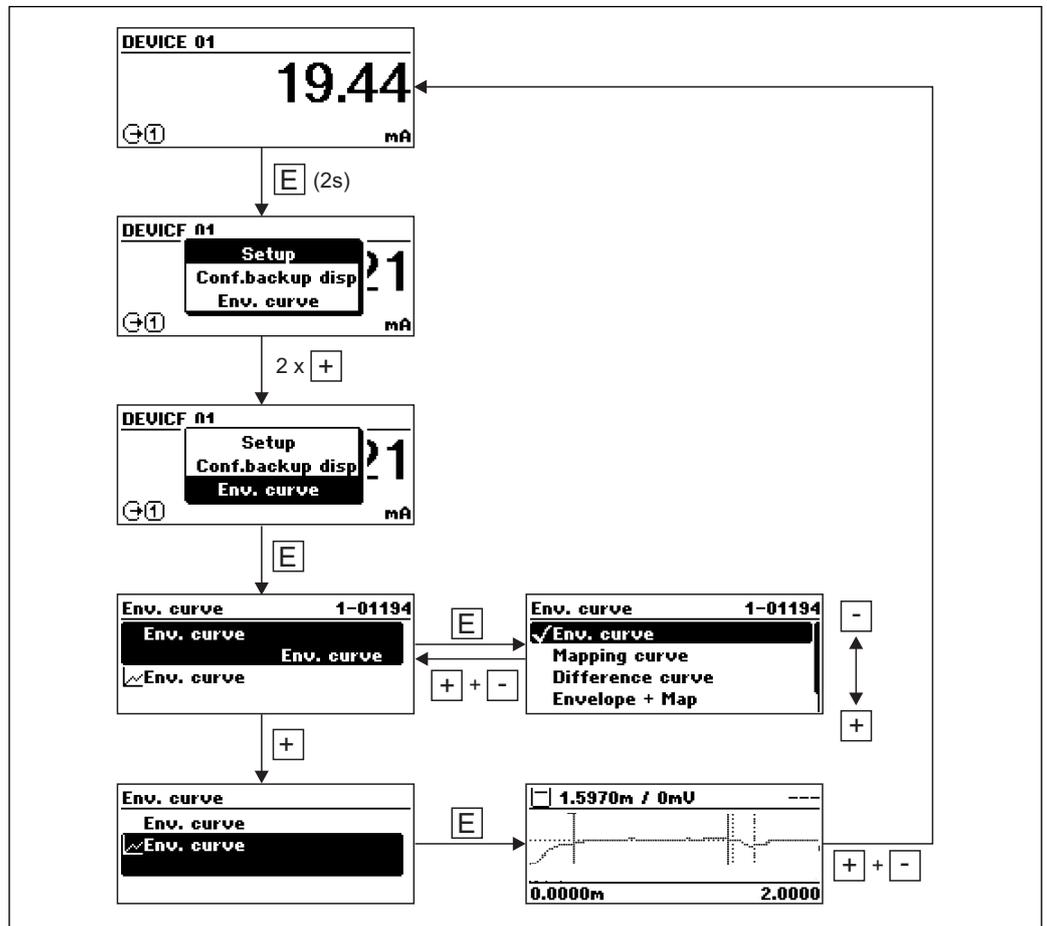
A0014277

9 Integration into a FOUNDATION Fieldbus network

9.1 Device Description (DD)

You require the following to configure a device and integrate it into an FF network:
- An FF configuration program
- The Cff file (Common File Format: *.cff)
- The device description (DD) in one of the following formats
  - Device Description format 4 : *sym, *ffo
  - Device Description format 5 : *sy5, *ff5

Information on the device-specific DD

Manufacturer ID	452B48hex
Device Type	100Fhex
Device Revision	05hex
DD Revision	Information and files at:
CFF Revision	• www.endress.com • www.fieldbus.org

9.2 Integration into the FOUNDATION Fieldbus network

- For more in-depth information on integrating the device into the FF system, see the description for the configuration software used.
- When integrating the field devices into the FF system, make sure you are using the right files. You can read out the required version by means of the Device Revision/ DEV_REV and DD Revision/ DD_REV parameters in the Resource Block.

The device is integrated into the FF network as follows:

1. Start the FF configuration program.
2. Download the Cff and device description files (*.ffo, *.sym (for format 4) *ff5, *sy5 (for format 5) to the system.
3. Configure the interface.
4. Configure the device for the measuring task and for the FF system.

9.3 Device identification and addressing

FOUNDATION Fieldbus identifies the device using its ID code (Device ID) and automatically assigns it a suitable field address. The identity code cannot be changed. The device appears in the network display once you have started the FF configuration program and integrated the device into the network. The blocks available are displayed under the device name.

If the device description has not yet been loaded, the blocks report "Unknown" or "(UNK)".
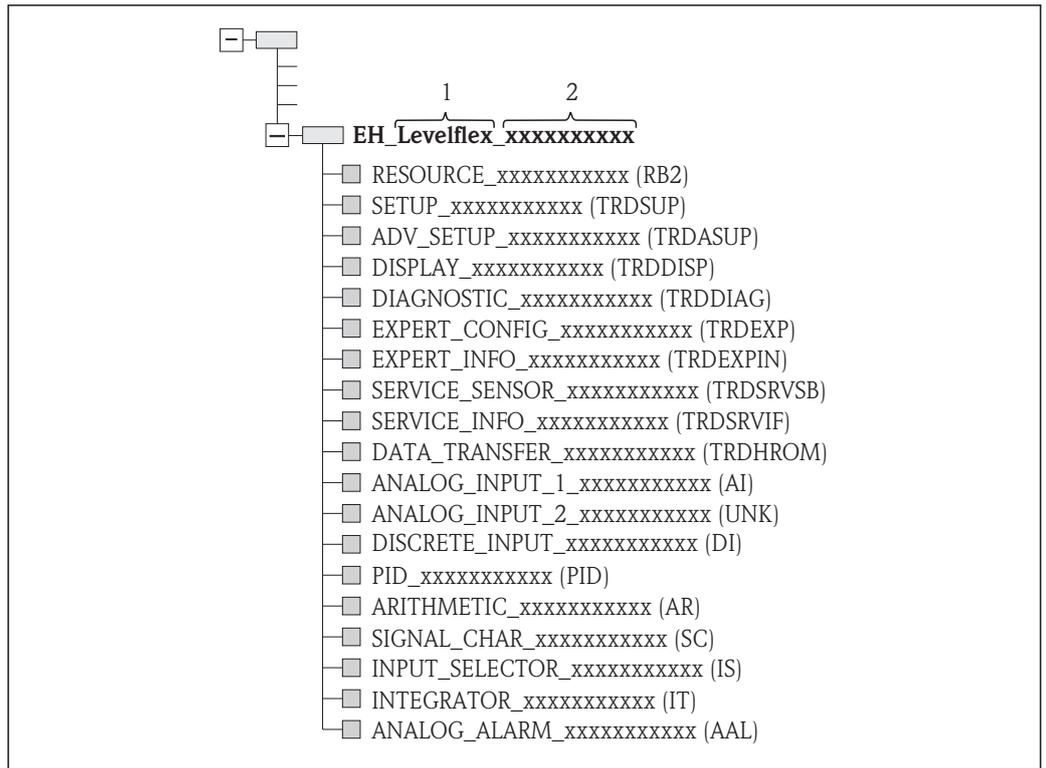
A0017208

▣ 20 Typical display in a configuration program after the connection has been established

1 Device name
2 Serial number

9.4 Block model

9.4.1 Blocks of the device software

The device has the following blocks:
- Resource Block (device block)
- Transducer Blocks
  - Setup Transducer Block (TRDSUP)
  - Advanced Setup Transducer Block (TRDASUP)
  - Display Transducer Block (TRDDISP)
  - Diagnostic Transducer Block (TRDDIAG)
  - Expert Configuration Transducer Block (TRDEXP)
  - Expert Information Transducer Block (TRDEXPIN)
  - Service Sensor Transducer Block (TRDSRVSB)
  - Service Information Transducer Block (TRDSRVIF)
  - Data Transfer Transducer Block (TRDHROM)
- Function Blocks
  - 2 Analog Input Blocks (AI)
  - 1 Discrete Input Block (DI)
  - 1 PID Block (PID)
  - 1 Arithmetic Block (AR)
  - 1 Signal Characterizer Block (SC)
  - 1 Input Selector Block (IS)
  - 1 Integrator Block (IT)
  - 1 Analog Alarm Block (AAL)

In addition to the pre-instantiated blocks already mentioned, the following blocks can also be instantiated:
• 5 Analog Input Blocks (AI)
• 2 Discrete Input Blocks (DI)
• 3 PID Blocks (PID)
• 3 Arithemetic Blocks (AR)
• 2 Signal Characterizer Blocks (SC)
• 5 Input Selector Blocks (IS)
• 3 Integrator Blocks (IT)
• 2 Analog Alarm Blocks (AAL)

Up to 20 blocks can be instantiated in the device altogether, including the blocks already instantiated. For instantiating blocks, see the appropriate Operating Instructions of the configuration program used.

Endress+Hauser Guideline BA00062S.

The guideline provides an overview of the standard function blocks that are described in FOUNDATION Fieldbus Specifications FF 890 - 894. It is designed to help operators use the blocks implemented in the Endress+Hauser field devices.

9.4.2 Block configuration when device is delivered
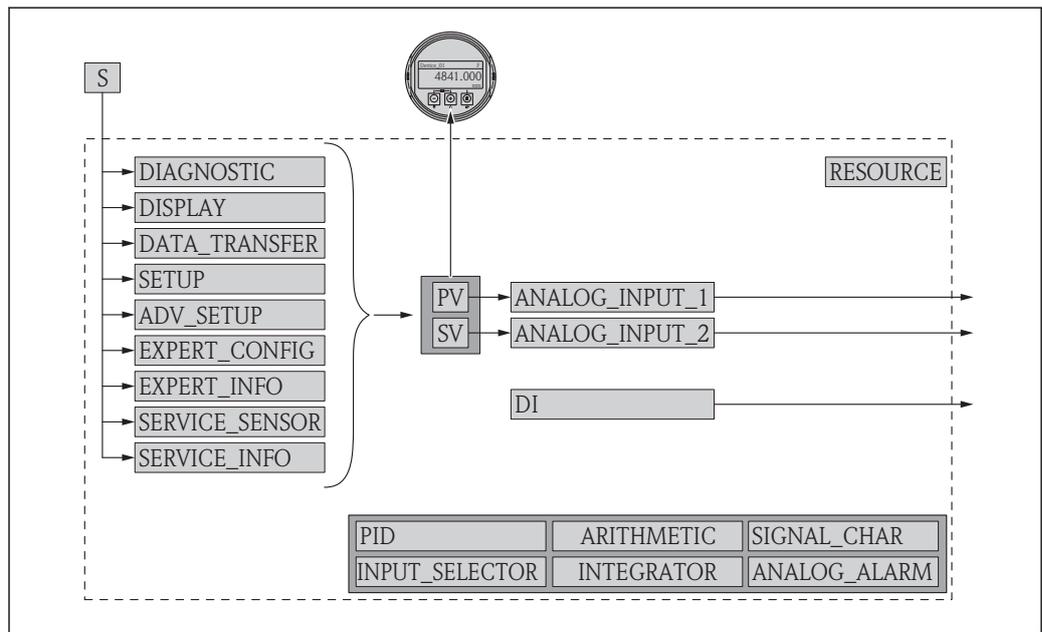
🖻 *21   Block configuration when device is delivered*

S   Sensor
PV   Primary value: Level linearized
SV   Secondary value: Distance

9.5   Assignment of the measured values (CHANNEL) in an AI Block

The input value of an Analog Input Block is defined by the **CHANNEL** parameter.

Channel	Measured value
0	Uninitialized
89	Measured capacitance
144	EOP shift

Channel	Measured value
145	Interface distance
172	Calculated DC value
211	Terminal voltage
212	Sensor debug
32785	Absolute EOP amplitude
32786	Absolute echo amplitude
32787	Absolute interface amplitude
32856	Distance
32885	Elektronic temperature
32938	Interface linearized
32949	Level linearized
33044	Relative echo amplitude
33045	Relative interface amplitude
33070	Noise of signal
33107	Upper interface thickness

9.6   Index tables of Endress+Hauser parameters

The following tables list the manufacturer-specific device parameters for the Resource Blocks. For the FOUNDATION Fieldbus parameters, see the document BA062S "Guidline - FOUNDATION Fieldbus Function Blocks", which can be downloaded from www.endress.com.

9.6.1   Setup Transducer Block

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
bin_type	Bin type	54	ENUM16	2	Static	x	OOS	
confirm_distance	Confirm distance	82	ENUM16	2	Static	x	OOS	
filtered_dist_val	Distance	76	FLOAT	4	Dynamic			
interface_distance	Interface distance	79	FLOAT	4	Dynamic			
map_end_x	Present mapping	84	FLOAT	4	Dynamic			
mapping_end_point	Mapping end point	83	FLOAT	4	Static	x	AUTO	
record_map	Record map	86	ENUM16	2	Static	x	OOS	
operating_mode	Operating mode	50	ENUM16	2	Static	x	OOS	
signal_quality	Signal quality	81	ENUM16	2	Dynamic			
medium_group	Medium group	55	ENUM16	2	Static	x	OOS	
tank_level	Tank level	66	ENUM16	2	Static	x	OOS	
tank_type	Tank type	52	ENUM16	2	Static	x	OOS	
tube_diameter	Tube diameter	53	FLOAT	4	Static	x	OOS	
dc_value	DC value	68	ENUM16	2	Static	x	OOS	
distance_to_upper_connection	Distance to upper connection	67	FLOAT	4	Static	x	OOS	
empty_calibration	Empty calibration	56	FLOAT	4	Static	x	OOS	
full_calibration	Full calibration	57	FLOAT	4	Static	x	OOS	

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
distance_unit	Distance unit	51	ENUM16	2	Static	x	OOS	
interface	Interface	70	FLOAT	4	Dynamic			
level_unit	Level unit	58	ENUM16	2	Static	x	OOS	
output_unit_after_linearization	Unit after linearization	62	ENUM16	2	Static			
level_linearized	Level linearized	64	FLOAT	4	Dynamic			
present_probe_length	Present probe length	87	FLOAT	4	Dynamic	x	AUTO	
level	Level	60	FLOAT	4	Dynamic			
interface_linearized	Interface linearized	73	FLOAT	4	Dynamic			
decimal_places_menu_ro	Decimal places menu	93	ENUM16	2	Static	x	AUTO	
locking_status	Locking status	96	BIT_ENUM16	2	Dynamic			
medium_type_ro	Medium type	92	ENUM16	2	Static	x	OOS	

9.6.2 Advanced Setup Transducer Block

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
calculated_dc_value	Calculated DC value	61	FLOAT	4	Dynamic			
blocking_distance	Blocking distance	55	FLOAT	4	Static	x	OOS	
interface_property	Interface property	57	ENUM16	2	Static	x	OOS	
dc_value_lower_medium	DC value lower medium	58	FLOAT	4	Static	x	OOS	
medium_type	Medium type	50	ENUM16	2	Static	x	OOS	
present_probe_length_ro	Present probe length	80	FLOAT	4	Dynamic	x	AUTO	
confirm_probe_length	Confirm probe length	79	ENUM16	2	Static	x	OOS	
process_property	Process property	52	ENUM16	2	Static	x	OOS	
advanced_process_conditions	Advanced process conditions	53	ENUM16	2	Static	x	OOS	
meas_upper_iface_thickness	Measured upper interface thickness	60	FLOAT	4	Dynamic			
manual_interface_thickness	Manual interface thickness	59	FLOAT	4	Static	x	OOS	
medium_property	Medium property	51	ENUM16	2	Static	x	OOS	
use_calculated_dc_value	Use calculated DC value	62	ENUM16	2	Static	x	OOS	
linearization_type	Linearization type	71	ENUM16	2	Static	x	OOS	
activate_table	Activate table	70	ENUM16	2	Static	x	OOS	
table_mode	Table mode	69	ENUM16	2	Static	x	OOS	
custom_table_sel_level	Level	73	FLOAT	4	Static	x	OOS	
custom_table_sel_value	Customer value	74	FLOAT	4	Static	x	OOS	
unit_after_linearization	Unit after linearization	63	ENUM16	2	Static	x	OOS	
free_text	Free text	64	STRING		Static	x	AUTO	
diameter	Diameter	66	FLOAT	4	Static	x	OOS	
output_echo_lost	Output echo lost	76	ENUM16	2	Static	x	OOS	
intermediate_height	Intermediate height	67	FLOAT	4	Static	x	AUTO	

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
level_correction	Level correction	56	FLOAT	4	Static	x	OOS	
level_unit_ro	Level unit	54	ENUM16	2	Static	x	OOS	
assign_limit	Assign limit	82	ENUM16	2	Static	x	AUTO	
maximum_value	Maximum value	65	FLOAT	4	Static	x	OOS	
assign_diag_behavior	Assign diagnostic behavior	83	ENUM16	2	Static	x	AUTO	
value_echo_lost	Value echo lost	77	FLOAT	4	Static	x	OOS	
ramp_at_echo_lost	Ramp at echo lost	78	FLOAT	4	Static	x	OOS	
switch_output_failure_mode	Switch output failure mode	88	ENUM16	2	Static	x	AUTO	
switch_output_function	Switch output function	81	ENUM16	2	Static	x	AUTO	
switch_status	Switch status	89	ENUM16	2	Dynamic			
switch_off_delay	Switch-off delay	87	FLOAT	4	Static	x	AUTO	
switch_off_value	Switch-off value	86	FLOAT	4	Static	x	AUTO	
switch_on_delay	Switch-on delay	85	FLOAT	4	Static	x	AUTO	
switch_on_value	Switch-on value	84	FLOAT	4	Static	x	AUTO	
operating_mode_ro	Operating mode	95	ENUM16	2	Static	x	OOS	
table_number	Table number	68	UINT8	1	Static	x	OOS	
level_semiautomatic	Level	75	FLOAT	4	Dynamic			
assign_status	Assign status	91	ENUM16	2	Static	x	AUTO	
locking_status	Locking status	99	BIT_ENUM16	2	Dynamic			
decimal_places_menu	Decimal places menu	93	ENUM16	2	Static	x	AUTO	
distance_unit_ro	Distance unit	92	ENUM16	2	Static	x	OOS	

9.6.3   Display Transducer Block

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
access_status_display	Access status display	51	ENUM16	2	Static			
display_damping	Display damping	65	FLOAT	4	Static	x	AUTO	
display_interval	Display interval	64	FLOAT	4	Static	x	AUTO	
header	Header	66	ENUM16	2	Static	x	AUTO	
format_display	Format display	55	ENUM16	2	Static	x	AUTO	
number_format	Number format	69	ENUM16	2	Static	x	AUTO	
display_separator	Separator	68	ENUM16	2	Static	x	AUTO	
language	Language	54	ENUM16	2	Static	x	AUTO	
contrast_display	Contrast display	71	FLOAT	4	Static	x	AUTO	
header_text	Header text	67	STRING		Static	x	AUTO	
access_code_for_display	Enter access code	52	UINT16	2	Static	x	AUTO	
configuration_management	Configuration management	75	ENUM16	2	Static	x	AUTO	
decimal_places_1	Decimal places 1	57	ENUM16	2	Static	x	AUTO	
decimal_places_2	Decimal places 2	59	ENUM16	2	Static	x	AUTO	
decimal_places_3	Decimal places 3	61	ENUM16	2	Static	x	AUTO	

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
decimal_places_4	Decimal places 4	63	ENUM16	2	Static	x	AUTO	
last_backup	Last backup	74	STRING		Static	x	AUTO	
value_1_display	Value 1 display	56	ENUM16	2	Static	x	AUTO	
value_2_display	Value 2 display	58	ENUM16	2	Static	x	AUTO	
value_3_display	Value 3 display	60	ENUM16	2	Static	x	AUTO	
value_4_display	Value 4 display	62	ENUM16	2	Static	x	AUTO	
locking_status_display	Locking status	50	ENUM16	2	Static			
define_access_code	Define access code	53	UINT16	2	Static	x	AUTO	
comparison_result	Comparison result	76	ENUM16	2	Static	x	AUTO	
decimal_places_menu	Decimal places menu	70	ENUM16	2	Static	x	AUTO	
operating_time	Operating time	73	STRING		Dynamic			
operating_mode_ro	Operating mode	83	ENUM16	2	Static	x	OOS	
locking_status	Locking status	85	BIT_ENUM16	2	Dynamic			

9.6.4 Diagnostic Transducer Block

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
operating_time	Operating time	55	STRING		Dynamic			
diagnostics_1	Diagnostics 1	56	UINT32	4	Static			
diagnostics_2	Diagnostics 2	58	UINT32	4	Static			
diagnostics_3	Diagnostics 3	60	UINT32	4	Static			
diagnostics_4	Diagnostics 4	62	UINT32	4	Static			
diagnostics_5	Diagnostics 5	64	UINT32	4	Static			
operating_time_from_restart	Operating time from restart	54	STRING		Dynamic			
launch_signal	Launch signal	81	ENUM16	2	Dynamic			
start_device_check	Start device check	77	ENUM16	2	Static	x	AUTO	
interface_signal	Interface signal	82	ENUM16	2	Dynamic			
level_signal	Level signal	80	ENUM16	2	Dynamic			
simulation_device_alarm	Simulation device alarm	75	ENUM16	2	Static	x	OOS	
filter_options	Filter options	66	ENUM8	1	Static	x	AUTO	
previous_diagnostics	Previous diagnostics	52	UINT32	4	Static			
actual_diagnostics	Actual diagnostics	50	UINT32	4	Static			
assign_sim_meas	Assign measurement variable	71	ENUM16	2	Static	x	OOS	
sim_value_process_variable	Value process variable	72	FLOAT	4	Static	x	OOS	
switch_output_simulation	Switch output simulation	73	ENUM16	2	Static	x	OOS	
sim_switch_status	Switch status	74	ENUM16	2	Static	x	OOS	
result_device_check	Result device check	78	ENUM16	2	Dynamic			
last_check_time	Last check time	79	STRING		Dynamic			
linearization_type	Linearization type	84	ENUM16	2	Static	x	OOS	
unit_after_linearization_ro	Free text	85	STRING		Static	x	AUTO	

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
decimal_places_menu	Decimal places menu	88	ENUM16	2	Static	x	AUTO	
level_unit_ro	Level unit	90	ENUM16	2	Static	x	OOS	
operating_mode_ro	Operating mode	91	ENUM16	2	Static	x	OOS	
assign_channel_1	Assign channel 1	92	ENUM16	2	Static	x	AUTO	
assign_channel_2	Assign channel 2	93	ENUM16	2	Static	x	AUTO	
assign_channel_3	Assign channel 3	94	ENUM16	2	Static	x	AUTO	
assign_channel_4	Assign channel 4	95	ENUM16	2	Static	x	AUTO	
clear_logging_data	Clear logging data	97	ENUM16	2	Static	x	AUTO	
logging_interval	Logging interval	96	FLOAT	4	Static	x	AUTO	
display_filter_options	Filter options	99	ENUM8	1	Static	x	AUTO	
locking_status	Locking status	108	BIT_ENUM16	2	Dynamic			
distance_unit_ro	Distance unit	89	ENUM16	2	Static	x	OOS	

9.6.5 Expert Configuration Transducer Block

ℹ️ The parameters of the **Expert Configuration Transducer Block** are described in GP01015F: "Levelflex FMP5x - Description of Device Parameters - FOUNDATION Fieldbus"

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
acknowledge_alarm	Acknowledge alarm	81	ENUM16	2	Static	x	AUTO
integration_time	Integration time	67	FLOAT	4	Static	x	OOS
result_self_check	Result self check	77	ENUM16	2	Dynamic		
start_self_check	Start self check	76	ENUM16	2	Static	x	AUTO
broken_probe_detection	Broken probe detection	75	ENUM16	2	Static	x	AUTO
gpc_mode	GPC mode	68	ENUM16	2	Static	x	OOS
reference_echo_threshold	Reference echo threshold	73	FLOAT	4	Static	x	OOS
const_gpc_factor	Const. GPC factor	74	FLOAT	4	Static	x	OOS
build_up_ratio	Build-up ratio	90	FLOAT	4	Dynamic		
build_up_threshold	Build-up thres.	91	FLOAT	4	Static	x	AUTO
delay_time_echo_lost	Delay time echo lost	78	FLOAT	4	Static	x	AUTO
empty_capacity	Empty capacity	92	FLOAT	4	Static	x	AUTO
external_pressure_selector	External pressure selector	69	ENUM16	2	Static	x	OOS
measured_capacity	Measured capacitance	89	FLOAT	4	Dynamic		
gas_phase_compens_factor	Gas phase compensation factor	70	FLOT	4	Static	x	OOS
in_safety_distance	In safety distance	80	ENUM16	2	Static	x	OOS
ratio_amplitude_interface_level	Ratio amplitude interface/level	86	FLOAT	4	Static	x	OOS
interface_criterion	Interface criterion	87	FLOAT	4	Dynamic		
control_measurement	Measurement	106	ENUM16	2	Static	x	AUTO
control_measurement	Control measurement	105	ENUM16	2	Static	x	AUTO
filter_dead_time	Dead time	66	FLOAT	4	Static	x	OOS
present_reference_distance	Present reference distance	72	FLOAT	4	Dynamic		
history_reset	History reset	83	ENUM16	2	Static	x	OOS
safety_distance	Safety distance	79	FLOAT	4	Static	x	OOS

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
history_learning_control	History learning	85	ENUM16	2	Static	x	AUTO
history_learning_control	History learning control	84	ENUM16	2	Static	x	AUTO
sensor_module	Sensor module	107	ENUM16	2	Static		
evaluation_mode	Evaluation mode	82	ENUM16	2	Static	x	OOS
thin_interface	Thin interface	88	ENUM16	2	Static	x	OOS
calculated_dc_value	Calculated DC value	59	FLOAT	4	Dynamic	x	AUTO
dc_value_expert	DC value	55	FLOAT	4	Static	x	OOS
distance_offset	Distance offset	60	FLOAT	4	Static	x	OOS
level_limit_mode	Level limit mode	62	ENUM16	2	Static	x	OOS
level_high_limit	High limit	63	FLOAT	4	Static	x	OOS
level_low_limit	Low limit	64	FLOAT	4	Static	x	OOS
output_mode	Output mode	65	ENUM16	2	Static	x	OOS
level_external_input_1	Level external input 1	93	ENUM16	2	Static	x	AUTO
level_external_input_2	Level external input 2	96	ENUM16	2	Static	x	AUTO
function_input_1_level	Function Input 1 Level	94	ENUM16	2	Static	x	AUTO
function_input_2_level	Function Input 2 Level	97	ENUM16	2	Static	x	AUTO
fixed_value_inp_1	Fixed value inp.1	95	FLOAT	4	Static	x	AUTO
fixed_value_inp_2	Fixed value inp.2	98	FLOAT	4	Static	x	AUTO
interface_external_input_1	Interface external input 1	99	ENUM16	2	Static	x	OOS
interface_external_input_2	Interface external input 2	102	ENUM16	2	Static	x	OOS
function_input_1_interface	Function input 1 interface	100	ENUM16	2	Static	x	OOS
function_input_2_interface	Function input 2 interface	103	ENUM16	2	Static	x	OOS
fixed_value_input_1_interface	Fixed value input 1 interface	101	FLOAT	4	Static	x	OOS
fixed_value_input_2_interface	Fixed value input 2 interface	104	FLOAT	4	Static	x	OOS
distance_unit_ro	Distance unit	53	ENUM16	2	Static	x	OOS
level_unit_ro	Level unit	61	ENUM16	2	Static	x	OOS
operating_mode_ro	Operating mode	54	ENUM16	2	Static	x	OOS
enter_access_code	Enter access code	52	UINT16	2	Static	x	AUTO
locking_status	Locking status	50	BIT_ENUM16	2	Dynamic		
access_status_tooling	Access status tooling	51	ENUM16	2	Static		
reference_distance	Reference distance	71	FLOAT	4	Static	x	OOS
sw_option_active_overview	SW option active overview	110	BIT_ENUM32	4	Static		
decimal_places_menu	Decimal places menu	109	ENUM16	2	Static	x	AUTO
fieldbus_type	Fieldbus Type	111	ENUM8	1	Static		
interface_property_ro	Interface property	108	ENUM16	2	Static	x	OOS
medium_type_ro	Medium type	112	ENUM16	2	Static	x	OOS
eop_level_evaluation_ro	EOP level evaluation	113	ENUM16	2	Static	x	OOS
sensor_type_ro	Sensor type	114	ENUM16	2	Static	x	OOS
calculated_dc_status_en	Status	58	ENUM8	1	Dynamic		

9.6.6　Expert Information Transducer Block

The parameters of the **Expert Information Transducer Block** are described in GP01015F: "Levelflex FMP5x - Description of Device Parameters - FOUNDATION Fieldbus"

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
abs_echo_amp_val	Absolute echo amplitude	51	FLOAT	4	Dynamic		
abs_eop_amp_val	Absolute EOP amplitude	55	FLOAT	4	Dynamic		
absolute_interface_amplitude	Absolute interface amplitude	58	FLOAT	4	Dynamic		
application_parameter	Application parameter	74	ENUM16	2	Dynamic		
electronic_temp_value	Electronic temperature	66	FLOAT	4	Dynamic		
eop_shift_value	EOP shift	69	FLOAT	4	Dynamic		
found_echoes	Found echoes	71	ENUM16	2	Dynamic		
max_electr_temp	Max. electronics temperature	73	FLOAT	4	Dynamic	x	AUTO
time_max_electr_temp	Time max. electronics temperature	75	STRING		Dynamic		
measurement_frequency	Measurement frequency	76	FLOAT	4	Dynamic		
min_electr_temp	Min. electronics temperature	77	FLOAT	4	Dynamic	x	AUTO
time_min_electr_temp	Time min. electronics temperature	78	STRING		Dynamic		
rel_echo_amp_val	Relative echo amplitude	53	FLOAT	4	Dynamic		
relative_interface_amplitude	Relative interface amplitude	60	FLOAT	4	Dynamic		
reset_min_max_temp	Reset min./max. temp.	79	ENUM16	2	Static	x	AUTO
noise_signal_val	Noise of signal	63	FLOAT	4	Dynamic		
used_calculation	Used calculation	80	ENUM16	2	Dynamic		
tank_trace_state	Tank trace state	81	ENUM16	2	Dynamic		
max_draining_speed	Max. draining speed	82	FLOAT	4	Dynamic	x	AUTO
max_filling_speed	L max. fill speed	83	FLOAT	4	Dynamic	x	AUTO
time_max_level	Time max. level	84	STRING		Dynamic		
max_level_value	Max. level value	85	FLOAT	4	Dynamic	x	AUTO
time_min_level	Time min. level	86	STRING		Dynamic		
min_level_value	Min. level value	87	FLOAT	4	Dynamic	x	AUTO
reset_min_max	Reset min./max.	94	ENUM16	2	Static	x	AUTO
interf_max_drain_speed	I max. drain speed	88	FLOAT	4	Dynamic	x	AUTO
interf_max_fill_speed	I max. fill speed	89	FLOAT	4	Dynamic	x	AUTO
time_max_interface	Time max. interface	90	STRING		Dynamic		
max_interface_value	Max. interface value	91	FLOAT	4	Dynamic	x	AUTO
time_min_interface	Time min. interface	92	STRING		Dynamic		
min_interface_value	Min. interface value	93	FLOAT	4	Dynamic	x	AUTO
application_parameter	Application parameter	95	ENUM16	2	Dynamic		
operating_mode_ro	Operating mode	108	ENUM16	2	Static	x	OOS
temperature_unit	Temperature unit	72	ENUM16	2	Static	x	AUTO
activate_sw_option	Activate SW option	110	UINT32	4	Static	x	AUTO
target_echo_status	Status	56	ENUM8	1	Dynamic		
iface_target_echo_status	Status	61	ENUM8	1	Dynamic		
signal_noise_status	Status	64	ENUM8	1	Dynamic		

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
sens_temp_status	Status	67	ENUM8	1	Dynamic		
eop_shift_status	Status	70	ENUM8	1	Dynamic		
terminal_voltage_1	Terminal voltage 1	97	FLOAT	4	Dynamic		
calculated_dc_value	Calculated DC value	100	FLOAT	4	Dynamic	x	AUTO
upper_interface_thickness	Upper interface thickness	103	FLOAT	4	Dynamic		
debug_value	Debug value	106	FLOAT	4	Dynamic	x	AUTO
sw_option_active_overview	SW option active overview	111	BIT_ENUM32	4	Static		
locking_status	Locking status	113	BIT_ENUM16	2	Dynamic		
decimal_places_menu_ro	Decimal places menu	109	ENUM16	2	Static	x	AUTO
linearization_type	Linearization type	104	ENUM16	2	Static	x	OOS
eop_level_evaluation	EOP level evaluation	112	ENUM16	2	Static	x	OOS
access_status_tooling	Access status tooling	114	ENUM16	2	Static		
calculated_dc_status	Status	99	UINT8	1	Dynamic		
status_up_iface_thickness	Customized upper phase thickness status	102	UINT8	1	Dynamic		
debug_status		107	UINT8	1	Dynamic	x	AUTO

9.6.7 Service Sensor Transducer Block

The parameters of the **Service Sensor** Transducer Block can only be operated by authorized Endress+Hauser service personnel.

9.6.8 Service Information Transducer Block

The parameters of the **Service Information** Transducer Block can only be operated by authorized Endress+Hauser service personnel.

9.6.9 Data Transfer Transducer Block

The parameters of the **Data Transfer Transducer Block** are described in GP01015F: "Levelflex FMP5x - Description of Device Parameters - FOUNDATION Fieldbus"

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
used_calculation	Used calculation	87	ENUM16	2	Dynamic		
bdt_cfg_rdwr_ctrl		101	UINT16	2	Static	x	AUTO
bdt_transferred_ctrl		102	BYTEARRAY		Static	x	AUTO
bdt_data_trans		103	BYTEARRAY		Static	x	AUTO
bdt_prepare		99	BYTEARRAY		Static	x	AUTO
bdt_status		100	BYTEARRAY		Static		
sw_option_active_overview	SW option active overview	98	BIT_ENUM32	4	Static		
digits_at_0_mVdB		90	FLOAT	4	Dynamic	x	AUTO
digits_per_mVdB		91	FLOAT	4	Dynamic	x	AUTO
actual_diagnostics	Actual diagnostics	97	UINT32	4	Static		
electric_probe_length	Electric probe length	92	FLOAT	4	Dynamic		
empty_calibration_ro	Empty calibration	93	FLOAT	4	Static	x	OOS
full_calibration_ro	Full calibration	94	FLOAT	4	Static	x	OOS

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
distance_unit_ro	Distance unit	95	ENUM16	2	Static	x	OOS
operating_mode_ro	Operating mode	88	ENUM16	2	Static	x	OOS
present_probe_length_ro	Present probe length	89	FLOAT	4	Dynamic	x	AUTO
trend_operation_hours		104	UINT32	4	Static		
trend_package_size		105	UINT8	1	Static	x	AUTO
trend_storage_time	Trend storage time	106	UINT32	4	Static		
trend_sup_pack_size		107	UINT8	1	Static		
gpc_mode_ro	GPC mode	109	ENUM16	2	Static	x	OOS
eop_level_evaluation_ro	EOP level evaluation	110	ENUM16	2	Static	x	OOS
temperature_unit_ro	Temperature unit	111	ENUM16	2	Static	x	OOS
max_trend_entries		108	UINT16	2	Static		
line_mapping_point_number	Line mapping point number	126	UINT16	2	Static	x	AUTO
line_mapping_array_x	Line mapping array X	127	FLOAT	4	Static	x	AUTO
line_mapping_array_y	Line mapping array Y	128	FLOAT	4	Static	x	AUTO
mapping_end_point_ro	Mapping end point	125	FLOAT	4	Static	x	AUTO
mapping_start_point	Mapping start point	124	FLOAT	4	Static	x	AUTO
function_block_table		143	UINT32	4	Static		
custom_empty_value		112	FLOAT	4	Static		
custom_full_value		113	FLOAT	4	Static		
customized	Customized	121	UINT8	1	Static		
reset_ordered_configuration	Reset ordered configuration	122	ENUM16	2	Static	x	AUTO
empty_scale		114	FLOAT	4	Static	x	AUTO
eop_map_point_number		116	UINT16	2	Static	x	AUTO
factory_data_valid		123	UINT8	1	Static		
fieldbus_type	Fieldbus Type	144	ENUM8	1	Static		
full_scale		115	FLOAT	4	Static	x	AUTO
init_map_point_number		117	UINT16	2	Static	x	AUTO
max_not_assoc_track		118	UINT16	2	Static	x	AUTO
ref_max_dist	Ref max. dist.	119	FLOAT	4	Static	x	AUTO
ref_min_dist	Ref min. dist.	120	FLOAT	4	Static	x	AUTO
line_mapping_accuracy	Line mapping accuracy	130	FLOAT	4	Static	x	AUTO
mapping_curve_left_margin	Mapping curve left margin	131	FLOAT	4	Static	x	AUTO
device_calib_changed		133	ENUM16	2	Static	x	AUTO
echo_thresh_attenuat_const_ee	Threshold attenuation constant	134	FLOAT	4	Dynamic	x	AUTO
echo_threshold_far_ee		135	FLOAT	4	Static	x	AUTO
echo_thresh_inactive_len		137	FLOAT	4	Static	x	AUTO
echo_threshold_near_ee		136	FLOAT	4	Static	x	AUTO
present_probe_length_ee		138	FLOAT	4	Static	x	AUTO
reset_appl_para_chg_flags		139	ENUM16	2	Static	x	AUTO
reset_dyn_persistent		140	ENUM16	2	Static	x	AUTO
locking_status	Locking status	142	BIT_ENUM16	2	Dynamic		
decimal_places_menu	Decimal places menu	96	ENUM16	2	Static	x	AUTO
access_status_tooling	Access status tooling	141	ENUM16	2	Static		

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
level_linearized	Level linearized	147	FLOAT	4	Dynamic		
bdt_transferred_ctrl		197	UINT8	1	Static	x	AUTO
bdt_cfg_rdwr_ctrl		196	UINT16	2	Static	x	AUTO

9.7   Methods

The FOUNDATION Fieldbus Specification includes the use of methods to make device operation easier. A method is a sequence of interactive steps to be carried out in the specified order so as to configure certain device functions.

The following methods are available for the device:
- **Restart**
  This method is located in the Resource Block and directly prompts the setting of the **Device reset** parameter. This resets the device configuration to a defined state.
- **ENP Restart**
  This method is located in the Resource Block and directly prompts the setting of the parameters of the Electronic Name Plate (ENP).
- **Setup**
  This method is located in the SETUP Transducer Block and allows to set the most important parameters in this block for device configuration (measuring units, type of tank or vessel, type of medium, empty and full calibration).
- **Linearization**
  This method is located in the ADV_SETUP Transducer Block and allows to manage the linearization table by which the measured value is converted into volume, mass or flow.
- **Self Check**
  This method is located in the EXPERT_CONFIG Transducer Block and prompts the device self check parameters.

10   Commissioning via wizard

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

1. Connect the device to FieldCare or DeviceCare → 🗐 53.

2. Open the device in FieldCare or DeviceCare.
    ↳ The dashboard (home page) of the device appears:
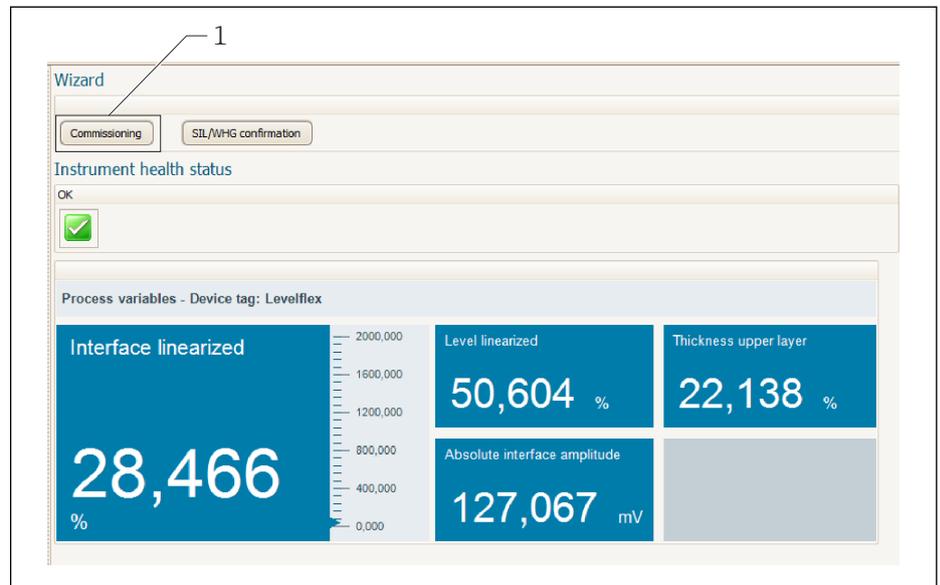
1   "Commissioning" button calls up the wizard.

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.

ℹ️ 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.

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" → 🖹 44
- Checklist "Post-connection check" → 🖹 50

11.2   Setting the operating language

Factory setting: English or ordered local language
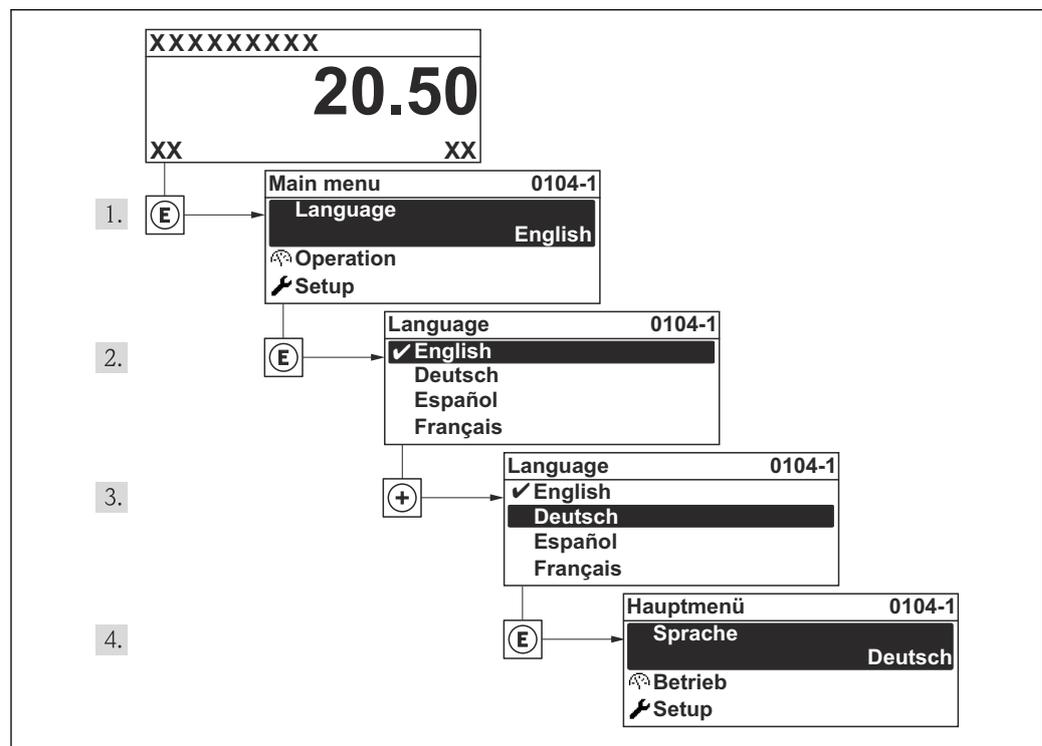
🖻 *22   Using the example of the local display*

11.3   Configuration of a level measurement
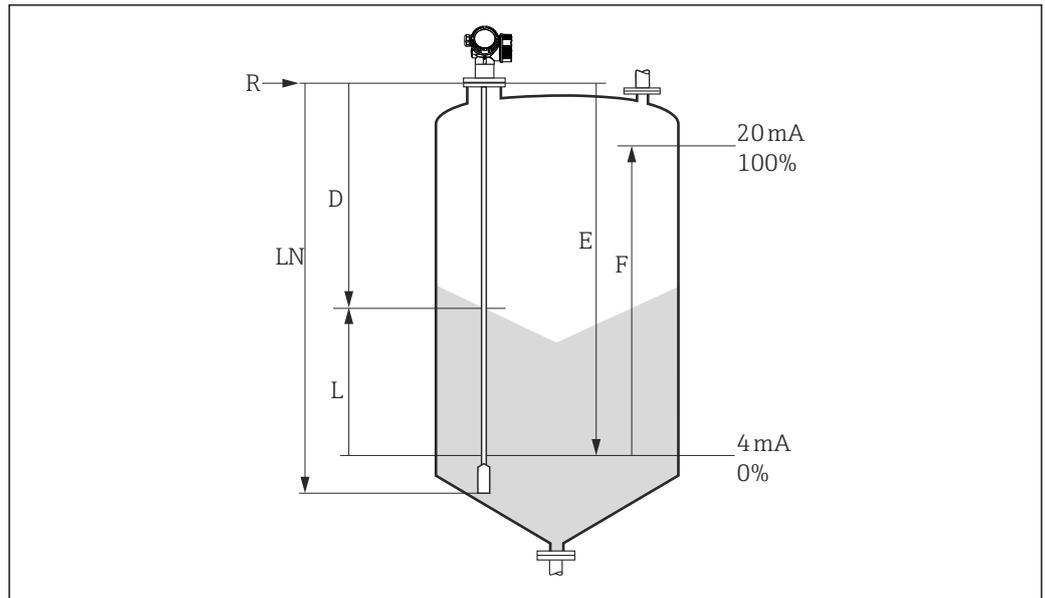
23   Configuration parameters for level measurements in solids

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

ℹ️ 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 mm (*LN* - 10 in).

1. "Setup" menu → Device tag
    ↳ Enter tag for measuring point.

2. Navigate to: "Setup" menu → Distance unit
    ↳ Select distance unit.

3. Navigate to: "Setup" menu → Bin type
    ↳ Select bin type.

4. Navigate to: "Setup" menu → Empty calibration
    ↳ Enter the distance E between the reference point R and the minimum level (0%).

5. Navigate to: "Setup" menu → Full calibration
    ↳ Enter distance F between the minimum (0%) and maximum (100%) level.

6. Navigate to: "Setup" menu → Level
    ↳ Displays the measured level L.

7. Navigate to: "Setup" menu → Distance
    ↳ Displays the distance D between the reference point R and the level L.

8. Navigate to: "Setup" menu → Signal quality
    ↳ Displays the signal quality of the level echo.

9. For operation via local display:
    Navigate to: "Setup" menu → Mapping → Confirm distance
    ↳ Compare the displayed distance to the real distance in order to start the recording of the mapping curve if required.

10. For operation via operating tool:

    Navigate to: "Setup" menu → 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" menu → 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:
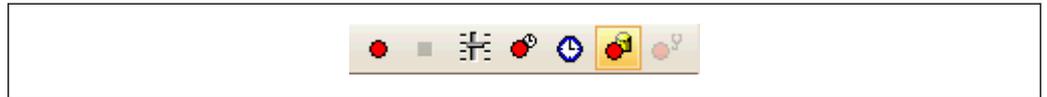
24   The "Load Reference Curve" function

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" menu → 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 → 🖹 184 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) → 🖹 57
- Via locking switch (hardware locking) → 🖹 59

12   Commissioning (block-based operation)

12.1   Function check

Carry out a post-installation and a post-connection check as per the checklist before commissioning the device:

- "Post-installation check" checklist
- "Post-connection check" checklist → 🖹 50

12.2   Block configuration

12.2.1   Preparatory steps

1. Switch on the device.

2. Note the DEVICE_ID.

3. Open the configuration program.

4. Load Cff and device description files into the host system or the configuration program. Make sure you are using the right system files.

5. Identify the device using the **DEVICE_ID** (see Point 2). Assign the desired tag name to the device by means of the **Pd-tag/FF_PD_TAG** parameter.

12.2.2   Configuring the Resource Block

1. Open the Resource Block.

2. If necessary, disable the lock for device operation.

3. If necessary, change the block name. Factory setting: RS-xxxxxxxxxxx (RB2)

4. If necessary, assign a description to the block by means of the **Tag Description/ TAG_DESC** parameter.

5. If necessary, change other parameters as per the requirements.

12.2.3   Configuring the Transducer Blocks

The measurement and the display module are configured using the Transducer Blocks. The general procedure is the same for all Transducer Blocks:

1. If necessary, change the block name.

2. Set the block mode to OOS by means of the **Block Mode/MODE_BLK** parameter, **TARGET** element.

3. Configure the device in accordance with the measuring task → 🖹 94.

4. Set the block mode to **Auto** by means of the **Block Mode/MODE_BLK** parameter, **TARGET** element.

The block mode must be set to **Auto** for the measuring device to function correctly.

12.2.4 Configuring the Analog Input Blocks

The device has 2 Analog Input Blocks that can be assigned as required to the various process variables.

Default settings	
Analog Input Block	CHANNEL
AI 1	32949: Level linearized
AI 2	32856: Distance

1. If necessary, change the block name.

2. Set the block mode to **OOS** by means of the **Block Mode/MODE_BLK** parameter, **TARGET** element.

3. Use the **Channel/CHANNEL** parameter to select the process variable which should be used as the input value for the Analog Input Block .

4. Use the **Transducer Scale/XD_SCALE** parameter to select the desired unit and the block input range for the process variable → 🖹 92. Make sure that the unit selected suits the process variable selected. If the process variable does not suit the unit, the **Block Error/BLOCK_ERR** parameter reports **Block Configuration Error** and the block mode cannot be set to **Auto**.

5. Use the **Linearization Type/L_TYPE** parameter to select the type of linearization for the input variable (factory setting: **Direct**). Make sure that the settings for the **Transducer Scale/XD_SCALE** and **Output Scale/ OUT_SCALE** parameters are the same for the **Direct** linearization type. If the values and units do not match, the **Block Error/BLOCK_ERR** parameter reports **Block Configuration Error** and the block mode cannot be set to **Auto**.

6. Enter the alarm and critical alarm messages by means of the **High High Limit/ HI_HI_LIM**, **High Limit/HI_LIM**, **Low Low Limit/LO_LO_LIM** and **Low Limit/ LO_LIM** parameters. The limit values entered must be within the value range specified for the **Output Scale/ OUT_SCALE** parameter → 🖹 92.

7. Specify the alarm priorities by means of the **High High Priority/HI_HI_PRI**, **High Priority/ HI_PRI**, **Low Low Priority/LO_LO_PRI** and **Low Priority/LO_PRI** parameters. Reporting to the field host system only takes place with alarms with a priority greater than 2.

8. Set the block mode to **Auto** using the **Block Mode/MODE_BLK** parameter, **TARGET** element. For this purpose, the Resource Block must also be set to the **Auto** block mode.

12.2.5 Additional configuration

1. Link the function blocks and output blocks.

2. After specifying the active LAS, download all the data and parameters to the field device.

12.3 Scaling of the measured value in an AI Block

If the type of linearisation **L_TYPE** = **indirect** has been selected in an AI block, the measured value can be scaled within the block. The input range is defined by the **XD_SCALE** parameter Through its **EU_0** and **EU_100** elements. This range is mapped linearly to the output ranged defined by the **OUT_SCALE** parameter through its **EU_0** and **EU_100** elements.
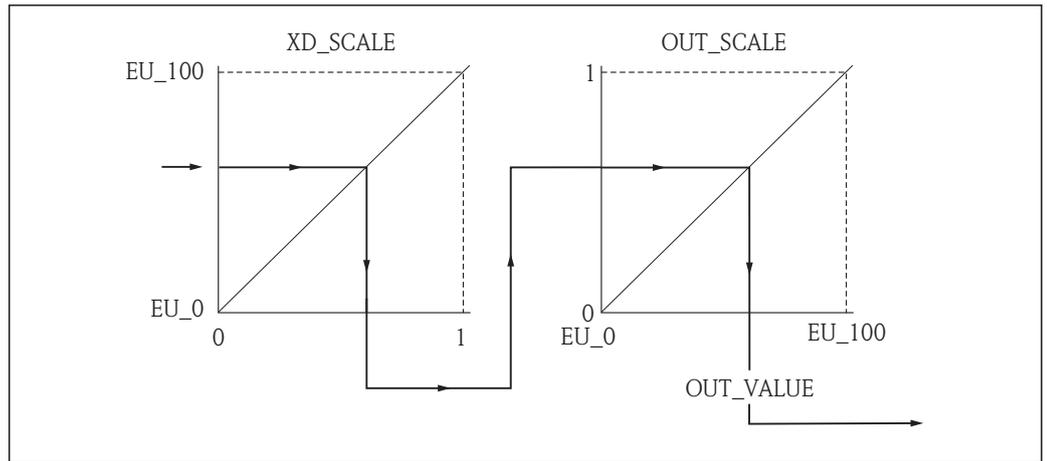
☒ 25   Scaling of the measured value in an AI Block

A0017338

- If you have selected the **Direct** mode for the **L_TYPE** parameter, you cannot change the values and units for **XD_SCALE** and **OUT_SCALE**.
- The **L_TYPE**, **XD_SCALE** and **OUT_SCALE** parameters can only be changed in the OOS block mode.

12.4   Language selection

Step	Block	Parameter	Action
1	DISPLAY (TRDDISP)	Language (language)	Select language [1]. **Selection:** • 32805: Arabian • 32824: Chinese simplified • 32842: Czech • 32881: Dutch • 32888: English • 32917: French • 32920: German • 32945: Italian • 32946: Japanese • 32948: Korean • 33026: Polish • 33027: Portuguese • 33062: Russian • 33083: Spanish • 33103: Thai • 33120: Vietnamese • 33155: Bahasa • 33166: Turkish

1)   When ordering a device the set of available languages is defined. Refer to the product structure, feature 500 "Additional Operation Language".

12.5　Configuration of a level measurement

The **Setup** method can also be used to configure the measurement. It is called up via the SETUP (TRDSUP) transducer block.
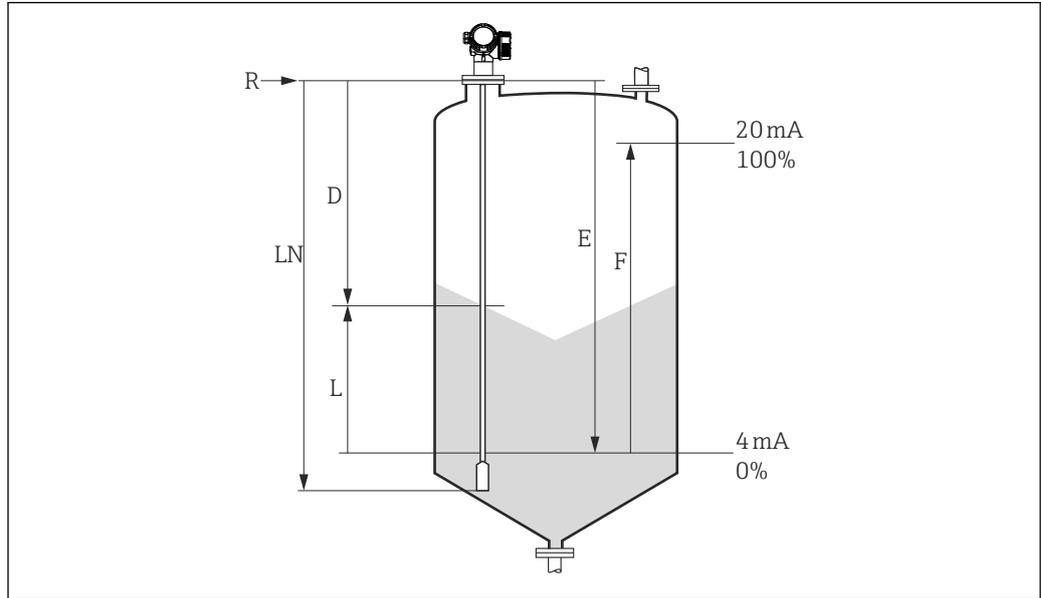
26　Configuration parameters for level measurements in solids

LN = Length of probe　　　　　　　*R = Reference point of the measurement*

D = Distance　　　　　　　　　　*E = Empty calibration (= Zero point)*

L = Level　　　　　　　　　　　*F = Full calibration (= span)*

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 allowed value for the empty calibration E is *LN* - 250 mm (*LN* - 10 in).

Step	Block	Parameter	Action
1	SETUP (TRDSUP)	Distance unit (distance_unit)	Select distance unit. **Selection:** ▪ 1010: m ▪ 1013: mm ▪ 1018: in ▪ 1019: ft
2	SETUP (TRDSUP)	Bin type (bin_type)	Select bin type. **Selection:** ▪ 33288: Metallic ▪ 33440: Plastic wood ▪ 33465: Concrete ▪ 33467: Aluminium
3	SETUP (TRDSUP)	Empty calibration (empty_calibration)	Enter the distance E between the reference point R and the minimum level (0%).
4	SETUP (TRDSUP)	Full calibration (full_calibration)	Enter distance F between the minimum (0%) and maximum (100%) level.
5	SETUP (TRDSUP)	Level (level)	Displays the measured level L.
6	SETUP (TRDSUP)	Distance (filtered_dist_val)	Displays the distance D between the reference point R and the level L.

Step	Block	Parameter	Action
7	SETUP (TRDSUP)	Signal quality (signal_quality)	Displays the signal quality of the level echo.
8	SETUP (TRDSUP)	Confirm distance (confirm_distance)	Compare the displayed distance to the real distance in order to start the recording of the mapping curve. **Selection:** • 179: Manual map • 32847: Delete all • 32859: Distance ok • 32860: Distance too big • 32861: Distance too small • 32862: Distance unknown • 33100: Tank empty

12.6 Configuration of the on-site display

12.6.1 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	Levele linearized	Levele linearized
Value 2 display	Distance	Distance
Value 3 display	Current output 1	Current output 1
Value 4 display	None	Current output 21

ℹ The on-site display can be adjusted in the **DISPLAY (TRDDISP)** transducer block.

12.7 Configuration management

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

Navigation path in the operating menu
Setup → Advanced setup → Conf.backup disp → Config. managem.

Block operation
Block: **DISPLAY (TRDDISP)**
Parameter: **Configuration management (configuration_management)**

Functions of the parameter options

Options	Description
33097: Execute backup	A backup copy of the current device configuration in the HistoROM is saved to the display module of the device. The backup copy comprises the transmitter data of the device.
33057: 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 data of the device.
33838: Duplicate	The transmitter configuration from another device is duplicated to the device using the display module.

Options	Description
265: Compare	The device configuration saved in the display module is compared to the current device configuration of the HistoROM.
32848: Clear backup data	The backup copy of the device configuration is deleted from the display module of the device.

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

ℹ️ 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.

ℹ️ For devices with FOUNDATION Fieldbus communication, the **PD Tag** parameter is also transmitted when duplicating the parameter configuration. If required change **PD Tag** to the required value after duplicating the set.

12.8 Configuration of the event behavior according to the FOUNDATION Fieldbus specification FF912

The device complies with the FOUNDATION Fieldbus specification FF912. This has - among other things - the following consequences:

- The diagnsotic category according to NAMUR recommendation NE107 is transmitted via the fieldbus in a manufacturer-independent form:
  - F: Failure
  - C: Function check
  - S: Out of specification
  - M: Maintenance required
- The diagnostic category of pre-defined groups of events can be adjusted by the user according to the requirements of the specific application.
- Certain events can be separated from their group and can be handled individually:
  - 941: Echo lost
  - 942: In safety distance
- Additional information and remedial measures are transmitted together with the event message via the fieldbus.

> The diagnostic messages according to FF912 are available in the host only if the **Multi-bit support** option has been activated in the **FEATURE_SEL** parameter of the Resource block. For reasons of compatibility, this option is **not** activated on delivery:
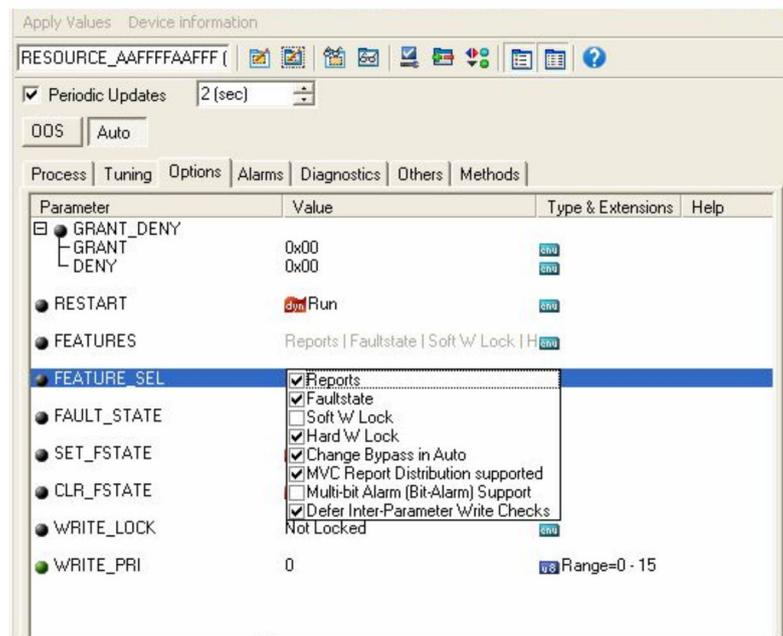
12.8.1 Groups of events

The diagnostic messages are classified into 16 groups according to the **source** and **severity** of the respective event. A **default diagnostic category** is allocated to each group. Each group is also represented by one bit of the allocation parameters.

Severity of the event	Default diagnostic category	Source of the event	Bit	Events within the group
Highest severity	Failure (F)	Sensor	31	• F003: Broken probe detected • F046: Build-up detected • F083: Memory content • F104: HF cable • F105: HF cable • F106: Sensor
		Electronics	30	• F242: Software incompatible • F252: Modules incompatible • F261: Electronic modules • F262: Module connecting • F270: Main electronic failure • F271: Main electronic failure • F272: Main electronic failure • F273: Main electronic failure • F275: I/O-Modul failure • F276: I/O module failure • F282: Datenspeicher • F283: Electronic memory • F311: Memory content
		Configuration	29	• F410: Data transfer • F411: Up-/download • F435: Linearization • F437: Configuration incompatible
		Process	28	• F803: Current loop 1 • F825: Current loop 1 • F936: EMC interference • F941: Echo lost [1] • F970: Linearization

1) This event can be removed from the group in order to define its behavior individually; see section "Configurable area".

Severity of the event	Default diagnostic category	Source of the event	Bit	Events within the group
High severity	Function check (C)	Sensor	27	not used in Levelflex
		Electronics	26	not used in Levelflex
		Configuration	25	• C411: Up-/download • C431: Trim • C484: Simulation failure mode • C485: Simulation measured value • C491: Simulation current output • C585: Simulation distance
		Process	24	not used in Levelflex

Severity of the event	Default diagnostic category	Source of the event	Bit	Events within the group
Low severity	Out of specification (S)	Sensor	23	not used in Levelflex
		Electronics	22	not used in Levelflex

Severity of the event	Default diagnostic category	Source of the event	Bit	Events within the group
		Configuration	21	S441: Current output 1
		Process	20	▪ S801: Energy too low ▪ S825: Operating temperature ▪ S921: Change of reference ▪ S942: In safety distance [1] ▪ S943: In blocking distance ▪ S944: Level range ▪ S968: Level limited

1)   This event can be removed from the group in order to define its behavior individually; see section "Configurable area".

Severity of the event	Default diagnostic category	Source of the event	Bit	Events within the group
Lowest severity	Maintenance required (M)	Sensor	19	not used in Levelflex
		Elektronics	18	▪ M270: Main electronics failure ▪ M272: Main electronics failure ▪ M311: Electronics failure
		Configuration	17	M438: Data set
		Process	16	M803: Current loop 1

12.8.2 Allocation parameters

The allocation of event categories to the event groups is controlled by the allocation parameters. They reside in the **RESOURCE (RB2)** block:

- **FD_FAIL_MAP**: for the **Failure (F)** event category
- **FD_CHECK_MAP**: for the **Function check (C)** event category
- **FD_OFFSPEC_MAP**: for the **Out of specification (S)** event category
- **FD_MAINT_MAP**: for the **Maintenance required (M)** event category

Each allocation parameter consists of 32 bits with the following meaning:

- **Bit 0:** reserved by the Fieldbus Foundation
- **Bits 1 to 15:** Configurable area; here, a number of predefined diagnostic events can be allocated irrespective of the group of events they belong to. In this case they are removed from their group and their bahavior can be configured individually . With Levelflex, the following parameters can be allocated to the configurable area:
  – 941: Echo lost
  – 942: In safety distance
- **Bits 16 ... 31:** Standard area; these bits are permanently allocated to a specific group of events. If a bit is set to **1**, the respective event category is assigned to the group.

The following table represents the default setting of the allocation parameters. In the default setting there is a unique relationship between the severity of the event and its category (i.e. its allocation parameter).

Default setting of the allocation parameters

Severity of the event	Standard area																Configurable area
	Highest severity				High severity				Low severity				Lowest severity				
Source of the event [1]	S	E	C	P	S	E	C	P	S	E	C	P	S	E	C	P	
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15 ... 1
FD_FAIL_MAP	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
FD_CHECK_MAP	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0
FD_OFFSPEC_MAP	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0
FD_MAINT_MAP	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0

1) S: Sensor; E: Electronics; C: Configuration; P: Process

In order to change the diagnostic behavior of a group of events, proceed as follows:

1. Open the allocation parameter to which the group is currently allocated.
2. Switch the bit of the group from **1** to **0**. In the case of operation via FieldCare this is done by deactivating the respective checkbox (see the example below).
3. Open the allocation to which the group is to be allocated.
4. Switch the bit of the group from **0** to**1**. In the case of operation via FieldCare this is done by activating the respective checkbox (see the example below).

Example

The **Highest severity / Configuration** group contains the messages **410: Data transfer**, **411: Up-/Download**, **435: Linearization** and **437: Configuration incompatible**. These messages are no longer to be classified as **Failure (F)** but as **Funcktion check (C)**.
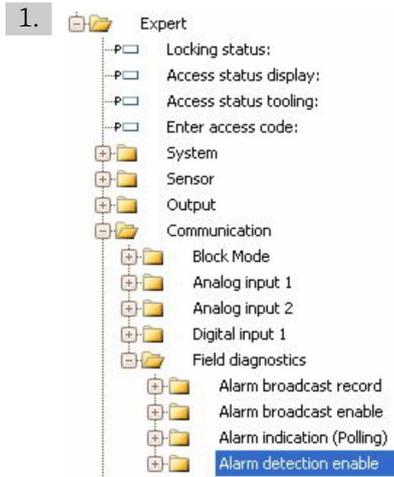
1.

```
Expert
  P   Locking status:
  P   Access status display:
  P   Access status tooling:
  P   Enter access code:
    System
    Sensor
    Output
    Communication
      Block Mode
      Analog input 1
      Analog input 2
      Digital input 1
      Field diagnostics
        Alarm broadcast record
        Alarm broadcast enable
        Alarm indication (Polling)
        Alarm detection enable
```

Use the FieldCare navigation window to navigate to the the following screen: **Expert → Communication → Field diagnostics → Alarm detection enable**.

2.
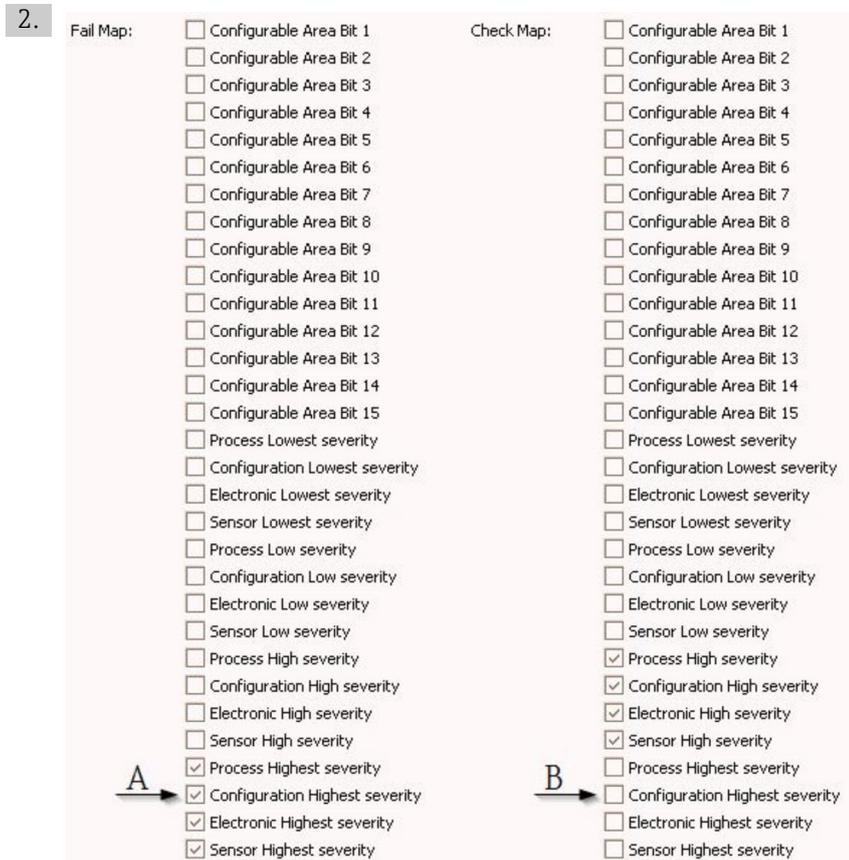
27   Default state of the "Fail Map" and "Check Map" columns

Look for the **Configuration Highest Severity** group in the **Fail Map** column and deactivate the associated checkbox (A). Activate the respective checkbox in the **Check Map** column (B). Remember to confirm each change by pressing the Enter key.

🖾 *28   Changed state of the "Fail Map" and "Check Map" columns*

ℹ️ Make sure that for each group the corresponding bit is set to **1** in at least one of the allocation parameters. Otherwise no event category is transmitted with the event message. As a consequence the message will not be recognized by the control system.

ℹ️ The **Alarm detection enable** screen is used to configure the detection of diagnostic events but not the transmission of event messages to the bus. The latter is configured on the **Alarm broadcast enable** screen, which is operated exactly in the same way as the **Alarm detection enable** screen. Status information is only transmitted to the bus if the Resource Block is in the **Auto** mode.

12.8.3   Configurable area

An event category can be individually defined for the following parameters - irrespective of the group of events they belong to by default.

- **F941**: Echo lost
- **S942:** In safety distance

Prior to changing the event category, the event must be allocated to one of the bits 1 to 15. This is performed by the parameters **FF912 ConfigArea_1** to **FF912ConfigArea_15** in the **DIAGNOSTIC (TRDDIAG)** block. Thereafter, the selected bit can be switched from **0** to **1** in the desired allocation parameter.

Example

To change the category of error **942 "In safety distance"** from **Out of specification (S)** (default), to **Function check (C)**, proceed as follows.
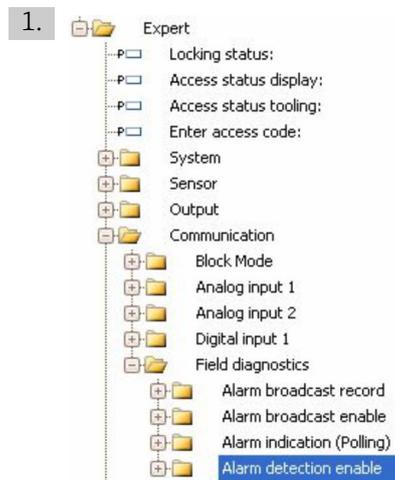
1.

Use the FieldCare navigation window to navigate to the the following screen: **Expert → Communication → Field diagnostics → Alarm detection enable**.

2.

By default all **Configurable Area Bits** are set to **not used**.

3.

Select one of these bits (in the example: Configurable Area Bit 1) and select **In safety distance** from the associated drop-down menu. Confirm the selection by pressing the Enter key.

4.

Got to the **Offspec Map** column and activate the checkbox of the respective bit (in the example: **Configurable Area Bit 1**). Confirm the selection by pressing the Enter key.

A change of the error category of **In safety distance** does not affect an error which is already present. The new category is only assigned if a new error of this type occurs after the change.

12.8.4 Transmission of the event meassages to the bus

Event priority

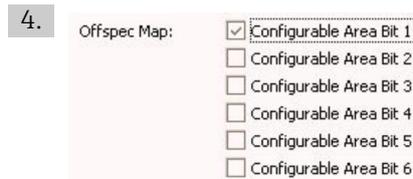Event messages are only transmitted to the bus if their priority is between 2 and 15. Events of priority 1 are indicated on the display but not transmitted to the bus. Events of priority 0 are ignored. By default, the priority is 0 for all events. The priority can be adjusted individually for each allocation parameter. This is done by the following four priority parameters:
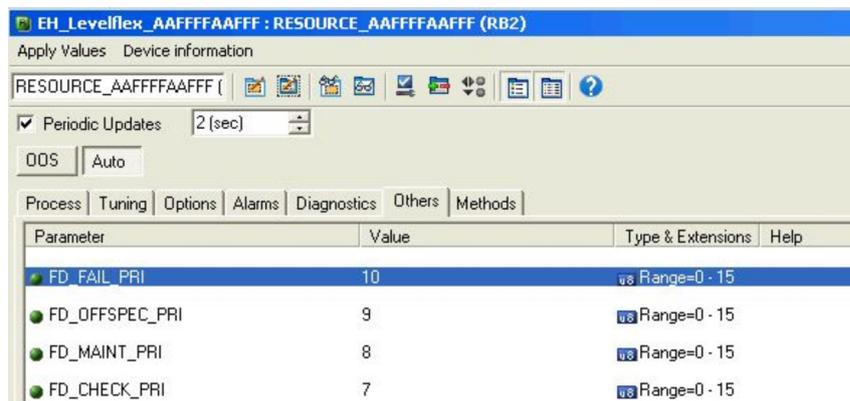
Suppression of individual events

For individual events, the transmission to the bus can suppressed by the use of a mask. The corresponding events will be displayed but not transmitted to the bus. In FieldCare, this mask can be found at **Expert → Communication → Field diagnostics → Alarm broadcast enable**. This mask functions as a negative mask, which means that, if a field is marked, the corresponding events will **not** be transmitted to the bus.

12.9 Protection of the settings against unauthorized changes

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

- Via locking switch (hardware locking)
- Via operating menu (software locking)
- Via block operation:
  - Block: **DISPLAY (TRDDISP)**; parameter: **Define access code (define_access_code)**
  - Block: **EXPERT_CONFIG (TRDEXP)**; parameter: **Enter access code (enter_access_code)**

13   Diagnostics and troubleshooting

13.1   General trouble shooting

13.1.1   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.	• Increase contrast by pressing ⊞ and Ⓔ simultaneously. • Decrease contrast by pressing ⊟ and Ⓔ simultaneously.
	The plug of the display cable is not connected correctly.	Connect the plut 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.
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.

13.1.2 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	• Check and adjust the **Empty calibration** parameter (→ 🖺 136) if necessary. • Check and adjust the **Full calibration** parameter (→ 🖺 137) if necessary. • Check and adjust linearization if necessary (**Linearization** submenu (→ 🖺 153)).
	If measured distance (Setup → Distance) does not match the real distance: An interference echo affects the measurement.	Perform mapping (**Confirm distance** parameter (→ 🖺 139)).
No change of the measured value when emptying/filling the tank	An interference echo affects the measurement.	Perform mapping (**Confirm distance** parameter (→ 🖺 139)).
	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 to high during initialization phase.	Enter **Empty calibration** parameter (→ 🖺 136) again.
Device displays a level when the tank is empty.	Incorrect probe length	• Carry out probe length correction (**Confirm probe length** parameter (→ 🖺 166)). • Carry out mapping over entire probe while the tank is empty (**Confirm distance** parameter (→ 🖺 139)).
Wrong slope of the level in the entire measuring range	Wrong bin property selected.	Set **Bin type** parameter (→ 🖺 136) correctly.

13.2   Diagnostic information on local display

13.2.1   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.

Measured value display in alarm condition	Diagnostic message

1   Status signal
2   Status symbol (symbol for event level)
3   Status symbol with diagnostics event
4   Event text
5   Operating elements

Status signals

F A0013956	**"Failure"** A device error is present. The measured value is no longer valid.
C A0013959	**"Function check"** The device is in service mode (e.g. during a simulation).
S A0013958	**"Out of specification"** The device is operated: • 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 A0013957	**"Maintenance required"** Maintenance is required. The measured value is still valid.

Status symbol (symbol for event level)

A0013961	**"Alarm" status** The measurement is interrupted. The signal outputs take on the defined alarm condition. A diagnostic message is generated.
A0013962	**"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.

	Diagnostics event		
Status symbol	Status signal	Event number	Event text
	↓	↓	↓
Example	⚠️ A0013962	**S** A0013958	441	Curr.output 1
			3-digit number	
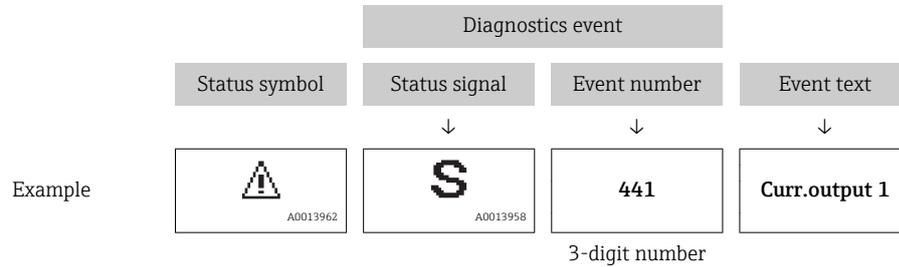
If two or more diagnostic messages are pending simultaneously, only the message with the highest priority is shown. Additional pending diagnostic messages can be shown in **Diagnostic list** submenu (→ 🗎 189).

ℹ️ Past diagnostic messages that are no longer pending are shown as follows:
- On the local display:
  in **Event logbook** submenu (→ 🗎 190)
- In FieldCare:
  via the "Event List /HistoROM" function.

Operating elements

Operating functions in menu, submenu	
⊕ A0013970	**Plus key** Opens the message about the remedial measures.
Ⓔ A0013952	**Enter key** Opens the operating menu.

13.2.2 Calling up remedial measures
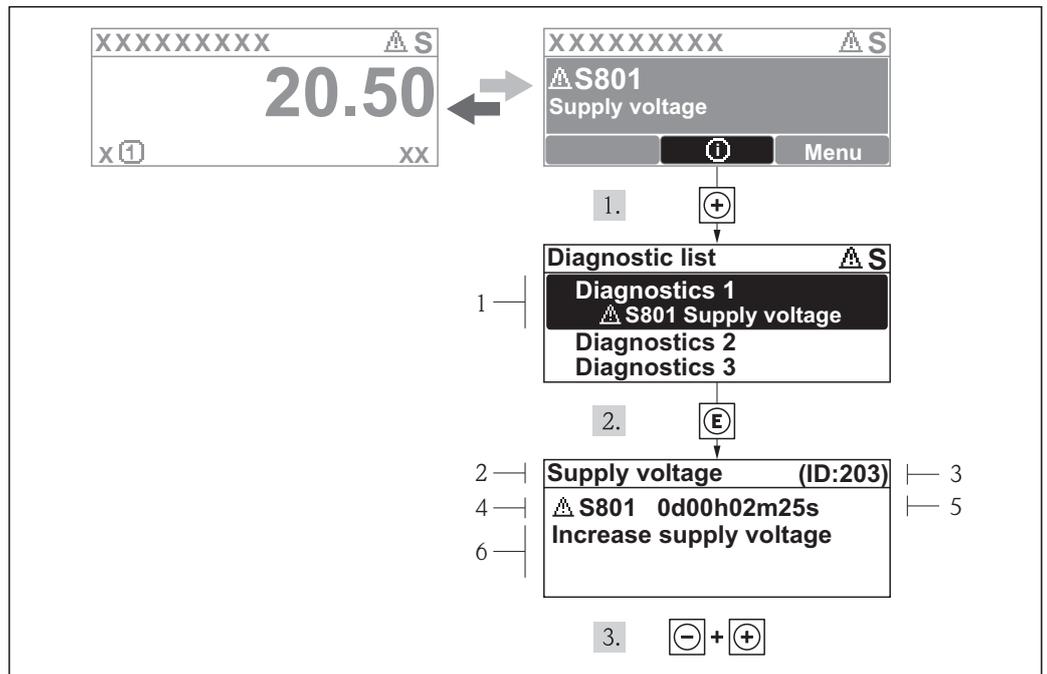
⊠ 29   Message for remedial measures

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

The user is in the diagnostic message.

1. Press ⊞ (ⓘ symbol).
   ↳ **Diagnostic list** submenu opens.

2. Select the desired diagnostic event with ⊞ or ⊟ and press ⒠ .
   ↳ 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 ⒠.
   ↳ The message for the remedial measures for the selected diagnostic event opens.

2. Press ⊟ + ⊞ simultaneously.
   ↳ The message for the remedial measures closes.

13.3   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)

Calling up remedial measures

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.

13.4   Diagnostic messages in the DIAGNOSTIC Transducer Block (TRDDIAG)

• The **Actual diagnostics** parameter displays the message with the highest priority. Every message is also output as per the FOUNDATION Fieldbus Specification by means of the **XD_ERROR** and **BLOCK_ERROR** parameters.
• A list of diagnostic messages is displayed in the **Diagnostics 1** to **Diagnostics 5** parameters. If more than 5 messages are currently active, only those with the highest priority are displayed.
• You can view a list of alarms which are no longer active (event log) via the **Previous diagnostics** parameter.

13.5   Diagnostic list

In the Diagnostic list 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" menu → Diagnostic list

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.

13.6   Event logbook

13.6.1   Event history

A chronological overview of the event messages that have occurred is provided in the **Event list** submenu [3].

Navigation path
Diagnostics → Event logbook → Event list

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

The event history includes entries for:
• 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.

13.6.2   Filtering the event logbook

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

Navigation path
"Diagnostics" menu → Event logbook → Filter options

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

13.6.3   Overview of information events

Info number	Info name
I1000	--------(Device ok)
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed

3) 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.

Info number	Info name
I1092	Trend data deleted
I1110	Write protection switch changed
I1137	Electronic changed
I1151	History reset
I1154	Reset terminal voltage min/max
I1155	Reset electronic temperature
I1156	Memory error trend
I1157	Memory error event list
I1185	Display backup done
I1186	Restore via display done
I1187	Settings downloaded with display
I1188	Display data cleared
I1189	Backup compared
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

13.7   Firmware history

Date	Software version	Modifications	Documentation (FMP56, FMP57, FOUNDATION Fieldbus)		
			Operating Instructions	Description of Parameters	Technical Information
04.2012	01.00.zz	Original-Software	BA01055F/00/EN/01.12	GP01015F/00/EN/01.12	TI01004F/00/EN/14.12
05.2015	01.01.zz	• Support of SD03 • additional languages • HistoROM functionality enhanced • "Advanced Diagnostic" function block integrated • Improvements and bugfixes	BA01055F/00/EN/03.15	GP01015F/00/EN/02.15	TI01004F/00/EN/17.15

14   Maintenance

The measuring device requires no special maintenance.

14.1   Exterior cleaning

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

15   Repairs

15.1   General information on repairs

15.1.1   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.

15.1.2   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.

15.1.3   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).

15.1.4   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
  → 🖺 181.
• 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.

15.2   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.
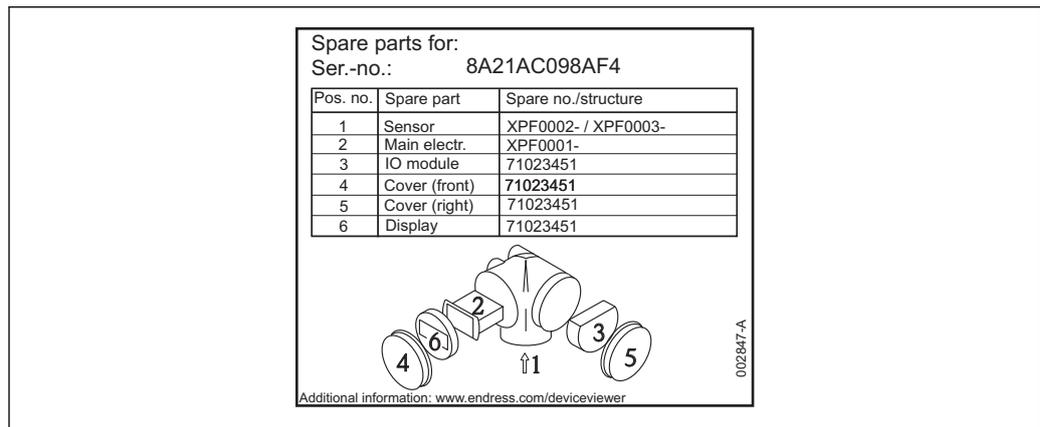
⊠ 30   Example for spare part nameplate in connection compartment cover

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.

15.3   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

15.4   Disposal

Observe the following notes during disposal:
- Observe valid federal/national regulations.
- Ensure proper separation and reuse of the device components.

16   Accessories

16.1   Device-specific accessories

16.1.1   Weather protection cover

Accessory	Description
Weather protection cover	 A0015466 A0015472 🖾 *31 Weather protection cover; Dimensions: mm (in)* *a 37,8 mm (1,5 in)* *b 54 mm (2,1 in)* ℹ 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.

16.1.2   Mounting bracket for the electronics housing

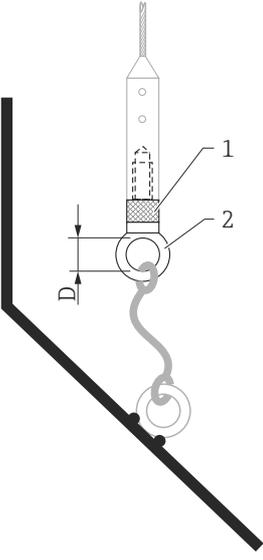| Accessory	Description
Mounting bracket for the electronics housing	 ⊠ 32 *Mounting bracket for the electronics housing; Dimensions: mm (in)* *A Wall mounting* *B Pipe mounting* ℹ️ For the "Sensor remote" device version (see feature 060 of the product structure), the mounting bracket is part of the delivery. If required, it can also be ordered as an accessory (order code 71102216).

16.1.3   Extension rod / centering HMP40

Accessory	Description

Extension rod / centering HMP40
 	
• can be used for: FMP57
• Admissible temperature at lower nozzle edge:
  – without center washer: no limitation
  – with center washer: -40 to 150 ℃ (-40 to 302 ℉)
• Additional information: SD01002F
	
	A0013597
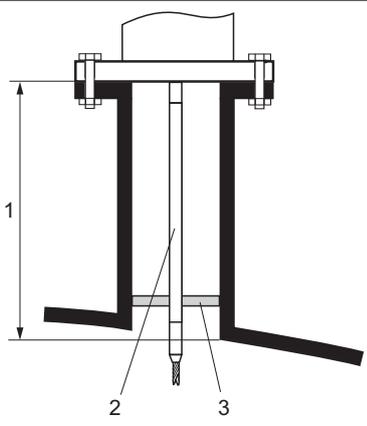	
	1 Nozzle height
	2 Extension rod
	3 Center washer

010	Approval:
A	A: Non-hazardous area
M	M: FM DIP Cl.II Div.1 Gr.E-G N.I., zone 21,22
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.

16.1.4 Mounting kit, isolated

Accessory	Description
Mounting kit, isolated can be used for • FMP50 • FMP51 • FMP54 • FMP56 • FMP57	A0013586 *⊡ 33 Scope of supply of the mounting kit:* *1 Insulating sleeve* *2 Eye-bolt* For reliably insulated fixing of the probe. Maximum process temperature: 150 °C (300 °F) For rope probes 4 mm (¹⁄₆ in) or 6 mm (1/4 in) with PA>steel: • Diameter D = 20 mm (0.8 in) • Order-No.: 52014249 For rope probes 6 mm (¹⁄₄ in) or 8 mm (1/3 in) with PA>steel: • Diameter D = 25 mm (1 in) • Order-No.: 52014250 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. 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").

16.1.5   Remote display FHX50

Accessory	Description

Remote display FHX50	
	A0019128
	
	• Material:
	  – Plastics PBT
	  – 316L
	• Ingress protection: IP68 / NEMA 6P and IP66 / NEMA 4x
	• Suitable for the display modules:
	  – SD02 (push buttons)
	  – SD03 (touch control)
	• Connection cable:
	  – Cable with M12 plug; supplied with the FHX50; up to 30 m (98 ft)
	  – Customer supplied standard cable; up to 60 m (196 ft)
	• Ambient temperature: –40 to 80 °C (–40 to 176 °F)
	
	• If the remote display is to be used, the device must be ordered in the version "Prepared for display FHX50" (feature 030, option L or M). For the FHX50, on the other hand, the option A: "Prepared for display FHX50" has to be selected in feature 050: "Option Measurement Device".
	• If a device has not been ordered in the version "Prepared for display FHX50", but is nevertheless to be equipped with an FHX50, it is essential to select the option B: "Not prepared for display FHX50" in feature 050: "Option Measurement Device" of the FHX50. In this case, a retrofit kit, needed to prepare the device for the remote display, is supplied together with the FHX50.
	
	For transmitters with approval, application of the FHX50 may be restricted. A device may only be retrofitted with the FHX50 if option L or M ("Prepared for FHX50") is quoted under *Basic specifications*, position 4 "Display, operation" in the associated Safety Instructions (XA).
	In addition to this, observe the Safety Instructions (XA) of the FHX50.
	
	Do not retrofit transmitters with:
	• approval for use in areas with combustible dusts (Dust-Ex approval)
	• type of protection Ex nA
	
	For details refer to the document SD01007F.

16.1.6 Overvoltage protection

Accessory	Description
Overvoltage protection for 2-wire-devices OVP10 (1 channel) OVP20 (2 channel)	 A0021734 **Technical data** • 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 mm^2 (24 to 14 AWG) **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 retrofitted with the overvoltage protection. **Order code for retrofitting** • For 1-channel devices (feature 020, option A) OVP10: 71128617 • For 2-channel devices (feature 020, option B, C, E or G) OVP20 : 71128619 **Hosuing 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: • GT18 housing: Lid 71185516 • GT19 housing: Lid 71185518 • GT20 housing: Lid 71185516 **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 *Optional Specifications* in the Safety Instructions (XA) pertaining to the device. For details refer to SD01090F.

16.2 Communication-specific accessories

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

Accessory	Description
Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the **non-Ex area**.
	📖 For details, see Operating Instructions BA01202S

Accessory	Description
Field Xpert SFX370	Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the **non-Ex area** and the **Ex area**.
	📖 For details, see Operating Instructions BA01202S

16.3 Service-specific accessories

Accessory	Description
FieldCare	Endress+Hauser's 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.
	📖 For details refer to Operating Instructions BA00027S and BA00059S.

16.4 System components

Accessory	Description
Graphic Data Manager Memograph M	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.
	📖 For details refer to Technical Information TI00133R and Operating Instructions BA00247R

17   Operating menu

17.1   Overview of the operating menu (display module)

Navigation   ▣   Operating menu

Language		→ 🗏 174
🔧 Setup		→ 🗏 136
	Distance unit	→ 🗏 136
	Bin type	→ 🗏 136
	Empty calibration	→ 🗏 136
	Full calibration	→ 🗏 137
	Level	→ 🗏 138
	Distance	→ 🗏 138
	Signal quality	→ 🗏 139
	▸ Mapping	→ 🗏 142
		Confirm distance	→ 🗏 142
		Mapping end point	→ 🗏 142
		Record map	→ 🗏 142
		Distance	→ 🗏 142
	▸ Analog inputs	
		▸ Analog input 1 to 5	→ 🗏 143
			Block tag	→ 🗏 143
			Channel	→ 🗏 143
			Process Value Filter Time	→ 🗏 144
	▸ Advanced setup	→ 🗏 145
		Locking status	→ 🗏 145

Access status display				→ 🖹 146
Enter access code				→ 🖹 146
▶ Level				→ 🖹 147
	Medium type			→ 🖹 147
	Medium property			→ 🖹 147
	Process property			→ 🖹 148
	Advanced process conditions			→ 🖹 149
	Level unit			→ 🖹 150
	Blocking distance			→ 🖹 150
	Level correction			→ 🖹 151
▶ Linearization				→ 🖹 153
	Linearization type			→ 🖹 155
	Unit after linearization			→ 🖹 156
	Free text			→ 🖹 157
	Maximum value			→ 🖹 158
	Diameter			→ 🖹 158
	Intermediate height			→ 🖹 158
	Table mode			→ 🖹 159
	▶ Edit table			
		Level		→ 🖹 160
		Customer value		→ 🖹 161
	Activate table			→ 🖹 161
▶ Safety settings				→ 🖹 162
	Output echo lost			→ 🖹 162
	Value echo lost			→ 🖹 162

	Ramp at echo lost		→ 🖹 163	
	Blocking distance		→ 🖹 150	
► Probe settings			→ 🖹 165	
	Probe grounded		→ 🖹 165	
	► Probe length correction		→ 🖹 167	
		Confirm probe length	→ 🖹 167	
		Present probe length	→ 🖹 167	
► Switch output			→ 🖹 168	
	Switch output function		→ 🖹 168	
	Assign status		→ 🖹 168	
	Assign limit		→ 🖹 169	
	Assign diagnostic behavior		→ 🖹 169	
	Switch-on value		→ 🖹 170	
	Switch-on delay		→ 🖹 171	
	Switch-off value		→ 🖹 171	
	Switch-off delay		→ 🖹 172	
	Failure mode		→ 🖹 172	
	Switch status		→ 🖹 172	
	Invert output signal		→ 🖹 172	
► Display			→ 🖹 174	
	Language		→ 🖹 174	
	Format display		→ 🖹 174	
	Value 1 to 4 display		→ 🖹 176	
	Decimal places 1 to 4		→ 🖹 176	
	Display interval		→ 🖹 177	

	Display damping		→ 🖹 177
	Header		→ 🖹 177
	Header text		→ 🖹 178
	Separator		→ 🖹 178
	Number format		→ 🖹 178
	Decimal places menu		→ 🖹 179
	Backlight		→ 🖹 179
	Contrast display		→ 🖹 180
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	Result device check	→ 🖹 204
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17.2　　Overview of the operating menu (operating tool)

Navigation　　　⊚　　Operating menu

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Empty calibration		→ 🖺 136
Full calibration		→ 🖺 137
Level		→ 🖺 138
Distance		→ 🖺 138
Signal quality		→ 🖺 139
Confirm distance		→ 🖺 139
Present mapping		→ 🖺 140
Mapping end point		→ 🖺 140
Record map		→ 🖺 141
▶ Analog inputs		
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▶ Advanced setup		→ 🖺 145
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	Medium property	→ 🖹 147
	Process property	→ 🖹 148
	Advanced process conditions	→ 🖹 149
	Level unit	→ 🖹 150
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	Switch output simulation	→ 🕮 202
	Switch status	→ 🕮 203
	Simulation device alarm	→ 🕮 203
▶ Device check		→ 🕮 204
	Start device check	→ 🕮 204
	Result device check	→ 🕮 204
	Last check time	→ 🕮 204
	Level signal	→ 🕮 205
	Launch signal	→ 🕮 205

17.3 "Setup" menu

ℹ️ • ▣📟 : 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 → 🖺 57.

Navigation   ▣📟 Setup

Distance unit	🔒

Navigation	▣📟 Setup → Distance unit
Description	Select distance unit.
Selection	*SI units* *US units* • mm • ft • m • in
Factory setting	m

Bin type	🔒

Navigation	▣📟 Setup → Bin type
Prerequsite	Medium type (→ 🖺 147) = Solid
Description	Specify bin type.
Selection	• Concrete • Plastic wood • Metallic • Aluminium
Factory setting	Metallic

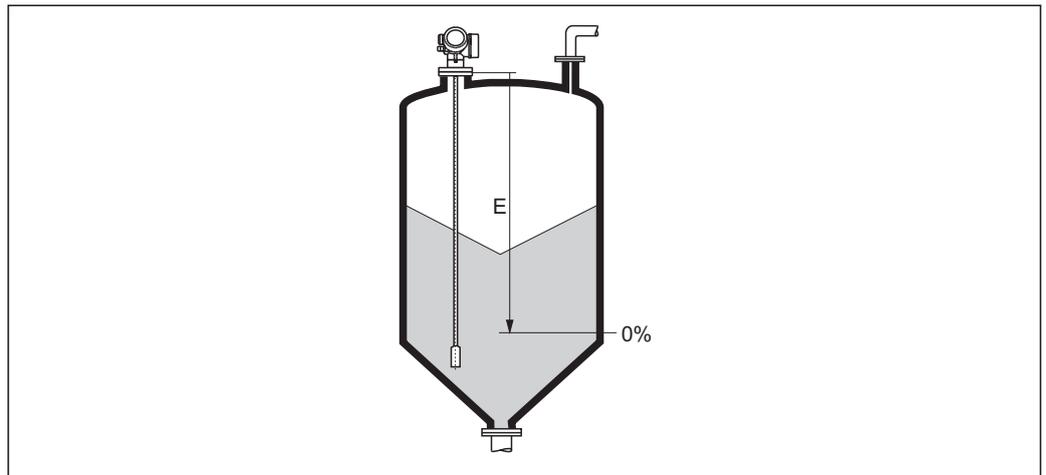| Empty calibration	🔒

Navigation	▣📟 Setup → Empty calibr.
Description	Specify the distance E between the process connection and the minimum level (0%). This defines the starting point of the measuring range.
User entry	Depending on the probe

Factory setting   Depending on the probe

Additional information

🖾 *34   Empty calibration (E) for level measurements in bulk solids.*

Full calibration   🔒

Navigation   ⊞⊟   Setup → Full calibr.

Description   Specify the distance F between the minimum level (0%) and the maximum level (100%).
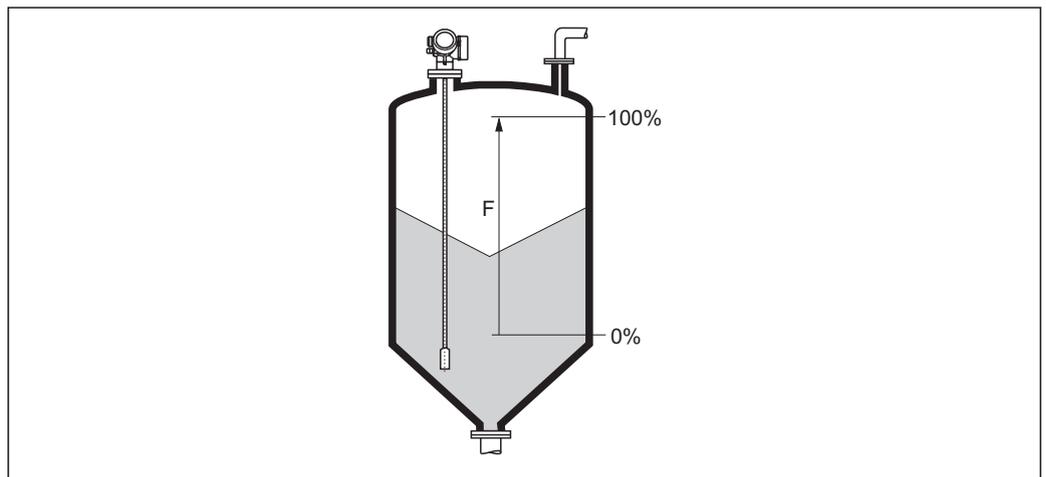
User entry   Depending on the probe

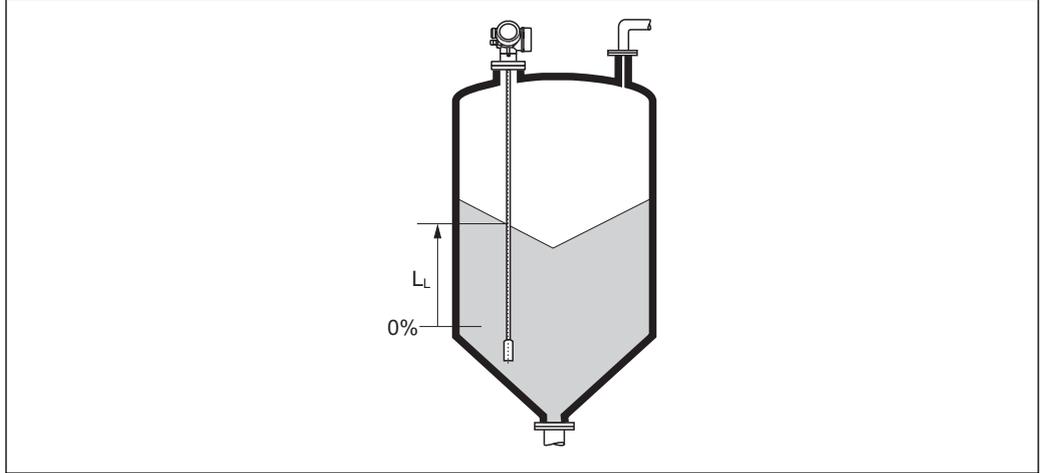**Factory setting**   Depending on the probe

Additional information

🖾 *35   Full calibration (F) for level measurements in bulk solids*

Level

Navigation	�◎◰ Setup → Level
Description	Displays measured level L_L (before linearization).

Additional information

🔲 36   Level in case of bulk solid measurements

The unit is defined in the **Level unit** parameter (→ 🖺 150).

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
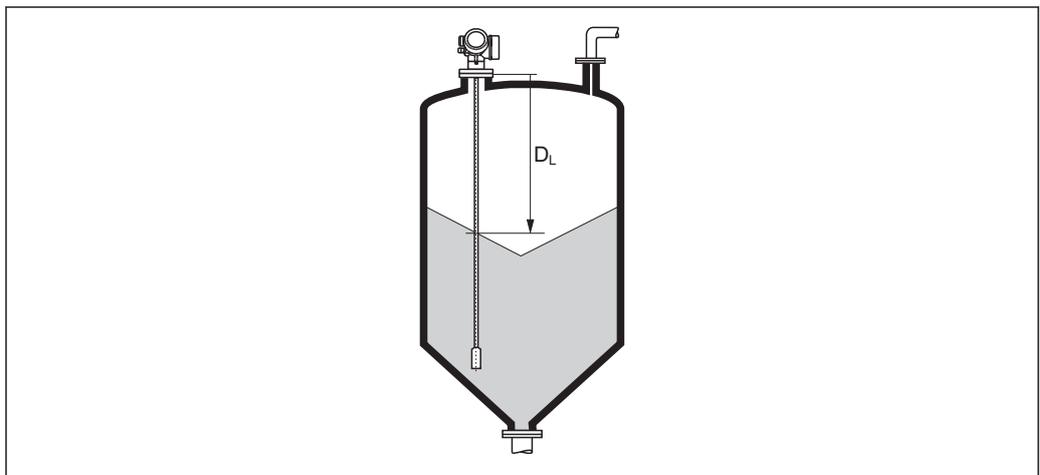
🔲 37   Distance for bulk solid measurements

The unit is defined in the **Distance unit** parameter (→ 🖺 136).

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 echo [4] 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** (→ 🖥 162) = **Alarm**.
- S941, if another option has been selected in **Output echo lost** (→ 🖥 162).

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	• Manual map
	• Distance ok
	• Distance unknown
	• Distance too small *
	• Distance too big *
	• Tank empty
	• Delete map

Factory setting	Distance unknown

---

4) Of these two echos the one with the lower quality is indicated.
*   Visibility depends on order options or device settings

Additional information

Meaning of the options
- **Manual map**
  To be selected if the range of mapping is to be defined manually in the **Mapping end point** parameter (→ 🖺 140). 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 big** [7]
  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.
- **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.

🛈 When operating via the display module, the measured distance is displayed together with this parameter for reference purposes.

🛈 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.

Present mapping

Navigation

🔲 Setup → Present mapping

Description

Indicates up to which distance a mapping has already been recorded.

Mapping end point   🔏

Navigation

🔲 Setup → Map. end point

Prerequisite

Confirm distance (→ 🖺 139) = Manual map or **Distance too small**

Description

Specify new end of the mapping.

---

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

User entry	0 to 200 000.0 m

Factory setting	0.1 m

Additional information	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.

For reference purposes the **Present mapping** parameter (→ 🖺 140) is displayed together with this parameter. It indicates up to which distance a mapping has already been recorded.

Record map	🔒

Navigation	▣ Setup → Record map

Prerequisite	Confirm distance (→ 🖺 139) = **Manual map** or **Distance too small**

Description	Start recording of the map.

Selection	• 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 ☑.

17.3.1 "Mapping" wizard

ℹ️ 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 (→ 🖺 136).

ℹ️ 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   → 🖺 139

Mapping end point   🔒

Navigation   ⊠   Setup → Mapping → Map. end point

Description   → 🖺 140

Record map   🔒

Navigation   ⊠   Setup → Mapping → Record map

Description   → 🖺 141

Distance

Navigation   ⊠   Setup → Mapping → Distance

Description   → 🖺 138

17.3.2   "Analog input 1 to 5" submenu

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

ℹ️ Only the most basic properties of the AI block can be configured in this submenu. For a detailed configuration of the AI blocks refer to the **Expert** menu.

Navigation   ▣▣   Setup → Analog inputs → Analog input 1 to 5

Block tag

Navigation	▣▣ Setup → Analog inputs → Analog input 1 to 7 → Block tag
Description	Defined to be unique throughout the control system at one plant site. The tag may be changed using the FB_Tag service.
Factory setting	

Channel

Navigation	▣▣ Setup → Analog inputs → Analog input 1 to 7 → Channel
Description	Select the process variable.

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

Factory setting   Uninitialized

---

* Visibility depends on order options or device settings

Process Value Filter Time

Navigation   �’🔲 Setup → Analog inputs → Analog input 1 to 7 → PV Filter Time

Description   Specify a time to suppress signal peaks. During the specified time the totalizer does not respond to an erratic increase in the process variable.

User entry   Positive floating-point number

Factory setting   0 s

17.3.3 "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	• Hardware locked • Temporarily locked

Additional information	**Meaning and priorities of the types of write protection**
	• **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.

On the display module, the 🔒-symbol appears in front of parameters that cannot be modified since they are write-protected.

Access status tooling

Navigation	⊞ Setup → Advanced setup → Access stat.tool
Description	Indicates access authorization to parameters via operating tool (e.g. FieldCare).
User interface	• Operator • Maintenance • Service
Additional information	The access authorization can be changed via the **Enter access code** parameter (→ 🖺 146).

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 (→ 🖺 145).

Access status display

| Navigation | ⊠ | Setup → Advanced setup → Access stat.disp |

Prerequsite   The device has a local display.

Description   Indicates access authorization to parameters via local display.

User interface
- Operator
- Maintenance
- Service

Additional information   ℹ️ If a 🔒 symbol appears in front of a parameter, the parameter cannot be changed via the local display with the current access authorization.

ℹ️ The access authorization can be changed via the **Enter access code** parameter (→ 📄 146).

ℹ️ 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 (→ 📄 145).

Enter access code

| Navigation | ⊠⊟ | Setup → Advanced setup → Ent. access code |

Description   Enter access code to disable write protection of parameters.

User entry   0 to 9 999

Additional information
- For local operation, the customer-specific access code, which has been defined in the **Define access code** parameter (→ 📄 184), 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.

ℹ️ Please contact your Endress+Hauser Sales Center if you lose your access code.

"Level" submenu

Navigation   ▤▤ Setup → Advanced setup → Level

Medium type

Navigation	▤▤ Setup → Advanced setup → Level → Medium type
Description	Specify type of medium.
User interface	• 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
Prerequsite	**EOP level evaluation ≠ Fix DC**
Description	Specify relative dielectric constant ε_r of the medium.
Selection	• 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** (→ ▣ 147) and **Medium group**.

Additional information   *Dependency on "Medium type" and "Medium group"*

Medium type (→ 🗎 147)	Medium group	Medium property
Solid		Unknown
Liquid	Water based (DC >= 4)	DC 4 … 7
	Others	Unknown

ℹ️ 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)

ℹ️ 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 → Adv. conditions

Description   Specify additional process conditions (if required).

Selection
- None
- Oil/Water condensate
- Probe near tank bottom
- Build up
- Foam (>5cm/0,16ft)

Factory setting   None

Additional information   **Meaning of the options**
- **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**
  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	*SI units* • % • m • mm	*US units* • ft • in

Factory setting	%

Additional information	The level unit may differ from the distance unit defined in the **Distance unit** parameter (→ 🗎 136): • The unit defined in the **Distance unit** parameter is used for the basic calibration (**Empty calibration (→ 🗎 136)** and **Full calibration (→ 🗎 137)**). • The unit defined in the **Level unit** parameter is used to display the (unlinearized) level.

Blocking distance	ⓐ

Navigation	ⓐⓔ Setup → Advanced setup → Level → Blocking dist.

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	No echos are evaluated within the blocking distance UB. Therefore, UB can be used to suppress interference echos within the upper end of the probe.
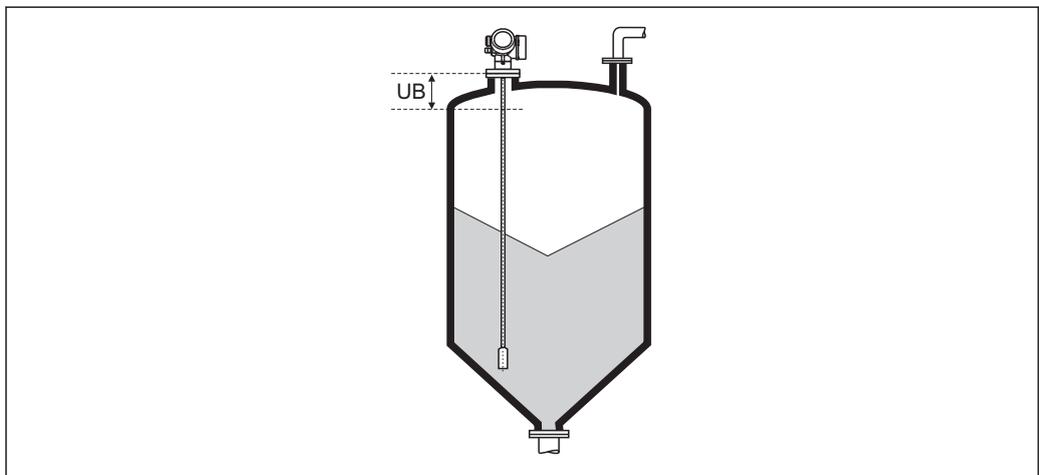
*38   Blocking distance (UB) for bulk solid measurements*

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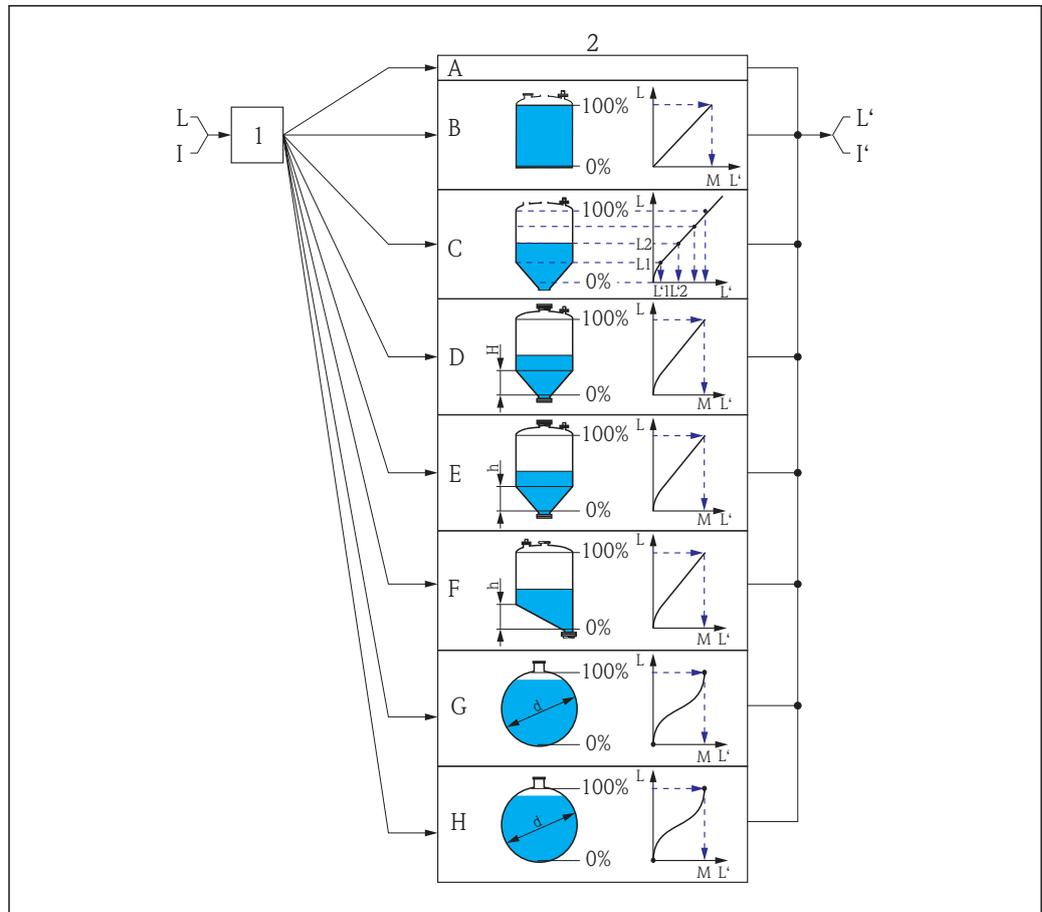
🔲 *39   Linearization: Transformation of the level and (if relevant) the interface height into a volume or weight; the transformation is dependent on the shape of the vessel.*

1   Selection of linearization type and unit
2   Configuration of the linearization
A   Linearization type (→ 🖺 155) = None
B   Linearization type (→ 🖺 155) = Linear
C   Linearization type (→ 🖺 155) = Table
D   Linearization type (→ 🖺 155) = Pyramid bottom
E   Linearization type (→ 🖺 155) = Conical bottom
F   Linearization type (→ 🖺 155) = Angled bottom
G   Linearization type (→ 🖺 155) = Horizontal cylinder
H   Linearization type (→ 🖺 155) = 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 (→ 🖺 157) (corresponds to volume or weight)
M   Maximum value (→ 🖺 158)
d   Diameter (→ 🖺 158)
h   Intermediate height (→ 🖺 158)

Structure of the submenu on the display module

Navigation   ⊠   Setup → Advanced setup → Linearization

‣ Linearization		
	Linearization type	→ 🖥 155
	Unit after linearization	→ 🖥 156
	Free text	→ 🖥 157
	Maximum value	→ 🖥 158
	Diameter	→ 🖥 158
	Intermediate height	→ 🖥 158
	Table mode	→ 🖥 159
	‣ Edit table	
		Level	→ 🖥 160
		Customer value	→ 🖥 161
	Activate table	→ 🖥 161

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

Navigation   ▤   Setup → Advanced setup → Linearization

‣ Linearization		
	Linearization type	→ 🗏 155
	Unit after linearization	→ 🗏 156
	Free text	→ 🗏 157
	Level linearized	→ 🗏 157
	Maximum value	→ 🗏 158
	Diameter	→ 🗏 158
	Intermediate height	→ 🗏 158
	Table mode	→ 🗏 159
	Table number	→ 🗏 160
	Level	→ 🗏 160
	Level	→ 🗏 161
	Customer value	→ 🗏 161
	Activate table	→ 🗏 161

Description of parameters

Navigation   ▣▣ Setup → Advanced setup → Linearization

Linearization type	🔒

Navigation   ▣▣ Setup → Advanced setup → Linearization → Lineariz. type

Description   Select linearization type.

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

Factory setting   None

Additional information
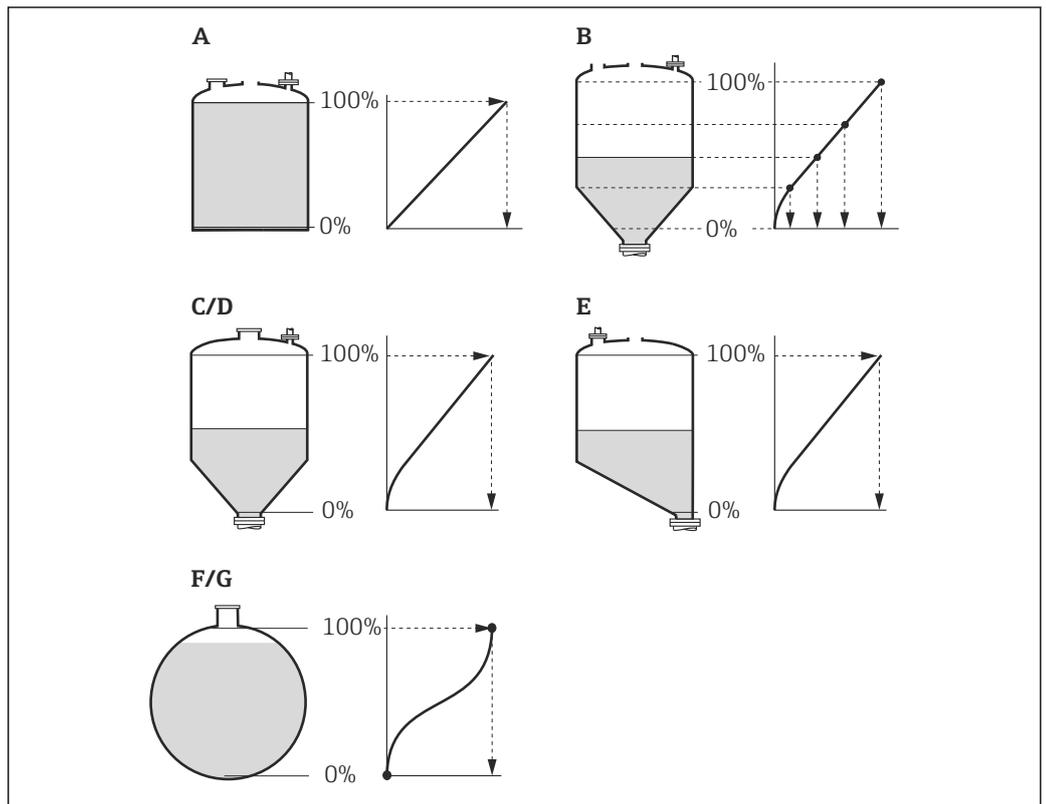
A0021476

☑ *40   Linearization types*

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

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** (→ 🖹 156)
  – **Maximum value** (→ 🖹 158): 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** (→ 🖹 156)
  – **Table mode** (→ 🖹 159)
  – For each table point: **Level** (→ 🖹 160)
  – For each table point: **Customer value** (→ 🖹 161)
  – **Activate table** (→ 🖹 161)
- **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** (→ 🖹 156)
  – **Maximum value** (→ 🖹 158): Maximum volume or weight
  – **Intermediate height** (→ 🖹 158): 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** (→ 🖹 156)
  – **Maximum value** (→ 🖹 158): Maximum volume or weight
  – **Intermediate height** (→ 🖹 158): 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** (→ 🖹 156)
  – **Maximum value** (→ 🖹 158): Maximum volume or weight
  – **Intermediate height** (→ 🖹 158): 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** (→ 🖹 156)
  – **Maximum value** (→ 🖹 158): Maximum volume or weight
  – **Diameter** (→ 🖹 158)
- **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** (→ 🖹 156)
  – **Maximum value** (→ 🖹 158): Maximum volume or weight
  – **Diameter** (→ 🖹 158)

Unit after linearization																	🔒

Navigation			Setup → Advanced setup → Linearization → Unit lineariz.

Prerequsite			**Linearization type** (→ 🖹 155) ≠ None

Description			Select unit of the lineaized value.

Selection	*SI units*	*US units*	*Imperial units*
	• STon	• lb	impGal
	• t	• UsGal	
	• kg	• ft³	
	• cm³		
	• dm³		
	• m³		
	• hl		
	• l		
	• %		

Custom-specific units
Free text

Factory setting	%

Additional information   The selected unit is only used to be indicated on the display. The measured value is **not** transformed according to the selected unit.

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 (→ 🖺 157).

Free text 🔒

Navigation	Setup → Advanced setup → Linearization → Free text
Prerequsite	Unit after linearization (→ 🖺 156) = **Free text**
Description	Enter unit symbol.
User entry	Up to 32 alphanumerical 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 → 🖺 156.

Maximum value	🔒

Navigation	�😊🖳 Setup → Advanced setup → Linearization → Maximum value
Prerequsite	Linearization type (→ 🖺 155) has one of the following values: • Linear • Pyramid bottom • Conical bottom • Angled bottom • Horizontal cylinder • Sphere
Description	Specify the maximum content of the vessel (100%) measured in the units after linearization.
User entry	−50 000.0 to 50 000.0 %
Factory setting	100.0 %

Diameter	🔒

Navigation	�😊🖳 Setup → Advanced setup → Linearization → Diameter
Prerequsite	Linearization type (→ 🖺 155) has one of the following values: • Horizontal cylinder • Sphere
Description	Specify tank diameter.
User entry	0 to 9 999.999 m
Factory setting	2 m
Additional information	The unit is defined in the **Distance unit** parameter (→ 🖺 136).

Intermediate height	🔒

Navigation	�😊🖳 Setup → Advanced setup → Linearization → Intermed. height
Prerequsite	Linearization type (→ 🖺 155) has one of the following values: • Pyramid bottom • Conical bottom • Angled bottom
Description	Specify intermediate height H.
User entry	0 to 200 m
Factory setting	0 m

Additional information
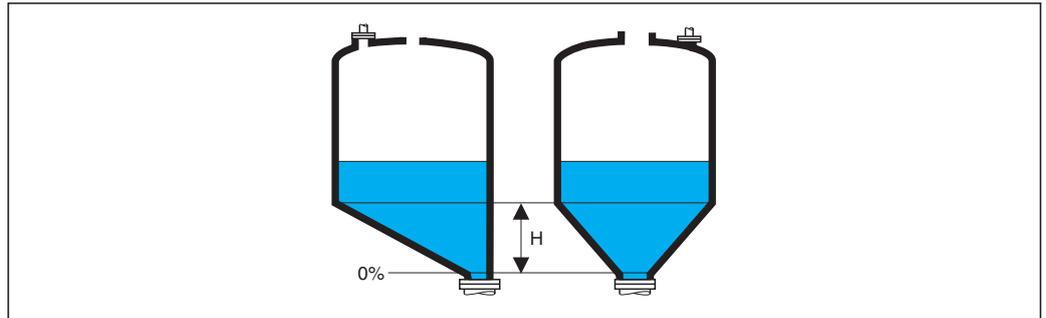
H   Intermediate height

The unit is defined in the **Distance unit** parameter (→ 🖺 136).

Table mode	🔒

Navigation   🖩🖳 Setup → Advanced setup → Linearization → Table mode

Prerequsite   Linearization type (→ 🖺 155) = **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 linerization 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.

ℹ️　Before entering a linearization table, the values for **Empty calibration** (→ 🖺 136) and **Full calibration** (→ 🖺 137) 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** (→ 🖺 159) = **Clear table**). Then enter a new table.

How to enter the table
- Via FieldCare
  The table points can be entered via the **Table number** (→ 🖺 160), **Level** (→ 🖺 160) and **Customer value** (→ 🖺 161) 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.

ℹ️　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 (→ 🖺 150) beforehand.

Table number　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　🔒

Navigation	🖥　Setup → Advanced setup → Linearization → Table number
Prerequsite	Linearization type (→ 🖺 155) = 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
Prerequsite	• Linearization type (→ 🖺 155) = Table • Table mode (→ 🖺 159) = 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 (→ 🗎 155)** = **Table**
                        • **Table mode (→ 🗎 159)** = **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 (→ 🗎 155)** = **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 (→ 🗎 155)** = **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 (→ 🗎 155)** = **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 sett.

Output echo lost	🔒

Navigation	ⓘⓔ Setup → Advanced setup → Safety sett. → Output echo lost
Description	Define the behavior of the output signal in case of a lost echo.
Selection	• Last valid value • Ramp at echo lost • Value echo lost • Alarm
Factory setting	Last valid value
Additional information	**Meaning of the options** • **Last valid value** The last valid value is kept in the case of a lost echo. • **Ramp at echo lost** In the case of a lost echo the output value is continously shifted towards 0% or 100%. The slope of the ramp is defined in the **Ramp at echo lost** parameter (→ 🕮 163). • **Value echo lost** In the case of a lost echo the output assumes the value defined in the **Value echo lost** parameter (→ 🕮 162). • **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 sett. → Value echo lost
Prerequsite	Output echo lost (→ 🕮 162) = **Value echo lost**
Description	Define output value in case of a lost echo.
User entry	0 to 200 000.0 %
Factory setting	0.0 %
Additional information	Use the unit which has been defined for the measured value output: • without linearization: **Level unit** (→ 🕮 150) • with linearization: **Unit after linearization** (→ 🕮 156)

Ramp at echo lost   ⊠

Navigation   ⊠⊞   Setup → Advanced setup → Safety sett. → Ramp echo lost

Prerequisite   Output echo lost (→ 🖺 162) = **Ramp at echo lost**

Description   Define the slope of the ramp in the case of a lost echo.

User entry   Signed floating-point number

Factory setting   0.0 %/min

Additional information
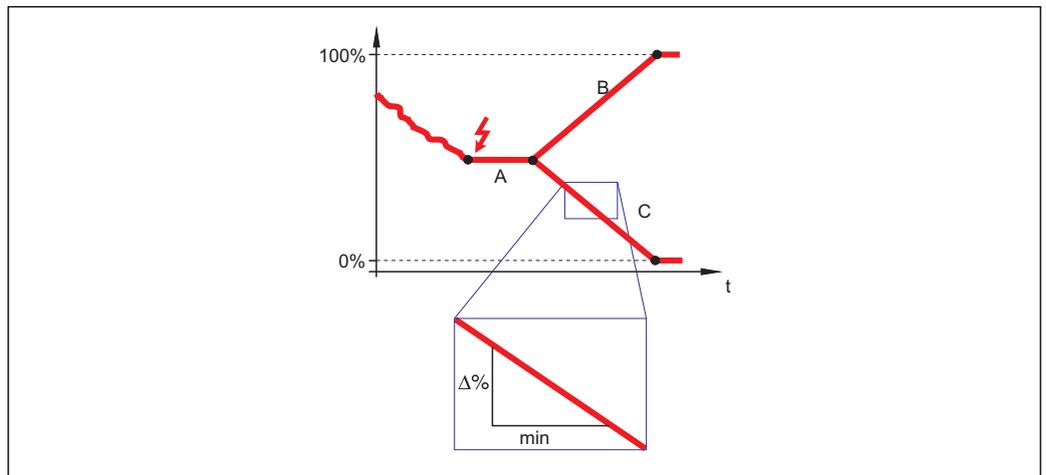
A0013269

A   Delay time echo lost
B   Ramp at echo lost (→ 🖺 163) (positive value)
C   Ramp at echo lost (→ 🖺 163) (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 continuosly increased until it reaches 100%.

Blocking distance   ⊠

Navigation   ⊠⊞   Setup → Advanced setup → Safety sett. → Blocking dist.

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   No echos are evaluated within the blocking distance UB. Therefore, UB can be used to suppress interference echos within the upper end of the probe.
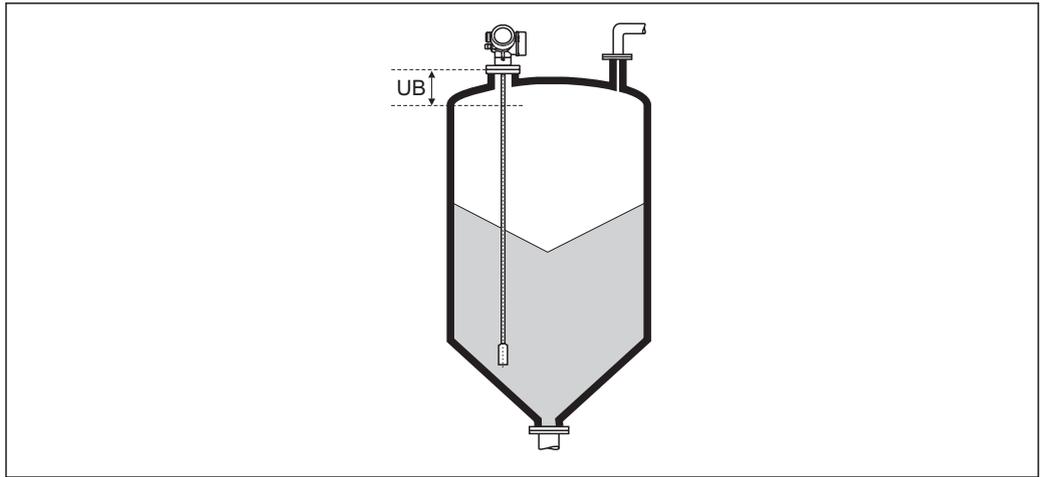
41   Blocking distance (UB) for bulk solid measurements

"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 acutal lenght 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 (→ 🖺 166)** = **Manual input** in order to enter the value manually.

ℹ️ 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 (→ 🖺 141) before performing the automatic probe length correction. After the probe length correction, a new map can be recorded using the **Record map** parameter (→ 🖺 141).
  • Alternative: Select **Confirm probe length (→ 🖺 166)** = **Manual input** and enter the probe length manually into the **Present probe length** parameter → 🖺 165.

ℹ️ An automatic probe length correction is only possible after the correct option has been selected in the **Probe grounded** parameter (→ 🖺 165).

Navigation   🖾🖳   Setup → Advanced setup → Probe settings

Probe grounded   🔒

Navigation	🖾🖳 Setup → Advanced setup → Probe settings → Probe grounded
Prerequsite	**Operating mode = Level**
Description	Specify whether the probe is grounded.
Selection	• No • Yes
Factory setting	No

Present probe length   🔒

Navigation	🖳 Setup → Advanced setup → Probe settings → Pres. length
Description	• In most cases: Displays the length of the probe according to the currently measured end-of-probe signal. • For **Confirm probe length (→ 🖺 166) = 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 length
Description	Select, whether the value displayed in the **Present probe length** parameter → 🖺 165 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 → 🖺 165. 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 → 🖺 165. 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 → 🖺 165 [16].
	• **Probe length unknown**
	  To be selected if the acutal length of the probe is unknown. A probe length correction is impossible in this case and the device quits the sequence.
	.

---

[16] 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

ℹ️ 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 (→ 🖺 165).

Navigation   🔊🖳   Setup → Advanced setup → Probe settings → Prob.length corr

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Confirm probe length   🔒

Navigation   🔊   Setup → Advanced setup → Probe settings → Prob.length corr → Confirm length

Description   → 🖺 166

Present probe length   🔒

Navigation   🔊🖳   Setup → Advanced setup → Probe settings → Prob.length corr → Pres. length

Description   → 🖺 165

"Switch output" submenu

Navigation   Setup → Advanced setup → Switch output

Switch output function	⌂

Navigation	Setup → Advanced setup → Switch output → Switch out funct
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 (→ 🗎 169) 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** (→ 🗎 169) – **Switch-on value** (→ 🗎 170) – **Switch-off value** (→ 🗎 171) • **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 (→ 🗎 168). ℹ️ The **Off** and **On** options can be used to simulate the switch output.

Assign status	⌂

Navigation	Setup → Advanced setup → Switch output → Assign status
Prerequsite	Switch output function (→ 🗎 168) = Digital Output
Description	Select device status for switch output.
Selection	• Off • Digital output AD 1 • Digital output AD 2 • Digital output 1

- Digital output 2
- Digital output 3
- Digital output 4
- Digital output 5
- Digital output 6
- Digital output 7
- Digital output 8

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 (→ 🔲 168) = **Limit**

Description   Select process variable for limit monitoring.

Selection   • 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 diag. beh

Prerequisite   Switch output function (→ 🔲 168) = **Diagnostic behavior**

Description   Select diagnostic behavior for switch output.

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* Visibility depends on order options or device settings

Selection	• Alarm
	• Alarm or warning
	• Warning

Factory setting	Alarm

Switch-on value

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

Prerequsite	Switch output function (→ 🖺 168) = 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**.
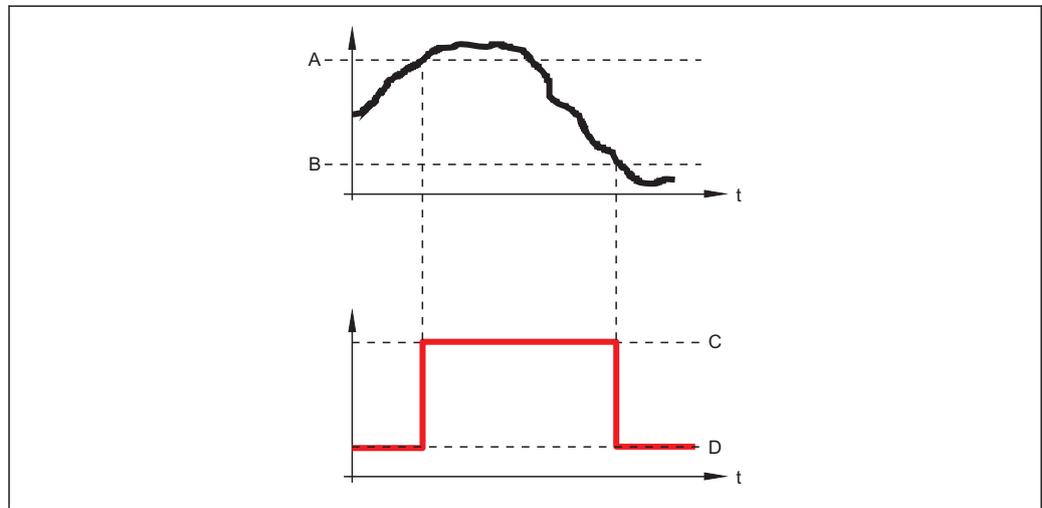
A0015585

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**.
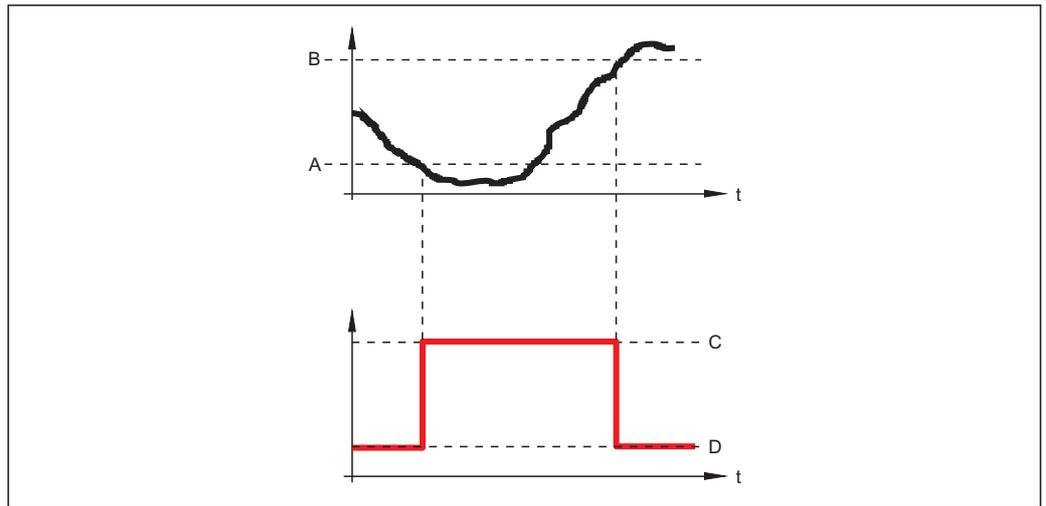
Endress+Hauser

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	▪ **Switch output function** (→ 🖺 168) = **Limit** ▪ **Assign limit** (→ 🖺 169) ≠ **Off**
Description	Define switch-on delay.
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** (→ 🖺 168) = **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 (→ 🖺 170).

Switch-off delay	🔒

Navigation	🔘🔲 Setup → Advanced setup → Switch output → Switch-off delay
Prerequsite	• Switch output function (→ 🔲 168) = Limit • Assign limit (→ 🔲 169) ≠ Off
Description	Define switch-off delay.
User entry	0.0 to 100.0 s
Factory setting	0.0 s

Failure mode	🔒

Navigation	🔘🔲 Setup → Advanced setup → Switch output → Failure mode
Description	Define output behavior in alarm condition.
Selection	• Actual status • Open • Closed
Factory setting	Open

Switch status	

Navigation	🔘🔲 Setup → Advanced setup → Switch output → Switch status
Description	Displays the current state of the switch output.

Invert output signal	🔒

Navigation	🔘🔲 Setup → Advanced setup → Switch output → Invert outp.sig.
Description	Specify whether the output signal is to be inverted.
Selection	• 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

ℹ️ 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) * • العَرَبِية (Arabic) * • Bahasa Indonesia * • ภาษาไทย (Thai) * • tiếng Việt (Vietnamese) * • čeština (Czech) *
Factory setting	The additional language selected in feature 500 of the product structure. If no additional language has been selected: **English**
Additional information	The **English** option can be selected in every device. One additional operating language can be selected in the product structure when ordering a device (feature 500 "Additional Operation Language") and will be selectable in the **Language** parameter.

Format display

Navigation	🔳🔲 Setup → Advanced setup → Display → Format display
Description	Select how measured values are shown on the display.

---

*   Visibility depends on order options or device settings

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

Factory setting   1 value, max. size

Additional information

42   "Format display" = "1 value, max. size"
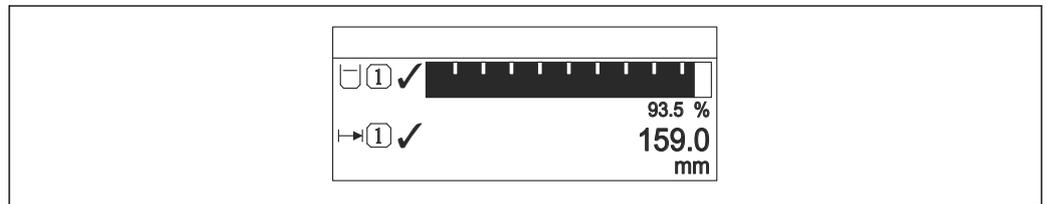
43   "Format display" = "1 bargraph + 1 value"
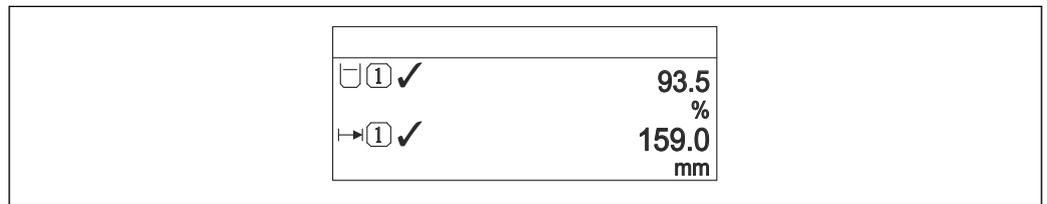
44   "Format display" = "2 values"
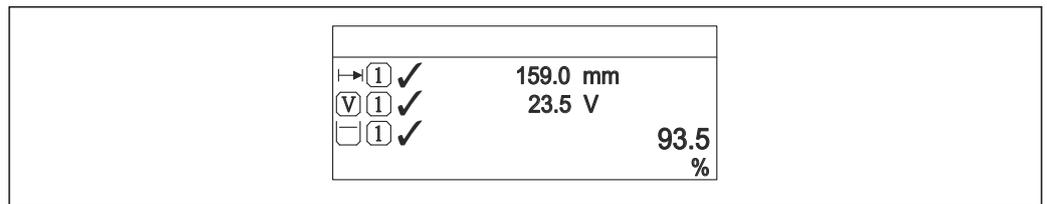
45   "Format display" = "1 value large + 2 values"
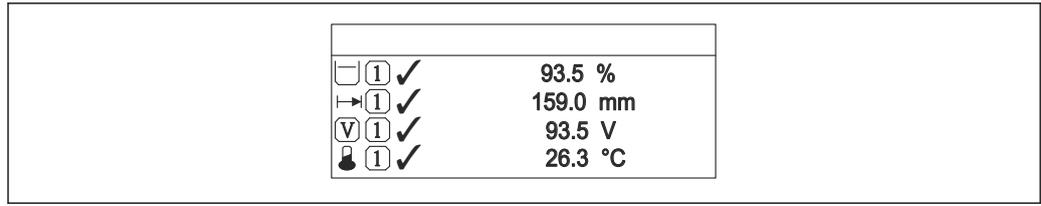
🔲 *46   "Format display" = "4 values"*

ℹ️ • The **Value 1 to 4 display** → 🔲 176 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 (→ 🔲 177).

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   • None [41]
                        • Level linearized
                        • Distance
                        • Current output 1 [42]
                        • Measured current
                        • Current output 2
                        • Terminal voltage
                        • Electronic temperature
                        • 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.

---

[41]   can not be selected for the 'Value 1 display' parameter.
[42]   "Visibility depends on order options or device settings"

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.

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	Define 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	• Device tag
	• Free text
Factory setting	Device tag

Additional information	
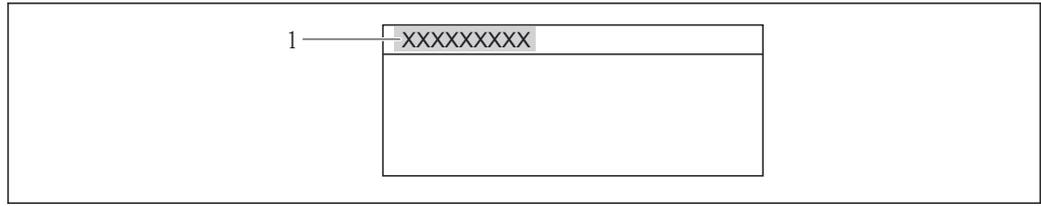
1   Position of the header text on the display

Meaning of the options

- **Device tag**
  Is defined in the **Device tag** parameter.
- **Free text**
  Is defined in the **Header text** parameter (→ 🖺 178).

Header text   🔒

Navigation	🎛🖥 Setup → Advanced setup → Display → Header text
Prerequsite	Header (→ 🖺 177) = **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 → Dec. places menu

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

Selection	• x • x.x • x.xx • x.xxx • x.xxxx

Factory setting	x.xxxx

Additional information	• 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** → 🖺 176 parameters. • The setting does not affect the accuracy of the measurement or the calculations.

Backlight

Navigation	🎛️🔲 Setup → Advanced setup → Display → Backlight

Prerequsite	The device has the SD03 local display (with optical keys).

Description	Switch the local display backlight on and off.

Selection	• Disable • Enable

Factory setting	Disable

Additional information	**Meaning of the options** • **Disable** Switches the backlight off. • **Enable** Switches the backlight on. ℹ️ Regardless of the setting in this parameter the backlight may be automatically switched off by the device if the supply voltage is too low.

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   Setting the contrast via push-buttons:
- Darker: press the ⊙ and ⓔ buttons simultaneously.
- Brighter: press the ⊙ and ⓔ buttons simultaneously.

"Configuration backup display" submenu

ℹ️ 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 configurateion 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 → Conf.backup disp

Operating time

Navigation	ⓘⓔ Setup → Advanced setup → Conf.backup disp → Operating time
Description	Indicates how long the device has been in operation.
User interface	Days (d), hours (h), minutes (m), seconds (s)
Additional information	*Maximum time* 9 999 d (≈ 27 years)

Last backup

Navigation	ⓘⓔ Setup → Advanced setup → Conf.backup disp → Last backup
Description	Indicates when the last data backup was saved to the display module.
User interface	Days (d), hours (h), minutes (m), seconds (s)

Configuration management   🔒

Navigation	ⓘⓔ Setup → Advanced setup → Conf.backup disp → Config. managem.
Description	Select action for managing the device data in the display module.
Selection	• Cancel • Execute backup • Restore • Duplicate • Compare • Clear backup data • Display incompatible
Factory setting	Cancel

Additional information   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.
• **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 (→ 🖺 182).
• **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 will not restore the original status.

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

Backup state

Navigation   🖳   Setup → Advanced setup → Conf.backup disp → Backup state

Description   Displays which backup action is currently in progress.

Comparison result

Navigation   🖳🖳   Setup → Advanced setup → Conf.backup disp → Compar. result

Description   Displays the comparison result between the device and the display.

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** (→ 🗐 181) = **Compare**.

If the transmitter configuration has been duplicated from a different device by **Configuration management** (→ 🗐 181) = **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 → Def. access code
Description	Define release code for write access to parameters.
User entry	0 to 9 999
Factory setting	0

Additional information

ℹ️ 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 *Maintenance* role.

ℹ️ 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.

ℹ️ 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 (→ 🖹 146).

ℹ️ Please contact your Endress+Hauser Sales Center if you lose your access code.

ℹ️ For display operation: The new access code is only valid after it has been confirmed in the **Confirm access code** parameter (→ 🖹 186).

Device reset 🔒

Navigation	▣▤ Setup → Advanced setup → Administration → Device reset
Description	Select to which state the device is to be reset.
Selection	• Cancel • To fieldbus defaults • 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 → Def. access code

---

Define access code

Navigation	Setup → Advanced setup → Administration → Def. access code → Def. access code
Description	→ 🖹 184

Confirm access code

Navigation	Setup → Advanced setup → Administration → Def. access code → Confirm code
Description	Confirm the entered access code.
User entry	0 to 9999
Factory setting	0

17.4 "Diagnostics" menu

Navigation   ▣▣   Diagnostics

Actual diagnostics

Navigation	▣▣ Diagnostics → Actual diagnos.
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
Description	Displays timestamp for the **Actual diagnostics** parameter (→ 🖹 187).
User interface	Days (d), hours (h), minutes (m), seconds (s)

Previous diagnostics

Navigation	▣▣ Diagnostics → Prev.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
Description	Displays timestamp for the **Previous diagnostics** parameter (→ 🗎 187).
User interface	Days (d), hours (h), minutes (m), seconds (s)

Operating time from restart

Navigation	▣▤ Diagnostics → Time fr. restart
Description	Displays the time the device has been in operation since the last device restart.
User interface	Days (d), hours (h), minutes (m), seconds (s)

Operating time

Navigation	▣▤ Diagnostics → Operating time
Description	Indicates how long the device has been in operation.
User interface	Days (d), hours (h), minutes (m), seconds (s)
Additional information	*Maximum time* 9 999 d (≈ 27 years)

17.4.1   "Diagnostic list" submenu

Navigation   ⊞⊟   Diagnostics → Diagnostic list

Diagnostics 1 to 5

Navigation   ⊞⊟   Diagnostics → Diagnostic list → Diagnostics 1 to 5

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

Description   Displays timestamp for the **Diagnostics 1 to 5** parameter (→ 🖺 189).

User interface   Days (d), hours (h), minutes (m), seconds (s)

17.4.2 "Event logbook" submenu

ℹ️ 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
Description	Select category (status signal) whose event messages are displayed in the events list.
Selection	• All • Failure (F) • Function check (C) • Out of specification (S) • Maintenance required (M) • Information (I)
Factory setting	All
Additional information	ℹ️ • 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 (→ 🕮 190). 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

ℹ️ 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

17.4.3   "Device information" submenu

Navigation   ▣▣   Diagnostics → Device info

Device tag

Navigation	▣▣ Diagnostics → Device info → Device tag
Description	Enter tag for measuring point.
Factory setting	FMP5x

Serial number

Navigation	▣▣ Diagnostics → Device info → Serial number
Description	Displays serial number of the 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 info → Firmware version
Description	Indicates the installed Firmware version.
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 info → Device name
Description	Displays device name.

Order code	

Navigation   ⌨☐   Diagnostics → Device info → Order code

Description   Displays order code of the device.

Additional information   The order code is generated from the extended roder 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 info → Ext. order cd. 1 to 3

Description   Displays 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.

17.4.4 "Measured values" submenu

Navigation   🖩🗏   Diagnostics → Measured val.

Distance

Navigation	🖩🗏 Diagnostics → Measured val. → 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	
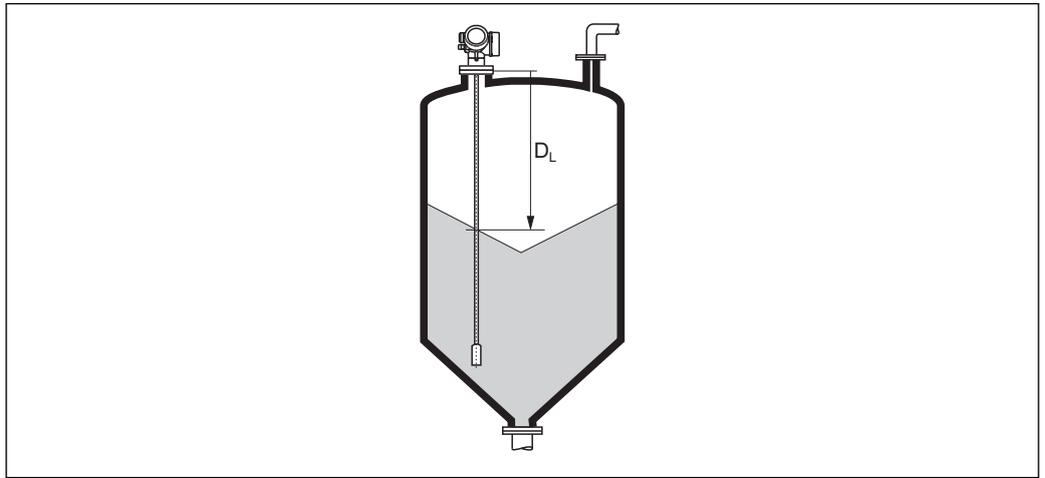
🖼 *47   Distance for bulk solid measurements*

ℹ The unit is defined in the **Distance unit** parameter (→ 🗏 136).

Level linearized

Navigation	🖩🗏 Diagnostics → Measured val. → Level linearized
Description	Displays linearized level.
Additional information	ℹ The unit is defined by the **Unit after linearization** parameter → 🗏 156.

Terminal voltage 1

Navigation	🖩🗏 Diagnostics → Measured val. → Terminal volt. 1
Description	Dipslays terminal voltage at the current output.

17.4.5 "Analog input 1 to 5" submenu

There is an **Analog inputs** submenu for every 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 block can be configured in this submenu. For a detailed configuration of the AI blocks refer to the **Expert** menu.

Navigation   Diagnostics → Analog inputs → Analog input 1 to 5

Block tag

Navigation   Diagnostics → Analog inputs → Analog input 1 to 7 → Block tag

Description   Defined to be unique throughout the control system at one plant site. The tag may be changed using the FB_Tag service.

Factory setting

Channel

Navigation   Diagnostics → Analog inputs → Analog input 1 to 7 → Channel

Description   Select the process variable.

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

Factory setting   Uninitialized

---

* Visibility depends on order options or device settings

Status

Navigation   ⓞⓔ Diagnostics → Analog inputs → Analog input 1 to 7 → Status

Description   Indicates the status of the output of the AI block according to the FOUNDATION Fieldbus
                              specification.

Value

Navigation   ⓞⓔ Diagnostics → Analog inputs → Analog input 1 to 7 → Value

Description   Indicates the output value of the AI block.

Units index

Navigation   ⓞⓔ Diagnostics → Analog inputs → Analog input 1 to 7 → Units index

Description   Indicates the unit of the output value.

17.4.6 "Data logging" submenu

Navigation　　　　⊞⊟　Diagnostics → Data logging

Assign channel 1 to 4	🔒

Navigation	⊞⊟	Diagnostics → Data logging → Assign chan. 1 to 4

Description　　　Allocate a process variable to the respective data logging channel.

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
- Analog output 1
- Analog output 2
- Analog output 3
- Analog output 4

Factory setting　　Off

Additional information　　A total of 500 measured values can be logged. This means:
- 500 data points if 1 logging channel is used
- 250 data points if 2 logging channels are used
- 166 data points if 3 logging channels are used
- 125 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 500, 250, 166 or 125 measured values are always in the log (ring memory principle).

ℹ️　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
Description	Define logging interval t_{log}.
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: $T_{log} = 500 \cdot t_{log}$
- If 2 logging channels are used: $T_{log} = 250 \cdot t_{log}$
- If 3 logging channels are used: $T_{log} = 166 \cdot t_{log}$
- If 4 logging channels are used: $T_{log} = 125 \cdot t_{log}$

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).

ℹ️ The logged data are deleted if this parameter is changed.

Example

When using 1 logging channel
- $T_{log} = 500 \cdot 1\ s = 500\ s \approx 8.5\ min$
- $T_{log} = 500 \cdot 10\ s = 5\,000\ s \approx 1.5\ h$
- $T_{log} = 500 \cdot 80\ s = 40\,000\ s \approx 11\ h$
- $T_{log} = 500 \cdot 3\,600\ s = 1\,800\,000\ s \approx 20\ d$

Clear logging data	🔒

Navigation	🖩🖵 Diagnostics → Data logging → Clear logging
Description	Initiate a deletion of the complete logging memory.
Selection	• Cancel • Clear data
Factory setting	Cancel

"Display channel 1 to 4" submenu

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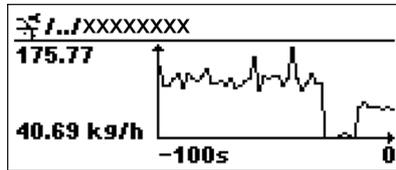
- x-axis: depending on the number of selected channels, 250 to 1000 measured values of a process variable are displayed.
- y-axis: covers the approximate measured value span and constantly adapts this to the measurement.

To return to the operating menu, press ⊞ and ⊟ simultaneaously.

Navigation   ⊞⊟   Diagnostics → Data logging → Displ.channel 1 to 4

17.4.7 "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	• Assign measurement variable (→ 🖺 202) • Process variable value (→ 🖺 202)
Specific state of the switch output	• Switch output simulation (→ 🖺 202) • Switch status (→ 🖺 203)
Existence of an alarm	Simulation device alarm (→ 🖺 203)

Enable/disable simulation

The simulation of measured values can be enabled or disabled via a hardware switch (SIM switch) at the electronics. Simulating a measured value is only possible if the SIM switch is in the ON position.

The switch output can always be simulated, irrespective of the position of the SIM switch.
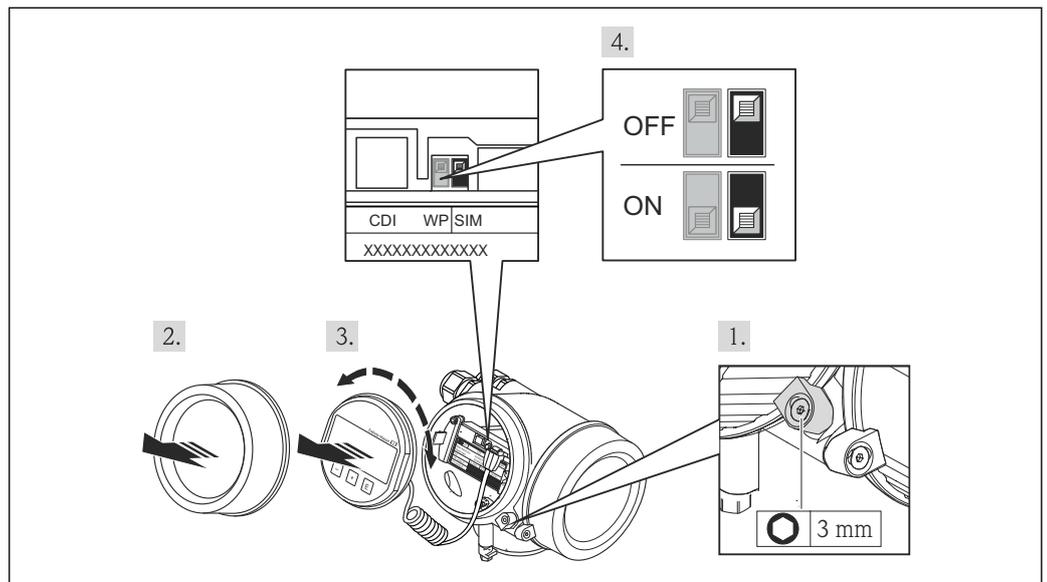
A0025882

1. Loosen the securing clamp.

2. Unscrew the housing cover.

3. Pull out the display module with a gentle rotation movement. To make it easier to access the SIM switch, attach the display module to the edge of the electronics compartment.
   ↳ Display module is attached to the edge of the electronics compartment.
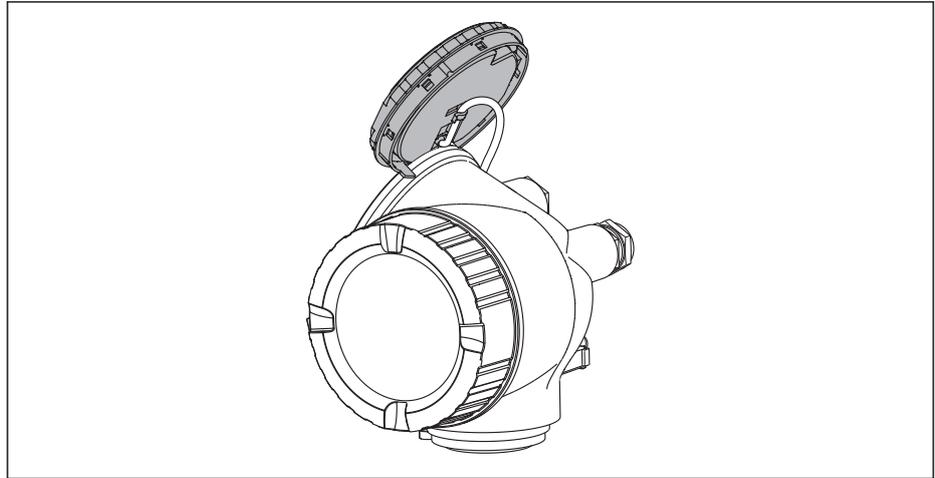
4. SIM switch in the **ON** position: measured values can be simulated. SIM switch in the **OFF** position (factory setting): Simulation of measured values is disabled.

5. Feed the spiral 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. Screw the electronics compartment cover closed and tighten the securing clamp.

Structure of the submenu

Navigation   Expert → Diagnostics → Simulation

‣ Simulation		
Assign measurement variable	→ 🖹	202
Process variable value	→ 🖹	202
Switch output simulation	→ 🖹	202
Switch status	→ 🖹	203
Simulation device alarm	→ 🖹	203

Description of parameters

Navigation   ⓘⓘ Expert → Diagnostics → Simulation

Assign measurement variable   ⓘ

Navigation   ⓘⓘ Expert → Diagnostics → Simulation → Assign meas.var.

Description   Selct process variable to be simulated.

Selection   • Off
                              • Level
                              • Interface *
                              • Level linearized
                              • Interface linearized
                              • Thickness linearized

Factory setting   Off

Additional information   • The value of the variable to be simulated is defined in the **Process variable value**
                                parameter (→ 🖺 202).
                              • If **Assign measurement variable** ≠ **Off**, a simulation is active. This is indicated by a
                                diagnotic message of the *Function check (C)* category.

Process variable value   ⓘ

Navigation   ⓘⓘ Expert → Diagnostics → Simulation → Proc. var. value

Prerequsite   Assign measurement variable (→ 🖺 202) ≠ Off

Description   Specify value of the process value being simulated.

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 sim.

Description   Switch the simulation of the switch output on or off.

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* Visibility depends on order options or device settings

Selection	• Off
	• On

Factory setting	Off

Switch status   🔒

Navigation	🔘🔲 Expert → Diagnostics → Simulation → Switch status

Prerequisite	Switch output simulation (→ 📄 202) = On

Description	Define the switch state to be simulated.

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 → Sim. alarm

Description	Switch alarm simulation on or 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.

17.4.8 "Device check" submenu

Navigation   ◧◨ Diagnostics → Device check

Start device check   ⓐ

Navigation	◧◨ Diagnostics → Device check → Start dev. check
Description	Start a device check.
Selection	▪ 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 dev.check
Description	Displays the result of the device check.

Additional information	**Meaning of the display options**
	▪ **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. Howerver, 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
Prerequsite	Device check has been performed.
Description	Displays result of the device check for the level signal.
User interface	• 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
Prerequsite	Device check has been performed.
Description	Displays result of the display check for the launch signal.
User interface	• 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.

Index

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