01.01.zz (Device firmware)

Products Solutions

Services

Operating Instructions Levelflex FMP51, FMP52, FMP54 PROFIBUS PA

Guided wave radar







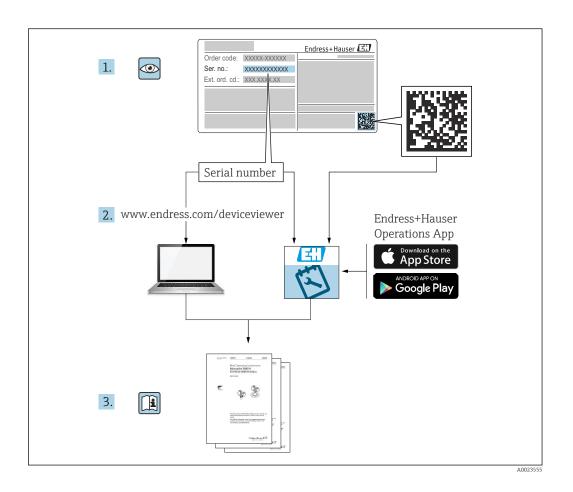


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1 Important document information

1.1 Purpose of this document

These Operating Instructions contain all the information that is required in the 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

A DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

WARNING

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

A CAUTION

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE

This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 Electrical symbols



Alternating current



Direct current and alternating current



Direct current



Ground connection

A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

Protective earth (PE)

Ground terminals that must be connected to ground prior to establishing any other connections

The ground terminals are located on the interior and exterior of the device:

- Interior ground terminal: protective earth is connected to the mains supply.
- Exterior ground terminal: device is connected to the plant grounding system.

1.2.3 Tool symbols



Phillips head screwdriver



Flat blade screwdriver



Torx screwdriver

06

Allen key



Open-ended wrench

1.2.4 Symbols for certain types of information and graphics

✓ Permitted

Procedures, processes or actions that are permitted

✓ ✓ Preferred

Procedures, processes or actions that are preferred

X Forbidden

Procedures, processes or actions that are forbidden

Tip

Indicates additional information

(I

Reference to documentation

 $\overline{\mathbb{Q}}$

Reference to graphic



Notice or individual step to be observed

1., 2., 3.

Series of steps

Result of a step

(

Visual inspection



Operation via operating tool

Write-protected parameter

1, 2, 3, ...

Item numbers

A, B, C, ...

Views

$\triangle \rightarrow \square$ 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

6

1.3 Documentation

The following types of documentation are available in the Download Area of the Endress +Hauser website (www.endress.com/downloads):



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

- Device Viewer (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- Endress+Hauser Operations app: Enter serial number from nameplate or scan matrix code on nameplate.

1.3.1 Technical Information (TI)

Planning aid

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.

1.3.2 Brief Operating Instructions (KA)

Guide that takes you quickly to the 1st measured value

The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

1.3.3 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.

The nameplate indicates the Safety Instructions (XA) that are relevant to the device.



1.3.4 Functional Safety Manual (FY)

Depending on the SIL approval, the Functional Safety Manual (FY) is an integral part of the Operating Instructions and applies in addition to the Operating Instructions, Technical Information and ATEX Safety Instructions.

The different requirements that apply for the protective function are described in the



1.4 Terms and abbreviations

BA

Document type "Operating Instructions"

KA

Document type "Brief Operating Instructions"

ΤI

Document type "Technical Information"

SD

Document type "Special Documentation"

XA

Document type "Safety Instructions"

PN

Nominal pressure

MWP

Maximum working pressure

The MWP is indicated on the nameplate.

ToF

Time of Flight

$\varepsilon_{\rm r}$ (Dk value)

Relative dielectric constant

PLC

Programmable logic controller (PLC)

CDI

Common Data Interface

BD

Blocking Distance; no signals are analyzed within the BD.

PI.C

Programmable logic controller (PLC)

CDI

Common Data Interface

PFS

Pulse Frequency Status (Switch output)

1.5 Registered trademarks

PROFIBUS®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

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

NORD-LOCK®

Registered trademark of Nord-Lock International AB

FISHER®

Registered trademark of Fisher Controls International LLC, Marshalltown, USA

MASONEILAN®

Registered trademark of Dresser, Inc., Addison, USA

2 Basic safety instructions

2.1 Requirements for the personnel

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

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

The operating personnel must fulfill the following requirements:

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

2.2 Intended use

Application and media

The measuring device described in this manual is intended only for the level and interface measurement of liquids. Depending on the version ordered, the measuring device can also measure potentially explosive, flammable, poisonous and oxidizing media.

If the limit values specified in the "Technical data" and the conditions listed in the instructions and additional documentation are observed, the measuring device may be used for the following measurements only:

- ▶ Measured process variables: level and/or interface height
- ► Calculable process variables: volume or mass in any shape of vessel (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 media to which the process-wetted materials have an adequate level of resistance.
- Observe the limit values in the "Technical data".

Incorrect use

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

Clarification of borderline cases:

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

Residual risks

Due to heat transfer from the process as well as power loss in the electronics, the temperature of the electronics housing and the assemblies contained therein (e.g. display module, main electronics module and I/O electronics module) may rise up to 80 $^{\circ}$ C (176 $^{\circ}$ F). When in operation, the sensor may reach a temperature close to the medium temperature.

Danger of burns from contact with surfaces!

► In the event of high medium temperatures, ensure protection against contact to prevent burns.

2.3 Workplace safety

When working on and with the device:

▶ Wear the required protective equipment according to federal or national regulations.

With separable probe rods, medium may penetrate the joints between the individual parts of the rod. This medium may escape when the joints are loosened. This can cause injuries in the case of dangerous (e.g., aggressive or toxic) media.

► When loosening the joints between the individual parts of the probe rod, wear appropriate protective equipment according to the medium.

2.4 Operational safety

Risk of injury!

- ▶ Operate the device only if it is in proper technical condition, free from errors and faults.
- ▶ The operator is responsible for the interference-free operation of the device.

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:

▶ If modifications are nevertheless 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 the repair of an electrical device.
- ▶ Use only original spare parts and accessories from the manufacturer.

Hazardous area

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

- ► Check the nameplate to verify whether the ordered device can be put to its intended use in the hazardous area.
- ▶ Observe the specifications in the separate supplementary documentation, which is an integral part of this manual.

2.5 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. It meets the general safety standards and legal requirements.

NOTICE

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

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

2.5.1 **CE mark**

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

The manufacturer confirms successful testing of the device by affixing to it the CE mark.

2.5.2 EAC conformity

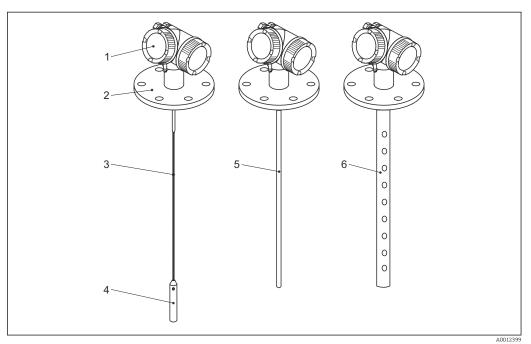
The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied.

The manufacturer confirms successful testing of the device by affixing to it the EAC mark.

3 Product description

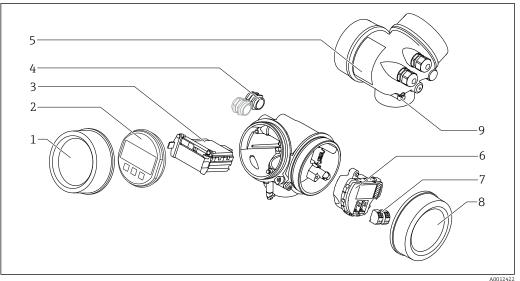
3.1 Product design

3.1.1 Levelflex FMP51/FMP52/FMP54/FMP55



- 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
- 6 Coax probe

3.1.2 **Electronics housing**



₽ 2 Design of the electronics housing

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

4 Incoming acceptance and product identification

4.1 Incoming acceptance

Check the following during incoming acceptance:

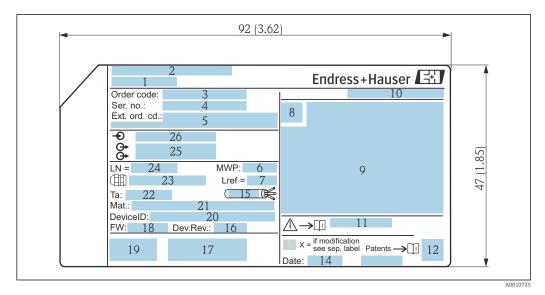
- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): are the Safety Instructions (XA) provided?
- If one of these conditions is not met, please contact your Endress+Hauser sales office.

4.2 Product identification

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

- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter the serial number from the nameplate in *W@M Device Viewer* (www.endress.com/deviceviewer): all the information about the device is displayed.
- Enter the serial number on the nameplate 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 about the measuring device is displayed.

4.2.1 Nameplate



■ 3 Nameplate of the Levelflex; engineering unit: mm (in)

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

Up to 33 characters of the extended order code are indicated on the nameplate. If the extended order code contains additional characters, these cannot be displayed. However, the complete extended order code can also be displayed via the device operating menu: **Extended order code 1 to 3** parameter

5 Storage, transport

5.1 Storage temperature

- Permitted storage temperature: -40 to +80 °C (-40 to +176 °F)
- Use original packaging.
- Option for FMP51 and FMP54: -50 to +80 °C (-58 to +176 °F)

 This range applies if the option JN "Transmitter ambient temperature" -50 °C (-58 °F) was selected in order code 580 "Test, Certificate". If the temperature is permanently below -40 °C (-40 °F), higher failure rates can be expected.

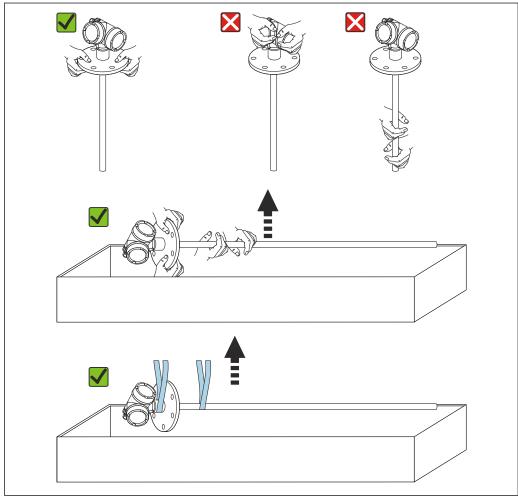
5.2 Transporting the product to the measuring point

A WARNING

Housing or rod may become damaged or pull off.

Danger of injury!

- ► Transport the measuring device to the measuring point in its original packaging or by the process connection.
- ▶ Always secure lifting equipment (slings, eyes, etc.) at the process connection and never lift the device by the electronic housing or probe. Pay attention to the center of gravity of the device so that it does not tilt or slip unintentionally.
- ► Follow the safety instructions and transport conditions for devices weighing more than 18 kg (39.6 lbs) (IEC 61010).

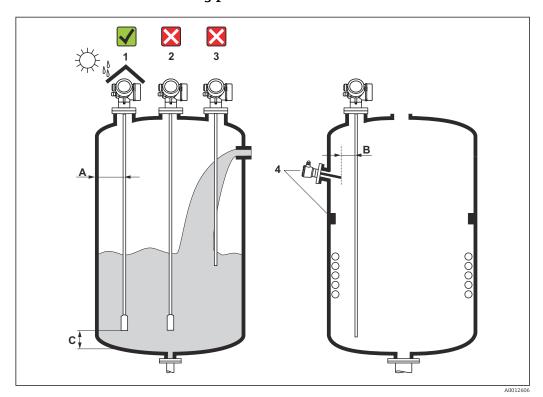


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6 Mounting

6.1 Mounting requirements

6.1.1 Suitable mounting position



 \blacksquare 4 Installation conditions for Levelflex

Spacing requirements when mounting

- Distance (A) between the vessel wall and rod and rope probes:
 - 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 permitted measuring range may be reduced.
- Distance (B) between rod probes and internal fittings (3): > 300 mm (12 in)
- When using more than one Levelflex:
 Minimum distance between the sensor axes: 100 mm (3.94 in)
- Distance (C) from the end of the probe to the bottom of the vessel:
 - Rope probe: > 150 mm (6 in)
 - Rod probe: > 10 mm (0.4 in)
 - Coax probe: > 10 mm (0.4 in)
- Coax probes can be mounted at any distance to the wall and internal fixtures.

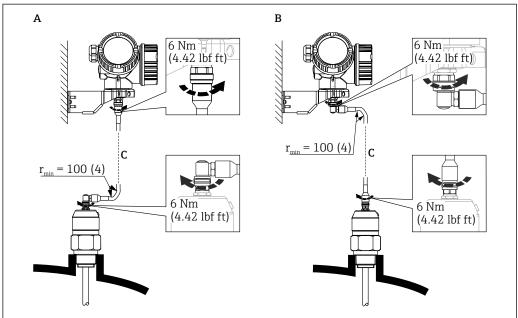
Additional conditions

- When mounting outdoors, a weather protection cover (1) can be used 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 cannot be avoided, it is essential to perform interference echo suppression (mapping) after commissioning the device.
- Do not mount the probe in the filling curtain (3).
- Avoid buckling the rope probe during installation or operation (e.g. as a result of product movement against silo wall) by selecting a suitable mounting location.
- In the case of freely suspended rope probes (probe end not fixed at the bottom), the distance between the probe rope and internal fittings, which can change due to the movement of the product, must never be less than 300 mm (12 in). Occasional contact between the probe end weight and the cone of the vessel, however, does not influence the measurement provided that the dielectric constant is at least DC = 1.8.
- When the housing is mounted in a recess (e.g. in a concrete ceiling), observe a minimum distance of 100 mm (4 in) between the cover of the connection compartment/electronics compartment and the wall. Otherwise the connection compartment/electronics compartment will not be accessible after installation.

6.1.2 Mounting under confined conditions

Mounting with remote probe

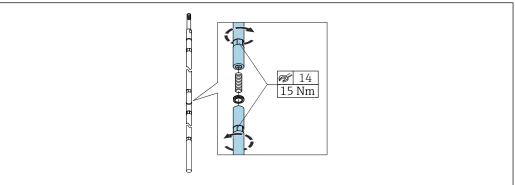
The device version with a remote probe is suitable for applications with restricted mounting space. In this case, the electronics housing is mounted at a separate position from the probe.



A001479

- 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":
 - Version MB "Sensor remote, 3m cable"
 - Version MC "Sensor remote, 6m cable"
 - Version MD "Sensor remote. 9m cable"
- The connecting cable is included in the delivery with these versions. Minimum bending radius: 100 mm (4 inch)
- The mounting bracket for the electronics housing is included in the delivery with these versions. Mounting options:
 - Wall mounting
 - Mounting on DN32 to DN50 (1-1/4 to 2 inch) post or pipe
- The connection cable has one straight plug and one plug angled at 90°. Depending on the local conditions the angled plug can be connected at the probe or at the electronics housing.
- The probe, electronics and connection cable are mutually compatible and bear a common serial number. Only components with the same serial number may be connected to one another.

Separable probes



A0021647

The use of separable rod probes (\emptyset 16 mm) is advisable in confined mounting conditions (limited distance to the ceiling).

- Max. probe length 10 m (394 in)
- Max. lateral loading capacity 30 Nm
- Probes can be separated several times, with the individual parts having the following lengths:
 - 500 mm (20 in)
 - 1000 mm (40 in)

The joints between the individual rod segments are secured by the enclosed Nord Lock washers. Install the pre-assembled washers in pairs, cam face to cam face.

20

6.1.3 Notes on the mechanical load of the probe

Tensile loading capacity of rope probes

FMP51

Rope 4mm (1/6") 316

5 kN

Rope 4mm (1/6") Alloy C

5 kN

Rope 4mm (1/6") PFA>316L

1 kN

FMP52

Rope 4mm (1/6") PFA>316

2 kN

FMP54

Rope 4mm (1/6") 316

10 kN

Lateral loading capacity (flexural strength) of rod probes

FMP51

Rod 8mm (1/3") 316L

10 Nm

Rod 12mm (1/2") 316L

30 Nm

Rod 12mm (1/2") AlloyC

30 Nm

Rod 16mm (0.63") 316L separable

30 Nm

FMP52

Rod 16mm (0.63") PFA>316L

30 Nm

FMP54

Rod 16mm (0.63") 316L

30 Nm

Rod 16mm (0.63") 316L separable

30 Nm

Lateral load (bending moment) from flow conditions

The formula for calculating the bending moment M acting on the probe:

 $M = c_w \times \rho/2 \times v^2 \times d \times L \times (L_N - 0.5 \times L)$

With:

cw: coefficient of friction

 ρ [kg/m³]: density of the medium

v [m/s]: flow velocity of the medium, perpendicular to the probe rod

d [m]: diameter of the probe rod

L [m]: level

LN [m]: probe length

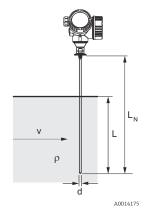
Sample calculation

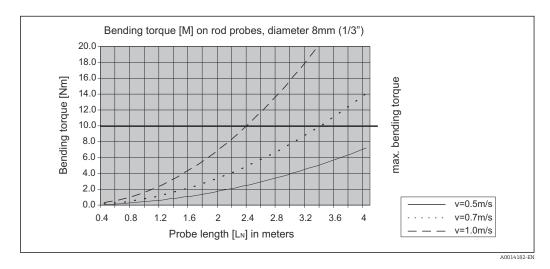
Coefficient of friction c_w 0.9 (assuming turbulent flow - high Reynolds number)

Density ρ [kg/m³] 1000 (e.g. water)

Probe diameter d [m] 0.008

 $L = L_N$ (unfavorable conditions)





6.1.4 Lateral loading capacity (flexural strength) of coax probes

FMP51

Probe Ø 21.3 mm 316L

60 Nm

Probe Ø 42.4 mm 316L

300 Nm

Probe Ø 42.4 mm AlloyC

300 Nm

FMP54

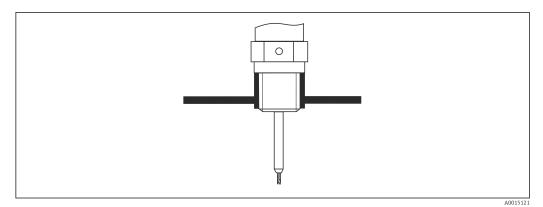
Probe Ø 42.4 mm 316L

300 Nm

6.1.5 Information concerning the process connection

Probes are mounted on the process connection with threaded connections or flanges. If there is the danger with this installation that the probe end moves so much that it occasionally touches the vessel floor or cone, the probe may need to be shortened at the lower end and fixed in place.

Threaded connection



₽ 5 Mounting with threaded connection; flush with the vessel ceiling

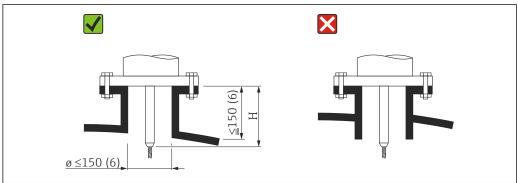
Seal

The thread and the type of seal comply with DIN 3852 Part 2, screwed plug, form A. The following types of sealing ring can be used:

- For thread G3/4": According to DIN 7603 with dimensions 27 mm × 32 mm
- For thread G1/-1/2": According to DIN 7603 with dimensions 48 mm × 55 mm

Use a sealing ring according to this standard in form A, C or D and of a material that offers appropriate resistance for the application.

Nozzle installation



Length of the centering rod or the rigid part of the rope probe

- Permissible nozzle diameter: ≤ 150 mm (6 in)
 For larger diameters, the near-range measuring capability may be reduced.
 For large nozzles, see the section "Mounting in nozzles ≥ DN300"
- Permissible nozzle height: ≤ 150 mm (6 in)
 For larger heights, the near-range measuring capability may be reduced.
 Larger nozzle heights are possible in special cases (on request), see sections "Centering rod for FMP51 and FMP52" and "Rod extension/centering device HMP40 for FMP54".
- The end of the nozzle should be flush with the tank ceiling in order to avoid ringing effects.
- In thermally insulated vessels, the nozzle should also be insulated in order to prevent condensate formation.

Centering rod

In the case of rope probes, it may be necessary to use a version with a centering rod so that the rope does not come in contact with the nozzle wall during the process.

The length of the optional centering rod determines the maximum nozzle height.

Rod extension/centering device HMP40 for FMP54

For FMP54 with rope probes, the rod extension/centering device HMP40 is available as an accessory. It must be used if the probe rope would otherwise come into contact with the lower edge of the nozzle.

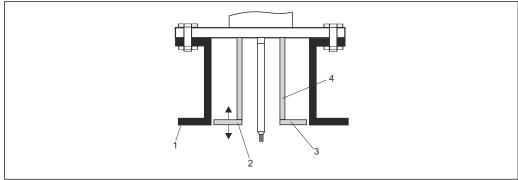
This accessory consists of the extension rod, corresponding to the nozzle height, on which a centering disk is also mounted if the nozzles are narrow or when used in bulk solids.

This component is delivered separately from the device. Order a correspondingly shorter probe length.

Only use centering disks with small diameters (DN40 and DN50) if there is no significant build-up in the nozzle above the disk. The nozzle must not become clogged with product.

Mounting in nozzles ≥ DN300

If installation in nozzles \geq 300 mm (12 in) is unavoidable, installation must be carried out in accordance with the following diagram in order to avoid interference signals in the near range.



A0014199

- 1 Lower edge of the nozzle
- 2 Approximately flush with the lower edge of the nozzle (±50 mm)
- 3 Plate, nozzle Ø 300 mm (12 in) = plate Ø 280 mm (11 in); nozzle Ø \geq 400 mm (16 in) = plate Ø \geq 350 mm (14 in)
- 4 Pipe Ø 150 to 180 mm

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6.1.6 Mounting cladded flanges



Note the following for cladded flanges:

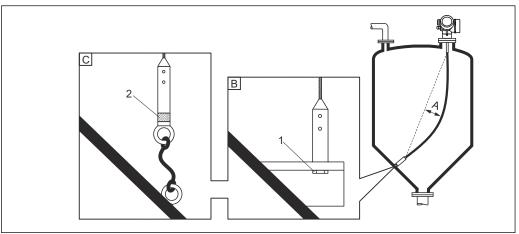
- Use the same number of flange screws as the number of flange bores provided.
- Tighten the screws with the necessary torque (see Table).
- Retighten after 24 hours or after the first temperature cycle.
- Depending on the process pressure and temperature, check and retighten the screws, where necessary, at regular intervals.

The PTFE flange cladding normally acts simultaneously as a seal between the nozzle and the device flange.

Flange size	Number of screws	Tightening torque
EN		
DN40/PN40	4	35 to 55 Nm
DN50/PN16	4	45 to 65 Nm
DN50/PN40	4	45 to 65 Nm
DN80/PN16	8	40 to 55 Nm
DN80/PN40	8	40 to 55 Nm
DN100/PN16	8	40 to 60 Nm
DN100/PN40	8	55 to 80 Nm
DN150/PN16	8	75 to 115 Nm
DN150/PN40	8	95 to 145 Nm
ASME		
1½"/150lbs	4	20 to 30 Nm
1½"/300lbs	4	30 to 40 Nm
2"/150lbs	4	40 to 55 Nm
2"/300lbs	8	20 to 30 Nm
3"/150lbs	4	65 to 95 Nm
3"/300lbs	8	40 to 55 Nm
4"/150lbs	8	45 to 70 Nm
4"/300lbs	8	55 to 80 Nm
6"/150lbs	8	85 to 125 Nm
6"/300lbs	12	60 to 90 Nm
JIS	1	1
10K 40A	4	30 to 45 Nm
10K 50A	4	40 to 60 Nm
10K 80A	8	25 to 35 Nm
10K 100A	8	35 to 55 Nm
10K 100A	8	75 to 115 Nm

6.1.7 Securing the probe

Securing rope probes



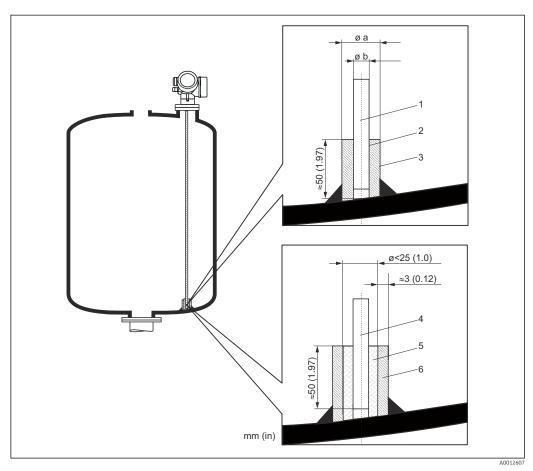
A001260

- A Rope sag: $\geq 10 \text{ mm/}(1 \text{ m probe length}) [0.12 \text{ in/}(1 \text{ ft probe length})]$
- B Reliably grounded end of probe
- C Reliably insulated end of probe
- 1 Fastener in female thread of probe end weight
- 2 Insulated fastening kit
- The end of the rope probe must be secured (fixed down) under the following conditions: If the probe would otherwise temporarily come into contact with the vessel wall, the cone, internal fittings/beams or another part of the installation
- A female thread is provided in the probe weight to secure the end of the probe: Rope 4 mm (1/6"), 316: M 14
- When fixed down, the end of the probe must be either reliably grounded or reliably insulated. Use an insulated fastening kit if it is not otherwise possible to secure the probe with a reliably insulated connection.
- If grounded fastening is used, the search for a positive probe end echo must be activated. Otherwise, automatic probe length correction is not possible.
 - Navigation: Expert \rightarrow Sensor \rightarrow EOP evaluation \rightarrow EOP search mode Setting: **Positive EOP** option
- To prevent an extremely high tensile load (e.g. due to thermal expansion) and the risk of the rope breaking, the rope must be slack. Required sag: ≥ 10 mm/(1 m rope length) [0.12 in/(1 ft rope length)].

Pay attention to the tensile loading capacity of rope probes.

Securing rod probes

- For WHG approval: A support is required for probe lengths \geq 3 m (10 ft).
- In general, rod probes must be secured in the event of horizontal flow (e.g. from an agitator) or strong vibrations.
- Only secure rod probes directly at the end of the probe.



Unit of measurement mm (in)

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

Probe Ø 8 mm (0.31 in)

- a < Ø 14 mm (0.55 in)
- $b = \emptyset 8.5 \text{ mm } (0.34 \text{ in})$

Probe Ø 12 mm (0.47 in)

- a < Ø 20 mm (0.78 in)
- $b = \emptyset 12.5 \text{ mm } (0.52 \text{ in})$

Probe Ø 16 mm (0.63 in)

- \bullet a < Ø 26 mm (1.02 in)
- $b = \emptyset 16.5 \text{ mm } (0.65 \text{ in})$

NOTICE

Poor grounding of the probe end may cause incorrect measurements.

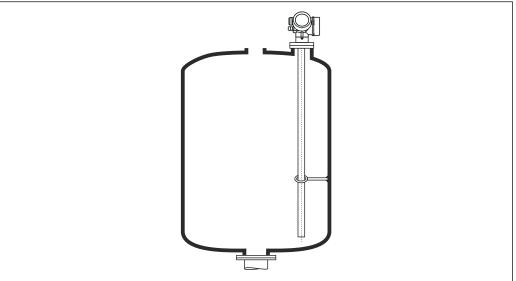
▶ Use a sleeve with a narrow bore to ensure good electrical contact between the sleeve and the probe rod.

NOTICE

Welding can damage the main electronics module.Before welding: Ground the probe rod and remove the electronics.

Securing coax probes

For WHG approval: A support is required for probe lengths \geq 3 m (10 ft).



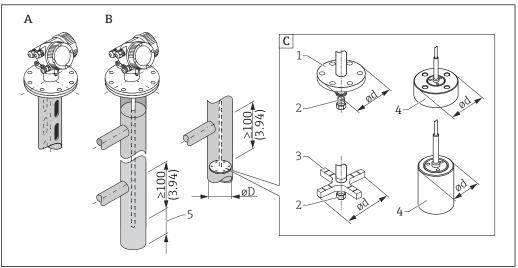
A0012608

Coax probes can be secured (fixed) at any point in the ground tube.

6.1.8 Special installation situations

Bypasses and stilling wells

- The use of centering disks/stars/weights (available as accessories) is recommended in bypass and stilling well applications.
- As the measuring signal penetrates many plastics, installation in plastic bypasses or stilling wells can produce incorrect results. For this reason use a metal bypass or stilling well.



A0039216

■ 6 Engineering unit: mm (in)

- A Mounting in stilling well
- B Mounting in bypass
- C Centering disk/centering star/centering weight
- 1 Metal centering disk (316L) for level measurement
- 2 Securing screw; torque: $25 \text{ Nm} \pm 5 \text{ Nm}$
- 3 Non-metal centering star (PEEK, PFA) preferred for interface measurement
- 4 Metal centering weight (316L) for level measurement
- 5 Minimum distance between probe end and lower edge of bypass 10 mm (0.4 in)
- Pipe diameter: > 40 mm (1.6 in) (for rod probes).
- A rod probe can be installed in pipes with a diameter of up to 150 mm (6 in). The use of a coax probe is recommended for larger pipe diameters.
- Side outlets, holes, slots and welds with a maximum inward projection of 5 mm (0.2 in) do not affect the measurement.
- There should not be any changes in the diameter of the pipe.
- The probe must be 100 mm (4 in) longer than the lower outlet.

- The probes must not touch the pipe wall within the measuring range. Support or brace the probe if necessary. All rope probes are prepared for bracing in vessels (tensioning weight with anchor hole).
- If a metal centering disk is mounted at the end of the probe rod, the signal for detecting the end of the probe is reliably defined.

Note: The non-metal centering stars made of PEEK or PFA are recommended for interface measurements. When using metal centering disks, it is important to ensure that the lower medium covers the centering disk at all times. Otherwise, incorrect interface measurements can result.

- Coax probes can be used within any restrictions provided that the pipe diameter permits their installation.
- For bypasses with condensate formation (water) and a medium with a low dielectric constant (e.g. hydrocarbons):

Over time, the bypass fills with condensate up to the lower outlet. When levels are low, the level echo is masked by the echo of the condensate as a result. In this range, the level of the condensate is output and the correct value is only output when levels are higher. For this reason, ensure that the lower outlet is 100 mm (4 in) below the lowest level to be measured and fit a metal centering disk at the level of the lower edge of the lower outlet.

In thermally insulated vessels, the bypass should also be insulated in order to prevent condensate formation.

Assignment of centering disk/centering star/centering weight to the pipe diameter Metal centering disk (316L)

for level measurement

Rod centering disk (Ød) 45 mm (1.77 in)

for pipe diameter (ØD) DN50/2" to DN65/ $2\frac{1}{2}$ "

Rod centering disk (Ød) 75 mm (2.95 in)

for pipe diameter (ØD) DN80/3" to DN100/4"

Rope centering disk (Ød) 75 mm (2.95 in)

for pipe diameter (ØD) DN80/3" to DN100/4"

Metal centering weight (316L)

for level measurement

Rope centering weight (\emptyset d) 45 mm (1.77 in), h 60 mm (2.36 in)

for pipe diameter (ØD) DN50/2"

Rope centering weight (\emptyset d) 75 mm (2.95 in), h 30 mm (1.81 in) for pipe diameter (\emptyset D)

DN80/3"

Rope centering weight (\emptyset d) 95 mm (3.74 in), h 30 mm (1.81 in)

for pipe diameter (ØD)

DN100/4"

Non-metal centering star (PEEK)

For level and interface measurement, operating temperature: -60 to +250 °C (-76 to 482 °F)

Rod centering star (Ød) 48 to 95 mm (1.89 to 3.74 in)

for pipe diameter (\emptyset D) \geq DN50/2"

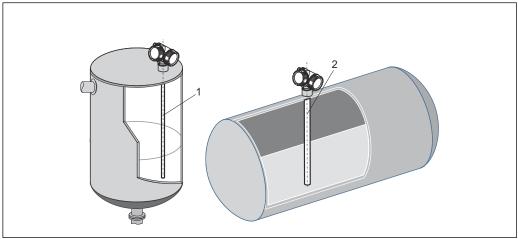
Non-metal centering star (PFA)

For level and interface measurement, operating temperature: -200 to $+250\,^{\circ}\!C$ (–328 to +482 $^{\circ}\!F)$

Rod centering star (Ød) 37 mm (1.46 in) for pipe diameter (ØD)

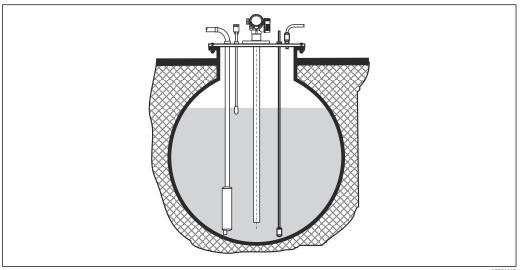
 \geq 40 mm (1.57 in)

Horizontal cylindrical and vertical tanks



- Coax probe
- Any distance from wall provided occasional contact is avoided.
 Use a coax probe (1) if installing in tanks with many internal fixtures or internal fixtures located close to the probe.

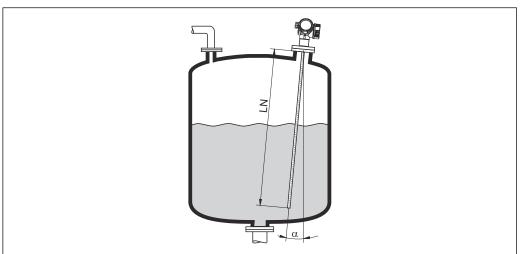
Underground tanks



A0014142

In the case of nozzles with large diameters, use a coax probe to avoid reflections at the nozzle wall.

Mounting at an angle

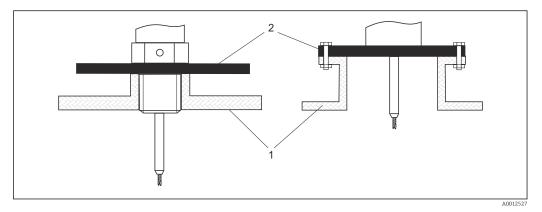


A0014145

- For mechanical reasons, the probe should be installed as vertically as possible.
- If the probe is installed at an angle, the length of the probe must be reduced depending on the angle of installation.

 - α 5°: LN_{max.} 4 m (13.1 ft) α 10°: LN_{max.} 2 m (6.6 ft) α 30°: LN_{max.} 1 m (3.3 ft)

Non-metal vessels



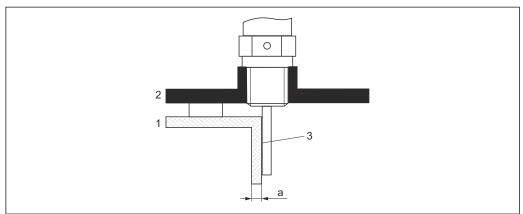
- Non-metal vessel
- 2 Metal sheet or metal flange

To ensure good measurement results when mounting on non-metal vessels

- Use a device with a metal flange (minimum size DN50/2").
- Alternatively: at the process connection, mount a metal sheet with a diameter of at least 200 mm (8 in) at a right angle to the probe.
- A metal surface is not required at the process connection in the case of coax probes.

Plastic and glass vessels: Mounting the probe on the outside wall

In the case of plastic and glass vessels, the probe can also be mounted on the outside wall under certain conditions.



A0014150

- 1 Plastic or glass vessel
- 2 Metal plate with screw-in sleeve
- 3 No space between vessel wall and probe!

Requirements

- Dielectric constant of the medium: $\varepsilon_r > 7$.
- Non-conductive vessel wall.
- Maximum wall thickness (a):
 - Plastic: < 15 mm (0.6 in)
 - Glass: < 10 mm (0.4 in)
- No metal reinforcements on the vessel.

Note the following when mounting the device:

- Mount the probe directly on the vessel wall without any space between the wall and probe.
- To prevent any influence on the measurement, fit a plastic half pipe with a diameter of at least 200 mm (8 in), or a similar protective unit, on the probe.
- For vessel diameters less than 300 mm (12 in):
 On the opposite side of the vessel, fit a grounding plate that is conductively connected to the process connection and covers around half of the vessel's circumference.
- For vessel diameters of 300 mm (12 in) and higher: At the process connection, fit a metal plate with a diameter of at least 200 mm (8 in) at a right angle to the probe (see above).

Adjustment when mounting on the vessel exterior

When the probe is mounted on the outside of the vessel wall, the speed of propagation of the signal is reduced. There are two ways to compensate for this.

Compensation via gas phase compensation factor

The effect of the dielectric wall is comparable to the effect of a dielectric gas phase and can therefore be corrected in the same way. The correction factor is calculated as the quotient of the actual probe length LN and the probe length measured when the vessel is empty.

- The device determines the position of the probe end echo in the differential curve. Therefore, the value of the measured probe length depends on the mapping curve. In order to obtain a more accurate value, it is advisable to determine the measured probe length manually using the envelope curve display in FieldCare.
- Parameter Expert → Sensor → Gas phase compensation → GPC mode
 Select the Const. GPC factor option.

Parameter Expert → Sensor → Gas phase compensation → Const. GPC factor
 Ouotient: Enter "(actual probe length)/(measured probe length)".

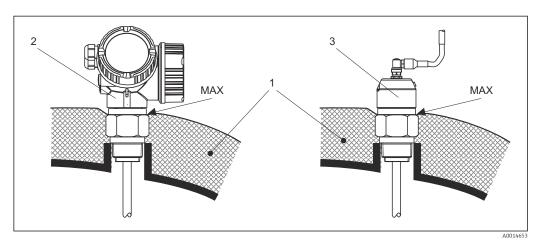
Compensation via the calibration parameters

If it is necessary to actually compensate for a gas phase, the gas phase compensation function is not available for the correction of external mounting. The calibration parameters (**Empty calibration** and **Full calibration**) must be adjusted in this case. Furthermore, a value that is greater than the actual probe length must be entered in the **Present probe length** parameter. In all three cases, the correction factor is the quotient of the probe length measured when the vessel is empty and the actual probe LN.

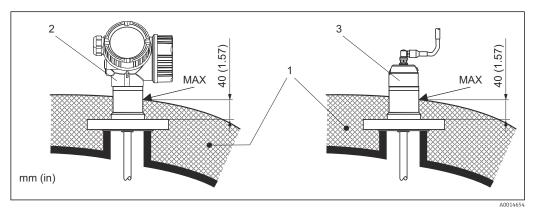
- The device searches for the probe end echo in the differential curve. Therefore, the value of the measured probe length depends on the mapping curve. In order to obtain a more accurate value, it is advisable to determine the measured probe length manually using the envelope curve display in FieldCare.
- 1. Parameter Setup → Empty calibration
 - Increase the parameter value by the factor "(measured probe length)/(actual probe length)".
- 2. Parameter Setup → Full calibration
 - Increase the parameter value by the factor "(measured probe length)/(actual probe length)".
- 3. Parameter Setup → Advanced setup → Probe settings → Probe length correction → Confirm probe length
 - ► Select the **Manual input** option.
- 4. Parameter Setup → Advanced setup → Probe settings → Probe length correction → Present probe length
 - ► Enter the measured probe length.

Vessel with thermal insulation

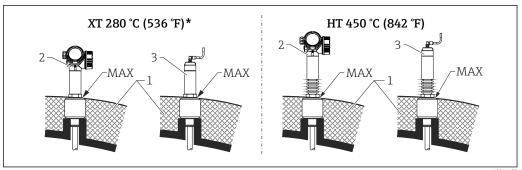
If process temperatures are high, the device must be included in normal vessel insulation (1) in order to prevent the electronics heating up as a result of thermal radiation or convection. The insulation may not go beyond the points labeled "MAX" in the drawings.



- 7 Process connection with thread
- 1 Vessel insulation
- 2 Compact device
- 3 Sensor, remote



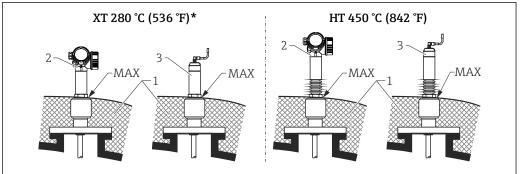
- 8 Process connection with flange
- Vessel insulation
- 2 Compact device
- 3 Sensor, remote



 \blacksquare 9 Process connection with thread - sensor version XT and HT

A001465

- 1 Vessel insulation
- 2 Compact device
- 3 Sensor, remote
- * The XT version is not recommended for saturated steam above 200 °C (392 °F); the HT version should be used instead



A001465

■ 10 Process connection with flange - sensor version XT and HT

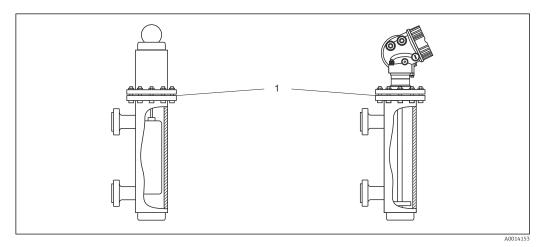
- 1 Vessel insulation
- 2 Compact device
- 3 Sensor, remote
- * The XT version is not recommended for saturated steam above 200 °C (392 °F); the HT version should be used instead

Replacing a displacer system in an existing displacer chamber

FMP51 and FMP54 are a perfect replacement for a conventional displacer system in an existing displacer chamber. Flanges that suit Fisher and Masoneilan displacer chambers are available for this purpose (special product for FMP51; feature 100 of the product structure, options LNJ, LPJ, LQJ for FMP54). Thanks to menu-guided local operation, commissioning the Levelflex only takes a few minutes. Replacement is also possible when partially filled, and wet calibration is not required.

Your benefits:

- No moving parts, therefore zero-maintenance operation.
- Not affected by process influences such as temperature, density, turbulence and vibrations.
- The rod probes can be easily shortened or replaced. Therefore, the probe can also be easily adjusted on site.



1 Flange of the displacer chamber

Planning instructions:

- In normal cases, use a rod probe. When installing into a metal displacer chamber up to 150 mm, you have all the advantages of a coax probe.
- Contact between the probe and the side wall must be avoided. Where necessary, use a centering disk or centering star at the bottom end of the probe.
- The centering disk or centering star must be adapted as accurately as possible to the internal diameter of the displacer chamber to also ensure correct operation around the probe end.

Additional information regarding interface measurement

- In the case of oil and water, the centering star should be positioned at the lower edge of the lower outlet (water level).
- There should not be any changes in the diameter of the pipe. Use the coax probe if necessary.
- It must be ensured that rod probes do not come into contact with the wall. Where necessary, use a centering star at the end of the probe.
- The non-metal centering stars made of PEEK or PFA are recommended for interface measurements. When using metal centering disks, it is important to ensure that the lower medium covers the centering disk at all times. Otherwise, incorrect interface measurements can result.

6.2 Mounting the measuring device

6.2.1 Tool list

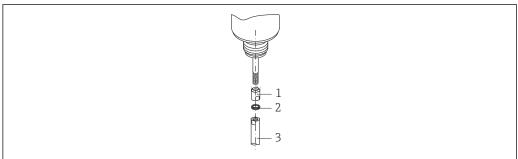


- To shorten rope probes: use a saw or bolt cutters
- To shorten rod or coax probes: use a saw
- For flanges and other process connections: use an appropriate mounting tool

6.2.2 Mounting the FMP54 rod probe

Coax probes are ready mounted and adjusted upon delivery. Once installed, they are ready for immediate use. Additional settings are not necessary.

FMP54 devices are supplied with the rod probe disassembled. The probe must be mounted as follows prior to installation:



- 1 Threaded sleeve
- 2 Nord Lock washers
- 3 Probe rod
- 1. Screw the threaded sleeve onto the connection thread (M10x1) of the gland as far as the end stop. In doing so, ensure that the chamfer is oriented towards the gland.
- 2. Fit Nord Lock washers on the connection thread. Install the pre-assembled washers in pairs, cam face to cam face.
- 3. Screw the probe rod onto the threaded bolt, hold it steady by the threaded sleeve with an open-end wrench (14 mm AF) and tighten at the wrench flats of the probe rod using an open-end wrench (14 mm AF). Torque 15 Nm.

6.2.3 Shortening the probe

Shortening rod probes

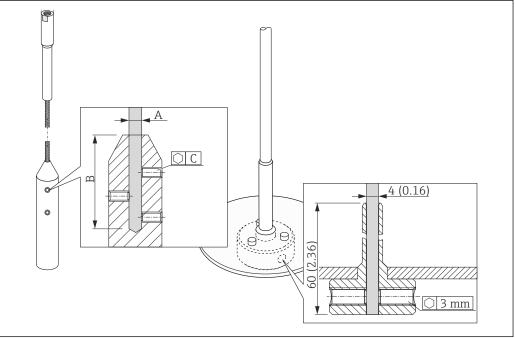
Rod probes must be shortened if the distance to the vessel floor or outlet cone is less than 10 mm (0.4 in). To shorten, saw off the bottom end of the rod probe.

Coated rod probes cannot be shortened.

Shortening rope probes

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

Coated rope probes **cannot** be shortened.



Rope material 316

- A:
- 4 mm (0.16 in)
- B:
 - 40 mm (1.6 in)
- C:
 - 3 mm; 5 Nm (3.69 lbf ft)
- 1. Using the Allen key, loosen the setscrews on the rope weight or on the fastener for the centering disk. Note: The setscrews have a clamping coating in order to prevent them from becoming loose accidentally. A higher torque is therefore required to loosen the screws.
- 2. Remove the released rope from the weight or from the sleeve.
- 3. Measure off the new rope length.
- 4. At the point to be shortened, wrap adhesive tape around the rope to prevent it from fraying.
- 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 or sleeve.
- 7. Screw the setscrews back into place. Due to the clamping coating of the setscrews, it is not necessary to apply a locking compound.

Shortening coax probes

Coax probes must be shortened if the distance to the vessel floor or outlet cone is less than 10 mm (0.4 in).

Coax probes can be shortened by a maximum of 80 mm (3.2 in) from the bottom. They have centering devices on the inside to secure the rod centrally in the pipe. A raised edge holds the centering devices in place on the rod. It is possible to shorten the probe up to approx. 10 mm (0.4 in) below the centering device.

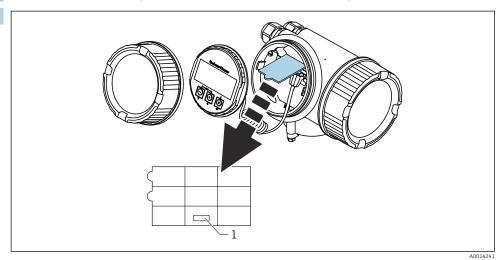
To shorten, saw off the bottom end of the coax probe.

Entering the new probe length

After shortening the probe:

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





1 Field for the new probe length

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

6.2.4 FMP54 with gas phase compensation: Mounting the probe rod

This section only applies to the FMP54 with the gas phase compensation function (product structure: feature 540 "Application packages", option EF or EG)

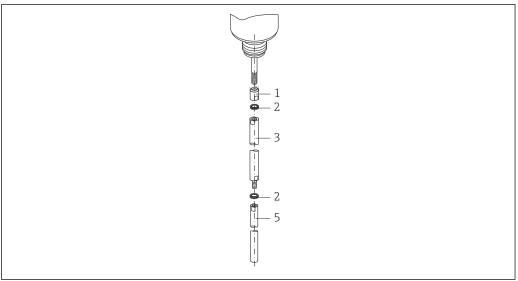
Coax probes

Coax probes with reference reflection are ready mounted and adjusted upon delivery. Once installed, they are ready for immediate use. Additional settings are not necessary.

Rod probes

Rod probes with reference reflection are supplied with the rod probe disassembled. The rod probe must be mounted as follows prior to installation:

The joints between the individual rod segments are secured by the enclosed Nord Lock washers. Install the pre-assembled washers in pairs, cam face to cam face.

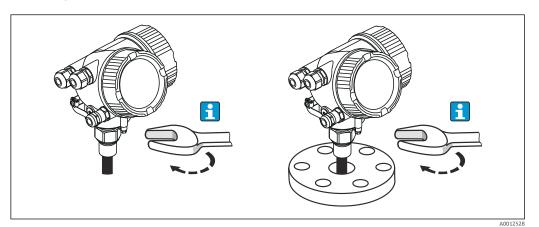


A001454

- 1 Threaded sleeve
- 2 Nord Lock washers
- 3 Probe rod; larger diameter
- 4 Probe rod; larger diameter
- 1. Screw the threaded sleeve onto the connection thread (M10x1) of the gland as far as the end stop. In doing so, ensure that the chamfer is oriented towards the gland.
- 2. Fit Nord Lock washers on the connection thread.
- 3. Screw the probe rod with the larger diameter onto the connection thread and fasten it hand-tight.
- 4. Fit the second pair of Nord Lock washers on the threaded bolt.
- 5. Screw the probe rod with the smaller diameter onto the threaded bolt, hold it steady by the threaded sleeve with an open-end wrench (14 mm AF) and tighten at the wrench flats of the probe rod using an open-end wrench (14 mm AF). Torque 15 Nm.
- After mounting the rod probe in the stilling well or bypass, check and if necessary correct the setting of the reference distance in the unpressurized state.

6.2.5 Mounting the device

Mounting devices with a threaded connection



Screw the device with the threaded connection into a sleeve or flange and then secure it to the process vessel via the sleeve/flange.



- When screwing into place, turn by the hex bolt only:
- Thread 3/4": 6 36 mm
- Thread 1-1/2": € 55 mm
- Maximum permissible tightening torque:
 - Thread 3/4": 45 Nm
 - Thread 1-1/2": 450 Nm
- Recommended torque when using the supplied aramid fiber seal and a process pressure of 40 bar (only FMP51, no seal is included with FMP54):
 - Thread 3/4": 25 Nm
 - Thread 1-1/2": 140 Nm
- When installing in metal vessels, ensure there is good metal contact between the process connection and the vessel.

Mounting devices with a flange

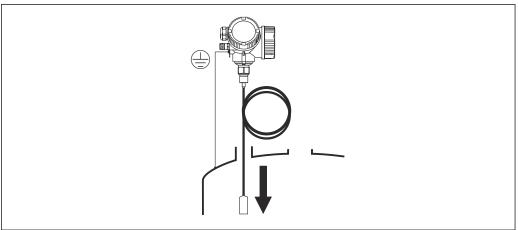
If a seal is used to mount the device, use uncoated metal screws to ensure good electrical contact between the process flange and the probe flange.

Mounting rope probes

NOTICE

Electrostatic discharge can damage the electronics.

▶ Ground the housing before lowering the rope probe into the vessel.



A0012852

Pay attention to the following when introducing the rope probe into the vessel:

- Uncoil the rope slowly and lower it carefully into the vessel.
- Make sure the rope does not bend or buckle.
- Avoid uncontrolled swinging of the weight, as this could damage internal fittings in the vessel.

6.2.6 Mounting the "Sensor, remote" version

This section only applies for devices with the version "Probe design" = "Sensor, remote" (feature 600, version MB/MC/MD).

The following is included in the delivery with the version "Probe design" = "Remote":

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

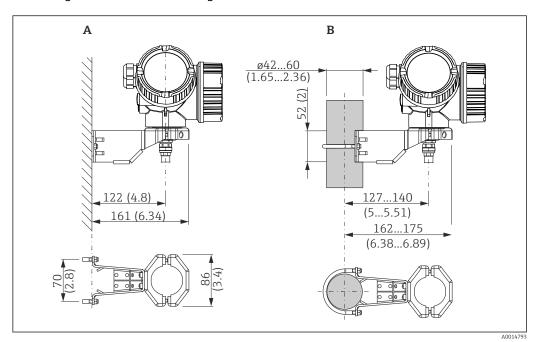
A CAUTION

Mechanical stress can damage the plugs of the connection cable or cause them to become loose.

- Mount the probe and the electronics housing securely before connecting the connecting cable.
- ► Lay the connecting cable in such a way that it is not exposed to mechanical stress. Minimum bending radius: 100 mm (4 in).
- ▶ When connecting the cable, connect the straight plug before you connect the angled plug. Torque for the union nuts of both plugs: 6 Nm.
- The probe, electronics and connection cable are mutually compatible and bear a common serial number. Only components with the same serial number may be connected to one another.

In the event of strong vibrations, a locking compound, e.g. Loctite 243, can also be used on the plug-in connectors.

Mounting the electronics housing



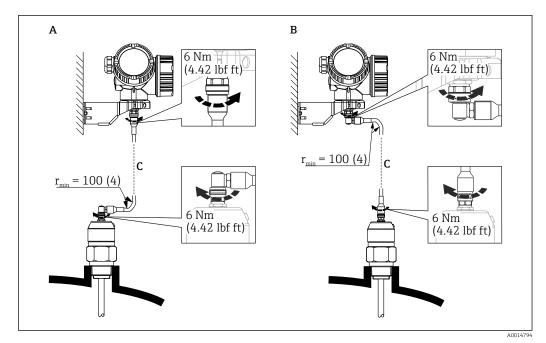
 $lap{1}$ Mounting the electronics housing with the mounting bracket. Unit of measurement mm (in)

A Wall mounting

B Post mounting

Connecting the connecting cable

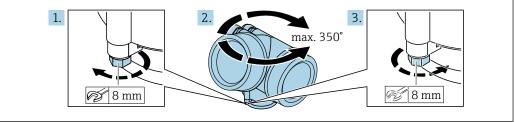




- 2 Connecting the connecting cable. The cable can be connected in the following ways:. Unit of measurement mm (in)
- A Angled plug at the probe
- B Angled plug at the electronics housing
- C Length of the remote cable as ordered

6.2.7 Turning the transmitter housing

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

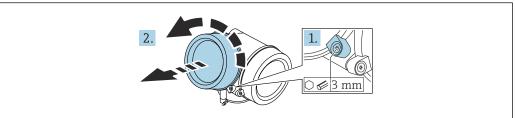


A003224

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

6.2.8 Turning the display

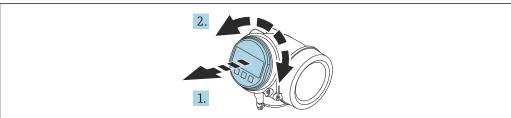
Opening the cover



Δ0021430

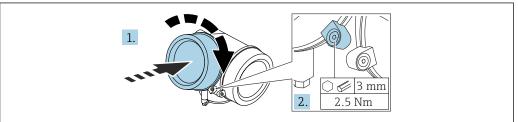
- 1. Loosen the screw of the securing clamp of the electronics compartment cover using an Allen key (3 mm) and turn the clamp 90 ° counterclockwise.
- 2. Unscrew the electronics compartment cover and check the cover seal; replace it if necessary.

Turning the display module



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

Closing the cover of the electronics compartment



A0021451

- 1. Screw down the cover of the electronics compartment.
- 2. Turn the securing clamp 90 ° in the clockwise direction and, using an Allen key (3 mm), tighten the screw of the securing clamp on the electronics compartment cover with 2.5 Nm.

6.3 Post-installation check

☐ Is the device undamaged (visual inspection)?

Does the device comply with the measuring point specifications?
 Process temperature
Process pressure
 Ambient temperature range
Measuring range
$\ \square$ Are the measuring point identification and labeling correct (visual inspection)?
\square Is the device adequately protected against precipitation and direct sunlight?
\square Is the device adequately protected against impact?
☐Are all mounting and safety screws securely tightened?

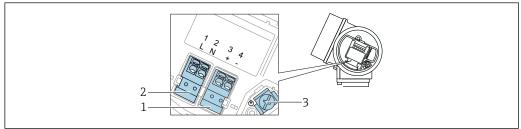
☐ Is the device properly secured?

7 Electrical connection

7.1 Connecting requirements

7.1.1 Terminal assignment

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



A003651

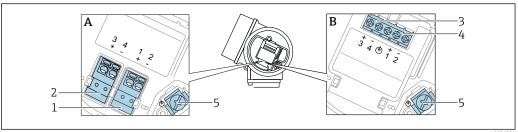
- \blacksquare 13 Terminal assignment, 4-wire: 4 to 20 mAHART (90 to 253 V_{AC})
- 1 Connection 4 to 20 mA HART (active): terminals 3 and 4
- 2 Connection, supply voltage: terminals 1 and 2
- 3 Terminal for cable shield

A CAUTION

To ensure electrical safety:

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

Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus

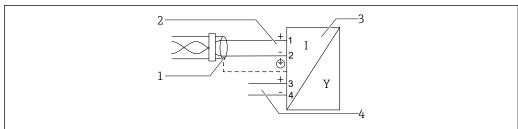


■ 14 Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus

A0036500

- A Without integrated overvoltage protection
- B With integrated overvoltage protection
- 1 Connection, PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, without integrated overvoltage protection
- $\stackrel{\cdot}{\text{Connection}}$, switch output (open collector): terminals 3 and 4, without integrated overvoltage protection
- 3 Connection, switch output (open collector): terminals 3 and 4, with integrated overvoltage protection
- 4 Connection, PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, with integrated overvoltage protection
- 5 Terminal for cable shield

Block diagram PROFIBUS PA / FOUNDATION Fieldbus

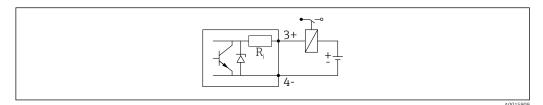


A003653

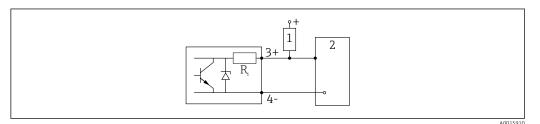
■ 15 Block diagram PROFIBUS PA / FOUNDATION Fieldbus

- 1 Cable screen; observe cable specification
- 2 Connection PROFIBUS PA / FOUNDATION Fieldbus
- 3 Measuring device
- 4 Switch output (open collector)

Connection examples for the switch output



■ 16 Connection of a relay



🖪 17 Connection to a digital input

- 1 Pull-up resistor
- 2 Digital input
- For optimum interference immunity we recommend to connect an external resistor (internal resistance of the relay or pull-up resistor) of $< 1000 \Omega$.

7.1.2 Cable specification

- **Devices without integrated overvoltage protection**Pluggable spring-force terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- Devices with integrated overvoltage protection
 Screw terminals for wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)
- For ambient temperature $T_U \ge 60$ °C (140 °F): use cable for temperature $T_U + 20$ K.

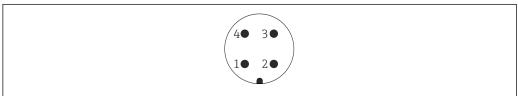
PROFIBUS

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

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

7.1.3 Device plug

In the case of the device versions with a plug, the housing does not need to be opened to connect the signal cable.



A001117

 \blacksquare 18 Pin assignment of M12 plug

- 1 Signal +
- 2 Not assigned
- 3 Signal -
- 4 Ground

7.1.4 Supply voltage

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-hazardous 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 / ISEx ia + Ex d[ia] / IS + XP	9 to 30 V ³⁾

- 1) Feature 020 in the product structure
- 2) Feature 010 in the product structure
- 3) Input voltages up to 35 V do not destroy the device.

Polarity-dependent	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), an overvoltage protection module has to be installed.

Integrated overvoltage protection module

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

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

Technical data		
Resistance per channel	$2 \times 0.5 \Omega$ 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	

External overvoltage protection module

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

For detailed information please refer to the following documents:

• HAW562: TI01012K

HAW569: TI01012K

7.2 Connecting the device

WARNING

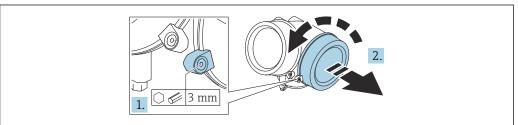
Explosion Hazard!

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

Required tools/accessories:

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

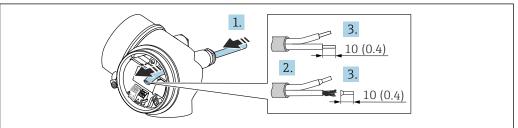
7.2.1 Opening cover



A0021490

- 1. Loosen the screw of the securing clamp of the connection compartment cover using an Allen key (3 mm) and turn the clamp 90 ° counterclockwise.
- 2. Unscrew the connection compartment cover and check the cover seal; replace it if necessary.

7.2.2 Connecting

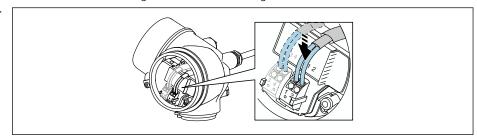


A003641

■ 19 Engineering unit: mm (in)

- 1. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 2. Remove the cable sheath.
- 3. Strip the cable ends 10 mm (0.4 in). In the case of stranded cables, also fit wire end ferrules.
- 4. Firmly tighten the cable glands.

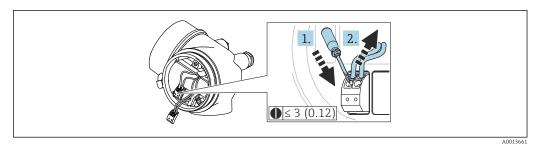
5. Connect the cable according to the terminal assignment.



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

7.2.3 Plug-in spring-force terminals

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

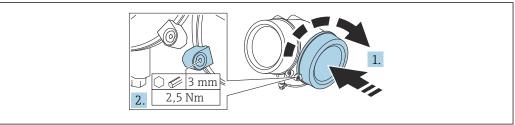


🖪 20 Engineering unit: mm (in)

To remove the cable from the terminal again:

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

7.2.4 Closing the cover of the connection compartment



A0021491

- 1. Screw down the cover of the connection compartment.
- 2. Turn the securing clamp 90 ° in the clockwise direction and, using an Allen key (3 mm), tighten the screw of the securing clamp on the connection compartment cover with 2.5 Nm.

7.3 Post-connection check

- ☐ Is the device or cable undamaged (visual inspection)?
- ☐ Do the cables used comply with the requirements?

\square Do the mounted cables have adequate strain relief?
□Are all the cable glands installed, firmly tightened and leak-tight?
\square Does the supply voltage match the specifications on the nameplate?
\square Is the terminal assignment correct?
□If necessary, has a protective ground connection been established?
$\hfill\Box$ If supply voltage is present, is the device ready for operation and do values appear on the display module?
☐ Are all the housing covers installed and tightened?
☐ Is the securing clamp firmly tightened?

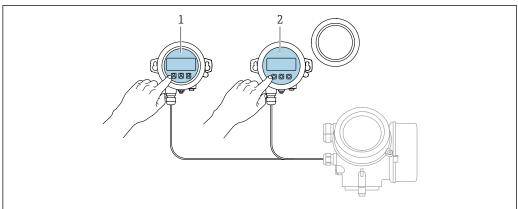
8 Operation methods

8.1 Overview

8.1.1 Local operation

Operation with	Pushbuttons	Touch Control	
Order code for "Display; Operation"	Option C "SD02"	Option E "SD03"	
Display elements	A0036312 4-line display	4-line display white background lighting; switches to red in	
Cicincints		event of device error	
	Format for displaying measured variables and status variables can be individually configured		
	Permitted ambient temperature for the display: -20 to $+70$ °C (-4 to $+158$ °F) The readability of the display may be impaired at temperatures outside the temperature range.		
Operating elements	local operation with 3 push buttons $(\boxdot, \boxdot, \sqsubseteq)$	external operation via touch control; 3 optical keys: ⊕, ⊡, 區	
	Operating elements also accessible in various hazardous areas		
Additional functionality	Data backup function The device configuration can be saved in the display module.		
	Data comparison function The device configuration saved in the display module can be compared to the current device configuration.		
	Data transfer function The transmitter configuration can be transmitte	ed to another device using the display module.	

8.1.2 Operation with remote display and operating module FHX50

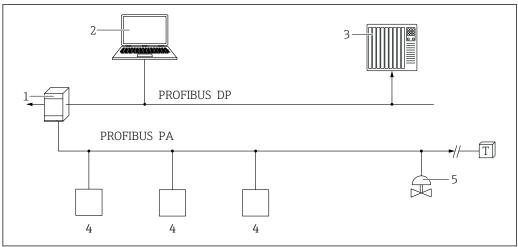


■ 21 FHX50 operating options

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

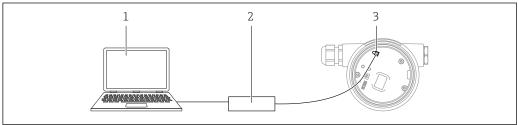
8.1.3 Remote operation

Via PROFIBUS PA protocol



- Segment coupler
- Computer with PROFIusb and operating tool (e.g. DeviceCare/FieldCare)
- PLC (programmable logic controller)
- Transmitter
- Additional functions (valves etc.)

Via service interface (CDI)



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

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 local display
Commissioning ²⁾		Launches the interactive wizard for guided commissioning. Additional settings generally do not need to be made in the other menus when the wizard is finished.
Setup	Parameter 1 Parameter N	Once values have been set for these parameters, the measurement should generally be completely configured.
	Advanced setup	Contains additional submenus and parameters: For more customized configuration of the measurement (adaptation to special measuring conditions). For converting the measured value (scaling, linearization). For scaling the output signal.
Diagnostics	Diagnostic list	Contains up to 5 currently active error messages.
	Event logbook 3)	Contains the last 20 messages (which are no longer active).
	Device information	Contains information for identifying the device.
	Measured values	Contains all current measured values.
	Data logging	Contains the history of the individual measuring values.
	Simulation	Is used to simulate measured values or output values.
	Device check	Contains all parameters needed to check the measurement capability of the device.
	Heartbeat 4)	Contains all the wizards for the Heartbeat Verification and Heartbeat Monitoring application packages.
Expert ⁵⁾ Contains all the parameters of the device (including those that are already contained in one of the other menus). This menu is	System	Contains all higher-level device parameters that do not pertain either to the measurement or to measured value communication.
organized according to the function blocks of the device.	Sensor	Contains all parameters needed to configure the measurement.
The parameters of the Expert menu are described in: GP01001F (PR0FIBUS PA)	Output	Contains all parameters needed to configure the switch output (PFS).

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

- 1) If you are operating via operating tools (e.g. FieldCare), the "Language" parameter is located under "Setup → Advanced setup → Display"
- 2)
- Only if operating via an FDT/DTM system
 Only available if operating via the local display 3)
- 4)
- Only available if operating via DeviceCare or FieldCare
 When you call up the "Expert" menu, you are always asked for an access code. If a customer-specific access 5) code has not been defined, "0000" must be entered.

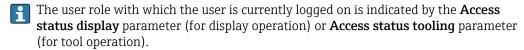
8.2.2 User roles and related access authorization

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 (Verweisziel existiert nicht, aber @y.link.required='true').

Access authorization to parameters

User role	Read access		Read access Write access	
	Without access code (from the factory)	With access code	Without access code (from the factory)	With access code
Operator	V	V	V	
Maintenance	V	V	V	~

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



8.2.3 Data access - Security

Write protection via access code

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

Define access code via local display

- Navigate to: Setup → Advanced setup → Administration → Define access code
 Define access code
- 2. Define a max. 4-digit numeric code as an access code.
- 3. Repeat the numeric code in the **Confirm access code** parameter to confirm it.

 → The ⑥-symbol appears in front of all write-protected parameters.

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

- 1. Navigate to: Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow 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, these parameters can always be modified even if the other parameters are locked.

The device automatically locks the write-protected parameters again if a key is not pressed for 10 minutes in the navigation and editing view. 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 an access code, it can only be deactivated again via this access code → 🖺 65.
 - In the "Description of Device Parameters" documents, each write-protected parameter is identified with the 🛍-symbol.

Disabling write protection via access code

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

- 1. After you press E, the input prompt for the access code appears.
- 2. Enter the access code.
 - The \(\mathbb{O} \) -symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

Deactivation of the write protection via access code

Via local display

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

Via an operating tool (e.g. FieldCare)

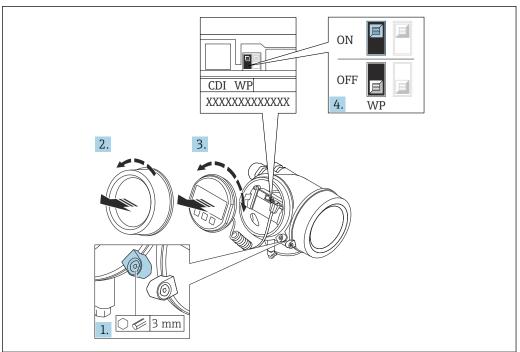
- 1. Navigate to: Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Define access code
- 2. Enter **0000**.
 - The write protection is deactivated. Parameters can be changed without entering an access code.

Write protection via write protection switch

Unlike parameter write protection via a user-specific access code, this allows the user to lock write access to the entire operating menu - apart from the **"Contrast display" parameter**.

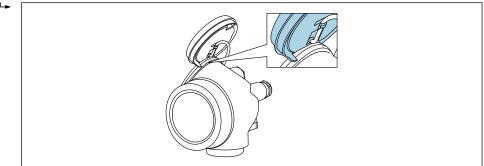
The parameter values are now read only and cannot be edited any more (exception "Contrast display" parameter):

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



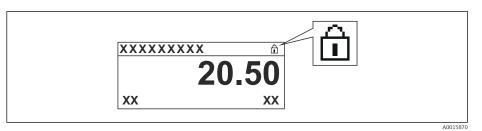
A0026157

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



A0036086

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



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

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

Enabling and disabling the keypad lock

Access to the entire operating menu via local operation can be locked via the keypad lock. When access is locked, it is no longer possible to navigate through the operating menu or change the values of individual parameters. Users can only read the measured values on the operational display.

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

Switching on the keypad lock

SD03 display module only

The keypad lock is switched on automatically:

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

To activate the keylock manually:

1. The device is in the measured value display.

Press E for at least 2 seconds.

- ► A context menu appears.
- 2. In the context menu select the **Keylock on** option.
 - ► The keypad lock is switched on.
- If the user attempts to access the operating menu while the keypad lock is active, the message **Keylock on** appears.

Switching off the keypad lock

1. The keypad lock is switched on.

Press E for at least 2 seconds.

- A context menu appears.
- 2. In the context menu select the **Keylock off** option.
 - ► The keypad lock is switched off.

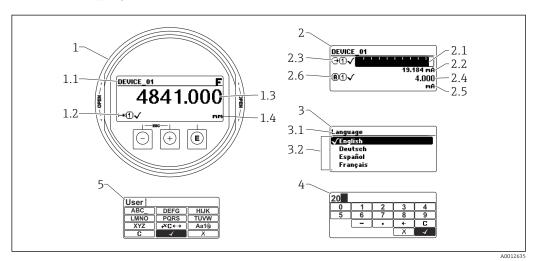
Bluetooth® wireless technology

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

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

8.3 Display and operating module

8.3.1 Display



22 Display format on the display and operating module

- 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 (bar graph + 1 value)*
- 2.1 Bargraph for measured value 1
- 2.2 Measured value 1 (including unit)
- $2.3 \quad \textit{Measured value symbols for measured value 1}$
- 2.4 Measured value 2
- $2.5 \quad \textit{Unit for measured value 2}$
- 2.6 Measured value symbols for measured value 2
- 3 Parameter display (here: parameter with picklist)
- 3.1 Header containing parameter name and error symbol (if an error is active)
- 3.2 Picklist; \square 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
A001836	Display/operat. Is displayed: In the main menu next to the "Display/operat." selection In the header on the left in the "Display/operat." menu
A001836	Setup Is displayed: In the main menu next to the "Setup" selection In the header on the left in the "Setup" menu
A001836	Expert Is displayed: In the main menu next to the "Expert" selection In the header on the left in the "Expert" menu
\\\\\\\\	Diagnostics Is displayed: In the main menu next to the "Diagnostics" selection In the header on the left in the "Diagnostics" menu

Status signals

Symbol	Meaning	
A0032902	"Failure" A device error has occurred. The measured value is no longer valid.	
C	"Function check" The device is in the service mode (e.g. during a simulation).	
S	 "Out of specification" The device is operated: Outside of its technical specifications (e.g. during startup or a cleaning) Outside of the configuration performed by the user (e.g. level outside the configured range) 	
M A0032905	"Maintenance required" Maintenance is required. The measured value is still valid.	

Display symbols for locking status

Symbol	Meaning
	Read-only parameter The parameter shown is only for display purposes and cannot be edited.
A0013150	 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.

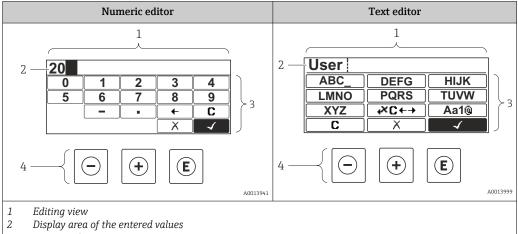
Measured value symbols

Symbol		Meaning	
Measured values			
~-		Level	
	A0032892		
→	A0032893	Distance	
(-)	A0032908	Current output	
	A0032300	Measured current	
(A)	A0032894		
W		Terminal voltage	
_	A0032895		
	A0032896	Electronics or sensor temperature	
Measuring channels			
1		Measuring channel 1	
	A0032897	Measuring channel 2	
(2)	A0032898	Medouring channel 2	
Status of the measured value			
		"Alarm" status	
	A0018361	The measurement is interrupted. The output assumes the defined alarm condition. A diagnostic message is generated.	
\triangle	A0018360	"Warning" status The device continues to measure. A diagnostic message is generated.	

8.3.2 Operating elements

Key	Meaning
	Minus key
	In a menu, submenu Moves the selection bar upwards in a picklist.
A0018330	In the text and numeric editor In the input mask, moves the selection bar to the left (backwards).
	Plus key
+	In a menu, submenu Moves the selection bar downwards in a picklist.
A0018329	In the text and numeric editor In the input mask, moves the selection bar to the right (forwards).
	Enter key
	For measured value display ■ Pressing the key briefly opens the operating menu. ■ Pressing the key for 2 s opens the context menu.
E A0018328	 In a menu, submenu Pressing the key briefly: Opens the selected menu, submenu or parameter. Pressing the key for 2 s in a parameter: If present, opens the help text for the function of the parameter.
	 In the 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.
	Escape key combination (press keys simultaneously)
— + + A0032909	 In a 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").
	In the text and numeric editor Closes the text or numeric editor without applying changes.
—+E	Minus/Enter key combination (press and hold down the keys simultaneously) Reduces the contrast (brighter setting).
++E	Plus/Enter key combination (press and hold down the keys simultaneously) Increases the contrast (darker setting).

8.3.3 Entering numbers and text

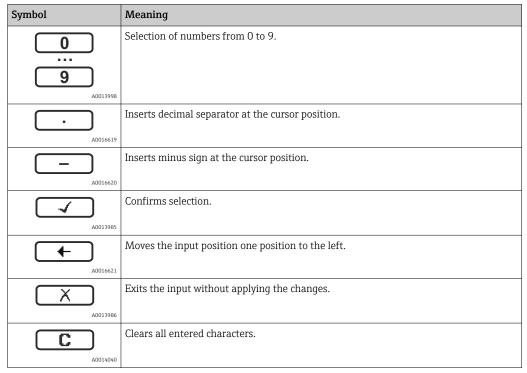


- 3 Input mask
- 4 Operating elements

Input mask

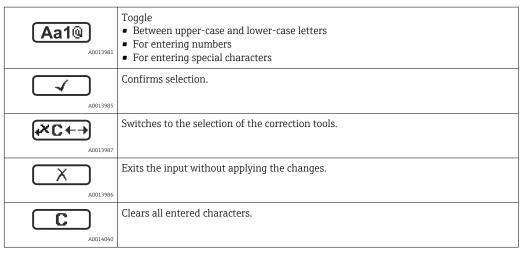
The following input and operating symbols are available in the input mask of the numeric and text editor:

Numeric editor



Text editor

Symbol	Meaning
ABCXYZ	Selection of letters from A to Z



Text correction under ✓ C++

Symbol	Meaning
C	Clears all entered characters.
A0018324	Moves the input position one position to the right.
A0018326	Moves the input position one position to the left.
A0032906	Deletes one character immediately to the left of the input position.

8.3.4 Opening the context menu

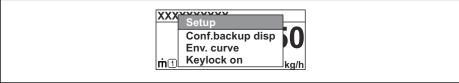
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

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

Calling up and closing the context menu

The user is in the operational display.

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



A0037872

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

Calling up the menu via the context menu

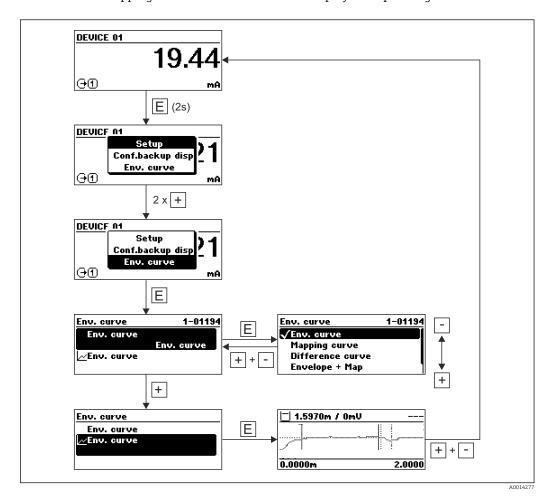
- 1. Open the context menu.

3. Press **E** to confirm the selection.

→ The selected menu opens.

8.3.5 Envelope curve display 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 shown on the display and operating module:

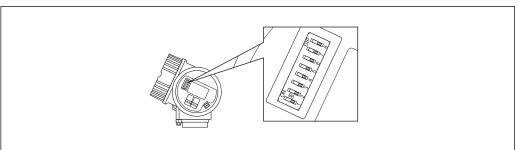


9 Integration into a PROFIBUS network

9.1 Overview of device master file (GSD)

Manufacturer ID	17 (0x11)
Ident number	0x1558
Profile version	3.02
GSD file	Information and files available at:
GSD file version	www.endress.comwww.profibus.org

9.2 Setting the device address



■ 23 Address switch in the connection compartment

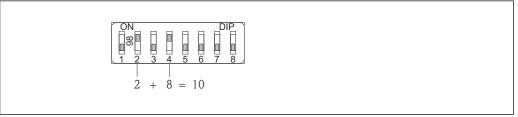
A0015686

9.2.1 Hardware addressing

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

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

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

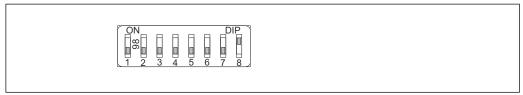


A0015902

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

9.2.2 Software addressing

- 1. Set switch 8 to "ON".
- 2. The device restarts automatically and reports the current address (factory setting: 126).
- 3. Configuring the address via the operating menu: Setup \rightarrow Device address



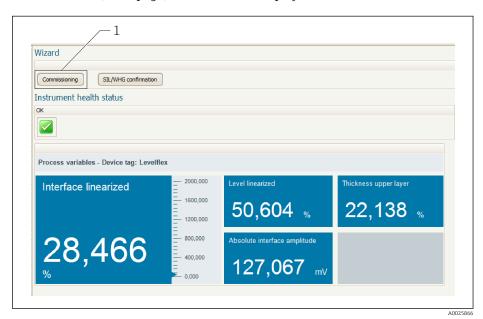
A001590

Example of software addressing; switch 8 is set to the "ON" position; the address is defined in the operating menu (Setup \rightarrow Device address).

10 Commissioning using the Commissioning Wizard

A Wizard is provided in FieldCare and DeviceCare ¹⁾ that guides the user through the initial commissioning process.

- 1. Connect the device with FieldCare or DeviceCare.
- 2. Open the device in FieldCare or DeviceCare.
 - The dashboard (homepage) of the device is displayed:



"Commissioning" button calls up the wizard

- 3. Click "Commissioning" to launch the Wizard.
- 4. Enter the appropriate value in each parameter or select the appropriate option. These values are written directly to the device.
- 5. Click "Next" to go to the next page.
- 6. Once all the pages have been completed, click "Finish" to close the Wizard.
- If you cancel the Wizard before all the necessary parameters have been entered, the device may be in an undefined state. In such situations, it is advisable to reset the device to the factory default settings.

¹⁾ DeviceCare is available for download at www.software-products.endress.com. To download the software, it is necessary to register in the Endress +Hauser software portal.

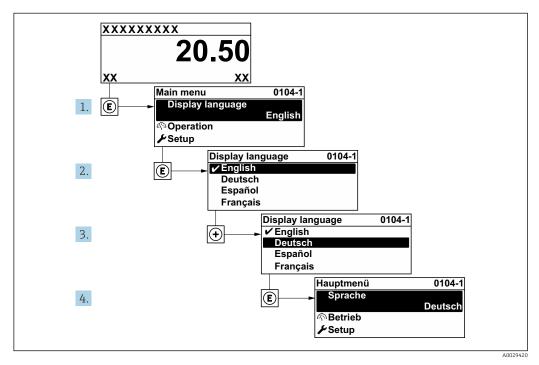
11 Commissioning via operating menu

11.1 Function check

Before commissioning your measuring point, ensure that the post-installation and post-connection checks have been performed:

11.2 Setting the operating language

Factory setting: English or ordered local language



26 Taking the example of the local display

11.3 Checking the reference distance

This section only applies to the FMP54 with the gas phase compensation function (product structure: feature 540 "Application packages", option EF or EG)

Coax probes with gas phase compensation are calibrated on delivery. Rod probes, on the other hand, must be recalibrated after mounting:

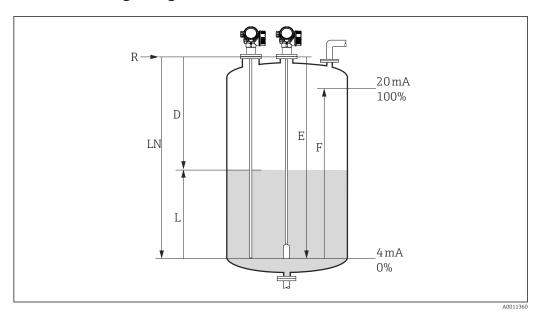
After mounting the rod probe in the stilling well or bypass, check and - if necessary - correct the setting of the reference distance in the unpressurized state. The level should be at least 200 mm below the reference distance $L_{\rm ref}$ in order to achieve maximum accuracy.

Step	Parameter	Action
1	Expert \rightarrow Sensor \rightarrow Gas phase compensation \rightarrow GPC mode	Select the On option to enable gas phase compensation.
2	Expert → Sensor → Gas phase compensation → Present reference distance	Check if the current reference distance displayed corresponds with the nominal value (300 mm or 550 mm, see nameplate). If yes: No further action is required. If not: Continue with Step 3.
3	Expert → Sensor → Gas phase compensation → Reference distance	Adopt the value displayed under the Present reference distance parameter. This corrects the reference distance.

For a detailed description of all parameters, see:

GP01001F, "Levelflex - Description of Device Parameters - PROFIBUS PA"

11.4 Configuring level measurement



 \blacksquare 27 Configuration parameters for level measurement in liquids

LN Probe length

- R Reference point of measurement
- D Distance
- L Level
- *E Empty calibration (= zero point)*
- F Full calibration (= span)
- If the ε_r value is lower than 7 in the case of rope probes, measurement is not possible in the area of the tensioning weight. The empty calibration E should not exceed LN 250 mm (LN 10 in) in these cases.
- 1. Navigate to: Setup → Device tag
 - ► Enter device tag.
- 2. Navigate to: Setup \rightarrow Device address
 - Enter the bus address of the device (only for software addressing).
- 3. For devices in the "Interface measurement" application package:

Navigate to: Setup → Operating mode

- Select the **Level** option.
- 4. Navigate to: Setup → Distance unit
 - ► Select the distance unit.
- 5. Navigate to: Setup → Tank type
 - ► Select tank type.
- 6. For **Tank type** parameter = Bypass / pipe:

Navigate to: Setup → Tube diameter

- ► Specify the diameter of the bypass or stilling well.
- 7. Navigate to: Setup → Medium group
 - ► Specify the medium group: (Water based (DC >= 4) or Others)
- 8. Navigate to: Setup → Empty calibration
 - ► Specify the empty distance E (distance from reference point R to 0% mark).
- 9. Navigate to: Setup \rightarrow Full calibration
 - ► Specify the full distance F (distance from the 0% mark to the 100% mark).

- 10. Navigate to: Setup \rightarrow Level
 - □ Displays the measured level L.
- 11. Navigate to: Setup \rightarrow Distance
 - └ Displays the distance D between the reference point R and the level L.
- 12. Navigate to: Setup \rightarrow Signal quality
 - ► Displays the signal quality of the analyzed level echo.
- 13. Operation via local display:

Navigate to: Setup \rightarrow Mapping \rightarrow Confirm distance

- Compare the distance displayed with the actual value in order to start recording an interference echo map if necessary ²⁾.
- 14. Operation via operating tool:

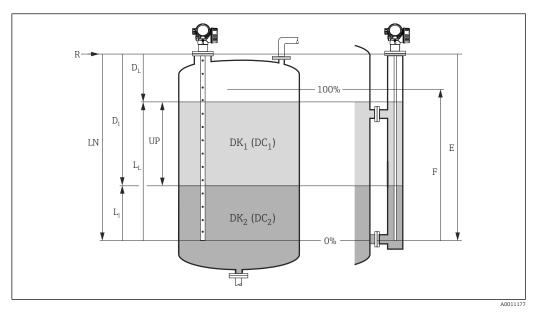
Navigate to: Setup \rightarrow Confirm distance

Compare the distance displayed with the actual value to start recording an interference echo map (where applicable) ²⁾.

²⁾ For FMP54 with gas phase compensation (product structure: feature 540 "Application Package", option "EF" or "EG"), an interference echo map may not be recorded

11.5 Configuring interface measurement

An interface measurement is only possible if the device has the corresponding software option. In the product structure: feature 540 "Application Package", option EB "Interface measurement".



■ 28 Configuration parameters for interface measurement

LN Probe length

- R Reference point of measurement
- DI Interface distance (distance from flange to lower medium)
- LI Interface
- DL Distance
- LL Level
- UP Thickness upper layer
- E Empty calibration (= zero point)
- F Full calibration (= span)
- 1. Navigate to: Setup → Device tag
 - ► Enter device tag.
- 2. Navigate to: Setup → Device address
 - Enter the bus address of the device (only for software addressing).
- 3. Navigate to: Setup → Operating mode
 - ► Select the **Interface** option.
- 4. Navigate to: Setup → Distance unit
 - ► Select the distance unit.
- 5. Navigate to: Setup \rightarrow Tank type
 - ► Select tank type.
- 6. For **Tank type** parameter = Bypass / pipe:

Navigate to: Setup → Tube diameter

- ► Specify the diameter of the bypass or stilling well.
- 7. Navigate to: Setup → Tank level
 - ► Specify the tank level (Fully flooded or Partially filled)
- 8. Navigate to: Setup → Distance to upper connection
 - In bypasses: Specify the distance from the reference point R to the lower edge of the upper outflow. In all other cases, retain the factory setting.

- 9. Navigate to: Setup → DC value
 - Specify the relative dielectric constant (ϵ_r) of the upper medium.
- 10. Navigate to: Setup \rightarrow Empty calibration
 - ► Specify the empty distance E (distance from reference point R to 0% mark).
- 11. Navigate to: Setup \rightarrow Full calibration
 - ► Specify the full distance F (distance from the 0% mark to the 100% mark).
- 12. Navigate to: Setup \rightarrow Level
 - ► Displays the measured level L_L.
- 13. Navigate to: Setup → Interface
 - ightharpoonup Displays the interface height L_I.
- 14. Navigate to: Setup → Distance
 - ightharpoonup Displays the distance D_L between the reference point R and the level L_L .
- 15. Navigate to: Setup → Interface distance
 - ▶ Displays the distance D_I between the reference point R and the interface L_I.
- **16.** Navigate to: Setup \rightarrow Signal quality
 - └ Displays the signal quality of the analyzed level echo.
- 17. Operation via local display:

Navigate to: Setup \rightarrow Mapping \rightarrow Confirm distance

- Compare the distance displayed with the actual value in order to start recording an interference echo map if necessary ³⁾.
- 18. Via an operating tool (e.g. FieldCare):

Navigate to: Setup → Confirm distance

Compare the distance displayed with the actual value to start recording an interference echo map (where applicable) ³⁾.

³⁾ For FMP54 with gas phase compensation (product structure: feature 540 "Application Package", option "EF" or "EG"), an interference echo map may not be recorded

11.6 Recording the reference envelope curve

After the measurement has been configured, it is recommended to record the current envelope curve as a reference envelope curve. This can then be used later for diagnostic purposes. The **Save reference curve** parameter is used to record the envelope curve.

Path in the menu

Expert \rightarrow Diagnostics \rightarrow Envelope diagnostics \rightarrow Save reference curve

Meaning of the options

- No
 - No action
- Yes

The current envelope curve is saved as a reference curve.

- This submenu is only visible for the "Service" user role in devices supplied with software version 01.00.zz.
- The reference envelope curve can only be displayed in the envelope curve diagram of FieldCare after it has been loaded from the device into FieldCare. The "Load Reference Curve" function in FieldCare is used for this.



■ 29 "Load Reference Curve" function

11.7 Configuring the local display

11.7.1 Factory setting of local 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

11.7.2 Factory setting of local display for interface 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	Interface linearized	Interface linearized
Value 2 display	Level linearized	Level linearized
Value 3 display	Thickness upper layer	Current output 1
Value 4 display	Current output 1	Current output 2

11.7.3 Adjusting the local display

The local display can be adjusted in the following submenu: Setup \rightarrow Advanced setup \rightarrow Display

11.8 Configuration management

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

Path in the menu

Setup \rightarrow Advanced setup \rightarrow Configuration backup display \rightarrow 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 is saved from the HistoROM (integrated in the device) 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 of the device is duplicated to another device using the display module. The following parameters, which characterize the individual measuring point are **not** transferred:

Medium type

Compare

The device configuration saved in the display module is compared to the current device configuration of the HistoROM. The result of the 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 copy is restored on a device other than the original device using the **Restore** option, in some cases individual device functions may not be available. In some cases it is also not possible to restore the original state by resetting to the "asdelivered" state.

The **Duplicate** option should always be used to copy the configuration to another device.

11.9 Protecting settings from unauthorized access

The settings can be protected from unauthorized access in two ways:

- Locking via parameters (software locking)
- Locking via write protection switch (hardware locking)

12 Diagnostics and troubleshooting

12.1 General troubleshooting

12.1.1 General errors

Error	Possible cause	Solution
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 E simultaneously. Decrease contrast by pressing ⊡ and E simultaneously.
	The plug of the display cable is not connected correctly.	Connect the plug correctly.
	Display is defective.	Replace display.
"Communication error" is indicated	Electromagnetic interference	Check grounding of the device.
on the display when starting the device or connecting the display.	Broken display cable or display plug.	Replace display.
Duplication of parameters via display from one device to another not working. Only the "Save" and "Cancel" options are available.	Display with backup is not properly detected if a data backup was not carried out on the new device previously.	Connect display (with backup) and restart device.
CDI communication does not work.	Wrong setting of the COM port on the computer.	Check the setting of the COM port on the computer and change it if necessary.
Device measures incorrectly.	Parameter configuration error	Check and correct the parameter configuration.

12.1.2 Parametrization errors

Parametrization errors for level measurements

Problem	Possible cause	Remedy
Measured value is incorrect	If measured distance (Setup → Distance) matches the real distance: Calibration error	 Check the Empty calibration parameter (→
	If measured distance (Setup → Distance) does not match the real distance: An interference echo is present.	Carry out mapping (Confirm distance parameter (\rightarrow $\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$
No change of measured value on filling/emptying	An interference echo is present.	Carry out mapping (Confirm distance parameter (→ 🖺 141)).
	Buildup at the probe.	Clean the probe.
	Error in the echo tracking.	Deactivate echo tracking (Expert → Sensor → Echo tracking → Evaluation mode = History off).
Echo lost diagnostic message appears after the supply voltage is switched on.	Echo threshold too high.	Check the Medium group parameter $(\rightarrow \boxminus 133)$. If necessary, select a more detailed setting with the Medium property parameter $(\rightarrow \boxminus 149)$.
	Level echo suppressed.	Delete the map and record it again if necessary (Record map parameter (→ 🖺 143)).
Device displays a level when the tank is empty.	Incorrect probe length	Perform probe length correction (Confirm probe length parameter (→ 🖺 177)).
	Interference echo	Carry out mapping over the entire probe length when the tank is empty (Confirm distance parameter (→ 🖺 141)).
Wrong slope of the level over the entire measuring range	Wrong tank type selected.	Select the correct Tank type parameter $(\rightarrow \stackrel{\text{\tiny le}}{=} 132)$.

Parametrization errors for interface measurements

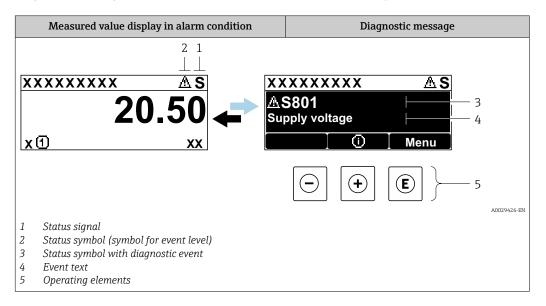
Problem	Possible cause	Remedy
With the setting Tank level = Fully flooded , the interface	The total level is detected outside the upper blocking distance.	Increase the blocking distance (Blocking distance parameter ($\rightarrow \stackrel{\triangle}{=} 152$)).
level displayed jumps to higher values when the tank is emptied.		Set Tank level parameter (→ 🖺 138) = Partially filled .
With the setting Tank level = Partially filled , the total level displayed jumps to lower values when the tank is filled.	The total level goes to the upper blocking distance.	Reduce the blocking distance (Blocking distance parameter ($\rightarrow \implies 152$)).
Incorrect slope of the interface measured value	The dielectric constant (DC value) of the upper medium is incorrectly set.	Enter the correct dielectric constant (DC value) of the upper medium (DC value parameter ($\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$
The measured value for the interface and the total level are identical.	The echo threshold for the total level is too high due to an incorrect dielectric constant.	Enter the correct dielectric constant (DC value) of the upper medium (DC value parameter ($\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$

Problem	Possible cause	Remedy
The total level jumps to the interface level in the case of thin interfaces.	The thickness of the upper medium is lower than 60 mm.	Measurement of the interface is only possible for interface heights greater than 60 mm.
Interface measured value jumps.	Emulsion layer present.	Emulsion layers impair the measurement. Contact Endress+Hauser.

12.2 Diagnostic information on local display

12.2.1 Diagnostic message

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



Status signals

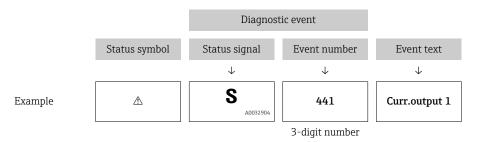
A0032902	"Failure (F)" option A device error has occurred. The measured value is no longer valid.
C	"Function check (C)" option The device is in the service mode (e.g. during a simulation).
S	 "Out of specification (S)" option The device is operated: Outside of its technical specifications (e.g. during startup or a cleaning) Outside of the configuration performed by the user (e.g. level outside the configured range)
M	"Maintenance required (M)" option Maintenance is required. The measured value is still valid.

Status symbol (symbol for event level)

"Alarm" status The measurement is interrupted. The signal outputs adopt the defined alarm diagnostic message is generated.	
\triangle	"Warning" status The device continues to measure. A diagnostic message is generated.

Diagnostic event and event text

The fault can be identified by means of the diagnostic event. The event text helps you by providing information about the fault. In addition, the associated status symbol is displayed in front of the diagnostic event.



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



Past diagnostic messages that are no longer pending are shown as follows:

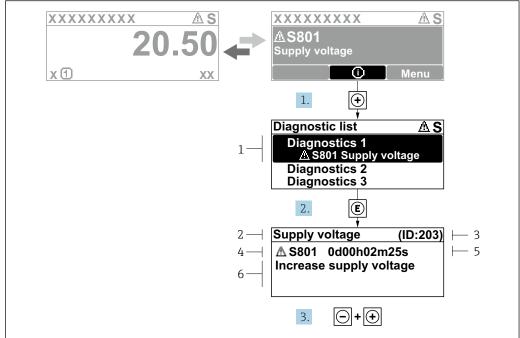
- On the local display:
 - In the **Event logbook** submenu
- In FieldCare:

Via the "Event List /HistoROM" function.

Operating elements

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

12.2.2 Calling up remedial measures



A0029431-EN

- 30 Message for remedial measures
- 1 Diagnostic information
- 2 Short text
- 3 Service ID
- 4 Diagnostic behavior with diagnostic code
- 5 Operation time when error occurred
- 6 Remedial measures

The user is in the diagnostic message.

- 1. Press ± (① symbol).
 - **└** The **Diagnostic list** submenu opens.
- 2. Select the desired diagnostic event with \pm or \Box and press \Box .
 - └ The message for the remedial measures for the selected diagnostic event opens.
- 3. Press \Box + \pm simultaneously.
 - ► The message about the remedial measures closes.

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

- 1. Press E.
 - └─ The message for the remedial measures for the selected diagnostic event opens.
- 2. Press \Box + \pm simultaneously.
 - ► The message about the remedial measures closes.

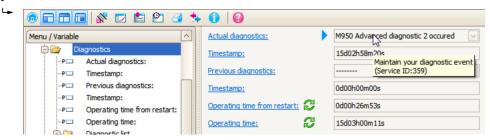
12.3 Diagnostic event in the operating tool

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

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

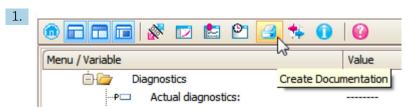
A: Via the operating menu

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

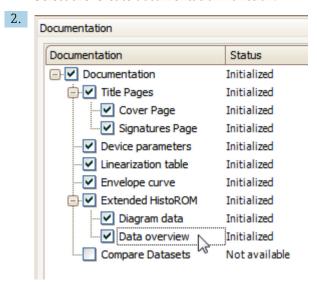


A tool tip with remedial measures for the diagnostic event appears.

B: Via the "Create documentation" function



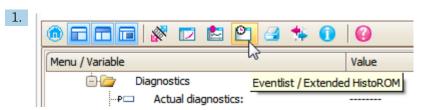
Select the "Create documentation" function.



Make sure "Data overview" is marked.

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

C: Via the "Eventlist / Extended HistoROM" function



Select the "Eventlist / Extended HistoROM" function.



Select the "Load Eventlist" function.

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

12.4 Diagnostic list

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

Navigation path

Diagnostics → Diagnostic list

Calling up and closing the remedial measures

- 1. Press E.
 - ► The message for the remedial measures for the selected diagnostic event opens.
- 2. Press \Box + \pm simultaneously.
 - ► The message about the remedial measures closes.

12.5 List of diagnostic events

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

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

¹⁾ Diagnostic behavior can be changed.

12.6 Event logbook

12.6.1 Event history

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

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

Navigation path

Diagnostics \rightarrow Event logbook \rightarrow Event list

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

Die Ereignishistorie umfasst Einträge zu:

- Diagnostic events
- Information events

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

- Diagnostic event
 - 🕤: Event has occurred
 - 🕒: Event has ended
- Information event
 - €: Event has occurred

Calling up and closing the remedial measures

- 1. Press E
 - ► The message for the remedial measures for the selected diagnostic event opens.
- 2. Press \Box + \pm simultaneously.
 - ► The message about the remedial measures closes.

12.6.2 Filtering the event logbook

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

Navigation path

Diagnostics \rightarrow Event logbook \rightarrow Filter options

Filter categories

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

12.6.3 Overview of information events

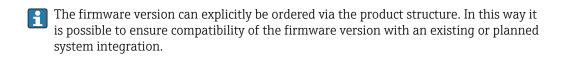
Info number	Info name		
I1000	(Device ok)		
I1089	Power on		
I1090	Configuration reset		
I1091	Configuration changed		
I1092	Trend data deleted		
I1110	Write protection switch changed		
I1137	Electronic changed		
I1151	History reset		
I1154	Reset terminal voltage min/max		
I1155	Reset electronic temperature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

Info number	Info name		
I1185	Display backup done		
I1186	Restore via display done		
I1187	Settings downloaded with display		
I1188	Display data cleared		
I1189	Backup compared		
I1256	Display: access status changed		
I1264	Safety sequence aborted		
I1335	Firmware changed		
I1397	Fieldbus: access status changed		
I1398	CDI: access status changed		
I1512	Download started		
I1513	Download finished		
I1514	Upload started		
I1515	Upload finished		

12.7 Firmware history

Date	Firmware	Modifications	Documentation (FMP51, FMP52, FMP54, PROFIBUS)		
	version		Operating Instructions	Description of Device Parameters	Technical Information
07.2011	01.00.zz	Original software	BA01006F/00/EN/10.10	GP01001F/00/EN/10.10	TI01001F/00/EN/13.11
02.2015	01.01.zz	 Support of SD03 Additional languages HistoROM functionality enhanced "Advanced Diagnostics" function block integrated Improvements and bugfixes 	BA01006F/00/EN/15.14 BA01006F/00/EN/16.16 ¹⁾	GP01001F/00/EN/13.14	TI01001F/00/EN/18.14 TI01001F/00/EN/22.16 ¹⁾

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



13 Maintenance

No special maintenance work is required.

13.1 Exterior cleaning

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

13.2 General cleaning instructions

Dirt or buildup may form on the probe depending on the application. A thin, even layer has little impact on the measurement. Thick layers can dampen the signal and reduce the measuring range. Very uneven deposit formation or caking (e.g. due to crystallization) can result in incorrect measurements. In such cases, use a non-contact measuring principle, or regularly inspect the probe for contamination.

Cleaning with sodium hydroxide solution (e.g. in CIP procedures): if the coupling is wetted, larger measurement errors can occur than under reference operating conditions. Wetting can cause temporary incorrect measurements.

14 Repair

14.1 General information

14.1.1 Repair concept

Under the Endress+Hauser repair concept, devices have a modular design and repairs can be carried out by Endress+Hauser Service or by properly trained customers.

Spare parts are grouped into logical kits with the associated replacement instructions.

For more information on service and spare parts, please contact Endress+Hauser Service.

14.1.2 Repair of Ex-certified devices

A WARNING

Incorrect repair can compromise electrical safety!

Explosion Hazard!

- ► Repairs to Ex-certified devices must be carried out by Endress+Hauser Service or by specialist personnel according to national regulations.
- Relevant standards and national regulations on hazardous areas, safety instructions and certificates must be observed.
- ▶ Use only original Endress+Hauser spare parts.
- ▶ Please note the device designation on the nameplate. Only identical parts may be used as replacements.
- ► Carry out repairs according to the instructions.
- ▶ Only the Endress+Hauser service team is permitted to modify a certified device and convert it to another certified version.

14.1.3 Replacing electronics modules

When electronics modules have been replaced the device does not need to be recalibrated as the parameters are saved in the HistoROM inside the housing. It may be necessary when replacing the main electronics to record a new interference echo suppression.

14.1.4 Replacing a device

Once a complete device has been replaced, the parameters can be transferred back into the device using one of the following methods:

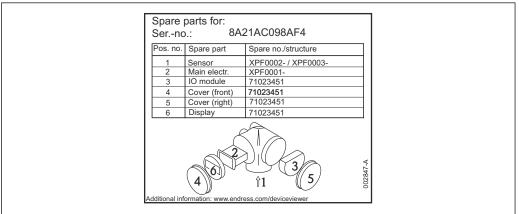
- Using the display module
 Prerequisite: The configuration of the old device was saved previously to the display module.
- Via FieldCare
 Prerequisite: The configuration of the old device was saved previously to the computer using FieldCare.

You can continue measuring without performing a new calibration. Only interference echo suppression may need to be carried out once again.

14.2 Spare parts

- Some replaceable measuring device components are identified by means of a spare part nameplate. This contains information about the spare part.
- In the connection compartment cover of the device there is a spare part nameplate which contains the following information:
 - A list of the most important spare parts for the measuring device, including their ordering information.
 - The URL to the W@M Device Viewer (www.endress.com/deviceviewer):

 All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.



A001497

■ 31 Example for spare part nameplate in the connection compartment cover

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

14.3 Return

The requirements for safe device return can vary depending on the device type and national legislation.

- 1. Refer to the web page for information: http://www.endress.com/support/return-material
 - ► Select the region.
- 2. Return the device if repairs or a factory calibration are required, or if the wrong device was ordered or delivered.

14.4 Disposal



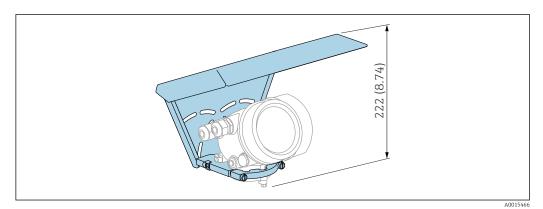
If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

15 Accessories

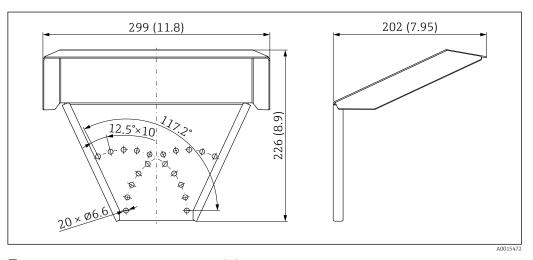
15.1 Device-specific accessories

15.1.1 Weather protection cover

The weather protection cover can be ordered together with the device via the "Accessory enclosed" product structure.



🖪 32 Height. Unit of measurement mm (in)



■ 33 Dimensions. Unit of measurement mm (in)

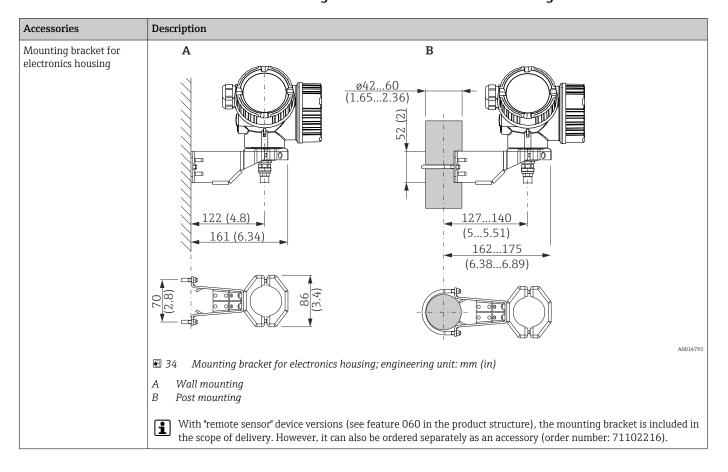
Material

316L

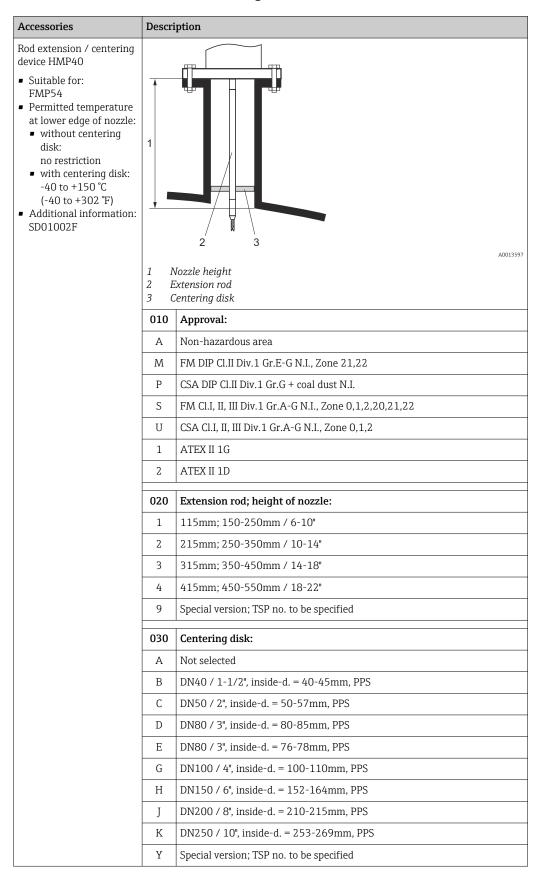
Order number for accessories:

71162242

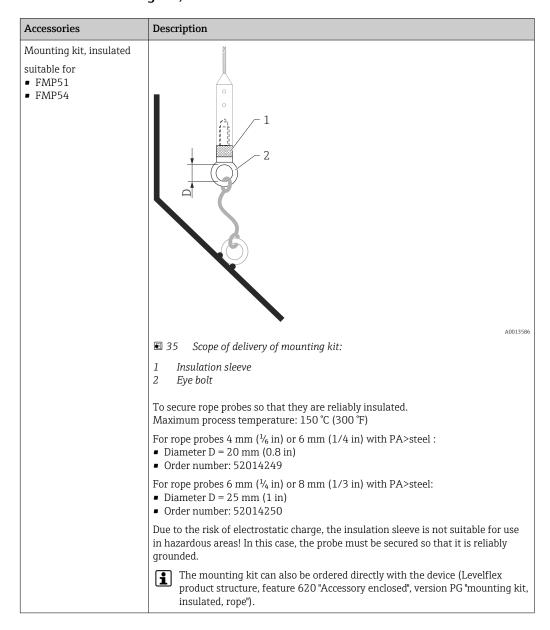
15.1.2 Mounting bracket for electronics housing



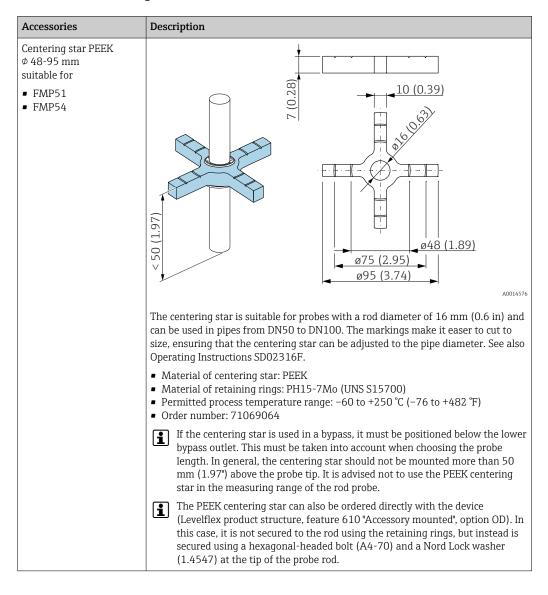
15.1.3 Rod extension / centering device



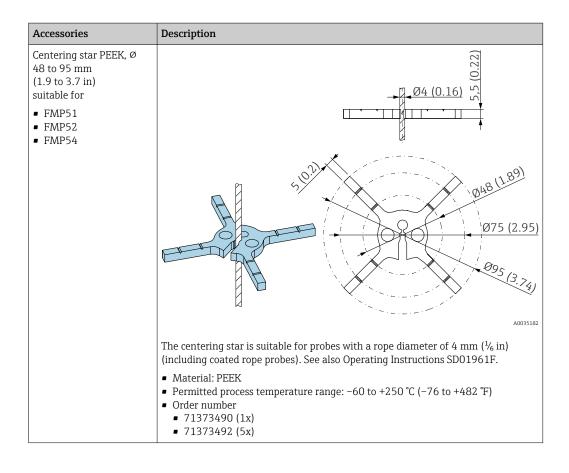
15.1.4 Mounting kit, insulated



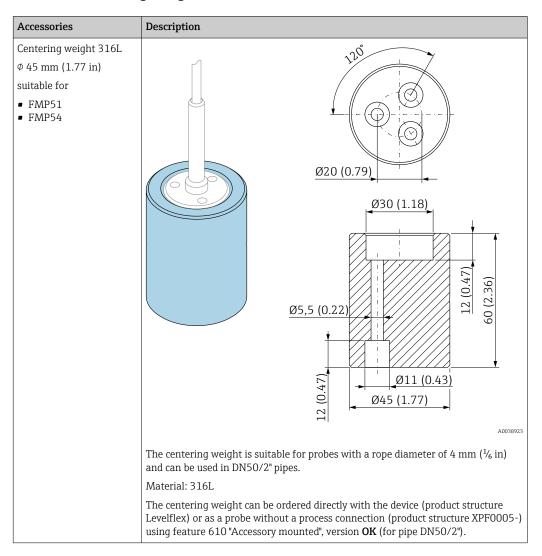
15.1.5 Centering star

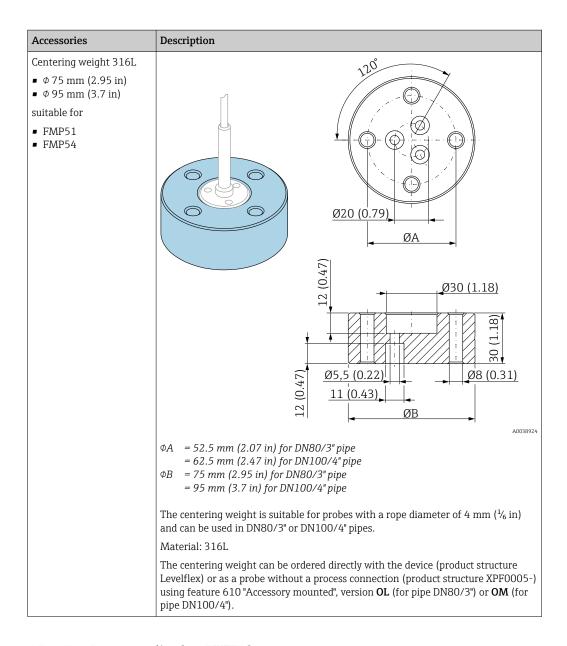


Accessories Description Centering star PFA (0.39)• \$\phi\$ 16.4 mm (0.65 in) ■ Ø 37 mm (1.46 in) suitable for ■ FMP51 ■ FMP52 ■ FMP54 A:ø16.4 (0.65) B: ø37 (1.46) A0014577 For probe 8 mm (0.3 in) For probes 12 mm (0.47 in) and 16 mm (0.63 in) The centering star is suitable for probes with a rod diameter of 8 mm (0.3 in), 12 mm (0.47 in) and 16 mm (0.63 in) (including coated rod probes) and can be used in pipes from DN40 to DN50. See also Operating Instructions BA00378F/00/A2. Material: PFA ■ Permitted process temperature range: -200 to +250 °C (-328 to +482 °F) Order number • Probe 8 mm (0.3 in): 71162453 ■ Probe 12 mm (0.47 in): 71157270 • Probe 16 mm (0.63 in): 71069065 The PFA centering star can also be ordered directly with the device (Levelflex product structure, feature 610 "Accessory mounted", option OE).

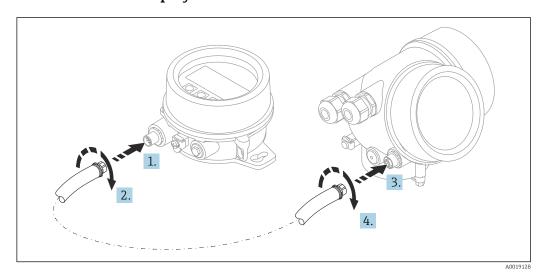


15.1.6 Centering weight





15.1.7 Remote display FHX50



Technical data

- Material:
 - Plastic PBT
 - 316L/1.4404
 - Aluminum
- Degree of protection: IP68 / NEMA 6P and IP66 / NEMA 4x
- Suitable for display modules:
 - SD02 (push buttons)
 - SD03 (touch control)
- Connecting cable:
 - Cable supplied with device up to 30 m (98 ft)
 - Standard cable supplied by customer up to 60 m (196 ft)
- Ambient temperature:-40 to 80 °C (-40 to 176 °F)
- Ambient temperature (option): -50 to 80 °C (-58 to 176 °F) $^{5)}$

Ordering information

• If the remote display is to be used, the device version "Prepared for display FHX50" must be ordered.

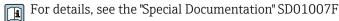
For the FHX50, the option "Prepared for display FHX50" must be selected under "Measuring device version".

- If a measuring device has not been ordered with the version "Prepared for display FHX50" and is to be retrofitted with an FHX50, the version "Not prepared for display FHX50" must be ordered for the FHX50 under "Measuring device version". In this case, a retrofit kit for the device is supplied with the FHX50. The kit can be used to prepare the device so that the FHX50 can be used.
- Use of the FHX50 may be restricted for transmitters with an approval. A device may only be retrofitted with the FHX50 if the option "Prepared for FHX50" is listed in the associated Safety Instructions (XA) under *Basic specifications*, "Display, operation".

Also pay attention to the Safety Instructions (XA) of the FHX50.

Retrofitting is not possible on transmitters with:

- An approval for use in areas with flammable dust (dust ignition-proof approval)
- Type of protection Ex nA



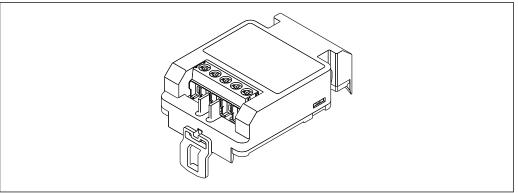
15.1.8 Overvoltage protection

The surge arrester for loop-powered devices can be ordered together with the device via the "Accessory mounted" section of the product order structure.

The surge arrester can be used for loop-powered devices.

- 1-channel devices OVP10
- 2-channel devices OVP20

⁵⁾ This range applies if the option JN "Transmitter ambient temperature" -50 °C (-58 °F) was selected in feature 580 "Test, Certificate". If the temperature is permanently below -40 °C (-40 °F), higher failure rates can be expected.



A002173

Technical data

■ Resistance per channel: $2 \times 0.5 \Omega_{max}$

■ Threshold DC voltage: 400 to 700 V

Threshold surge voltage: < 800 VCapacitance at 1 MHz: < 1.5 pF

• Nominal leakage current (8/20 μs): 10 kA

• Suitable for conductor cross-sections: 0.2 to 2.5 mm² (24 to 14 AWG)

If retrofitting:

- Order number for 1-channel devices (OVP10): 71128617
- Order number for 2-channel devices (OVP20): 71128619
- The use of the OVP module may be restricted depending on the transmitter approval. A device may only be retrofitted with the OVP module if the option *NA* (overvoltage protection) is listed under *Optional specifications* in the Safety Instructions (XA) associated with the device.
- In order to keep the necessary safety distances when using the surge arrester module, the housing cover also needs to be replaced when the device is retrofitted.
 Depending on the housing type, the suitable cover can be ordered using the following order number:

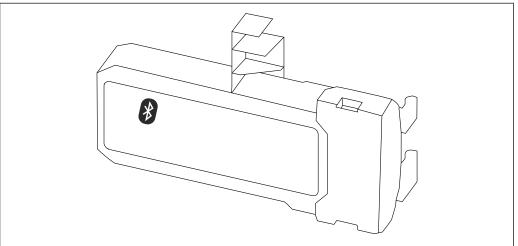
Housing GT18: 71185516
Housing GT19: 71185518
Housing GT20: 71185517

Housing GT20: 71185517

For details, see the "Special Documentation" SD01090F

15.1.9 Bluetooth module BT10 for HART devices

The Bluetooth module BT10 can be ordered together with the device via the "Accessory mounted" section of the product order structure.



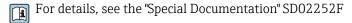
A003649

Technical data

- Quick and easy setup with the SmartBlue app
- No additional tools or adapters needed
- Signal curve via SmartBlue (app)
- Encrypted single point-to-point data transmission (tested by Fraunhofer Institute) and password-protected communication via Bluetooth® wireless technology
- Range under reference conditions: > 10 m (33 ft)
- When the Bluetooth module is used, the minimum supply voltage of the device increases by up to 3 V.

If retrofitting:

- Order number: 71377355
- The use of the Bluetooth module may be restricted depending on the transmitter approval. A device may only be retrofitted with the Bluetooth module if the option NF (Bluetooth module) is listed under Optional specifications in the Safety Instructions (XA) associated with the device.



15.2 Communication-specific accessories

Commubox FXA291

Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop Order number: 51516983



For details, see "Technical Information" TI00405C

15.3 Service-specific accessories

DeviceCare SFE100

Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus field devices



Technical Information TI01134S

FieldCare SFE500

FDT-based plant asset management tool

It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.



Technical Information TI00028S

15.4 System components

Memograph M graphic data manager

The Memograph M graphic data manager 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 a SD card or USB stick.

Technical Information TI00133R and Operating Instructions BA00247R $\,$

→ 🖺 144

16 Operating menu

16.1 Overview of the operating menu (display module)

Navigation Operating menu Language **ℱ** Setup → 🖺 131 Device tag → 🖺 131 Device address → 🖺 131 → 🖺 131 Operating mode → 🖺 132 Distance unit Tank type → 🖺 132 Tube diameter → 🖺 132 Tank level → 🖺 138 Distance to upper connection → 🖺 139 DC value → 🖺 139 → 🖺 133 Medium group → 🖺 133 Empty calibration → 🖺 134 Full calibration Level → 🖺 135 Interface → 🖺 140 Distance → 🗎 136 Interface distance → 🖺 141 Signal quality → 🖺 137 **▶** Mapping → 🖺 144

Endress+Hauser 117

Confirm distance

	Mapping end point		→ 🖺 144
	Record map		→ 🖺 144
	Distance		→ 🖺 144
► Analog inputs			
	► Analog input 1	to 6	→ 🖺 145
		Channel	→ 🖺 145
		PV filter time	→ 🖺 145
		Fail safe type	→ 🖺 146
		Fail safe value	→ 🖺 146
► Advanced setup)		→ 🖺 147
	Locking status		→ 🖺 147
	Access status displa	ay	→ 🖺 148
	Enter access code		→ 🖺 148
	► Level		→ 🖺 149
		Medium type	→ 🖺 149
		Medium property	→ 🖺 149
		Process property	→ 🖺 150
		Advanced process conditions	→ 🖺 151
		Level unit	→ 🖺 152
		Blocking distance	→ 🖺 152
		Level correction	→ 🖺 153
	► Interface		→ 🖺 154
		Process property	→ 🖺 154
		DC value lower medium	→ 🖺 154
		Level unit	→ 🖺 155

	Blocking distance		→ 🖺 155
	Level correction		→ 🖺 156
	► Automatic DC ca	lculation	→ 🖺 159
		Manual thickness upper layer	→ 🖺 159
		DC value	→ 🖺 159
		Use calculated DC value	→ 🖺 159
► Linearization			→ 🖺 161
	Linearization type		→ 🖺 163
	Unit after linearizat	ion	→ 🖺 164
	Free text		→ 🖺 165
	Maximum value		→ 🖺 166
	Diameter		→ 🖺 166
	Intermediate height	t	→ 🖺 167
	Table mode		→ 🖺 167
	► Edit table		
		Level	
		Customer value	
	Activate table		→ 🖺 169
► Safety settings			→ 🖺 171
	Output echo lost		→ 🖺 171
	Value echo lost		→ 🖺 171
	Ramp at echo lost		→ 🖺 172
	Blocking distance		→ 🖺 152
► WHG confirmat	ion		→ 🖺 174
		1	

	► Deactivate WHG			→ 🖺 175
l				
		Reset write protecti	on	→ 🗎 175
		Code incorrect		→ 🖺 175
	► Probe settings			→ 🖺 176
		Probe grounded	'	→ 🗎 176
		► Probe length con	rection	→ 🖺 178
			Confirm probe length	→ 🖺 178
			Present probe length	→ 🖺 178
	► Switch output			→ 🖺 179
ı		Switch output funct	ion	→ 🗎 179
		Switch output funct	1011	7 目 1/9
		Assign status		→ 🖺 179
		Assign limit		→ 🖺 180
		Assign diagnostic b	ehavior	→ 🖺 180
		Switch-on value		→ 🖺 181
		Switch-on delay		→ 🗎 182
		Switch-off value		→ 🖺 182
		Switch-off delay		→ 🖺 183
		Failure mode		→ 🖺 183
		Switch status		→ 🖺 183
		Invert output signal		→ 🗎 183
[► Display			→ 🖺 185
		Language		→ 🖺 185
		Format display		→ 🖺 185
		Value 1 to 4 display		→ 🖺 187
		Decimal places 1 to	4	→ 🖺 187

	Display interval	→ 🖺 188
	Display damping	→ 🖺 188
	Header	→ 🖺 188
	Header text	→ 🖺 189
	Separator	→ 🖺 189
	Number format	→ 🗎 189
	Decimal places menu	→ 🗎 189
	Backlight	→ 🖺 190
	Contrast display	→ 🖺 190
► Configuration	backup display	→ 🖺 191
	Operating time	→ 🖺 191
	Last backup	→ 🖺 191
	Configuration management	→ 🖺 191
	Comparison result	→ 🖺 192
► Administration	n	→ 🖺 194
	► Define access code	→ 🖺 196
	Define access code	→ 🖺 196
	Confirm access code	→ 🖺 196
	Device reset	→ 🖺 194
억 Diagnostics		→ 🖺 197
Actual diagnostics		→ 🖺 197
Previous diagnostics		→ 🖺 197
Operating time from restart		→ 🖺 198
Operating time		→ 🖺 191

► Diagnostic list		→ 🖺 199
	Diagnostics 1 to 5	→ 🖺 199
► Event logbook		→ 🖺 200
	Filter options	
	► Event list	→ 🖺 200
► Device informat	ion	→ 🖺 201
	Device tag	→ 🖺 201
	Serial number	→ 🖺 201
	Firmware version	→ 🖺 201
	Device name	→ 🖺 201
	Order code	→ 🖺 202
	Extended order code 1 to 3	→ 🖺 202
	Status PROFIBUS Master Config	→ 🖺 202
	PROFIBUS ident number	→ 🖺 202
► Measured value	S	→ 🖺 203
	Distance	→ 🖺 136
	Level linearized	→ 🖺 166
	Interface distance	→ 🖺 141
	Interface linearized	→ 🖺 166
	Thickness upper layer	→ 🖺 205
	Terminal voltage 1	→ 🖺 205
	Switch status	→ 🖺 183
► Analog inputs		
	► Analog input 1 to 6	→ 🖺 206
	Channel	→ 🖺 145

		Out value)	₽ 206
		Out status)	₽ 207
		Out status HEX	→	₽ 207
► Data logging)	₽ 208
	Assign channel 1 to	o 4)	₽ 208
	Logging interval)	₽ 208
	Clear logging data)	₽ 209
	► Display channel	1 1 to 4)	₽ 210
► Simulation)	₽ 212
	Assign measureme	nt variable)	₽ 🖺 213
	Value process varia	ble)	₽ 213
	Switch output simu	alation)	₽ 213
	Switch status)	₽ 214
	Simulation device a	alarm)	₽ 214
	Diagnostic event ca	ategory		
	Simulation diagnos	stic event)	₽ 214
▶ Device check)	₽ 215
	Start device check)	₽ 215
	Result device check)	₽ 215
	Last check time)	₽ 215
	Level signal)	₽ 216
	Launch signal)	₽ 216
	Interface signal)	₽ 216
•				

16.2 Overview of the operating menu (operating tool)

≯ Setup		→ 🖺 131
	Device tag	→ 🖺 131
	Device address	→ 🖺 131
	Operating mode	→ 🖺 131
	Distance unit	→ 🖺 132
	Tank type	→ 🖺 132
	Tube diameter	→ 🗎 132
	Medium group	→ 🖺 133
	Empty calibration	→ 🖺 133
	Full calibration	→ 🖺 134
	Level	→ 🖺 135
	Distance	→ 🖺 136
	Signal quality	→ 🖺 137
	Tank level	→ 🖺 138
	Distance to upper connection	→ 🖺 139
	DC value	→ 🖺 139
	Interface	→ 🖺 140
	Interface distance	→ 🖺 141
	Confirm distance	→ 🗎 141
	Present mapping	→ 🗎 142
	Mapping end point	→ 🖺 143
	Record map	→ 🖺 143

► Analog inputs			
	► Analog input 1	to 6	→ 🗎 1
		Channel	→ 🖺 1
		PV filter time	→ 🖺 1
		Fail safe type	→ 🖺 1
		Fail safe value	→ 🖺 1
► Advanced setup	p		→ 🖺 1
	Locking status		→ 🖺 1
	Access status tool	ing	→ 🖺 1
	Enter access code		→ 🖺 1
	► Level		→ 🗎 1
		Medium type	→ 🖺 1
		Medium property	→ 🖺 1
		Process property	→ 🖺 1
		Advanced process conditions	→ 🖺 1
		Level unit	→ 🖺 1
		Blocking distance	→ 🗎 1
		Level correction	→ 🗎 1
	► Interface		→ 🗎 1
		Process property	→ 🗎 1
		DC value lower medium	→ 🗎 1
		Level unit	→ 🖺 1
		Blocking distance	→ 🖺 1
		Level correction	→ 🖺 1

	Measured thickness upper layer	→ 🖺 157
	DC value	→ 🖺 157
	Calculated DC value	→ 🖺 157
	Use calculated DC value	→ 🖺 158
▶ Linearization		→ 🖺 161
	Linearization type	→ 🖺 163
	Unit after linearization	→ 🖺 164
	Free text	→ 🗎 165
	Level linearized	→ 🖺 166
	Interface linearized	→ 🖺 166
	Maximum value	→ 🖺 166
	Diameter	→ 🖺 166
	Intermediate height	→ 🖺 167
	Table mode	→ 🖺 167
	Table number	→ 🖺 168
	Level	→ 🖺 169
	Level	→ 🖺 169
	Customer value	→ 🖺 169
	Activate table	→ 🖺 169
► Safety settings		→ 🖺 171
	Output echo lost	→ 🖺 171
	Value echo lost	→ 🗎 171
	Ramp at echo lost	→ 🗎 172
	Blocking distance	→ 🖺 152
► WHG confirmat	ion	→ 🖺 174

► Deactivate WF	IG	→ 🗎 175
	Reset write protection	→ 🖺 175
	Code incorrect	→ 🖺 175
► Probe settings	3	→ 🖺 176
	Probe grounded	→ 🖺 176
	Present probe length	→ 🖺 176
	Confirm probe length	→ 🖺 177
► Switch output		→ 🖺 179
	Switch output function	→ 🖺 179
	Assign status) → 🖺 179
	Assign limit	→ 🖺 180
	Assign diagnostic behavior	→ 🖺 180
	Switch-on value	→ 🖺 181
	Switch-on delay	→ 🖺 182
	Switch-off value	→ 🖺 182
	Switch-off delay	→ 🖺 183
	Failure mode	→ 🖺 183
	Switch status	→ 🗎 183
	Invert output signal	→ 🖺 183
► Display		→ 🖺 185
	Language	→ 🗎 185
	Format display	→ 🖺 185
	Value 1 to 4 display	→ 🖺 187
	Decimal places 1 to 4	→ 🖺 187
	Display interval	→ 🖺 188

I	Display damping)	₿ 188
I	Header	\rightarrow	₿ 188
I	Header text)	₿ 189
5	Separator	→	₿ 189
	Number format	→	₿ 189
I	Decimal places menu	→	₿ 189
I	Backlight	\rightarrow	₿ 190
	Contrast display	\rightarrow	₿ 190
► Configuration bac	kup display	\rightarrow	1 91
	Operating time	\rightarrow	₿ 191
I	Last backup	\rightarrow	₿ 191
	Configuration management	\rightarrow	₿ 191
I	Backup state	\rightarrow	₿ 192
	Comparison result	\rightarrow	192
► Administration		\rightarrow	₿ 194
I	Define access code		
Ι	Device reset	\rightarrow	₿ 194
억 Diagnostics		\rightarrow	197 ■ 197
Actual diagnostics		\rightarrow	197
Timestamp		\rightarrow	197
Previous diagnostics		\rightarrow	197 ■ 197
Timestamp		\rightarrow	₿ 198
Operating time from restart		\rightarrow	₿ 198
Operating time)	₿ 191

► Diagnostic list		→ 🖺 199
	Diagnostics 1 to 5	→ 🖺 199
	Timestamp 1 to 5	→ 🖺 199
► Device informa	tion	→ 🖺 20
	Device tag	→ 🖺 201
	Serial number	→ 🖺 20:
	Firmware version	→ 🖺 201
	Device name	→ 🖺 20:
	Order code	→ 🖺 202
	Extended order code 1 to 3	→ 🖺 202
	Status PROFIBUS Master Config	→ 🖺 202
	PROFIBUS ident number	→ 🖺 202
► Measured value	es	→ 🖺 20
	Distance	→ 🖺 13
	Level linearized	→ 🖺 16
	Interface distance	→ 🖺 14
	Interface linearized	→ 🖺 16
	Thickness upper layer	→ 🖺 20!
	Terminal voltage 1	→ 🖺 20
	Switch status	→ 🖺 183
► Analog inputs		
	► Analog input 1 to 6	→ 🖺 20
	Channel	→ 🖺 14:
	Out value	→ 🖺 20

	Out status	→ 🖺 207
	Out status HEX	→ 🖺 207
► Data logging		→ 🖺 208
	Assign channel 1 to 4	→ 🖺 208
	Logging interval	→ 🖺 208
	Clear logging data	→ 🖺 209
▶ Simulation		→ 🖺 212
	Assign measurement variable	→ 🖺 213
	Value process variable	→ 🖺 213
	Switch output simulation	→ 🖺 213
	Switch status	→ 🖺 214
	Simulation device alarm	→ 🖺 214
	Simulation diagnostic event	→ 🖺 214
► Device check		→ 🖺 215
	Start device check	→ 🗎 215
	Result device check	→ 🗎 215
	Last check time	→ 🖺 215
	Level signal	→ 🖺 216
	Launch signal	→ 🖺 216
	Interface signal	→ 🖺 216
► Heartbeat		→ 🖺 217

16.3 "Setup" menu



- 🗐 : Indicates how to navigate to the parameter using the display and operating module
 - ☐: Indicates how to navigate to the parameter using operating tools (e.g. FieldCare)
 - 🗈 : Indicates parameters that can be locked via the access code.

Navigation ■ ■ Setup

Device tag		
Navigation		
Description	Enter tag for measuring point.	
User entry	Up to 32 alphanumerical characters	
Device address		
Navigation	Setup → Device address	
Description	 for Address mode = Software: Enter bus address. for Address mode = Hardware: Displays bus address. 	
User entry	0 to 126	
Operating mode		<u> </u>
Navigation	Setup → Operating mode	
Prerequisite	The device has the "interface measurement" application package (available for FMP51 FMP52, FMP54) $^{6)}$.	,
Description	Select operating mode.	
Selection	 Level Interface with capacitance * Interface * 	
Factory setting	FMP51/FMP52/FMP54: Level	

Product structure: Feature 540 "Application Package", Option EB "Interface measurement" 6)

Visibility depends on order options or device settings

Distance unit			1
Navigation		ce unit	
Description	Length unit for distar	ce calculation.	
Selection	SI units ■ mm ■ m	US units ■ ft ■ in	
Tank type			a
Navigation	Setup → Tank t	ype	
Prerequisite	Medium type (→ 🖺	149) = Liquid	
Description	Select tank type.		
Selection	MetallicBypass / pipeNon metallicMounted outsideCoaxial		
Factory setting	Depending on the pro	be	

corresponds to the type of probe and cannot be changed.

• Depending on the probe some of the options mentioned above may not be available or

• For coax probes and probes with metallic center washer **Tank type** parameter

Navigation \blacksquare Setup \rightarrow Tube diameter

Prerequisite ■ Tank type (→ 🗎 132) = Bypass / pipe

■ The probe is coated.

there may be additional options.

Description Specify diameter of bypass or stilling well.

User entry 0 to 9.999 m

Additional information

Medium group

Navigation $\blacksquare \Box$ Setup \rightarrow Medium group

Prerequisite ■ For FMP51/FMP52/FMP54/FMP55: Operating mode (→ 🖺 131) = Level

■ Medium type (→ 🖺 149) = Liquid

Description Select medium group.

Selection • Others

■ Water based (DC >= 4)

Additional information

This parameter roughly specifies the dielectric constant (DC) of the medium. For a more detailed definition of the DC use the **Medium property** parameter ($\rightarrow \square$ 149).

The **Medium group** parameter presets the **Medium property** parameter ($\rightarrow \implies 149$) as follows:

Medium group	Medium property (→ 🖺 149)
Others	Unknown
Water based (DC >= 4)	DC 4 7

The **Medium property** parameter can be changed at a later point of time. However, when doing so, the **Medium group** parameter retains its value. Only the **Medium property** parameter is relevant for the signal evaluation.

The measuring range may be reduced for small dielectric constants. For details refer to the Technical Information (TI) of the respective device.

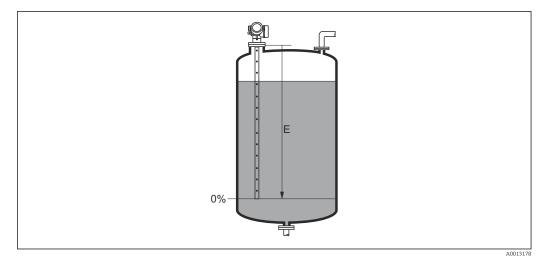
Empty calibration	8

Navigation \blacksquare Setup \rightarrow Empty calibr.

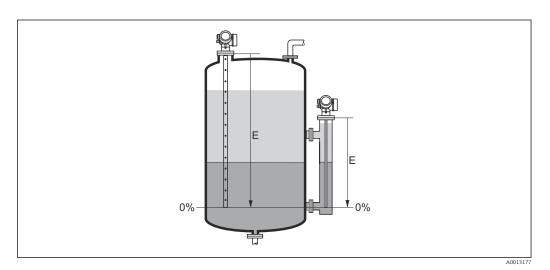
Description Distance process connection to min. level.

User entry Depending on the probe

Factory setting Depending on the probe



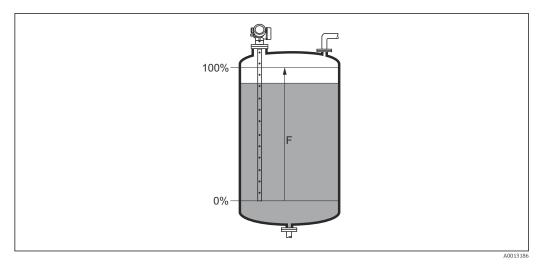
■ 36 Empty calibration (E) for level measurements in liquids



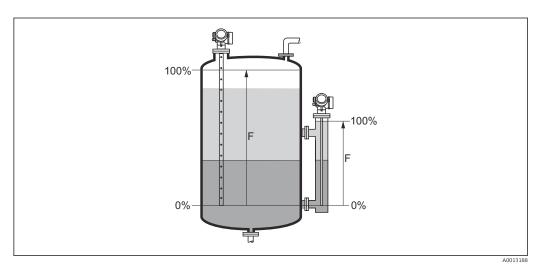
 \blacksquare 37 Empty calibration (E) for interface measurements

In the case of interface measurements the **Empty calibration** parameter is valid for both, the total and the interface level.

Full calibration		۵
Navigation	Setup → Full calibr.	
Description	Span: max. level - min level.	
User entry	Depending on the probe	
Factory setting	Depending on the probe	



■ 38 Full calibration (F) for level measurements in liquids



■ 39 Full calibration (F) for interface measurements

In the case of interface measurements the **Full calibration** parameter is valid for both, the total and the interface level.

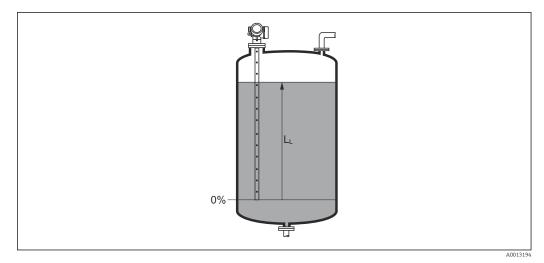
Level

Navigation

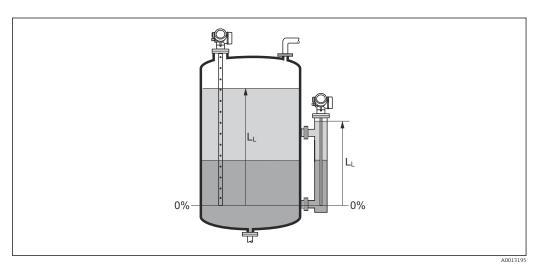
Setup → Level

Description

Displays measured level L_{L} (before linearization).



■ 40 Level in case of liquid measurements



 \blacksquare 41 Level in case of interface measurements

 \blacksquare The unit is defined in the **Level unit** parameter (→ \blacksquare 152).

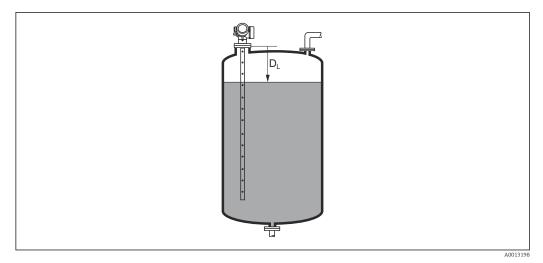
• In case of interface measurements, this parameter always refers to the total level.

Distance

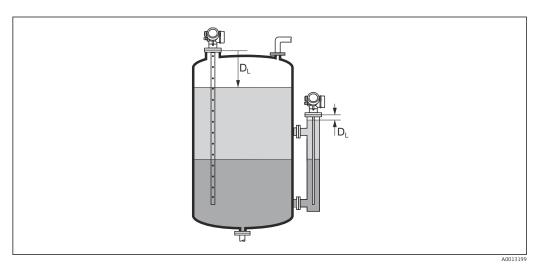
Navigation

Description

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



■ 42 Distance for liquid measurements



■ 43 Distance for interface measurements

The unit is defined in the **Distance unit** parameter ($\rightarrow \equiv 132$).

Signal quality

Description Displays the signal quality of the evaluated echo.

Additional information Meaning

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 7) 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 (\rightarrow 🖺 171) = Alarm.
 - S941, if another option has been selected in **Output echo lost** (→ 🗎 **171**).

Navigation

Prerequisite

Operating mode ($\rightarrow \equiv 131$) = Interface

Description

Specify whether the tank or bypass is completely flooded or not.

Selection

- Partially filled
- Fully flooded

Additional information

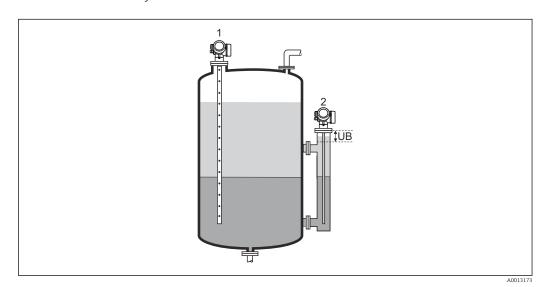
Meaning of the options

Partially filled

The device searches for 2 echo signals, one for the interface and one for the total level.

Fully flooded

The device searches for the interface level only. With this setting it is essential that the upper level signal always is within the upper blocking distance (UB) in order to avoid that it is evaluated by mistake.



- Partially filled 1
- Fully flooded
- UB Upper blocking distance

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

Distance to upper connection

Navigation $\blacksquare \square$ Setup \rightarrow Dist. up.connect

Prerequisite The device has the "Interface measurement" application package ⁸⁾.

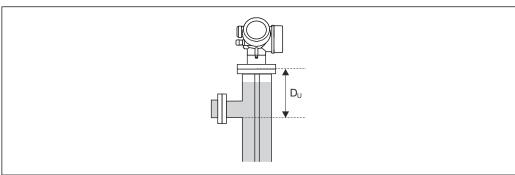
Description Specify distance D_U to upper connection.

User entry 0 to 200 m

Factory setting • For Tank level (\rightarrow \cong 138) = Partially filled: 0 mm (0 in)

■ For **Tank level (→ 🖺 138)** = **Fully flooded**: 250 mm (9.8 in)

Additional information



A0013174

Dependence on the "Tank level" parameter

- Tank level (→ 🗎 138) = Partially filled:
 In this case the Distance to upper connection parameter does not influence the measurement. Thus, the default setting needs not to be changed.
- Tank level (\rightarrow 🗎 138) = Fully flooded: In this case enter the distance D_U between the reference point and the lower edge of the upper connection.

DC value	

Navigation $\blacksquare \Box$ Setup \rightarrow DC value

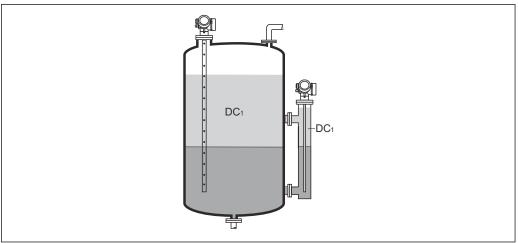
Prerequisite The device has the "Interface measurement" application package ⁹⁾.

Description Specify the relative dielectric constant ε_r of the upper medium (DC₁).

User entry 1.0 to 100

⁸⁾ Product structure: Feature 540 "Application Package", Option EB "Interface measurement"

⁹⁾ Product structure: feature 540 "Application packages", option EB "Interface measurement"



A001318

DC1 Relative dielectric constant of the upper medium.

- For the dielectric constants (DC values) of many media commonly used in industry, please refer to:
 - Dielectric constant (DC value) Compendium CP01076F
 - The Endress+Hauser "DC Values app" (available for Android and iOS)

Interface

Navigation

Setup → Interface

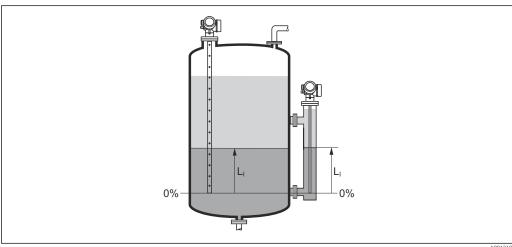
Prerequisite

Operating mode (→ 🗎 131) = Interface or Interface with capacitance

Description

Displays the measured interface level $L_{\rm I}$ (before linearization).

Additional information



A0013197

The unit is defined in the **Level unit** parameter ($\rightarrow \triangleq 152$).

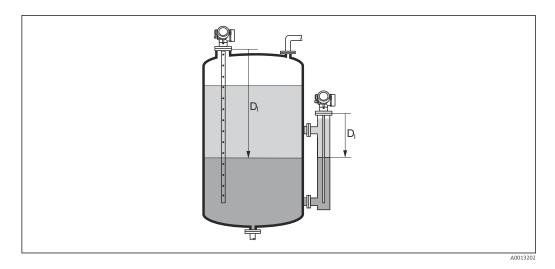
Interface distance

Navigation $\blacksquare \square$ Setup \rightarrow Interface dist.

Prerequisite Operating mode (→ 🖺 131) = Interface or Interface with capacitance

threaded connection) and the interface.

Additional information



The unit is defined in the **Distance unit** parameter ($\rightarrow \equiv 132$).

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

Visibility depends on order options or device settings

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 ($\Rightarrow \implies 143$). 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 ¹⁰⁾

To be selected if the measured distance exceeds the actual distance. The device adjusts the signal evaluation and returns to the **Confirm distance** parameter. The distance is recalculated and displayed. The comparison must be repeated until the displayed distance matches the actual distance. After this, the recording of the map can be started by selecting **Distance ok**.

Tank empty

To be selected if the tank is completely empty. The device records a mapping covering the complete measuring range.

To be selected if the tank is completely empty. The device records a mapping covering the complete measuring range minus **Map gap to LN**.

Factory map

To be selected if the present mapping curve (if one exists) is to be deleted. The device returns to the **Confirm distance** parameter and a new mapping can be recorded.

- When operating via the display module, the measured distance is displayed together with this parameter for reference purposes.
- For interface measurements the distance always refers to the toatal level (not the interface level).
- 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.
- For FMP54 with gas phase compensation (product structure: feature 540 "Application Package", option EF or EG) a map must **not** be recorded.

Present mapping

Navigation

 \square Setup \rightarrow Present mapping

Description

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

⁰⁰ Only available for "Expert \rightarrow Sensor \rightarrow Echo tracking \rightarrow **Evaluation mode** parameter" = "Short time history" or "Long time history

Mapping end point

Navigation $riangleq ext{Setup} o ext{Map. end point}$

Prerequisite Confirm distance (→ 🖺 141) = Manual map or Distance too small

Description Specify new end of the mapping.

User entry 0 to 200 000.0 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 ($\rightarrow \implies 142$) is displayed together with this parameter. It indicates up to which distance a mapping has already been recorded.

Record map

Prerequisite Confirm distance (→ 🖺 141) = Manual map or Distance too small

Description Start recording of the map.

Selection • No

Record mapDelete map

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 \square .

■ 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 \square .

16.3.1 "Mapping" wizard

The **Mapping** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the mapping are located directly in the **Setup** menu ($\rightarrow \square$ 131).

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	→ 🖺 141	
Mapping end point		<u> </u>
Navigation	Setup → Mapping → Map. end point	
Description	→ 🖺 143	
Record map		
Navigation	Setup → Mapping → Record map	
Description	→ 🖺 143	
Distance		
Navigation	Setup → Mapping → Distance	
Description	→ ■ 136	

16.3.2 "Analog input 1 to 6" submenu

i

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

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

Navigation \square Expert \rightarrow Analog inputs \rightarrow Analog input 1 to 6

Channel **Navigation** Expert \rightarrow Analog inputs \rightarrow Analog input 1 to 6 \rightarrow Channel Description Standard parameter **CHANNEL** of the Analog Input Block according to the PROFIBUS Profile. Selection Level linearized Distance • Interface linearized ⁷ ■ Interface distance Thickness upper layer * ■ Terminal voltage ■ Electronic temperature Measured capacitance Absolute echo amplitude ■ Relative echo amplitude Absolute interface amplitude ⁷ Relative interface amplitude ■ Absolute EOP amplitude Noise of signal ■ EOP shift

Additional information

Allocates a measured value to the AI block.

Analog output adv. diagnostics 1Analog output adv. diagnostics 2

Calculated DC value *Sensor debug

PV filter time

Navigation

Expert \Rightarrow Analog input 1 to 6 \Rightarrow PV filter time

Description Standard parameter **PV_FTIME** of the Analog Input Block according to the PROFIBUS

profile.

User entry Positive floating-point number

Visibility depends on order options or device settings

Additional information

This parameter defines the damping constant $\boldsymbol{\tau}$ (in seconds) for the output of the Analog Input Block.

Fail safe type	
Navigation	
Description	Standard parameter FSAFE_TYPE of the Analog Input Block according to the PROFIBUS profile.
Selection	 Fail safe value Fallback value Off
Additional information	 Meaning of the options This parameter specifies the output value of the Analog Input block in the event of an error. Fail safe value The output value in the event of an error is defined in the Fail safe value parameter (→ 🖺 146). Fallback value The last output value that was valid before the error occurred is retained. Off

The output value follows the current measured value. The status is set to BAD.

Fail safe value	
Navigation	
Prerequisite	Fail safe type (→ 🗎 146) = Fail safe value
Description	Standard parameter FSAFE_VALUE of the Analog Input Block according to the PROFIBUS profile.
User entry	Signed floating-point number
Additional information	This parameter defines the output value of the Analog Input Block in case of an error.

146

16.3.3 "Advanced setup" submenu

Navigation \square Setup \rightarrow Advanced setup

Locking status

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Locking status

Description Indicates the write protection with the highest priority that is currently active.

User interface ■ Hardware locked

- SIL locked
- WHG 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 a-symbol appears in front of parameters that cannot be modified since they are write-protected.

Access status tooling

Navigation \square Setup \rightarrow Advanced setup \rightarrow Access stat.tool

Description Shows the access authorization to the parameters via the operating tool.

Additional information

The access authorization can be changed via the **Enter access code** parameter $(\rightarrow \boxminus 148)$.

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 ($\Rightarrow \implies 147$).

Access status display

Navigation

Setup → Advanced setup → Access stat.disp

Prerequisite

The device has a local display.

Description

Indicates access authorization to parameters via local display.

Additional information

The access authorization can be changed via the **Enter access code** parameter $(\rightarrow \implies 148)$.

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 ($\rightarrow \implies 147$).

Enter access code

Navigation

Description

Enter access code to disable write protection of parameters.

User entry

0 to 9999

Additional information

- The customer-specific access code that was defined in the **Define access code** parameter
 (→ ≦ 194) must be entered for local operation.
- If an incorrect access code is entered, users retain their current access authorization.
- The write protection affects all parameters marked with the 🗈 symbol in the 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 minutes or 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 another 60 s.
- Please contact your Endress+Hauser Sales Center if you lose your access code.

"Level" submenu

Level submenu ($\rightarrow \triangleq 149$) is only visible for **Operating mode** ($\rightarrow \triangleq 131$) = **Level**

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Level

Medium type

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Medium type

Description Specify type of medium.

User interface • Liquid

Selection

Solid

Factory setting FMP50, FMP51, FMP52, FMP53, FMP54, FMP55: Liquid

Additional information The Solid option is only available for Operating mode (→ 🗎 131) = Level

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 $\blacksquare \square$ Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Medium property

Prerequisite ■ Operating mode (→ 🖺 131) = Level

■ EOP level evaluation ≠ Fix DC

Description Specify the dielectric constant ε_r of the medium.

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 Depends on the **Medium type** ($\rightarrow \triangleq 149$) and **Medium group** ($\rightarrow \triangleq 133$) parameters.

Additional information

Dependency of "Medium type" and "Medium group"

Medium type (→ 🗎 149)	Medium group (→ 🗎 133)	Medium property
Solid		Unknown
Liquid	Water based (DC >= 4)	DC 4 7
	Others	Unknown

- For the dielectric constants (DC values) of many media commonly used in industry, please refer to:
 - Dielectric constant (DC value) Compendium CP01076F
 - The Endress+Hauser "DC Values app" (available for Android and iOS)
- If **EOP level evaluation** = **Fix DC**, the exact dielectric constant must be specified in the **DC value** parameter (→ 🖺 139). The **Medium property** parameter therefore does not apply in this case.

Process property	
------------------	--

Navigation

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
- \blacksquare 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

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

A

Navigation

Prerequisite

Operating mode ($\rightarrow \equiv 131$) = Level

Description

Specify additional process conditions (if required).

Selection

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

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

Increases **EOP range upper area** in order to ensure a safe empty-detection even if the end-of-probe signal has shifted due to build-up.

Enables a safe empty-detection even if the end-of-probe signal has shifted due to build-up.

■ Foam (>5cm/0,16ft) (only for Medium type = Liquid)

Optimizes the signal evaluation in applications with foam formation.

Level unit

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Level unit

Description Select level unit.

Selection $SI \ units$ $US \ units$ $\bullet \ \%$

■ m ■ in

■ mm

Additional information

The level unit may differ from the distance unit defined in the **Distance unit** parameter $(\rightarrow \implies 132)$:

- The unit defined in the **Distance unit** parameter is used for the basic calibration (**Empty calibration** ($\rightarrow \implies 133$) and **Full calibration** ($\rightarrow \implies 134$)).
- The unit defined in the **Level unit** parameter is used to display the (unlinearized) level.

Blocking distance

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Blocking dist.

Description Specify upper blocking distance UB.

User entry 0 to 200 m

Factory setting

- For coax probes: 0 mm (0 in)
- 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

For FMP51/FMP52/FMP54 with the **Interface measurement** application package $^{11)}$ and for FMP55:

100 mm (3.9 in) for all antenna types

Additional information

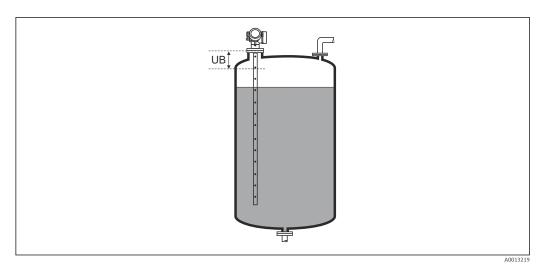
Signals in the upper blocking distance are only evaluated if they have been outside the blocking distance when the device was switched on and move into the blocking distance due to a level change during operation. Signals which are already in the blocking distance when the device is switched on, are ignored.

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

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

- A different behavior for signals in the blocking distance can be defined in the **Blocking distance evaluation mode** parameter.
- If required, a different behavior for signals in the blocking distance can be defined by the Endress+Hauser service.

¹¹⁾ Ordering feature 540 "Application Package", option EB "Interface measurement"



■ 44 Blocking distance (UB) for liquid measurements

Level correction

Navigation Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Level correction

Description Specify level correction (if required).

User entry -200 000.0 to 200 000.0 %

Additional information The value specified in this parameter is added to the measured level (before linearization).

"Interface" submenu

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Interface

Process property

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Process property

Description Specify typical rate of change for the interface position.

Selection ■ Fast > 1 m (40 in)/min

Standard < 1 m (40in) /minMedium < 10 cm (4in) /min

■ Slow < 1 cm (0.4in) /min

■ No filter / test

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:

Process property	Step response time / s
Fast > 1 m (40 in)/min	5
Standard < 1 m (40in) /min	15
Medium < 10 cm (4in) /min	40
Slow < 1 cm (0.4in) /min	74
No filter / test	2.2

DC value lower medium	
-----------------------	--

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow DC lower medium

Prerequisite Operating mode (→ 🖺 131) = Interface or Interface with capacitance

Description Specify the dielectric constant ε_r of the lower medium.

User entry 1 to 100

Additional information

- For the dielectric constants (DC values) of many media commonly used in industry, please refer to:
 - Dielectric constant (DC value) Compendium CP01076F
 - The Endress+Hauser "DC Values app" (available for Android and iOS)

The factory setting, $\varepsilon_{\rm r}$ = 80, applies for water at 20 °C (68 °F).

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Level unit

Description Select level unit.

Selection SI units US units

■ % ■ ft ■ in

■ mm

Additional information The level unit may differ from the distance unit defined in the **Distance unit** parameter $(\rightarrow \implies 132)$:

• The unit defined in the Distance unit parameter is used for the basic calibration (Empty calibration (→ □ 133) and Full calibration (→ □ 134)).

■ The unit defined in the **Level unit** parameter is used to display the (unlinearized) level and interface position.

Blocking distance		
Navigation	Setup → Advanced setup → Interface → Blocking dist.	
Description	Specify upper blocking distance UB.	
User entry	0 to 200 m	

Factory setting • For coax probes: 100 mm (3.9 in)

• For rod and rope probes up to 8 m (26 ft): 200 mm (8 in)

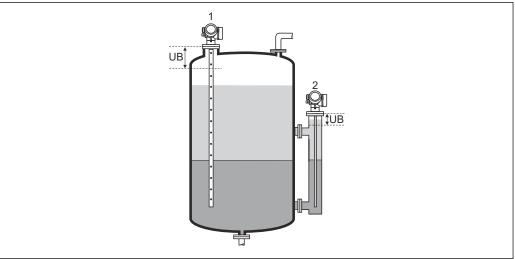
■ For rod and rope probes above 8 m (26 ft): 0.025 * length of probe

Additional information Echoes from within the blocking distance are not taken into account in the signal

evaluation. The upper blocking distance is used

• to suppress interference echoes at the top end of the probe.

• to suppress the echo of the total level in the case of flooded bypasses.



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- 1 Suppression of interference echoes at the top end of the probe.
- 2 Suppression of the level signal in case of a flooded bypass.
- UB Upper blocking distance

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Level correction

Description Specify level correction (if required).

User entry -200 000.0 to 200 000.0 %

Additional information The value specified in this parameter is added to the measured total and interface levels

(before linearization).

Manual thickness upper layer

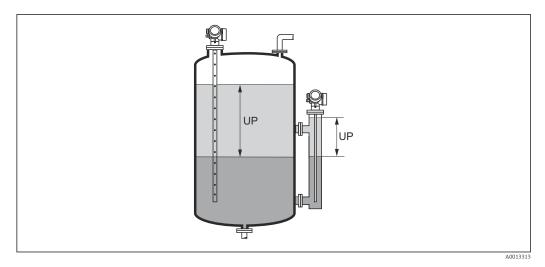
Navigation \square Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Man.thick.up.lay

Description Specify the manually determined interface thickness UP (i.e. the thickness of the upper

medium).

User entry 0 to 200 m

Additional information



UP Interface thickness (= thickness of upper medium)

On the local display, the measured interface thickness is indicated together with the manual interface thickness. By comparing these two values the device can automatically adjust the dielectric constant of the upper medium.

Measured thickness upp	er layer	
Navigation	☐ Setup → Advanced setup → Interface → Meas.thick.u.lay	
Description	Displays the measured interface thickness. (Thickness UP of the upper medium).	
DC value		
Navigation		
Description	Displays relatvie dielectric constant ϵ_{r} of the upper medium (DC $_{1}$) before correct	
Calculated DC value		
Navigation	\square Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Calc. DC value	
Description	Displays calculated (i.e. corrected) relative dielectric constant $\epsilon_{\rm r}$ (DC1) of the upper medium.	

 Use calculated DC value

 Navigation
 \blacksquare Setup \Rightarrow Advanced setup \Rightarrow Interface \Rightarrow Use calc. DC

 Description
 Specify whether the calculated dielectric constant is to be used.

Selection ■ Save and exit ■ Cancel and exit

Additional information Meaning of the options

Save and exit
 The calculated constant is assumed to be the correct one.

Cancel and exit The calculated dielectric constant is rejected; the previous dielectric constant remains active.

On the local display, the **Calculated DC value** parameter ($\Rightarrow \triangleq 157$) is displayed together with this parameter.

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"Automatic DC calculation" wizard

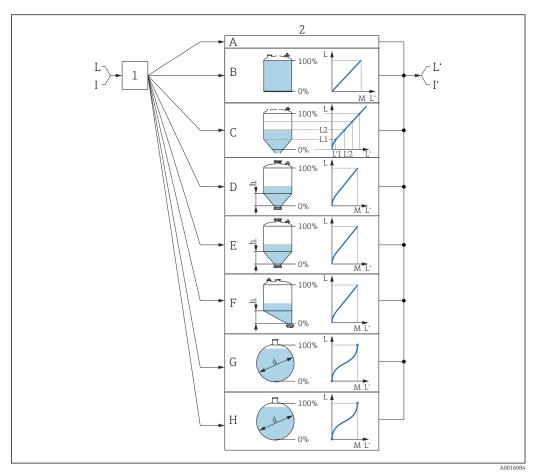
The **Automatic DC calculation** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the automatic DC calculation are located directly in the **Interface** submenu (→ 🖺 154)

In the **Automatic DC calculation** 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 \rightarrow Advanced setup \rightarrow Interface \rightarrow Autom. DC calc.

Manual thickness upper la	ayer		
Navigation		Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Autom. DC calc. \rightarrow Man.thick.up.lay	
Description	→ 	→ 🖺 156	
DC value			
Navigation		Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Autom. DC calc. \rightarrow DC value	
Description	→ E	157	
Use calculated DC value			
Navigation		Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Autom. DC calc. \rightarrow Use calc. DC	
Description	→ 🖺	158	

"Linearization" submenu



Linearization: Conversion of the level and, if applicable, interface into a volume or a weight; the € 45 conversion depends on the vessel shape

- 1 Selection of linearization type and unit
- Configuration of the linearization 2
- Α
- Linearization type (→ 🖺 163) = Linear В
- Linearization type ($\rightarrow \blacksquare 163$) = Table С
- D *Linearization type* ($\rightarrow \blacksquare 163$) = *Pyramid bottom*
- Linearization type ($\rightarrow \blacksquare 163$) = Conical bottom Ε
- F *Linearization type* ($\rightarrow \square 163$) = *Angled bottom*
- Linearization type ($\rightarrow \triangleq 163$) = Horizontal cylinder G
- *Linearization type* ($\rightarrow \equiv 163$) = *Sphere* Н
- For "Operating mode (→ 🖺 131)" = "Interface" or "Interface with capacitance": interface before linearization Ι (measured in the level unit)
- For "Operating mode ($\rightarrow \cong 131$)" = "Interface" or "Interface with capacitance": interface after linearization (corresponds to volume or weight)
- Level before linearization (measured in level unit) L
- Level linearized (\rightarrow 🖺 166) (corresponds to volume or weight) L'
- Maximum value (→ 🖺 166) Μ
- d *Diameter (→ 🖺 166)*
- Intermediate height ($\rightarrow = 167$) h

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Structure of the submenu on the local display

► Linearization			
	Linearization type		
	Unit after linearization		
	Free text		
	Maximum value		
	Diameter		
	Intermediate height		
	Table mode		
	► Edit table		
	Lev	evel	
	Cu	ustomer value	
	Activate table		

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

Navigation \square Setup \rightarrow Advanced setup \rightarrow Linearization

► Linearization		
	Linearization type	
	Unit after linearization	
	Free text	
	Level linearized	
	Interface linearized	
	Maximum value	
	Diameter	
	Intermediate height	
	Table mode	
	Table number	
	Level	
	Level	
	Customer value	
	Activate table	

Description of the parameters

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Linearization

Linearization type

Navigation Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Lineariz. type

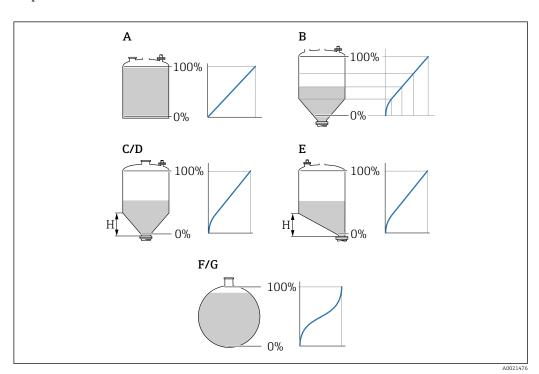
Description Select linearization type.

Selection ■ None

Linear

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

Additional information



- 46 Linearization types
- A None
- B Table
- C Pyramid bottom
- D Conical bottom
- $E \qquad \textit{Angled bottom}$
- F Sphere
- G Horizontal cylinder

Meaning of the options

None

The level is output in the level unit without being converted (linearized) beforehand.

Linear

The output value (volume/weight) is proportional to the level L. This applies, for example, to vertical cylindrical tanks and silos. The following parameters must also be specified:

- Unit after linearization (→ 🗎 164)
- Maximum value (→ 🖺 166): maximum volume or weight

Table

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

- **■** Table mode (→ 🗎 167)
- For every point in the table: **Level (\rightarrow** 🖺 **169)**
- For every point in the table: **Customer value** (→ 🗎 **169**)
- Activate table (→ \(\begin{cases} \begin{ca

Pyramid bottom

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

- **Maximum value (→** 🗎 **166)**: maximum volume or weight
- **Intermediate height (→ 🖺 167)**: the height of the pyramid

Conical bottom

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

- Maximum value (→ 🖺 166): maximum volume or weight
- **Intermediate height (→** 🖺 **167)**: the height of the cone

Angled bottom

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

- Maximum value (→ 🖺 166): maximum volume or weight
- **Intermediate height (→** 🗎 **167)**: height of the angled bottom

Horizontal cylinder

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

- Maximum value (→ 🖺 166): maximum volume or weight
- **■** Diameter (→ 🗎 166)

Sphere

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

- Maximum value (→ 🖺 166): maximum volume or weight
- **■** Diameter (→ 🗎 166)

Unit after linearization

Navigation

Prerequisite

Linearization type (→ 🖺 163) ≠ None

Description

Select the unit for the linearized value.

Selection

Selection/input (uint16)

- 1095 = [short Ton]
- 1094 = [lb]
- 1088 = [kg]
- 1092 = [Ton]
- 1048 = [US Gal.]
- 1049 = [Imp. Gal.]
- \bullet 1043 = [ft³]
- \blacksquare 1571 = [cm³]
- \bullet 1035 = [dm³]
- \blacksquare 1034 = [m³]
- 1038 = [l]
- 1041 = [hl]
- **1**342 = [%]
- -1010 = [m]
- 1012 = [mm]
- 1018 = [ft]
- 1019 = [inch]
- $\blacksquare 1351 = [1/s]$
- 1352 = [l/min]
- 1353 = [l/h]
- \blacksquare 1347 = [m³/s]
- \blacksquare 1348 = [m³/min]
- \blacksquare 1349 = $[m^3/h]$
- \blacksquare 1356 = [ft³/s]
- \blacksquare 1357 = [ft³/min]
- $1358 = [ft^3/h]$
- 1362 = [US Gal./s]
- 1363 = [US Gal./min]
- 1364 = [US Gal./h]
- 1367 = [Imp. Gal./s]
- 1358 = [Imp. Gal./min]
- 1359 = [Imp. Gal./h]
- \blacksquare 32815 = [Ml/s]
- \blacksquare 32816 = [Ml/min]
- 32817 = [Ml/h]
- 1355 = [Ml/d]

Additional information

The selected unit is only used for display purposes. The measured value is **not** converted on the basis of the selected unit.



Distance-to-distance linearization is also possible, i.e. a linearization from the level unit to another length unit. Select the **Linear** linearization mode for this purpose. To specify the new level unit, select the Free text option in the Unit after linearization parameter and enter the unit in the **Free text** parameter ($\rightarrow \triangleq 165$).

Free text

Navigation

Prerequisite

Unit after linearization (→ 🗎 164) = Free text

Description

Enter unit symbol.

User entry Up to 32 alphanumerical characters (letters, numbers, special characters)

Level linearized

Navigation \square Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Level linearized

Description Displays linearized level.

Additional information

- The unit is defined by the **Unit after linearization** parameter $\rightarrow \triangleq 164$.
- For interface measurements, this parameter always refers to the total level.

Interface linearized

Navigation \square Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Interf. lineariz

Prerequisite Operating mode (→ 🖺 131) = Interface or Interface with capacitance

Description Displays the linearized interface height.

Additional information The unit is defined in the **Unit after linearization** parameter $\rightarrow \triangleq 164$.

Maximum value

Navigation $\blacksquare \square$ Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Maximum value

Prerequisite Linearization type ($\rightarrow \triangleq 163$) has one of the following values:

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

User entry -50 000.0 to 50 000.0 %

Diameter

Navigation $\blacksquare \square$ Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Diameter

Prerequisite Linearization type (→ 🗎 163) has one of the following values:

- Horizontal cylinder
- Sphere

User entry 0 to 9 999.999 m

Additional information The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 132$).

Intermediate height

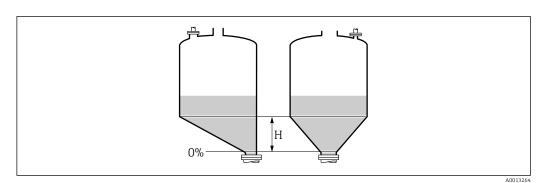
Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Intermed. height

Prerequisite Linearization type ($\rightarrow \triangleq 163$) has one of the following values:

Pyramid bottomConical bottomAngled bottom

User entry 0 to 200 m

Additional information



H Intermediate height

The unit is defined in the **Distance unit** parameter ($\rightarrow \square 132$).

Table mode 🗈

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Table mode

Prerequisite Linearization type (→ 🗎 163) = Table

Description Select editing mode of the linearization table.

Selection • Manual

- Semiautomatic *Clear table
- Sort table

^{*} Visibility depends on order options or device settings

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.

Conditions the linearization table must meet:

- The table may consist of up to 32 pairs of values "Level Linearized Value".
- The table must be monotonic (monotonically increasing or decreasing).
- The first linearization point must refer to the minimum level.
- The last linearization point must refer to the maximum level.
- Before entering a linearization table, the values for **Empty calibration** ($\rightarrow \triangleq 133$) and **Full calibration** ($\rightarrow \triangleq 134$) 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** $(\rightarrow \ \ \)$ = 167) = Clear table). Then enter a new table.

How to enter the table

■ Via FieldCare

The table points can be entered via the **Table number** (\rightarrow \cong **168**), **Level** (\rightarrow \cong **169**) and **Customer value** (\rightarrow \cong **169**) parameters. As an alternative, the graphic table editor may be used: Device Operation \rightarrow Device Functions \rightarrow Additional Functions \rightarrow Linearization (Online/Offline)

Via local display

Select the **Edit table** submenu to call up the graphic table editor. The table is displayed and can be edited line by line.

The factory setting for the level unit is "%". If you want to enter the linearization table in physical units, you must select the appropriate unit in the **Level unit** parameter $(\rightarrow \implies 152)$ beforehand.

Table number		
Navigation		
Prerequisite	Linearization type (→ 🗎 163) = Table	
Description	Select table point you are going to enter or change.	
User entry	1 to 32	

168

Level (Manual)	

Navigation \square Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Level

Prerequisite ■ Linearization type (→ 🖺 163) = Table

■ Table mode (→ 🖺 167) = Manual

Description Enter level value of the table point (value before linearization).

User entry Signed floating-point number

Level (Semiautomatic)

Navigation \square Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Level

Prerequisite ■ Linearization type (→ 🖺 163) = Table

■ Table mode (→ 🗎 167) = Semiautomatic

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

Customer value

Navigation \square Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Customer value

Prerequisite Linearization type (→ 🗎 163) = Table

Description Enter linearized value for the table point.

User entry Signed floating-point number

Activate table

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Activate table

Prerequisite Linearization type (→ 🗎 163) = Table

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

Selection ■ Disable

Enable

Additional information

Meaning of the options

Disable

The measured level is not linearized.

If **Linearization type** (\rightarrow **\stackrel{\triangle}{=} 163)** = **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 $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Safety sett.

Output echo lost

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Safety sett. \rightarrow Output echo lost

Description Output signal in case of a lost echo.

Selection • Last valid value

Ramp at echo lostValue echo lost

Alarm

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 ¹²⁾

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 ($\rightarrow \stackrel{\triangle}{=} 172$).

■ Value echo lost ¹²⁾

In the case of a lost echo the output assumes the value defined in the **Value echo lost** parameter ($\rightarrow \implies 171$).

Alarm

In the case of a lost echo the device generates an alarm; see the Failure mode parameter

Value echo lost

Navigation Setup \rightarrow Advanced setup \rightarrow Safety sett. \rightarrow Value echo lost

Prerequisite Output echo lost $(\rightarrow \ \ \ \ \ \ \ \ \ \)$ = Value echo lost

Description Output value in case of a lost echo

User entry 0 to 200 000.0 %

Additional information Use the unit which has been defined for the measured value output:

■ without linearization: **Level unit (→ 🖺 152)**

• with linearization: Unit after linearization (\rightarrow $\stackrel{ riangle}{=}$ 164)

¹²⁾ Only visible if "Linearization type ($\Rightarrow = 163$)" = "None"

Ramp at echo lost

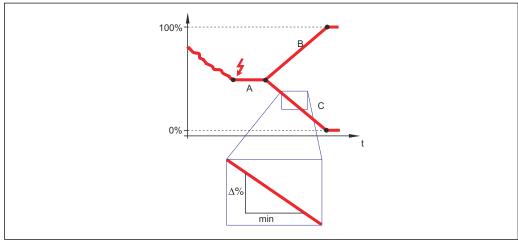
Navigation

Prerequisite

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

User entry Signed floating-point number

Additional information



- Α Delay time echo lost
- В
- Ramp at echo lost ($\rightarrow \equiv 172$) (negative value)
- The unit for the slope of the ramp is "percentage of the measuring range per minute" (%/
- 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 continuouly increased until it reaches 100%.

Blocking distance

Navigation

Description Specify upper blocking distance UB.

User entry 0 to 200 m

Factory setting • For coax probes: 0 mm (0 in)

- 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

172

For FMP51/FMP52/FMP54 with the **Interface measurement** application package ¹³⁾ and for FMP55:

100 mm (3.9 in) for all antenna types

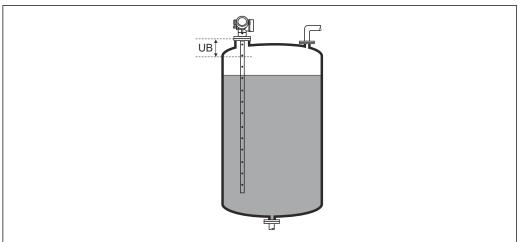
Additional information

Signals in the upper blocking distance are only evaluated if they have been outside the blocking distance when the device was switched on and move into the blocking distance due to a level change during operation. Signals which are already in the blocking distance when the device is switched on, are ignored.

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

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

- A different behavior for signals in the blocking distance can be defined in the **Blocking distance evaluation mode** parameter.
- If required, a different behavior for signals in the blocking distance can be defined by the Endress+Hauser service.



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47 Blocking distance (UB) for liquid measurements

¹³⁾ Ordering feature 540 "Application Package", option EB "Interface measurement"

"WHG confirmation" wizard



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

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

Navigation

"Deactivate WHG" wizard

The **Deactivate WHG** wizard ($\rightarrow \triangleq 175$) is only visible if the device is WHG-locked. For details refer to the "Functional Safety Manual" of the respective device.

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Deactivate WHG

Reset write protection		
Navigation		
Description	Enter unlocking code.	
User entry	0 to 65 535	
Code incorrect		
Navigation		
Description	Indicates that a wrong unlocking code has been entered. Select procedure.	
Selection	Reenter codeAbort sequence	

"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 length of the probe. The automatic probe length correction can only be performed if the probe is installed in the vessel and is completely uncovered (no medium). For partially filled vessels and if the probe length is known, select **Confirm probe length** (\rightarrow 177) = **Manual input** in order to enter the value manually.

- If a mapping (interference echo suppression) has been recorded after shortening the probe, it is no longer possible to perform an automatic probe length correction. In this case there are two options:
 - Delete the map using the **Record map** parameter ($\rightarrow \boxminus 143$) before performing the automatic probe length correction. After the probe length correction, a new map can be recorded using the **Record map** parameter ($\rightarrow \boxminus 143$).
 - Alternative: Select Confirm probe length (→ □ 177) = Manual input and enter the probe length manually into the Present probe length parameter → □ 176.
- An automatic probe length correction is only possible after the correct option has been selected in the **Probe grounded** parameter ($\rightarrow \implies 176$).

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Probe settings

Probe grounded		
Navigation		
Prerequisite	Operating mode (→ 🖺 131) = Level	
Description	Specify whether the probe is grounded.	
Selection	■ No ■ Yes	
Present probe length		
Navigation		
Description	 In most cases: Displays the length of the probe according to the currently measured end-of-probe signal. For Confirm probe length (→ 🗎 177) = Manual input: Enter actual length of probe. 	
User entry	0 to 200 m	

Confirm probe length

Navigation

Description

Select, whether the value displayed in the **Present probe length** parameter $\rightarrow \triangleq 176$ 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

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 $\rightarrow \boxminus 176$. 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 $\rightarrow \implies 176$. 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 guits 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 $\rightarrow \implies 176^{14}$.

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.

¹⁴⁾ When operated via FieldCare, the **Manual input** option needs not to be selected explicitly. In FieldCare the length of the probe can always be edited.

"Probe length correction" wizard

The **Probe length correction** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the probe length correction are located directly in the **Probe settings** submenu ($\rightarrow \square$ 176).

Navigation

Confirm probe length		
Navigation		
Description	→ 🖺 177	
Present probe length		A
Navigation		
Description	→ 🗎 176	

"Switch output" submenu

The **Switch output** submenu ($\rightarrow \triangleq 179$) is only visible for devices with switch output. ¹⁵⁾

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Switch output

Switch output function

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Switch out funct

Description Select function for switch output.

Selection ■ Off

- On
- Diagnostic behavior
- Limit
- Digital Output

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 ($\rightarrow \implies 180$) 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:

- Switch-on value ($\rightarrow \triangleq 181$)
- Switch-off value (→ \bigsim 182)
- 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 ($\Rightarrow \triangleq 179$).

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

Assign status

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Assign status

Prerequisite Switch output function (→ 🗎 179) = Digital Output

Description Select device status for switch output.

¹⁵⁾ Ordering feature 020 "Power supply; Output", option B, E or G

Selection

■ Off

Digital output AD 1Digital output AD 2

■ Digital output 1

■ Digital output 2

■ Digital output 3

■ Digital output 4

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 $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Assign limit

Prerequisite Switch output function (→ 🗎 179) = Limit

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 *

Assign diagnostic behavior

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Assign diag. beh

Prerequisite Switch output function (→ 🖺 179) = Diagnostic behavior

Description Select diagnostic behavior for switch output.

Selection • Alarm

Alarm or warning

Warning

180

Visibility depends on order options or device settings

Switch-on value

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Switch-on value

Prerequisite Switch output function (→ 🗎 179) = Limit

Description Enter measured value for the switch-on point.

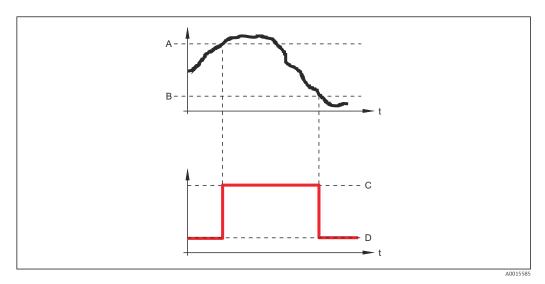
User entry Signed floating-point number

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

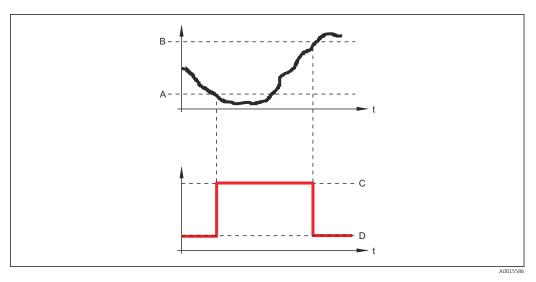
- The output is closed if the measured value is larger than **Switch-on value**.
- The output is opened if the measured value is smaller than **Switch-off value**.



- 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**.



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

Switch-on delay	

Prerequisite ■ Switch output function (→ 🗎 179) = Limit

■ Assign limit (→ 🖺 180) ≠ Off

Description Define delay for the switch-on of status output.

User entry 0.0 to 100.0 s

Switch-off value	
------------------	--

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Switch-off value

Prerequisite Switch output function (→ 🖺 179) = Limit

Description Enter measured value for the switch-off point.

User entry Signed floating-point number

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

(→ 🖺 181).

Switch-off delay

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Switch-off delay

Prerequisite • Switch output function ($\rightarrow \stackrel{\triangle}{=} 179$) = Limit

■ Assign limit (→ 🖺 180) ≠ Off

Description Define delay for the switch-off of status output.

User entry 0.0 to 100.0 s

Failure mode

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Failure mode

Prerequisite Switch output function (→ 🗎 179) = Limit or Digital Output

Description Define output behavior in alarm condition.

Selection • Actual status

OpenClosed

Additional information

Switch status

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Switch status

Description Shows the current switch output status.

Invert output signal

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Invert outp.sig.

Description Invert the output signal.

Selection ■ No

Yes

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

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

Navigation

Language

Navigation

Description Set display language.

Selection ■ English

Deutsch

Français

■ Español

■ Italiano

Nederlands ' Portuguesa

■ Polski

■ русский язык (Russian) *

Svenska

Türkçe

■ 中文 (Chinese) *

■ 日本語 (Japanese) *

■ 한국어 (Korean) *
■ Bahasa Indonesia *

tiếng Việt (Vietnamese) *

čeština (Czech)

Factory setting The language selected in feature 500 of the product structure.

If no language has been selected: English

Additional information

Format display

Navigation

Description Select how measured values are shown on the display.

Selection ■ 1 value, max. size

■ 1 bargraph + 1 value

■ 2 values

■ 1 value large + 2 values

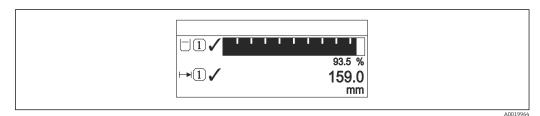
4 values

Visibility depends on order options or device settings

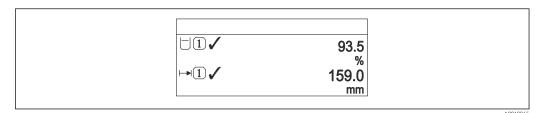
Additional information



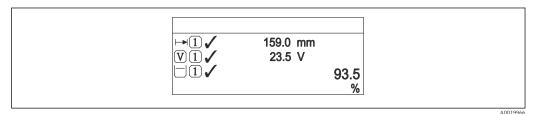
■ 48 "Format display" = "1 value, max. size"



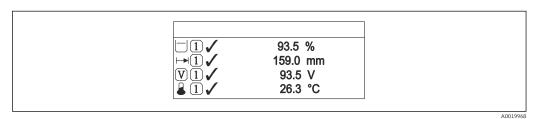
■ 49 "Format display" = "1 bargraph + 1 value"



■ 50 "Format display" = "2 values"



■ 51 "Format display" = "1 value large + 2 values"



■ 52 "Format display" = "4 values"

- The **Value 1 to 4 display** \rightarrow $\stackrel{\triangle}{=}$ 187 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 (→ 🖺 188).

Value 1 to 4 display **Navigation** Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Value 1 display Description Select the measured value that is shown on the local display. Level linearized

Selection

Distance

 Interface linearized ■ Interface distance

Thickness upper layer

■ Terminal voltage

■ Electronic temperature

Measured capacitance

Analog output 1

Analog output 2

Analog output 3

Analog output 4

Analog output adv. diagnostics 1

Analog output adv. diagnostics 2

Factory setting For level measurements

■ Value 1 display: Level linearized

Value 2 display: Distance

Value 3 display: Current output 1

■ Value 4 display: None

For interface measurements and one current output

■ Value 1 display: Interface linearized

■ Value 2 display: Level linearized

■ Value 3 display: Thickness upper layer

■ Value 4 display: Current output 1

For interface measurements and two current outputs

Value 1 display: Interface linearized

■ Value 2 display: Level linearized

■ Value 3 display: Current output 1

■ Value 4 display: Current output 2

Decimal places 1 to 4	
2 commar praces 2 to 1	

Navigation

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

Selection ■ X

■ X.X

X.XX

X.XXX

x.xxxx

Additional information

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

Visibility depends on order options or device settings

Display interval

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Display interval

Description Set time measured values are shown on display if display alternates between values.

User entry 1 to 10 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 $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Display damping

Description Set display reaction time to fluctuations in the measured value.

User entry 0.0 to 999.9 s

Header 🗈

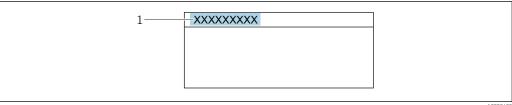
Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Header

Description Select header contents on local display.

Selection ■ Device tag

■ Free text

Additional information



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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 ($\rightarrow \equiv 189$).

Header text

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Header text

Prerequisite Header (→ 🗎 188) = Free text

Description Enter display header text.

User entry Character string comprising numbers, letters and special characters (12)

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

Separator

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Separator

Description Select decimal separator for displaying numerical values.

Selection • .

■ ,

Number format

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Number format

Description Choose number format for the display.

Selection • Decimal

■ ft-in-1/16"

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

Decimal places menu

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow 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

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** \Rightarrow \cong 187 parameters.
- The setting does not affect the accuracy of the measurement or the calculations.

Backlight

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Backlight

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

Description Switch the local display backlight on and off.

Selection • Disable

■ Enable

Additional information

Meaning of the options

Disable

Switches the backlight off.

■ Enable

Switches the backlight on.

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 \blacksquare Setup \rightarrow Advanced setup \rightarrow Display \rightarrow 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 🔘 🖲 buttons simultaneously.

■ Brighter: press the 🕦 📵 buttons simultaneously.

"Configuration backup display" submenu

i

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.



Configurations can only be exchanged between devices which are in the same operating mode (see the **Operating mode** parameter ($\Rightarrow \implies 131$)).

Navigation

 \blacksquare Setup \rightarrow Advanced setup \rightarrow Conf.backup disp

Ωn	aratina	tima
UD	erating	time

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Conf.backup disp \rightarrow Operating time

Description Indicates how long the device has been in operation.

Additional information *Maximum time*

9999 d (≈ 27 years)

Last backup

Navigation Setup \rightarrow Advanced setup \rightarrow Conf.backup disp \rightarrow Last backup

Description Indicates when the last data backup was saved to the display module.

Configuration management

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Conf.backup disp \rightarrow Config. managem.

Description Select action for managing the device data in the display module.

Selection • Cancel

- Execute backup
- Restore
- Duplicate
- Compare
- Clear backup data

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 ($\rightarrow \implies 192$).

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		
Description	Displays which backup action is currently in progress.	
Comparison result		
Navigation		
Description	Comparison between present device data and display backup.	

192

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** ($\rightarrow \triangleq 191$) = **Compare**.

If the transmitter configuration has been duplicated from a different device by Configuration management (→ 🖺 191) = 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 \square Setup \rightarrow Advanced setup \rightarrow Administration

Navigation \square Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Def. access code

Description Define release code for write access to parameters.

User entry 0 to 9 999

Additional information

- If the factory setting is not changed or if "0" is entered, the parameters are not write-protected and the device configuration data can therefore always be modified. The user is logged on in the "Maintenance" role.
- The write protection affects all parameters marked with the fall symbol in the document. On the local display, the fall symbol in front of a parameter indicates that the parameter is write-protected.
- 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 (\rightarrow) 148).
- Please contact your Endress+Hauser Sales Center if you lose the access code.
- If operating via the local display: the new access code is only valid once it has been confirmed in the **Confirm access code** parameter ($\Rightarrow \triangleq 196$).

Device reset

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Device reset

Description Reset the device configuration - either entirely or in part - to a defined state.

Selection • Cancel

- To factory defaults
- To delivery settings
- ullet Of customer settings
- To transducer defaults
- Restart device

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.

194

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.

Define access code		
Navigation	Setup → Advanced setup → Administration → Def. access code → Def. access code	2
Description	Description → 🖺 194	
Confirm access code		1
Navigation		
Description	Confirm the entered access code.	
User entry	0 to 9 999	

16.4 "Diagnostics" menu

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 ① symbol on the display.
Timestamp	
Navigation	□ Diagnostics → Timestamp
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 ① symbol on the display.

Tim	esta	mn

Navigation

□ Diagnostics → Timestamp

Operating time from restart

Navigation \Box Diagnostics \rightarrow Time fr. restart

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

Operating time

Navigation \Box Diagnostics \rightarrow Operating time

Description Indicates how long the device has been in operation.

Additional information *Maximum time*

9999 d (≈ 27 years)

16.4.1 "Diagnostic list" submenu

Navigation \square Diagnostics \rightarrow Diagnostic list

Diagnostics 1 to 5

Navigation \blacksquare Diagnostics \rightarrow Diagnostic list \rightarrow Diagnostics 1

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

Additional information The display consists of:

Symbol for event behaviorCode for diagnostic behaviorOperating time of occurrence

Event text

Timestamp 1 to 5

Navigation Diagnostics \rightarrow Diagnostic list \rightarrow Timestamp 1 to 5

16.4.2 "Event logbook" submenu



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

Filter options

Navigation

Selection

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

Additional information



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

"Event list" submenu

The **Event list** submenu displays the history of past events of the category selected in the **Filter options** parameter ($\rightarrow \implies 200$). A maximum of 100 events are displayed in chronological order.

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

- ①: Event has occurred
- (→: Event has ended
- Information on what is causing the message, and remedy instructions, can be viewed via the ①-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 \square Diagnostics \rightarrow Event logbook \rightarrow Event list

200

16.4.3 "Device information" submenu

Navigation \square Diagnostics \rightarrow Device info

Device tag

Navigation \square Diagnostics \rightarrow Device info \rightarrow Device tag

Description Enter the name for the measuring point.

User interface Character string comprising numbers, letters and special characters

Serial number

Navigation $\blacksquare \square$ Diagnostics \rightarrow Device info \rightarrow Serial number

Description Shows the serial number of the measuring device.

Additional information

- Uses of the serial number
 - To identify the device quickly, e.g. when contacting Endress+Hauser.
 - To obtain specific information on the device using the Device Viewer: www.endress.com/deviceviewer
- The serial number is also indicated on the nameplate.

Firmware version

Navigation \blacksquare Diagnostics \rightarrow Device info \rightarrow Firmware version

Description Shows the device firmware version installed.

User interface xx.yy.zz

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

Device name

Navigation $\blacksquare \square$ Diagnostics \rightarrow Device info \rightarrow Device name

Description Shows the name of the transmitter.

Order code

Navigation \Box Diagnostics \rightarrow Device info \rightarrow Order code

Description Shows the device order code.

User interface Character string comprising numbers, letters and special characters

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 \blacksquare Diagnostics \rightarrow Device info \rightarrow Ext. order cd. 1

Description Display the three parts of the extended order code.

User interface Character string comprising numbers, letters and special characters

Additional information The extended order code indicates the version of all the features of the product structure

and thus uniquely identifies the device.

Status PROFIBUS Master Config

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

User interface ■ Active

Not active

PROFIBUS ident number

Navigation $\blacksquare \blacksquare$ Diagnostics \Rightarrow Device info \Rightarrow Ident number

Description Indicates the ident number of the device.

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

16.4.4 "Measured values" submenu

Navigation $\blacksquare \blacksquare$ Diagnostics \rightarrow Measured val.

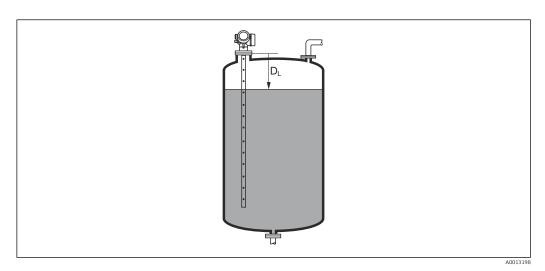
Distance

Navigation

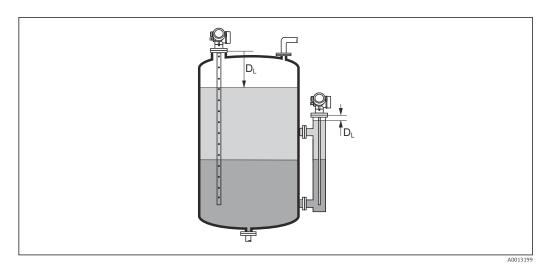
Description

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

Additional information



■ 53 Distance for liquid measurements



■ 54 Distance for interface measurements

The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 132$).

Level linearized

Navigation \blacksquare Diagnostics \rightarrow Measured val. \rightarrow Level linearized

Description Displays linearized level.

Additional information The unit is defined by the **Unit after linearization** parameter $\rightarrow \triangleq 164$.

• For interface measurements, this parameter always refers to the total level.

Interface distance

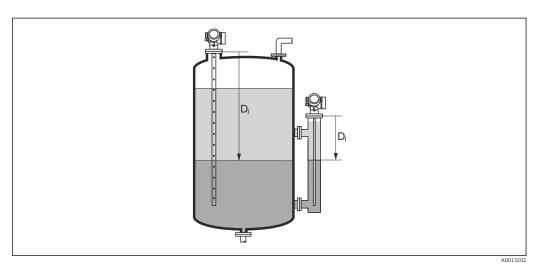
Navigation $\blacksquare \Box$ Diagnostics \rightarrow Measured val. \rightarrow Interface dist.

Prerequisite Operating mode (→ 🖺 131) = Interface or Interface with capacitance

 $\textbf{Description} \qquad \qquad \text{Displays the measured distance } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{$

threaded connection) and the interface.

Additional information



The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 132$).

Interface linearized

Navigation \square Diagnostics \rightarrow Measured val. \rightarrow Interf. lineariz

Prerequisite Operating mode (→ 🖺 131) = Interface or Interface with capacitance

Description Displays the linearized interface height.

Additional information The unit is defined in the **Unit after linearization** parameter $\rightarrow \triangleq 164$.

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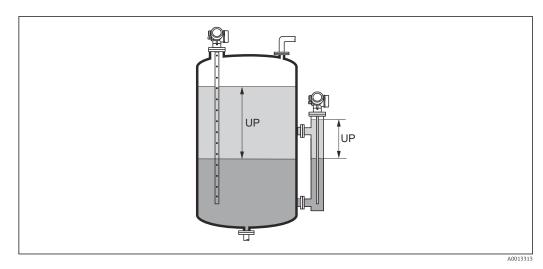
Thickness upper layer

Navigation \blacksquare Diagnostics \rightarrow Measured val. \rightarrow Thickn.upp.layer

Prerequisite Operating mode (→ 🖺 131) = Interface or Interface with capacitance

Description Displays the upper interface thickness (UP).

Additional information



UP Thickness upper layer

The unit is defined by the **Unit after linearization** parameter $\rightarrow \triangleq 164$.

Terminal voltage 1

Navigation \blacksquare Diagnostics \rightarrow Measured val. \rightarrow Terminal volt. 1

Switch status

Description Shows the current switch output status.

"Analog input 1 to 6" submenu 16.4.5

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

Navigation

Channel		
Navigation		
Description	Standard parameter CHANNEL of the Analog Input Block according to the PROFIBUS Profile.	
Selection	 Level linearized Distance Interface linearized * Interface distance * Thickness upper layer * Terminal voltage Electronic temperature Measured capacitance * Absolute echo amplitude Relative echo amplitude Relative interface amplitude * Relative interface amplitude * Noise of signal EOP shift Calculated DC value * Sensor debug Analog output adv. diagnostics 1 Analog output adv. diagnostics 2 	
Additional information	Allocates a measured value to the AI block.	
Out value		
Navigation		
Description	Element Value of the standard parameter OUT in the Analog Input Block according to PROFIBUS Profile.	the

Signed floating-point number

206

User entry

Visibility depends on order options or device settings

Additional information

■ For Mode block actual = Man:

Enter the output value of the Analog Input Block.

■ Else:

Displays the output value of the Analog Input Block.

Out status

Navigation Diagnostics \rightarrow Analog input 1 to 6 \rightarrow Out status

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

the PROFIBUS Profile.

User interface ■ Good

UncertainBad

Additional information

Only the two quality bits are evaluated in this parameter.

Out status HEX

Navigation Diagnostics \rightarrow Analog input 1 to 6 \rightarrow Out status HEX

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

PROFIBUS Profile.

User entry 0 to 255

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

this parameter.

16.4.6 "Data logging" submenu

Assign channel 1 to 4

Navigation

Selection

- Off
- Level linearized
- Distance
- Unfiltered distance
- Interface linearized *
- Interface distance
- Unfiltered interface distance
- Thickness upper layer ³
- 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

Additional information

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

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

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

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

Logging interval

Navigation

- Diagnostics → Data logging → Logging interval

User entry

1.0 to 3600.0 s

208

^{*} Visibility depends on order options or device settings

Additional information

This parameter defines the interval between the individual data points in the data log, and thus the maximum loggable process time T $_{\text{log}}$:

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

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

The logged data are deleted if this parameter is changed.

Example

When using 1 logging channel

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

Clear logging data	

Navigation

- □ Diagnostics → Data logging → Clear logging
- Diagnostics → Data logging → Clear logging

Selection

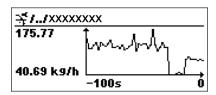
- Cancel
- Clear data

"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 \pm and \Box simultaneaously.

Navigation

□ Diagnostics → Data logging → Displ.channel 1 to 4

16.4.7 "Simulation" submenu

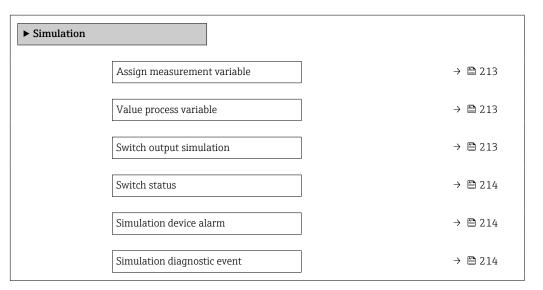
The **Simulation** submenu is used to simulate specific measuring values or other conditions. This helps to check the correct configuration of the device and connected control units.

Conditions which can be simulated

Condition to be simulated	Associated parameters
Specific value of a process variable	 Assign measurement variable (→ 🖺 213) Value process variable (→ 🖺 213)
Specific state of the switch output	 Switch output simulation (→ 213) Switch status (→ 214)
Existence of an alarm	Simulation device alarm (→ 🖺 214)
Existence of a specific diagnostic message	Simulation diagnostic event (→ 🖺 214)

Structure of the submenu

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation



Description of parameters

Navigation $\blacksquare \blacksquare$ Expert \rightarrow Diagnostics \rightarrow Simulation

Assign measurement variable

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Assign meas.var.

Selection ■ Off

- Level
- Interface
- Level linearized
- Interface linearized
- Thickness linearized

Additional information

- The value of the variable to be simulated is defined in the **Value process variable** parameter ($\rightarrow \cong 213$).
- If **Assign measurement variable** ≠ **Off**, a simulation is active. This is indicated by a diagnotic message of the *Function check (C)* category.

Value process variable

Navigation $\blacksquare \blacksquare$ Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Value proc. var.

Prerequisite Assign measurement variable ($\rightarrow \triangleq 213$) $\neq 0$ ff

User entry Signed floating-point number

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 \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Switch sim.

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

Selection ■ Off

■ On

Endress+Hauser

213

Visibility depends on order options or device settings

Switch status

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Switch status

Prerequisite Switch output simulation ($\rightarrow \triangleq 213$) = On

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

Selection ■ Open

Closed

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 \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Sim. alarm

Description Switch the device alarm on and off.

Selection ■ Off

■ On

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 **⊗C484 Simulation failure mode** diagnostic

message.

Simulation diagnostic event

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Sim. diag. event

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

Additional information When operated via the local display, the selection list can be filtered according to the event

categories (Diagnostic event category parameter).

16.4.8 "Device check" submenu

Navigation $\blacksquare \square$ Diagnostics \rightarrow Device check

Start device check

Navigation \blacksquare Diagnostics \rightarrow Device check \rightarrow Start dev. check

Description Start a device check.

Selection • No

Yes

Additional information In the case of a lost echo a device check can not be performed.

Result device check

Navigation Diagnostics \rightarrow Device check \rightarrow 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. However, there is the risk of an echo loss. Check the mounting position of the device and the dielectric constant of the medium.

Check not done

No device check has been performed.

Last check time

Navigation $\blacksquare \Box$ Diagnostics \rightarrow Device check \rightarrow Last check time

Description Displays the operating time at which the last device check has been performed.

User interface Character string comprising numbers, letters and special characters

T 1		1
Level	CIA	ınəl
Level	SIU	mai

Navigation \Box Diagnostics \rightarrow Device check \rightarrow Level signal

Prerequisite Device check has been performed.

Description Displays result of the device check for the level signal.

User interface ■ Check not done

Check not OKCheck 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 $\blacksquare \square$ Diagnostics \rightarrow Device check \rightarrow Launch signal

Prerequisite Device check has been performed.

Description Displays result of the display check for the launch signal.

User interface ■ Check not done

Check not OKCheck 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.

Interface signal

Navigation $\blacksquare \Box$ Diagnostics \rightarrow Device check \rightarrow Interface signal

Prerequisite ■ Operating mode (→ 🖺 131) = Interface or Interface with capacitance

Device check has been performed.

Description Displays result of the device check for the interface signal.

User interface ■ Check not done

■ Check not OK

■ Check OK

16.4.9 "Heartbeat" submenu

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

Detailed description SD01872F

Navigation \square Diagnostics \rightarrow Heartbeat

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