01.01.zz (Device firmware)

Products Solutions

Services

Operating Instructions Levelflex FMP51, FMP52, FMP54 FOUNDATION Fieldbus

Guided wave radar







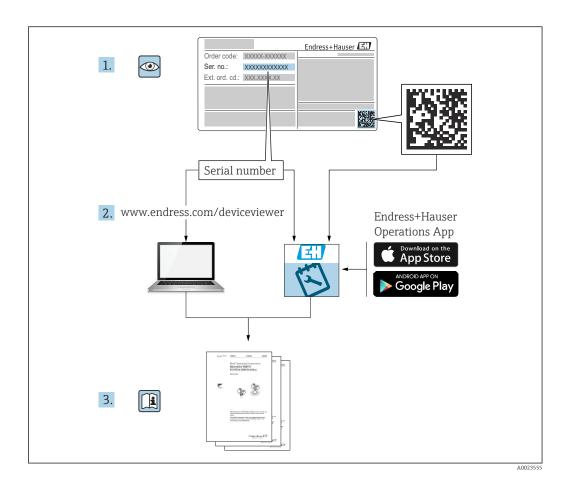


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1 Important document information

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

⚠ 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



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



Indicates additional information



Reference to documentation



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

⚠ → **🗓** Safety instructions

Observe the safety instructions contained in the associated Operating Instructions

Temperature resistance of the connection cables

Specifies the minimum value of the temperature resistance of the connection cables

1.3 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 Functional Safety Manual (FY).

1.4 Terms and abbreviations

BA

Document type "Operating Instructions"

KA

Document type "Brief Operating Instructions"

TI

Document type "Technical Information"

SD

Document type "Special Documentation"

XA

Document type "Safety Instructions"

PN

Nominal pressure

MWP

Maximum working pressure

The MWP is indicated on the nameplate.

ToF

Time of Flight

FieldCare

Scalable software tool for device configuration and integrated plant asset management solutions

DeviceCare

Universal configuration software for Endress+Hauser HART, PROFIBUS, FOUNDATION Fieldbus and Ethernet field devices

DTM

Device Type Manager

ε_r (Dk value)

Relative dielectric constant

PLC

Programmable logic controller (PLC)

CDI

Common Data Interface

Operating tool

The term "operating tool" is used in place of the following operating software: SmartBlue (app), for operation using an Android or iOS smartphone or tablet

BI

Blocking Distance; no signals are analyzed within the BD.

PLC

Programmable logic controller (PLC)

CDI

Common Data Interface

PFS

Pulse Frequency Status (Switch output)

MBP

Manchester Bus Powered

PDU

Protocol Data Unit

1.5 Registered trademarks

FOUNDATION™ Fieldbus

Registration-pending trademark of the FieldComm Group, Austin, Texas, USA

Bluetooth®

The *Bluetooth*® word mark and logos are registered trademarks owned by the Bluetooth SIG, Inc. and any use of such marks by Endress+Hauser is under license. Other trademarks and trade names are those of their respective owners.

Apple[®]

Apple, the Apple logo, iPhone, and iPod touch are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.

Android[®]

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

KALREZ®, VITON®

Registered trademarks of DuPont Performance Elastomers L.L.C., Wilmington, DE USA

TEFLON®

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

TRI-CLAMP®

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 $^{\circ}\text{C}$ (176 $^{\circ}\text{F}$). 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

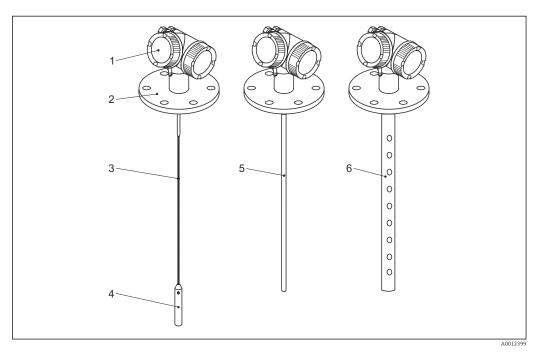
The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied.

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

Product description 3

3.1 Product design

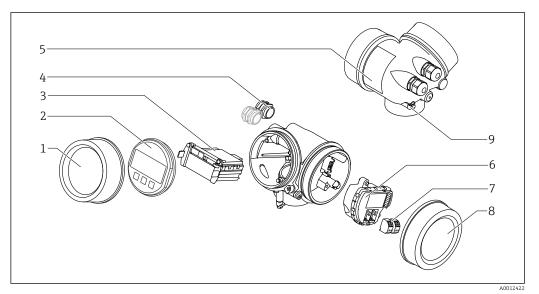
3.1.1 Levelflex FMP51/FMP52/FMP54/FMP55



₽ 1 Design of the Levelflex

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

3.1.2 Electronics housing



■ 2 Design of the electronics housing

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

Endress+Hauser

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4 Incoming acceptance and product identification

4.1 Incoming acceptance

Check the following during incoming acceptance:

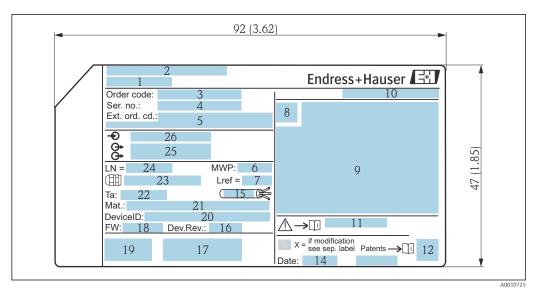
- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): are the Safety Instructions (XA) provided?
- If one of these conditions is not met, please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

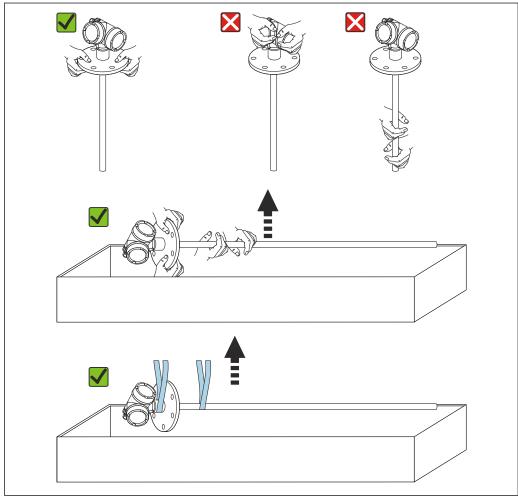
5.2 Transporting the product to the measuring point

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).

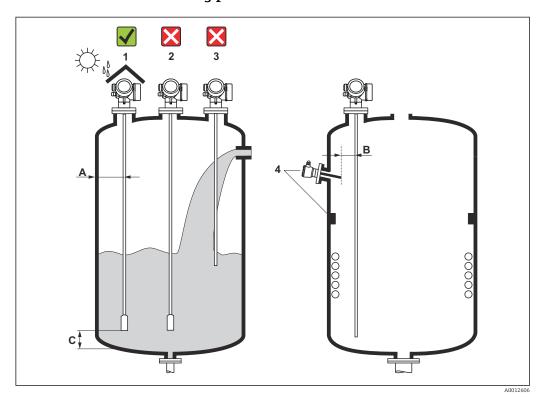


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6 Mounting

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.

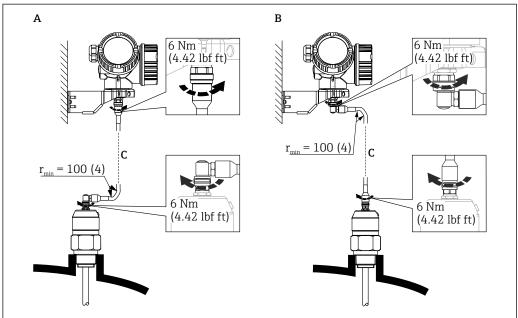
Additional conditions

- 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

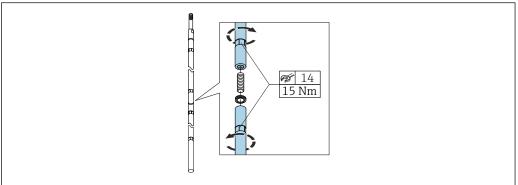
The device version with a remote probe is suitable for applications with restricted mounting space. In this case, the electronics housing is mounted at a separate position from the probe.



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.

22

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

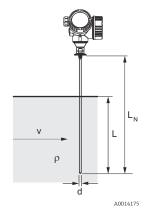
Sample calculation

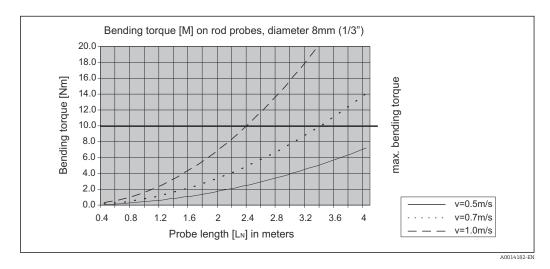
Coefficient of friction c_w 0.9 (assuming turbulent flow - high Reynolds number)

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

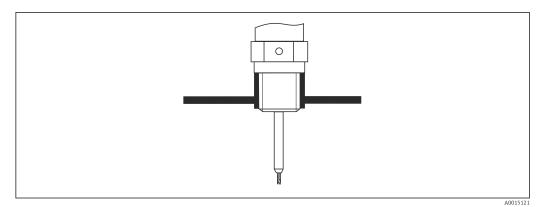
Probe Ø 42.4 mm 316L

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

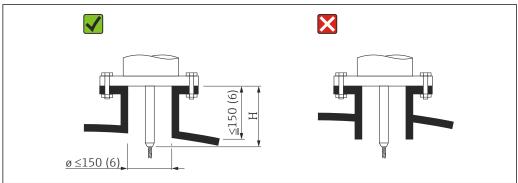
Seal

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.

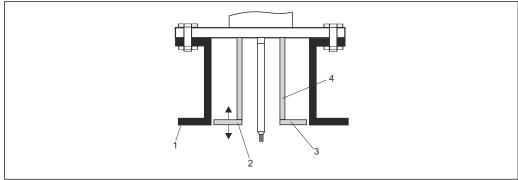
This accessory consists of the extension rod, corresponding to the nozzle height, on which a centering disk is also mounted if the nozzles are narrow or when used in bulk solids.

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

6.1.6 Mounting cladded flanges

Note the following for cladded flanges:

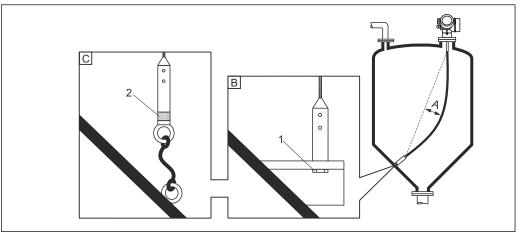
- Use the same number of flange screws as the number of flange bores provided.
- Tighten the screws with the necessary torque (see Table).
- Retighten after 24 hours or after the first temperature cycle.
- Depending on the process pressure and temperature, check and retighten the screws, where necessary,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



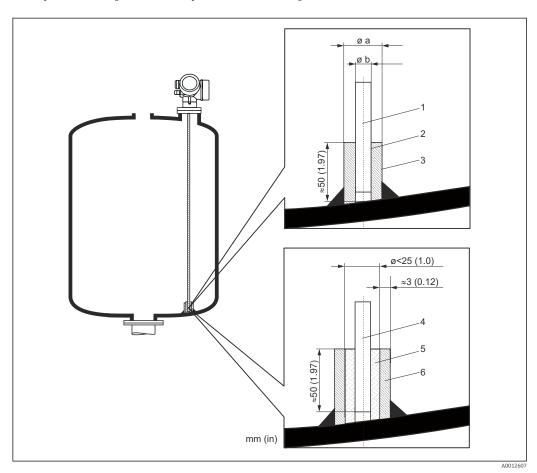
A0012609

- 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.

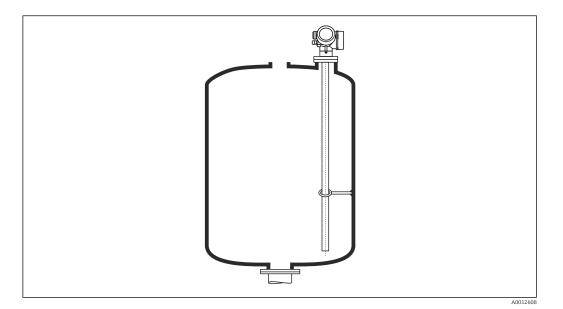
▶ Use a sleeve with a narrow bore to ensure good electrical contact between the sleeve and the probe rod.

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).

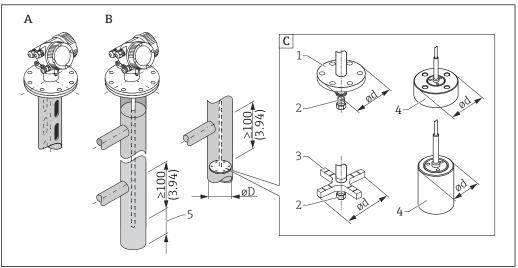


Coax probes can be secured (fixed) at any point in the ground tube.

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 (Ød) 75 mm (2.95 in), h 30 mm (1.81 in)

for pipe diameter (ØD)

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)

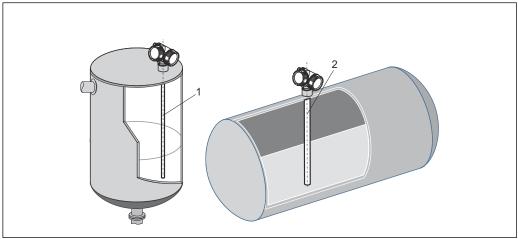
for pipe diameter (\emptyset D) \geq DN50/2"

Non-metal centering star (PFA)

For level and interface measurement, operating temperature: -200 to +250 °C (-328 to +482 °F)

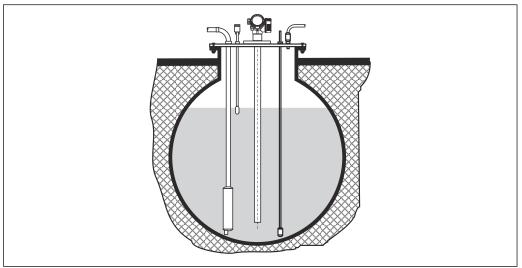
Rod centering star (\emptyset d) 37 mm (1.46 in) for pipe diameter (\emptyset D) \geq 40 mm (1.57 in)

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.

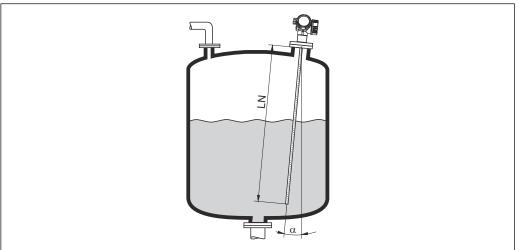
Underground tanks



A001414

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

Mounting at an angle

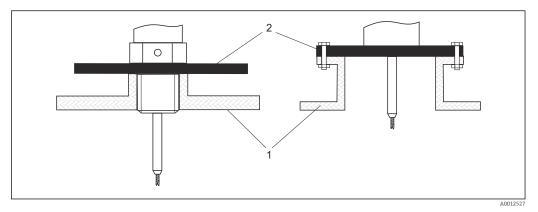


A0014145

- 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



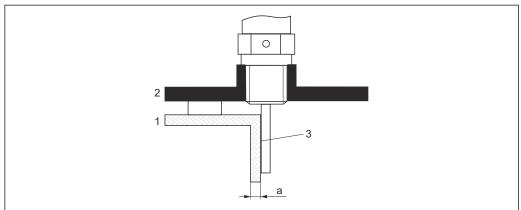
- 1 Non-metal vessel
- 2 Metal sheet or metal flange

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.



A001/s150

- 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)".

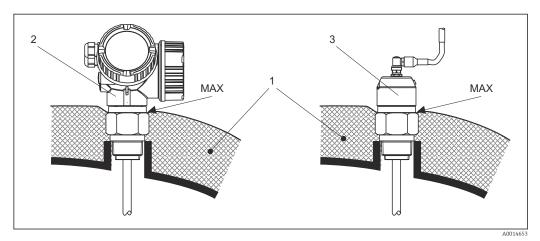
Compensation via the calibration parameters

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.

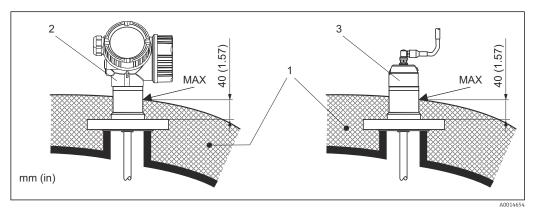
- The device searches for the probe end echo in the differential curve. Therefore, the value of the measured probe length depends on the mapping curve. In order to obtain a more accurate value, it is advisable to determine the measured probe length manually using the envelope curve display in FieldCare.
- 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

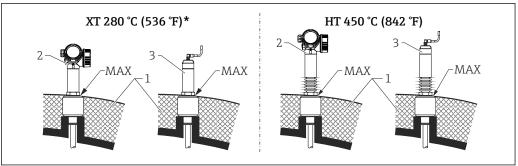
If process temperatures are high, the device must be included in normal vessel insulation (1) in order to prevent the electronics heating up as a result of thermal radiation or convection. The insulation may not go beyond the points labeled "MAX" in the drawings.



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



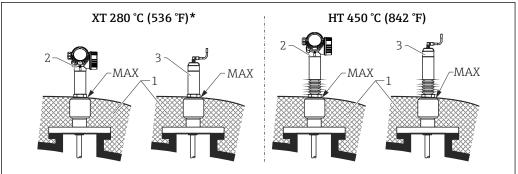
- 8 Process connection with flange
- 1 Vessel insulation
- 2 Compact device
- 3 Sensor, remote



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

10014657

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



A0014658

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

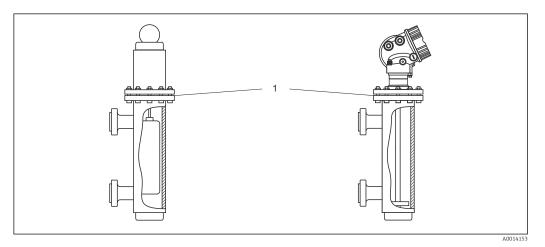
- 1 Vessel insulation
- 2 Compact device
- 3 Sensor, remote
- * The XT version is not recommended for saturated steam above 200 °C (392 °F); the HT version should be used instead

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

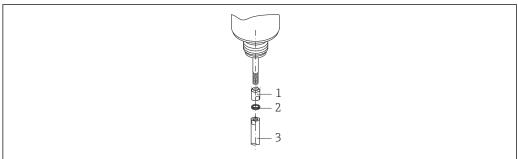


- To shorten rope probes: use a saw or bolt cutters
- To shorten rod or coax probes: use a saw
- For flanges and other process connections: use an appropriate mounting tool

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

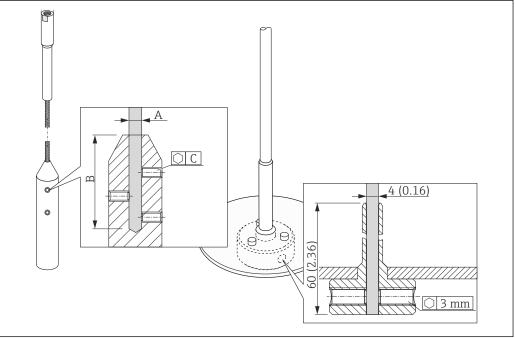
Rod probes must be shortened if the distance to the vessel floor or outlet cone is less than 10 mm (0.4 in). To shorten, saw off the bottom end of the rod probe.

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.

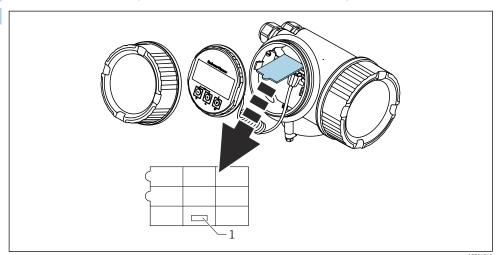
To shorten, saw off the bottom end of the coax probe.

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)

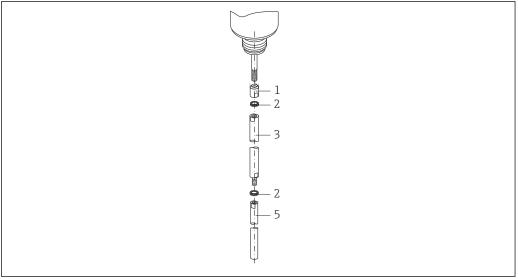
Coax probes

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.

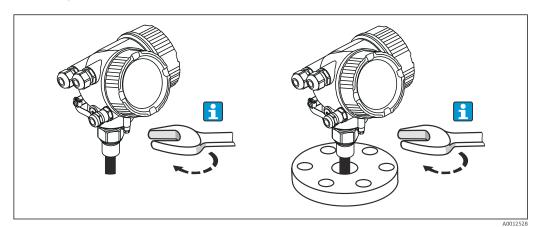


A0014545

- 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

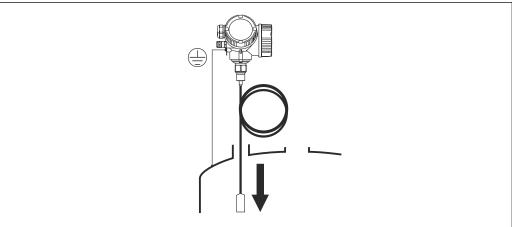
If a seal is used to mount the device, use uncoated metal screws to ensure good electrical contact between the process flange and the probe flange.

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.

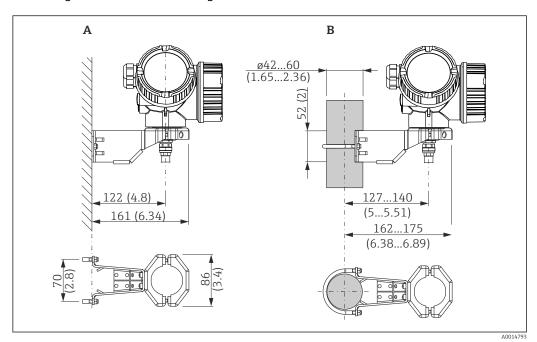
A CAUTION

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

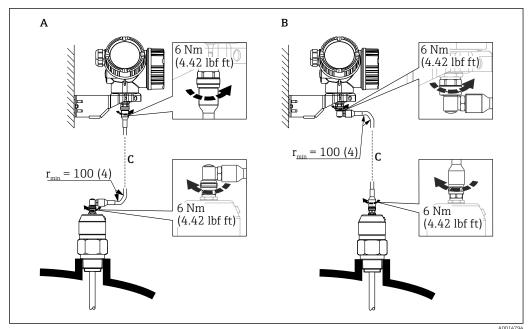


 $\blacksquare~11~$ Mounting the electronics housing with the mounting bracket. Unit of measurement mm (in)

- A Wall mounting
- B Post mounting

Connecting the connecting cable

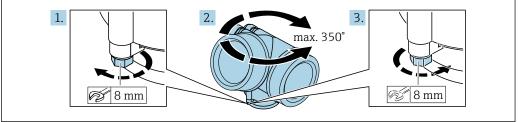




- 710021731
- 2 Connecting the connecting cable. The cable can be connected in the following ways:. Unit of measurement mm (in)
- A Angled plug at the probe
- B Angled plug at the electronics housing
- C Length of the remote cable as ordered

6.2.7 Turning the transmitter housing

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

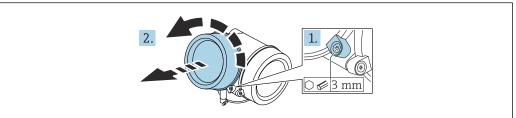


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- 1. Unscrew the securing screw using an open-ended wrench.
- 2. Rotate the housing in the desired direction.
- 3. Tighten the securing screw (1.5 Nm for plastic housing; 2.5 Nm for aluminum or stainless steel housing).

6.2.8 Turning the display

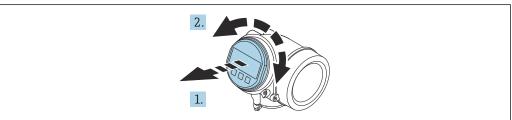
Opening the cover



A0021430

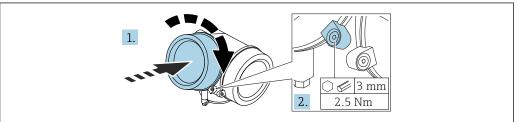
- 1. Loosen the screw of the securing clamp of the electronics compartment cover using an Allen key (3 mm) and turn the clamp 90 ° counterclockwise.
- 2. Unscrew the electronics compartment cover and check the cover seal; replace it if necessary.

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?
☐ Is the device adequately protected against impact?
□Are all mounting and safety screws securely tightened?

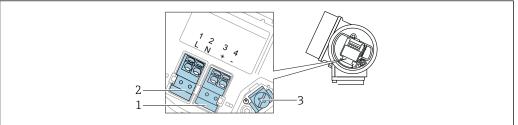
☐ Is the device properly secured?

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

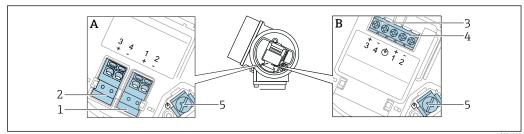
- \blacksquare 13 Terminal assignment, 4-wire: 4 to 20 mAHART (90 to 253 V_{AC})
- 1 Connection 4 to 20 mA HART (active): terminals 3 and 4
- 2 Connection, supply voltage: terminals 1 and 2
- 3 Terminal for cable shield

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

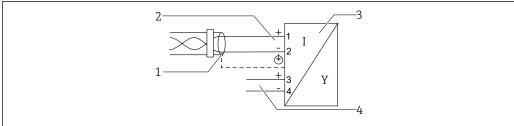


■ 14 Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus

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

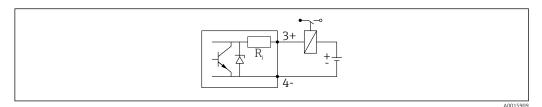


A003653

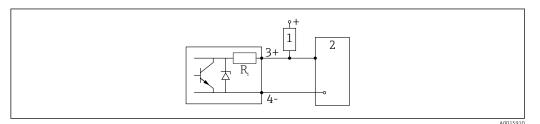
■ 15 Block diagram PROFIBUS PA / FOUNDATION Fieldbus

- 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



Connection of a relay



Connection to a digital input

- Pull-up resistor
- 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.

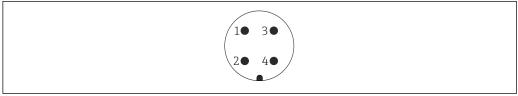
FOUNDATION Fieldbus

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

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

7.1.3 Device plug

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



■ 18 Pin assignment of 7/8" plug

- Signal -
- Signal +
- Not assigned
- Shielding

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

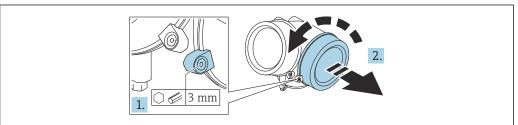
Explosion Hazard!

- ▶ 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.

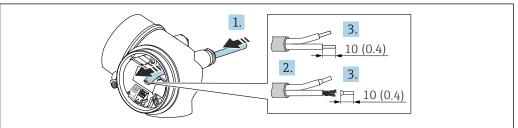
7.2.1 Opening cover



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

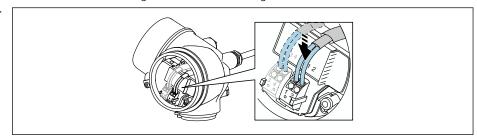


A003641

■ 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.

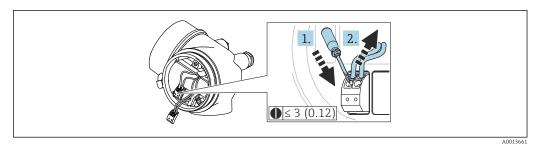
5. Connect the cable according to the terminal assignment.



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.

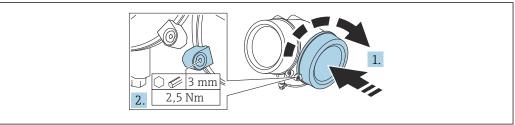


🖪 20 Engineering unit: mm (in)

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?

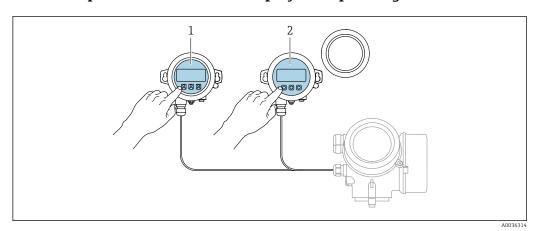
8 Operation methods

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 st	tatus 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 (ℍ, □, 區) external operation via touch control; 3 optical keys: ℍ, □, 區			
	Operating elements also accessible in various hazardous areas			
Additional functionality				

8.1.2 Operation with remote display and operating module FHX50

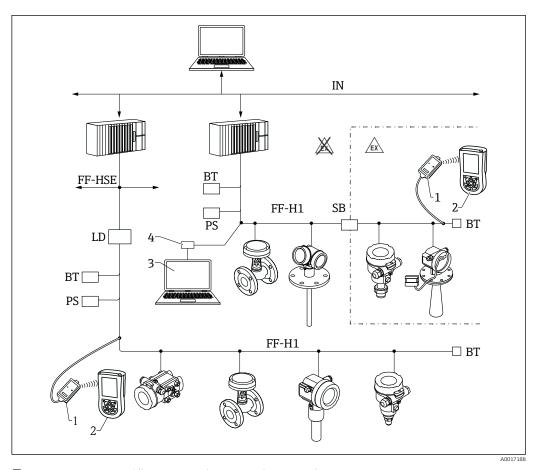


■ 21 FHX50 operating options

- 1 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 FOUNDATION Fieldbus

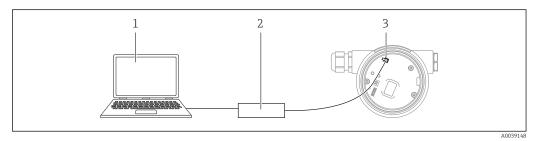


 \blacksquare 22 FOUNDATION Fieldbus system architecture with associated components

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

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

Via service interface (CDI)



- 1 Computer with FieldCare/DeviceCare operating tool
- 2 Commubox FXA291
- 3 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 organized according to the function blocks of the device.	System	Contains all higher-level device parameters that do not pertain either to the measurement or to measured value communication.
	Sensor	Contains all parameters needed to configure the measurement.
The parameters of the Expert menu are described in: GP01015F (FOUNDATION Fieldbus)	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 ri you are operating via operating tools (e.g. FieldCare), the Language parameter is located under Setup

 → Advanced setup → Display"

 Only if operating via an FDT/DTM system

 Only available if operating via the local display

 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
- 2)
- 3)
- 4) 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		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.



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

8.2.3 **Data access - Security**

Write protection via access code

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

Define access code via local display

- 1. Navigate to: Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow 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 🖻-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 $\rightarrow \triangleq 68$.
- In the "Description of Device Parameters" documents, each write-protected parameter is identified with the \(\bar{\mathbb{D}}\)-symbol.

Disabling write protection via access code

If the \square symbol appears in front of a parameter on the local display, the parameter is write-protected by a device-specific access code and its value cannot currently be changed via the local display $\rightarrow \square$ 67.

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)

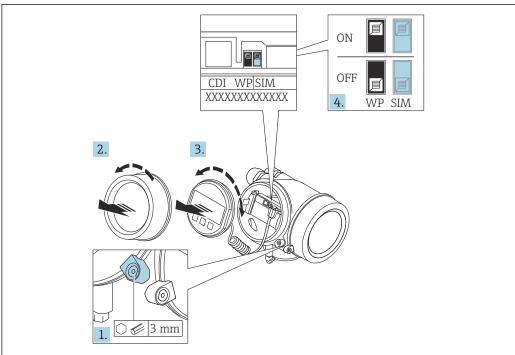
- 1. Navigate to: Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Define access code
- 2. Enter **0000**.
 - The write protection is deactivated. Parameters can be changed without entering an access code.

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.

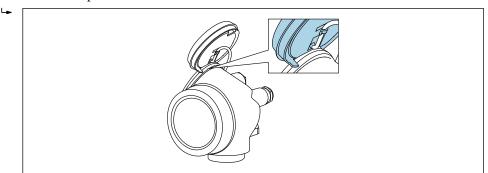
The parameter values are now read only and cannot be edited any more (exception "Contrast display" parameter):

- Via local display
- Via FOUNDATION Fieldbus



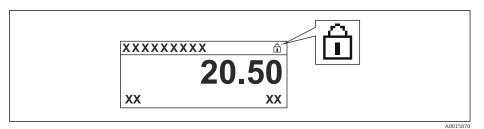
A0021474

- 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.

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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

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.

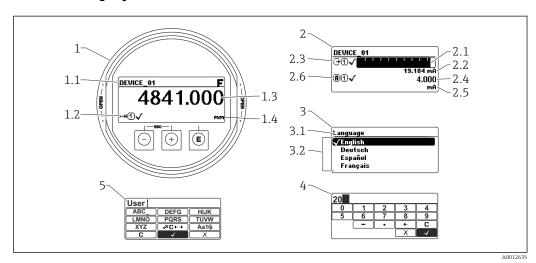
Bluetooth® wireless technology

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



■ 23 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 Measured value symbols for measured value 1
- 2.4 Measured value 2
- 2.5 Unit for measured value 2
- 2.6 Measured value symbols for measured value 2
- 3 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

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Display symbols for the submenus

Symbol	Meaning					
A0018367	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					
A0018364	Setup Is displayed: In the main menu next to the "Setup" selection In the header on the left in the "Setup" menu					
A0018365	Expert Is displayed: In the main menu next to the "Expert" selection In the header on the left in the "Expert" menu					
A0018366	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	"Maintenance required" Maintenance is required. The measured value is still valid.				

Display symbols for locking status

Symbol	Meaning			
A001314	Read-only parameter The parameter shown is only for display purposes and cannot be edited.			
	Device locked			
A001315	 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. 			

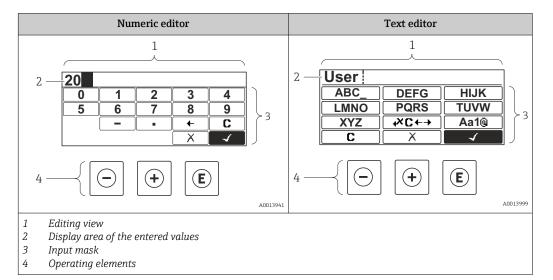
Measured value symbols

Symbol		Meaning					
Measured value	es						
~~		Level					
	A0032892						
⊢		Distance					
	A0032893						
\rightarrow		Current output					
	A0032908						
(A)		Measured current					
	A0032894						
(U)		Terminal voltage					
	A0032895						
0		Electronics or sensor temperature					
	A0032896						
Measuring cha	nnels						
1		Measuring channel 1					
	A0032897						
②		Measuring channel 2					
	A0032898						
Status of the measured value							
		"Alarm" status					
	A0018361	The measurement is interrupted. The output assumes the defined alarm condition. A diagnostic message is generated.					
^		"Warning" status					
<u></u>		The device continues to measure. A diagnostic message is generated.					
	A0018360						

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.					
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



Input mask

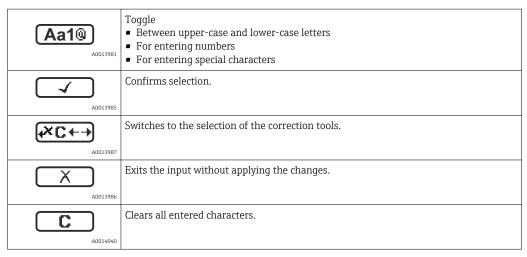
The following input and operating symbols are available in the input mask of the numeric and text editor:

Numeric editor

Symbol	Meaning					
0	election of numbers from 0 to 9.					
9 A0013998						
A0016619	Inserts decimal separator at the cursor position.					
A0016620	Inserts minus sign at the cursor position.					
A0013985	Confirms selection.					
A0016621	Moves the input position one position to the left.					
X A0013986	Exits the input without applying the changes.					
A0014040	Clears all entered characters.					

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

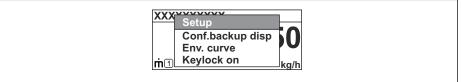
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- 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.



A00378

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

Calling up the menu via the context menu

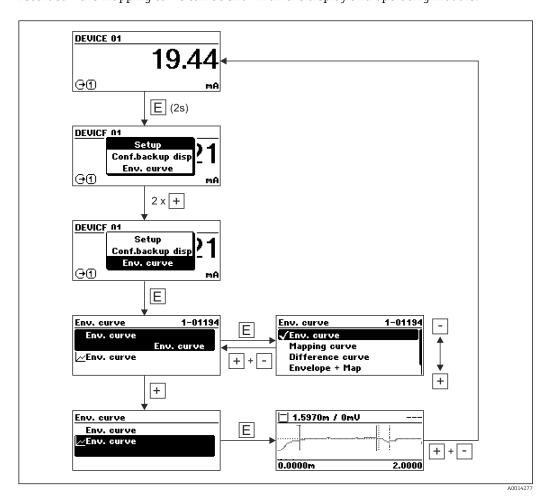
- 1. Open the context menu.
- 2. Press 🛨 to navigate to the desired menu.

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

► The selected menu opens.

8.3.5 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 FOUNDATION Fieldbus network

9.1 Device Description (DD)

You require the following to configure a device and integrate it into an FF network:

- An FF configuration program
- The Cff file (Common File Format: *.cff)
- The device description (DD) in one of the following formats
 - Device Description format 4: *sym, *ffo
 - Device Description format 5: *sy5, *ff5

Information on the device-specific DD

Manufacturer ID	452B48hex			
Device Type	00Fhex			
Device Revision	5hex			
DD Revision	Information and files at:			
CFF Revision	www.endress.comwww.fieldcommgroup.org			

9.2 Integration into the FOUNDATION Fieldbus network

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

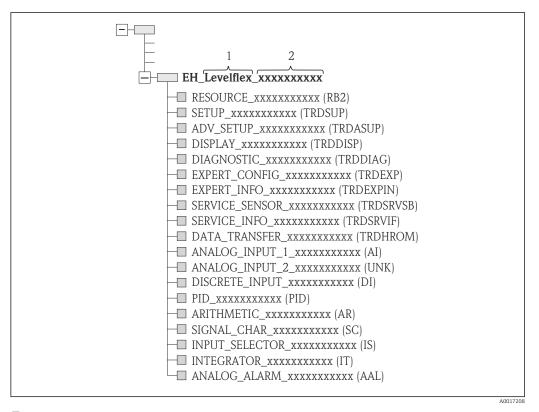
The device is integrated into the FF network as follows:

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

9.3 Device identification and addressing

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

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



■ 24 Typical display in a configuration program after the connection has been established

- Device name
- 2 Serial number

9.4 Block model

9.4.1 Blocks of the device software

The device has the following blocks:

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

In addition to the pre-instantiated blocks already mentioned, the following blocks can also be instantiated:

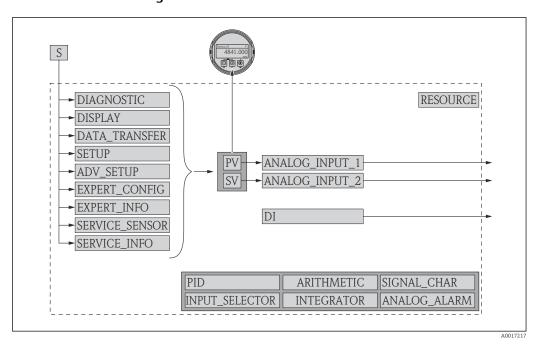
- 5 Analog Input Blocks (AI)
- 2 Discrete Input Blocks (DI)
- 3 PID Blocks (PID)
- 3 Arithemetic Blocks (AR)
- 2 Signal Characterizer Blocks (SC)
- 5 Input Selector Blocks (IS)
- 3 Integrator Blocks (IT)
- 2 Analog Alarm Blocks (AAL)

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

Endress+Hauser Guideline BA00062S.

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

9.4.2 Block configuration when device is delivered



 \blacksquare 25 Block configuration when device is delivered

S Sensor

PV Primary value: Level linearized

SV Secondary value: Distance

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

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

Channel	Measured value				
0	Uninitialized				
89	easured capacitance				
144	EOP shift				

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

9.6 Index tables of Endress+Hauser parameters

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

9.6.1 Setup Transducer Block

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BL K	Description
confirm_distance	Confirm distance	82	ENUM16	2	Static	х	oos	→ 🖺 172
filtered_dist_val	Distance	76	FLOAT	4	Dynamic			→ 🖺 167
interface_distance	Interface distance	79	FLOAT	4	Dynamic			→ 🖺 172
map_end_x	Present mapping	84	FLOAT	4	Dynamic			→ 🖺 173
mapping_end_point	Mapping end point	83	FLOAT	4	Static	х	AUTO	→ 🖺 174
record_map	Record map	86	ENUM16	2	Static	х	OOS	→ 🖺 174
operating_mode	Operating mode	50	ENUM16	2	Static	х	OOS	→ 🖺 162
signal_quality	Signal quality	81	ENUM16	2	Dynamic			→ 🖺 168
medium_group	Medium group	55	ENUM16	2	Static	х	OOS	→ 🖺 163
tank_level	Tank level	66	ENUM16	2	Static	х	OOS	→ 🖺 169
tank_type	Tank type	52	ENUM16	2	Static	х	oos	→ 🖺 162
tube_diameter	Tube diameter	53	FLOAT	4	Static	х	OOS	→ 🖺 163
dc_value	DC value	68	ENUM16	2	Static	х	OOS	→ 🖺 170
distance_to_upper_connect ion	Distance to upper connection	67	FLOAT	4	Static	х	OOS	→ 🖺 169
empty_calibration	Empty calibration	56	FLOAT	4	Static	х	OOS	→ 🖺 164
full_calibration	Full calibration	57	FLOAT	4	Static	х	OOS	→ 🖺 165
distance_unit	Distance unit	51	ENUM16	2	Static	х	OOS	→ 🖺 162

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BL K	Description
interface	Interface	70	FLOAT	4	Dynamic			→ 🖺 171
level_unit	Level unit	58	ENUM16	2	Static	х	OOS	→ 🖺 183
output_unit_after_lineariza tion	Unit after linearization	62	ENUM16	2	Static			→ 🖺 195
level_linearized	Level linearized	64	FLOAT	4	Dynamic			→ 🖺 197
present_probe_length	Present probe length	87	FLOAT	4	Dynamic	х	AUTO	→ 🖺 205
level	Level	60	FLOAT	4	Dynamic			→ 🖺 166
interface_linearized	Interface linearized	73	FLOAT	4	Dynamic			→ 🖺 197
decimal_places_menu_ro	Decimal places	93	ENUM16	2	Static	х	AUTO	→ 🖺 216
locking_status	Locking status	96	BIT_ENU M16	2	Dynamic			→ 🖺 178
medium_type_ro	Medium type	92	ENUM16	2	Static	х	OOS	→ 🖺 180

9.6.2 Advanced Setup Transducer Block

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
calculated_dc_value	Calculated DC value	61	FLOAT	4	Dynamic			→ 🖺 188
blocking_distance	Blocking distance	55	FLOAT	4	Static	х	OOS	→ 🖺 183
dc_value_lower_medium	DC value lower medium	58	FLOAT	4	Static	х	OOS	→ 🖺 185
medium_type	Medium type	50	ENUM16	2	Static	х	OOS	→ 🖺 180
present_probe_length_ro	Present probe length	80	FLOAT	4	Dynamic	х	AUTO	→ 🖺 205
confirm_probe_length	Confirm probe length	79	ENUM16	2	Static	х	OOS	→ 🖺 206
process_property	Process property	52	ENUM16	2	Static	х	OOS	→ 🖺 181
advanced_process_conditio	Advanced process conditions	53	ENUM16	2	Static	х	OOS	→ 🖺 182
meas_upper_iface_thickne	Measured thickness upper layer	60	FLOAT	4	Dynamic			→ 🖺 188
manual_interface_thicknes	Manual thickness upper layer	59	FLOAT	4	Static	х	OOS	→ 🖺 187
medium_property	Medium property	51	ENUM16	2	Static	х	OOS	→ 🖺 180
use_calculated_dc_value	Use calculated DC value	62	ENUM16	2	Static	х	OOS	→ 🖺 189
linearization_type	Linearization type	71	ENUM16	2	Static	х	OOS	→ 🖺 194
activate_table	Activate table	70	ENUM16	2	Static	х	OOS	→ 🖺 200
table_mode	Table mode	69	ENUM16	2	Static	х	OOS	→ 🖺 198
custom_table_sel_level	Level	73	FLOAT	4	Static	х	OOS	→ 🖺 166
custom_table_sel_value	Customer value	74	FLOAT	4	Static	х	OOS	→ 🖺 200
unit_after_linearization	Unit after linearization	63	ENUM16	2	Static	х	OOS	→ 🖺 195
free_text	Free text	64	STRING		Static	х	AUTO	→ 🖺 196
diameter	Diameter	66	FLOAT	4	Static	х	OOS	→ 🖺 197
output_echo_lost	Output echo lost	76	ENUM16	2	Static	х	OOS	→ 🖺 202
intermediate_height	Intermediate height	67	FLOAT	4	Static	х	AUTO	→ 🖺 198
level_correction	Level correction	56	FLOAT	4	Static	х	OOS	→ 🖺 184
level_unit_ro	Level unit	54	ENUM16	2	Static	х	OOS	→ 🖺 183

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
assign_limit	Assign limit	82	ENUM16	2	Static	х	AUTO	→ 🖺 209
maximum_value	Maximum value	65	FLOAT	4	Static	х	OOS	→ 🖺 197
assign_diag_behavior	Assign diagnostic behavior	83	ENUM16	2	Static	х	AUTO	→ 🖺 209
value_echo_lost	Value echo lost	77	FLOAT	4	Static	х	OOS	→ 🖺 202
ramp_at_echo_lost	Ramp at echo lost	78	FLOAT	4	Static	х	OOS	→ 🖺 203
switch_output_failure_mod e	Failure mode	88	ENUM16	2	Static	х	AUTO	→ 🖺 212
switch_output_function	Switch output function	81	ENUM16	2	Static	х	AUTO	→ 🖺 208
switch_status	Switch status	89	ENUM16	2	Dynamic			→ 🖺 212
switch_off_delay	Switch-off delay	87	FLOAT	4	Static	х	AUTO	→ 🖺 212
switch_off_value	Switch-off value	86	FLOAT	4	Static	х	AUTO	→ 🖺 211
switch_on_delay	Switch-on delay	85	FLOAT	4	Static	х	AUTO	→ 🖺 211
switch_on_value	Switch-on value	84	FLOAT	4	Static	х	AUTO	→ 🖺 210
operating_mode_ro	Operating mode	95	ENUM16	2	Static	x	oos	→ 🖺 162
table_number	Table number	68	UINT8	1	Static	x	oos	→ 🖺 199
level_semiautomatic	Level	75	FLOAT	4	Dynamic			→ 🖺 200
assign_status	Assign status	91	ENUM16	2	Static	х	AUTO	→ 🖺 208
locking_status	Locking status	99	BIT_ENUM16	2	Dynamic			→ 🖺 178
decimal_places_menu	Decimal places menu	93	ENUM16	2	Static	х	AUTO	→ 🖺 219
distance_unit_ro	Distance unit	92	ENUM16	2	Static	х	OOS	→ 🖺 162

9.6.3 Display Transducer Block

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
access_status_display	Access status display	51	ENUM16	2	Static			→ 🖺 178
display_damping	Display damping	65	FLOAT	4	Static	х	AUTO	→ 🖺 217
display_interval	Display interval	64	FLOAT	4	Static	х	AUTO	→ 🖺 217
header	Header	66	ENUM16	2	Static	х	AUTO	→ 🖺 217
format_display	Format display	55	ENUM16	2	Static	х	AUTO	→ 🖺 214
number_format	Number format	69	ENUM16	2	Static	х	AUTO	→ 🖺 218
display_separator	Separator	68	ENUM16	2	Static	х	AUTO	→ 🖺 218
language	Language	54	ENUM16	2	Static	х	AUTO	→ 🖺 214
contrast_display	Contrast display	71	FLOAT	4	Static	х	AUTO	→ 🖺 219
header_text	Header text	67	STRING		Static	х	AUTO	→ 🖺 218
access_code_for_display	Enter access code	52	UINT16	2	Static	х	AUTO	→ 🖺 179
configuration_management	Configuration management	75	ENUM16	2	Static	х	AUTO	→ 🖺 221
decimal_places_1	Decimal places 1	57	ENUM16	2	Static	х	AUTO	→ 🖺 216
decimal_places_2	Decimal places 2	59	ENUM16	2	Static	х	AUTO	→ 🖺 216
decimal_places_3	Decimal places 3	61	ENUM16	2	Static	х	AUTO	→ 🖺 216
decimal_places_4	Decimal places 4	63	ENUM16	2	Static	x	AUTO	→ 🖺 216
last_backup	Last backup	74	STRING		Static	х	AUTO	→ 🖺 221
value_1_display	Value 1 display	56	ENUM16	2	Static	х	AUTO	→ 🖺 216

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
value_2_display	Value 2 display	58	ENUM16	2	Static	х	AUTO	→ 🖺 216
value_3_display	Value 3 display	60	ENUM16	2	Static	х	AUTO	→ 🖺 216
value_4_display	Value 4 display	62	ENUM16	2	Static	х	AUTO	→ 🖺 216
locking_status_display	Locking status	50	ENUM16	2	Static			→ 🖺 178
define_access_code	Define access code	53	UINT16	2	Static	х	AUTO	→ 🖺 224
comparison_result	Comparison result	76	ENUM16	2	Static	х	AUTO	→ 🖺 222
decimal_places_menu	Decimal places menu	70	ENUM16	2	Static	х	AUTO	→ 🖺 219
operating_time	Operating time	73	STRING		Dynamic			→ 🖺 221
operating_mode_ro	Operating mode	83	ENUM16	2	Static	х	OOS	→ 🖺 162
locking_status	Locking status	85	BIT_ENUM16	2	Dynamic			→ 🖺 178

9.6.4 Diagnostic Transducer Block

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
operating_time	Operating time	55	STRING		Dynamic			→ 🖺 221
diagnostics_1	Diagnostics	56	UINT32	4	Static			→ 🖺 229
diagnostics_2	Diagnostics 2	58	UINT32	4	Static			→ 🖺 229
diagnostics_3	Diagnostics 3	60	UINT32	4	Static			→ 🖺 229
diagnostics_4	Diagnostics 4	62	UINT32	4	Static			→ 🖺 229
diagnostics_5	Diagnostics 5	64	UINT32	4	Static			→ 🖺 229
operating_time_from_resta rt	Operating time from restart	54	STRING		Dynamic			→ 🖺 228
launch_signal	Launch signal	81	ENUM16	2	Dynamic			→ 🖺 247
start_device_check	Start device check	77	ENUM16	2	Static	x	AUTO	→ 🖺 246
interface_signal	Interface signal	82	ENUM16	2	Dynamic			→ 🖺 247
level_signal	Level signal	80	ENUM16	2	Dynamic			→ 🖺 247
simulation_device_alarm	Simulation device alarm	75	ENUM16	2	Static	х	OOS	→ 🖺 245
filter_options	Filter options	66	ENUM8	1	Static	x	AUTO	→ 🖺 230
previous_diagnostics	Previous diagnostics	52	UINT32	4	Static			→ 🖺 227
actual_diagnostics	Actual diagnostics	50	UINT32	4	Static			→ 🖺 227
assign_sim_meas	Assign measurement variable	71	ENUM16	2	Static	х	OOS	→ 🖺 244
sim_value_process_variabl e	Process variable value	72	FLOAT	4	Static	х	OOS	→ 🖺 244
switch_output_simulation	Switch output simulation	73	ENUM16	2	Static	х	OOS	→ 🖺 244
sim_switch_status	Switch status	74	ENUM16	2	Static	х	OOS	→ 🖺 245
result_device_check	Result device check	78	ENUM16	2	Dynamic			→ 🖺 246
last_check_time	Last check time	79	STRING		Dynamic			→ 🖺 246
linearization_type	Linearization type	84	ENUM16	2	Static	х	OOS	→ 🖺 194
unit_after_linearization_ro	Unit after linearization	85	STRING		Static	х	AUTO	→ 🖺 195
decimal_places_menu	Decimal places menu	88	ENUM16	2	Static	х	AUTO	→ 🖺 219
level_unit_ro	Level unit	90	ENUM16	2	Static	х	OOS	→ 🖺 183
operating_mode_ro	Operating mode	91	ENUM16	2	Static	х	OOS	→ 🖺 162

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK	Description
assign_channel_1	Assign channel 1	92	ENUM16	2	Static	х	AUTO	→ 🖺 238
assign_channel_2	Assign channel 2	93	ENUM16	2	Static	х	AUTO	→ 🖺 238
assign_channel_3	Assign channel 3	94	ENUM16	2	Static	х	AUTO	→ 🖺 238
assign_channel_4	Assign channel 4	95	ENUM16	2	Static	х	AUTO	→ 🖺 238
clear_logging_data	Clear logging data	97	ENUM16	2	Static	х	AUTO	→ 🖺 239
logging_interval	Logging interval	96	FLOAT	4	Static	х	AUTO	→ 🖺 239
display_filter_options	Filter options	99	ENUM8	1	Static	х	AUTO	→ 🖺 230
locking_status	Locking status	108	BIT_ENUM16	2	Dynamic			→ 🖺 178
distance_unit_ro	Distance unit	89	ENUM16	2	Static	х	oos	→ 🖺 162

Expert Configuration Transducer Block 9.6.5



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

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
acknowledge_alarm	Acknowledge alarm	81	ENUM16	2	Static	х	AUTO
integration_time	Integration time	67	FLOAT	4	Static	х	OOS
result_self_check	Result self check	77	ENUM16	2	Dynamic		
start_self_check	Start self check	76	ENUM16	2	Static	х	AUTO
broken_probe_detection	Broken probe detection	75	ENUM16	2	Static	х	AUTO
gpc_mode	GPC mode	68	ENUM16	2	Static	х	OOS
reference_echo_threshold	Reference echo threshold	73	FLOAT	4	Static	х	OOS
const_gpc_factor	Const. GPC factor	74	FLOAT	4	Static	х	OOS
build_up_ratio	Build-up ratio	90	FLOAT	4	Dynamic		
build_up_threshold	Build-up thres.	91	FLOAT	4	Static	х	AUTO
delay_time_echo_lost	Delay time echo lost	78	FLOAT	4	Static	х	AUTO
empty_capacity	Empty capacity	92	FLOAT	4	Static	х	AUTO
external_pressure_selector	External pressure selector	69	ENUM16	2	Static	х	OOS
measured_capacity	Measured capacitance	89	FLOAT	4	Dynamic		
gas_phase_compens_factor	Gas phase compensation factor	70	FLOT	4	Static	х	OOS
in_safety_distance	In safety distance	80	ENUM16	2	Static	х	OOS
ratio_amplitude_interface_level	Ratio amplitude interface/level	86	FLOAT	4	Static	х	OOS
interface_criterion	Interface criterion	87	FLOAT	4	Dynamic		
control_measurement	Measurement	106	ENUM16	2	Static	х	AUTO
control_measurement	Control measurement	105	ENUM16	2	Static	х	AUTO
filter_dead_time	Dead time	66	FLOAT	4	Static	х	OOS
present_reference_distance	Present reference distance	72	FLOAT	4	Dynamic		
history_reset	History reset	83	ENUM16	2	Static	х	OOS
safety_distance	Safety distance	79	FLOAT	4	Static	х	OOS
history_learning_control	History learning	85	ENUM16	2	Static	х	AUTO
history_learning_control	History learning control	84	ENUM16	2	Static	х	AUTO
sensor_module	Sensor module	107	ENUM16	2	Static		

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
evaluation_mode	Evaluation mode	82	ENUM16	2	Static	х	oos
thin_interface	Thin interface	88	ENUM16	2	Static	х	oos
calculated_dc_value	Calculated DC value	59	FLOAT	4	Dynamic	х	AUTO
dc_value_expert	DC value	55	FLOAT	4	Static	х	oos
distance_offset	Distance offset	60	FLOAT	4	Static	х	00S
level_limit_mode	Level limit mode	62	ENUM16	2	Static	х	00S
level_high_limit	High limit	63	FLOAT	4	Static	х	00S
level_low_limit	Low limit	64	FLOAT	4	Static	х	OOS
output_mode	Output mode	65	ENUM16	2	Static	х	00S
level_external_input_1	Level external input 1	93	ENUM16	2	Static	х	AUTO
level_external_input_2	Level external input 2	96	ENUM16	2	Static	х	AUTO
function_input_1_level	Function Input 1 Level	94	ENUM16	2	Static	х	AUTO
function_input_2_level	Function Input 2 Level	97	ENUM16	2	Static	х	AUTO
fixed_value_inp_1	Fixed value inp.1	95	FLOAT	4	Static	х	AUTO
fixed_value_inp_2	Fixed value inp.2	98	FLOAT	4	Static	х	AUTO
interface_external_input_1	Interface external input 1	99	ENUM16	2	Static	х	OOS
interface_external_input_2	Interface external input 2	102	ENUM16	2	Static	х	OOS
function_input_1_interface	Function input 1 interface	100	ENUM16	2	Static	х	OOS
function_input_2_interface	Function input 2 interface	103	ENUM16	2	Static	х	OOS
fixed_value_input_1_interface	Fixed value input 1 interface	101	FLOAT	4	Static	х	OOS
fixed_value_input_2_interface	Fixed value input 2 interface	104	FLOAT	4	Static	х	OOS
distance_unit_ro	Distance unit	53	ENUM16	2	Static	х	OOS
level_unit_ro	Level unit	61	ENUM16	2	Static	х	OOS
operating_mode_ro	Operating mode	54	ENUM16	2	Static	х	OOS
enter_access_code	Enter access code	52	UINT16	2	Static	х	AUTO
locking_status	Locking status	50	BIT_ENUM16	2	Dynamic		
access_status_tooling	Access status tooling	51	ENUM16	2	Static		
reference_distance	Reference distance	71	FLOAT	4	Static	х	OOS
sw_option_active_overview	SW option active overview	110	BIT_ENUM32	4	Static		
decimal_places_menu	Decimal places menu	109	ENUM16	2	Static	х	AUTO
fieldbus_type	Fieldbus Type	111	ENUM8	1	Static		
interface_property_ro	Interface property	108	ENUM16	2	Static	х	OOS
medium_type_ro	Medium type	112	ENUM16	2	Static	х	OOS
eop_level_evaluation_ro	EOP level evaluation	113	ENUM16	2	Static	х	OOS
sensor_type_ro	Sensor type	114	ENUM16	2	Static	х	OOS
calculated_dc_status_en	Status	58	ENUM8	1	Dynamic		

9.6.6 Expert Information Transducer Block

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

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
abs_echo_amp_val	Absolute echo amplitude	51	FLOAT	4	Dynamic		
abs_eop_amp_val	Absolute EOP amplitude	55	FLOAT	4	Dynamic		
absolute_interface_amplitude	Absolute interface amplitude	58	FLOAT	4	Dynamic		
application_parameter	Application parameter	74	ENUM16	2	Dynamic		
electronic_temp_value	Electronic temperature	66	FLOAT	4	Dynamic		
eop_shift_value	EOP shift	69	FLOAT	4	Dynamic		
found_echoes	Found echoes	71	ENUM16	2	Dynamic		
max_electr_temp	Max. electronics temperature	73	FLOAT	4	Dynamic	х	AUTO
time_max_electr_temp	Time max. electronics temperature	75	STRING		Dynamic		
measurement_frequency	Measurement frequency	76	FLOAT	4	Dynamic		
min_electr_temp	Min. electronics temperature	77	FLOAT	4	Dynamic	х	AUTO
time_min_electr_temp	Time min. electronics temperature	78	STRING		Dynamic		
rel_echo_amp_val	Relative echo amplitude	53	FLOAT	4	Dynamic		
relative_interface_amplitude	Relative interface amplitude	60	FLOAT	4	Dynamic		
reset_min_max_temp	Reset min./max. temp.	79	ENUM16	2	Static	х	AUTO
noise_signal_val	Noise of signal	63	FLOAT	4	Dynamic		
used_calculation	Used calculation	80	ENUM16	2	Dynamic		
tank_trace_state	Tank trace state	81	ENUM16	2	Dynamic		
max_draining_speed	Max. draining speed	82	FLOAT	4	Dynamic	х	AUTO
max_filling_speed	L max. fill speed	83	FLOAT	4	Dynamic	х	AUTO
time_max_level	Time max. level	84	STRING		Dynamic		
max_level_value	Max. level value	85	FLOAT	4	Dynamic	х	AUTO
time_min_level	Time min. level	86	STRING		Dynamic		
min_level_value	Min. level value	87	FLOAT	4	Dynamic	Х	AUTO
reset_min_max	Reset min./max.	94	ENUM16	2	Static	х	AUTO
interf_max_drain_speed	I max. drain speed	88	FLOAT	4	Dynamic	х	AUTO
interf_max_fill_speed	I max. fill speed	89	FLOAT	4	Dynamic	х	AUTO
time_max_interface	Time max. interface	90	STRING		Dynamic		
max_interface_value	Max. interface value	91	FLOAT	4	Dynamic	х	AUTO
time_min_interface	Time min. interface	92	STRING		Dynamic		
min_interface_value	Min. interface value	93	FLOAT	4	Dynamic	х	AUTO
application_parameter	Application parameter	95	ENUM16	2	Dynamic		
operating_mode_ro	Operating mode	108	ENUM16	2	Static	х	OOS
temperature_unit	Temperature unit	72	ENUM16	2	Static	х	AUTO
activate_sw_option	Activate SW option	110	UINT32	4	Static	x	AUTO
target_echo_status	Status	56	ENUM8	1	Dynamic		
iface_target_echo_status	Status	61	ENUM8	1	Dynamic		
signal_noise_status	Status	64	ENUM8	1	Dynamic		
sens_temp_status	Status	67	ENUM8	1	Dynamic		
eop_shift_status	Status	70	ENUM8	1	Dynamic		
terminal_voltage_1	Terminal voltage 1	97	FLOAT	4	Dynamic		
calculated_dc_value	Calculated DC value	100	FLOAT	4	Dynamic	X	AUTO

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

9.6.7 Service Sensor Transducer Block

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

9.6.8 Service Information Transducer Block

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

9.6.9 Data Transfer Transducer Block

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

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
used_calculation	Used calculation	87	ENUM16	2	Dynamic		
bdt_cfg_rdwr_ctrl		101	UINT16	2	Static	х	AUTO
bdt_transferred_ctrl		102	BYTEARRAY		Static	х	AUTO
bdt_data_trans		103	BYTEARRAY		Static	х	AUTO
bdt_prepare		99	BYTEARRAY		Static	х	AUTO
bdt_status		100	BYTEARRAY		Static		
sw_option_active_overview	SW option active overview	98	BIT_ENUM32	4	Static		
digits_at_0_mVdB		90	FLOAT	4	Dynamic	х	AUTO
digits_per_mVdB		91	FLOAT	4	Dynamic	х	AUTO
actual_diagnostics	Actual diagnostics	97	UINT32	4	Static		
electric_probe_length	Electric probe length	92	FLOAT	4	Dynamic		
empty_calibration_ro	Empty calibration	93	FLOAT	4	Static	х	OOS
full_calibration_ro	Full calibration	94	FLOAT	4	Static	х	OOS
distance_unit_ro	Distance unit	95	ENUM16	2	Static	х	OOS
operating_mode_ro	Operating mode	88	ENUM16	2	Static	х	OOS
present_probe_length_ro	Present probe length	89	FLOAT	4	Dynamic	х	AUTO
trend_operation_hours		104	UINT32	4	Static		

Name	Label	Index	Data type	Size (Bytes)	Storage Class	Write access	MODE_BLK
trend_package_size		105	UINT8	1	Static	х	AUTO
trend_storage_time	Trend storage time	106	UINT32	4	Static		
trend_sup_pack_size		107	UINT8	1	Static		
gpc_mode_ro	GPC mode	109	ENUM16	2	Static	х	OOS
eop_level_evaluation_ro	EOP level evaluation	110	ENUM16	2	Static	х	OOS
temperature_unit_ro	Temperature unit	111	ENUM16	2	Static	х	OOS
max_trend_entries		108	UINT16	2	Static		
line_mapping_point_number	Line mapping point number	126	UINT16	2	Static	х	AUTO
line_mapping_array_x	Line mapping array X	127	FLOAT	4	Static	х	AUTO
line_mapping_array_y	Line mapping array Y	128	FLOAT	4	Static	х	AUTO
mapping_end_point_ro	Mapping end point	125	FLOAT	4	Static	х	AUTO
mapping_start_point	Mapping start point	124	FLOAT	4	Static	х	AUTO
function_block_table		143	UINT32	4	Static		
custom_empty_value		112	FLOAT	4	Static		
custom_full_value		113	FLOAT	4	Static		
customized	Customized	121	UINT8	1	Static		
reset_ordered_configuration	Reset ordered configuration	122	ENUM16	2	Static	х	AUTO
empty_scale		114	FLOAT	4	Static	х	AUTO
eop_map_point_number		116	UINT16	2	Static	х	AUTO
factory_data_valid		123	UINT8	1	Static		
fieldbus_type	Fieldbus Type	144	ENUM8	1	Static		
full_scale		115	FLOAT	4	Static	х	AUTO
init_map_point_number		117	UINT16	2	Static	х	AUTO
max_not_assoc_track		118	UINT16	2	Static	х	AUTO
ref_max_dist	Ref max. dist.	119	FLOAT	4	Static	х	AUTO
ref_min_dist	Ref min. dist.	120	FLOAT	4	Static	х	AUTO
line_mapping_accuracy	Line mapping accuracy	130	FLOAT	4	Static	х	AUTO
mapping_curve_left_margin	Mapping curve left margin	131	FLOAT	4	Static	х	AUTO
device_calib_changed		133	ENUM16	2	Static	х	AUTO
echo_thresh_attenuat_const_ee	Threshold attenuation constant	134	FLOAT	4	Dynamic	х	AUTO
echo_threshold_far_ee		135	FLOAT	4	Static	х	AUTO
echo_thresh_inactive_len		137	FLOAT	4	Static	х	AUTO
echo_threshold_near_ee		136	FLOAT	4	Static	х	AUTO
present_probe_length_ee		138	FLOAT	4	Static	х	AUTO
reset_appl_para_chg_flags		139	ENUM16	2	Static	х	AUTO
reset_dyn_persistent		140	ENUM16	2	Static	х	AUTO
locking_status	Locking status	142	BIT_ENUM16	2	Dynamic		
decimal_places_menu	Decimal places menu	96	ENUM16	2	Static	х	AUTO
access_status_tooling	Access status tooling	141	ENUM16	2	Static		
level_linearized	Level linearized	147	FLOAT	4	Dynamic		
bdt_transferred_ctrl		197	UINT8	1	Static	х	AUTO
bdt_cfg_rdwr_ctrl		196	UINT16	2	Static	х	AUTO

9.7 Methods

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

The following methods are available for the device:

Restart

This method is located in the Resource Block and directly prompts the setting of the **Device reset** parameter. This resets the device configuration to a defined state.

■ ENP Restart

This method is located in the Resource Block and directly prompts the setting of the parameters of the Electronic Name Plate (ENP).

Setup

This method is located in the SETUP Transducer Block and allows to set the most important parameters in this block for device configuration (measuring units, type of tank or vessel, type of medium, empty and full calibration).

Linearization

This method is located in the ADV_SETUP Transducer Block and allows to manage the linearization table by which the measured value is converted into volume, mass or flow.

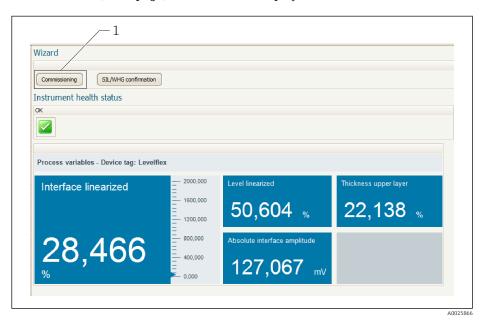
Self Check

This method is located in the EXPERT_CONFIG Transducer Block and prompts the device self check parameters.

10 Commissioning 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.

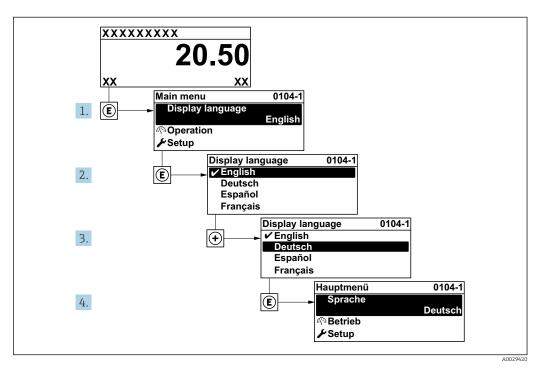
11 Commissioning via operating menu

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:

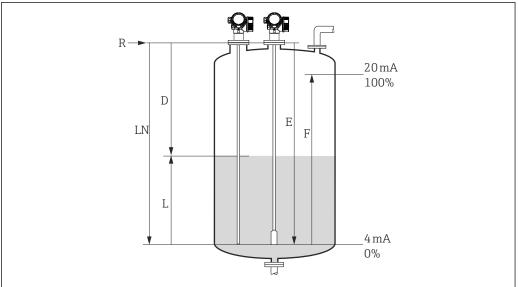
After mounting the rod probe in the stilling well or bypass, check and - if necessary - correct the setting of the reference distance in the unpressurized state. The level should be at least 200 mm below the reference distance $L_{\rm ref}$ in order to achieve maximum accuracy.

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:

GP01015F, "Levelflex - Description of Device Parameters - FOUNDATION Fieldbus"

11.4 Configuring level measurement



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- 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. Setup → Device tag
 - ► Enter device tag.
- 2. For devices in the "Interface measurement" application package:

Navigate to: Setup → Operating mode

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

Navigate to: Setup \rightarrow Tube diameter

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

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

Navigate to: Setup → Mapping → Confirm distance

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

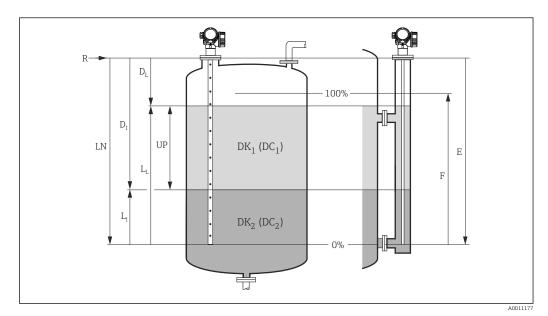
Navigate to: Setup \rightarrow Confirm distance

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 → Operating mode

► Select the **Interface** option.

3. Navigate to: Setup \rightarrow Distance unit

► Select the distance unit.

4. Navigate to: Setup → Tank type

Select tank type.

5. For **Tank type** parameter = Bypass / pipe:

Navigate to: Setup → Tube diameter

► Specify the diameter of the bypass or stilling well.

6. Navigate to: Setup → Tank level

► Specify the tank level (**Fully flooded** or **Partially filled**)

7. 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.

8. Navigate to: Setup \rightarrow DC value

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

- 9. Navigate to: Setup → Empty calibration
 - ► Specify the empty distance E (distance from reference point R to 0% mark).
- 10. Navigate to: Setup \rightarrow Full calibration
 - ► Specify the full distance F (distance from the 0% mark to the 100% mark).
- 11. Navigate to: Setup \rightarrow Level
 - ightharpoonup Displays the measured level L_L.
- 12. Navigate to: Setup → Interface
 - ightharpoonup Displays the interface height L_I.
- 13. Navigate to: Setup → Distance
 - ightharpoonup Displays the distance D_L between the reference point R and the level L_L .
- 14. Navigate to: Setup → Interface distance
 - ► Displays the distance D_I between the reference point R and the interface L_I.
- 15. Navigate to: Setup \rightarrow Signal quality
 - ► Displays the signal quality of the analyzed level echo.
- 16. 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⁾.
- 17. 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 \to Advanced setup \to 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 → Advanced setup → Configuration backup display → Configuration management

Meaning of the options

Cancel

No action is executed and the user exits the parameter.

Execute backup

A backup copy of the current device configuration 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 Commissioning (block-oriented operation)

12.1 Function check

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

- "Post-installation check" checklist → 🖺 53
- "Post-connection check" checklist → 🖺 60

12.2 Block configuration

12.2.1 Preparatory steps

- 1. Switch on the measuring device.
- 2. Make a note of the **DEVICE ID**.
- 3. Open the configuration program.
- 4. Load Cff and device description files into the host system or the configuration program. Make sure you are using the right system files.
- 5. Identify the device using the **DEVICE_ID** (see Point 2). Assign the desired tag name to the device via the **Pd-tag/FF_PD_TAG** parameter.

12.2.2 Configuring the Resource Block

- 1. Open the Resource Block.
- 2. If necessary, disable the lock for device operation.
- 3. If necessary, change the block name. Factory setting: RS-xxxxxxxxxx (RB2)
- 4. If necessary, assign a description to the block via the **Description of the identification tag/TAG_DESC** parameter.
- 5. If necessary, change other parameters as required.

12.2.3 Configuring the Transducer Blocks

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

- 1. If necessary, change the block name.
- 2. Set the block mode to **OOS** via the **Block mode/MODE_BLK** parameter, **TARGET** element.
- 3. Configure the device in accordance with the measuring task.
- 4. Set the block mode to **Auto** via the **Block mode/MODE_BLK** parameter, **TARGET** element.
- The block mode must be set to **Auto** to ensure the smooth operation of the device.

12.2.4 Configuring the Analog Input Blocks

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

Factory setting		
Analog Input Block	CHANNEL	
AI 1 32949: Level linearized		
AI 2 32856: Distance		

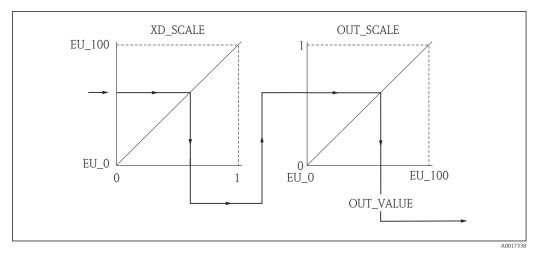
- 1. If necessary, change the block name.
- 2. Set the block mode to **OOS** via the **Block mode/MODE_BLK** parameter, **TARGET** element.
- 3. Via the **Channel/CHANNEL** parameter, select the process variable which should be used as the input value for the Analog Input Block .
- 4. Via the Transducer scale/XD_SCALE parameter, select the desired unit and the block input range for the process variable → 🗎 105. Make sure that the selected unit suits the process variable that is selected. If the process variable and the unit do not suit one another, the Block error/ BLOCK_ERR parameter reports the Block Configuration Error and the block mode cannot be set to Auto.
- 5. Via the Linearization type/L_TYPE parameter, select the type of linearization for the input variable (factory setting: Direct). Make sure that the settings for the Transducer scale/XD_SCALE and Output scale/OUT_SCALE parameters are the same for the Direct linearization type. If the values and units do not match, the Block error/ BLOCK_ERR parameter reports the Block Configuration Error and the block mode cannot be set to Auto.
- 6. Enter the alarms and critical alarm messages via the High alarm limit/ HI_HI_LIM, High early warning limit/HI_LIM, Low alarm limit/ LO_LO_LIM and Low early warning limit/LO_LIM parameters. The limit values entered must be within the value range specified for the Output scale/OUT_SCALE parameter → 105.
- 7. Specify the alarm priorities via the **Priority for high limit value alarm/HI_HI_PRI**, **Priority for high early warning/HI_PRI**, **Priority for low limit value alarm/ LO_LO_PRI** and **Priority for low limit value early warning/LO_PRI** parameters. Reporting to the field host system only takes place with alarms with a priority greater than 2.
- 8. Set the block mode to **Auto** via the **Block mode/MODE_BLK** parameter, **TARGET** element. For this purpose, the Resource Block must also be set to the **Auto** block mode.

12.2.5 Additional configuration

- 1. Link the function blocks and output blocks.
- After specifying the active LAS, download all the data and parameters to the field device.

12.3 Scaling the measured value in the AI Block

The measured value can be scaled if the $L_TYPE = Indirect$ linearization type has been selected in the AI Block. XD_SCALE defines the input range with the EU_0 and EU_100 elements. This is mapped linearly to the output range, defined by OUT_SCALE also with the elements EU_0 and EU_100 .



Scaling the measured value in the AI Block

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

12.4 Selecting the language

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

¹⁾ The languages the device supports are specified when the device is ordered. See feature 500 "Additional operating language" in the product structure for this purpose

12.5 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.

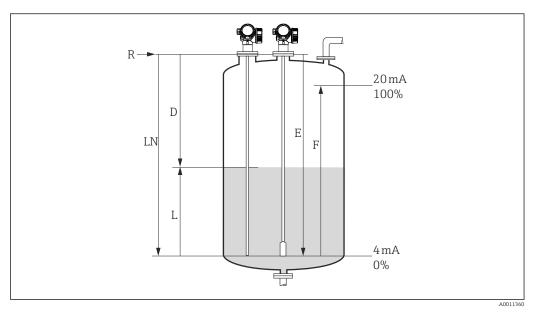
Step	Block	Parameter	Action
1	EXPERT_CONFIG (TRDEXP)	GPC mode (gpc_mode)	Select the On (33006) option to enable gas phase compensation.
2	EXPERT_CONFIG (TRDEXP)	Present reference distance (present_reference_distance)	Check if the current reference distance displayed corresponds with the nominal value (300 mm or 550 mm, see nameplate). If yes: No further action is required. If not: Continue with Step 3.
3	EXPERT_CONFIG (TRDEXP)	Reference distance (reference_distance)	Accept the value displayed under "Present reference distance" for the "Reference distance" parameter.

For a detailed description of all parameters, see:

GP01015F, "Levelflex M - Description of Device Parameters - FOUNDATION Fieldbus"

12.6 Configuring level measurement

The **Setup** method can also be used to configure the measurement. This method can be called via the SETUP Transducer Block (TRDSUP).



eals 31 Configuration parameters for level measurement in liquids

 $LN = Probe \ length$ $R = Reference \ point \ of \ measurement$ D = Distance $E = Empty \ calibration \ (= zero \ point)$ L = Level $F = Full \ calibration \ (= span)$

If the DC value is less than 7 in the case of rope probes, measurement in the area of the tensioning weight is not possible. The empty calibration E may not exceed LN - 250 mm (LN - 10 in) in these cases.

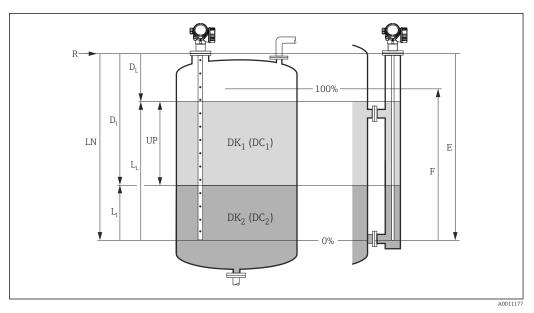
Step	Block	Parameter	Action
1	SETUP (TRDSUP)	Distance unit (distance_unit)	Select the distance unit. Options: 1010: m 1013: mm 1018: in 1019: ft
2	SETUP (TRDSUP)	Operating mode (operating_mode) 1)	Select 32949: Level.
3	SETUP (TRDSUP)	Tank type (tank_type)	Select tank type. Options: 32816: Bypass/stilling well 33288: Metal 33302: Coax 33432: Double cable 33433: Double rod 33437: Rope, metal centering disk 33438: Rod, metal centering disk 33441: Non-metal 33444: Installation outside
4	SETUP (TRDSUP)	Tube diameter (tube_diameter) 2)	Specify the diameter of the bypass or stilling well.

Step	Block	Parameter	Action				
5	SETUP (TRDSUP)	Medium group (medium_group)	Specify the medium group. Options: Other (DC > 1.9) ³) Water-based (DC > 4)				
6	SETUP (TRDSUP)	Empty calibration (empty_calibration)	Specify the empty distance E (distance from reference point R to 0% mark).				
7	SETUP (TRDSUP)	Full calibration (full_calibration)	Specify the full distance F (distance from the 0% mark to the 100% mark).				
8	SETUP (TRDSUP)	Level (level)	Displays the measured level L.				
9	SETUP (TRDSUP)	Distance (filtered_dist_val)	Displays the distance D between the reference point R and the level L.				
10	SETUP (TRDSUP)	Signal quality (signal_quality)	Displays the signal quality of the analyzed level echo.				
11	SETUP (TRDSUP)	Confirm distance (confirm_distance)	Compare the distance displayed with the actual value to start recording an interference echo map. Options: 179: Record map manually 32847: Delete mapping curve 32859: Distance Ok 32860: Distance too large 32861: Distance too small 32862: Distance unknown 33100: Tank empty				

- 1) Only available in devices with the "Interface measurement" application package
- 2) Only available for coated probes and "Tank type" = "Bypass/stilling well"
- 3) Lower DCs can also be entered in the "DC Value (dc_value)" parameter if necessary. However, the measuring range can be limited if DC<1.6. In this case, contact Endress+Hauser.</p>

12.7 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".
- The **Setup** method can also be used to configure the measurement. This method can be called via the SETUP Transducer Block (TRDSUP).



■ 32 Configuration parameters for interface measurement

R = Reference point of measurement

E = *Empty calibration* (= *zero point*)

 $F = Full\ calibration\ (= span)$

LN = Probe length

 $\mathit{UP} = \mathit{Thickness}\ \mathit{of}\ \mathit{upper}\ \mathit{medium}$

 D_I = Distance to interface (distance from flange to DC_2)

 L_I = Interface level

 D_L = Total level distance

 $L_L = Total\ level$

Step	Block	Parameter	Action
1	SETUP (TRDSUP)	Distance unit (distance_unit)	Select the distance unit.
			Options: 1010: m 1013: mm 1018: in 1019: ft
2	SETUP (TRDSUP)	Operating mode (operating_mode) 1)	Select 32938: Interface.
3	SETUP (TRDSUP)	Tank type (tank_type)	Select tank type.
			Options: 32816: Bypass/stilling well 33288: Metal 33302: Coax 33432: Double cable 33433: Double rod 33437: Rope, metal centering disk 33438: Rod, metal centering disk 33441: Non-metal 33444: Installation outside
4	SETUP (TRDSUP)	Tube diameter (tube_diameter) 2)	Specify the diameter of the bypass or stilling well.
5	SETUP (TRDSUP)	Tank level (tank_level)	Select the tank level.
			Options: 32919: Flooded (typical if measuring in the bypass) 33021: Partially filled (typical if measuring in the tank)

Step	Block	Parameter	Action				
6	SETUP (TRDSUP)	Distance to upper connection (distance_to_upper_connection)	 For measurement in bypasses: Enter the distance from the reference point R to the lower edge of the upper connection. In all other cases, keep the factory setting. 				
7	SETUP (TRDSUP)	DC value (dc_value)	Specify the dielectric constant of the upper medium.				
8	SETUP (TRDSUP)	Empty calibration (empty_calibration)	Specify the empty distance E (distance from reference point R to 0% mark).				
9	SETUP (TRDSUP)	Full calibration (full_calibration)	Specify the full distance F (distance from the 0% mark to the 100% mark).				
10	SETUP (TRDSUP)	Level (level)	Displays the measured level L.				
11	SETUP (TRDSUP)	Interface (interface)	Displays the interface height L _I .				
12	SETUP (TRDSUP)	Distance (filtered_dist_val)	Displays the distance D between the reference point R and the level L.				
13	SETUP (TRDSUP)	Interface distance (interface_distance)	Displays the distance D_{I} between the reference point R and the interface L_{I} .				
14	SETUP (TRDSUP)	Signal quality (signal_quality)	Displays the signal quality of the analyzed level echo.				
15	SETUP (TRDSUP)	Confirm distance (confirm_distance)	Compare the distance displayed with the actual value to start recording an interference echo map.				
			Options: 179: Record map manually 2847: Delete mapping curve 2859: Distance Ok 2860: Distance too large 2861: Distance too small 2862: Distance unknown 31100: Tank empty				

- 1) Only available in devices with the "Interface measurement" application package
- 2) Only available for coated probes and "Tank type" = "Bypass/stilling well"

12.8 Configuring the local display

12.8.1 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, large format	1 value, large format
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

The local display can be customized in the Transducer Block **DISPLAY (TRDDISP)**.

12.8.2 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, large format	1 value, large format
Value 1 display	Interface	Interface
Value 2 display	Level linearized	Level linearized
Value 3 display	Upper interface thickness	Current output 1
Value 4 display	Current output 1	Current output 2

The local display can be customized in the Transducer Block **DISPLAY (TRDDISP)**.

12.9 Configuration management

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

Path in the menu

Setup → Extended setup → Data backup → Configuration management

Block operation

Block: **DISPLAY (TRDDISP)**

Parameter: Configuration management (configuration_management)

Functions of the parameter options

Options	Description
33097: Backup	A backup copy of the current device configuration in the HistoROM is saved to the display module of the device. The backup copy includes the transmitter data of the device.
33057: Restore	The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. The backup copy includes the transmitter data of the device.
33838: Duplicate	The transmitter configuration from another device is duplicated to the device using the display module.
265: Compare	The device configuration saved in the display module is compared to the current device configuration of the HistoROM.
32848: Delete data backup	The backup copy of the device configuration is deleted from the display module of the device.

HistoROM

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

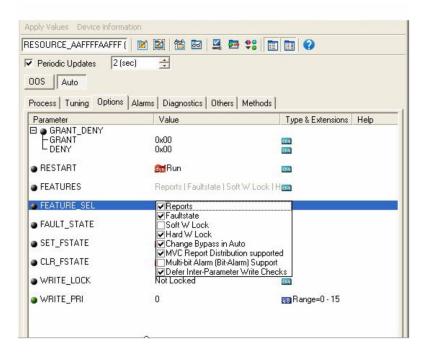
- While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.
- In devices with FOUNDATION Fieldbus communication, the "PD-Tag" parameter is also accepted when duplicating the parameters. If necessary, set this parameter to the desired value after duplication.

12.10 Configuring event behavior according to FOUNDATION Fieldbus specification FF912

The device complies with FOUNDATION Fieldbus specification FF912. Among other things this means that:

- The diagnostic category as per NAMUR Recommendation NE107 is transmitted over the fieldbus in a format that is independent of the manufacturer:
 - F: Failure
 - C: Function check
 - S: Out of specification
 - M: Maintenance required
- The diagnostic category of the predefined event groups can be adapted by the user according to the requirements of the individual application.
- Certain events can be separated from their group and be treated individually:
 - 941: Lost echo
 - 942: In safety distance
- Additional information and troubleshooting measures are transmitted over the fieldbus with the event message.
- Diagnostic messages according to FF912 are only available in the host if the **Multi-bit Alarm Support** option is activated in the **FEATURE_SEL** parameter of the Resource

 Block. For reasons of compatibility, this option is **not** enabled when the device is delivered:



12.10.1 Event groups

The diagnostic events are divided into 16 groups according to the **source** and the **weighting**. A **default event category** is assigned to each group at the factory. Here, one bit of the assignment parameters belongs to every event group.

Event weighting	Default event category	Event source	Bit	Events in this group
Highest weighting	Failure (F)	Sensor	31	 F003: Broken probe detected F046: Buildup detected F083: Memory content F104: HF cable F105: HF cable F106: Sensor
		Electronics	30	■ F242: Software incompatible ■ F252: Modules incompatible ■ F261: Electronic modules ■ F262: Module connection ■ F270: Main electronic failure ■ F271: Main electronic failure ■ F272: Main electronic failure ■ F273: Main electronic failure ■ F275: I/O module failure ■ F276: I/O module failure ■ F282: Data storage ■ F283: Memory content ■ F311: Memory content
		Configuration	29	 F410: Data transfer F411: Upload/download F435: Linearization F437: Configuration incompatible
		Process	28	 F803: Loop current 1 F825: Operating temperature F936: EMC interference F941: Echo lost ¹⁾ F970: Linearization

1) This event can be removed from the group and treated separately; see the "Configurable area" section.

Event weighting	Default event category	Event source	Bit	Events in this group
High weighting	Function check (C)	Sensor	27	Not used in Levelflex
		Electronics	26	Not used in Levelflex
		Configuration	25	 C411: Upload/download C431: Trim C484: Failure mode simulation C485: Simulation measured value C491: Simulation current output C585: Simulation distance
		Process	24	Not used in Levelflex

Event weighting	Default event category	Event source	Bit	Events in this group		
Low weighting	Out of specification (S)	Sensor	23	Not used in Levelflex		
	Electronics		22	Not used in Levelflex		

Event weighting	Default event category	Event source	Bit	Events in this group				
		Configuration	21	S441: Current output 1				
		Process	20	 S801: Energy too low S825: Operating temperature S921: Change of reference S942: In safety distance ¹⁾ S943: In blocking distance S944: Level range S968: Level limited 				

1) This event can be removed from the group and treated separately; see the "Configurable area" section.

Event weighting	Default event category	Event source	Bit	Events in this group
Lowest weighting	Maintenance required (M)	Sensor	19	Not used in Levelflex
	Electron		18	 M270: Main electronics error M272: Main electronics error M311: Memory content
		Configuration	17	M438: Dataset
		Process	16	M801: Loop current 1

12.10.2 Assignment parameters

Event categories are assigned to the event groups via four assignment parameters. These are located in the **RESOURCE (RB2)** Block:

- FD FAIL MAP: For the Failure (F) event category
- FD_CHECK_MAP: For the Function check (C) event category
- FD_OFFSPEC_MAP: For the Out of specification (S) event category
- FD_MAINT_MAP: For the Maintenance required (M) event category

Each of these parameters consists of 32 bits with the following meaning:

- **Bit 0:** Reserved by the Fieldbus Foundation
- **Bits 1 to 15:** Configurable area; certain diagnostic events can be assigned here independently of the event group they belong to. They are then removed from the event group and their behavior can be configured individually.

In the Levelflex the following parameters can be assigned to the configurable area:

- 941: Lost echo
- 942: In safety distance
- **Bits 16-31:** Standard range; these bits are permanently assigned to the event groups. If the bit is set to **1**, this event group is assigned to the individual event category.

The following table indicates the default setting of the assignment parameters. In the default setting, there is a clear assignment between the event weighting and the event category (i.e. the assignment parameter).

Default setting of assignment parameters

		Standard range										Configurable area					
Event weighting	Highest weighting		High weighting			Low weighting			Lowest weighting			I					
Event source 1)	S	Е	С	P	S	Е	С	P	S	Е	С	P	S	Е	С	P	
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15 1
FD_FAIL_MAP	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
FD_CHECK_MAP	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0
FD_OFFSPEC_MAP	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0
FD_MAINT_MAP	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0

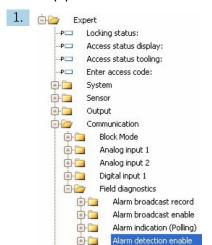
1) S: Sensor; E: Electronics; C: Configuration; P: Process

Proceed as follows to change the diagnostic behavior of an event group:

- 1. Open the assignment parameter in which the group is currently assigned.
- 2. Change the event group bit from **1** to **0**. When operating via FieldCare, this is done by unchecking the corresponding check box (see the next example).
- 3. Open the assignment parameter to which the group should be assigned.
- 4. Change the event group bit from **0** to **1**. When operating via FieldCare, this is done by checking the corresponding check box (see the next example).

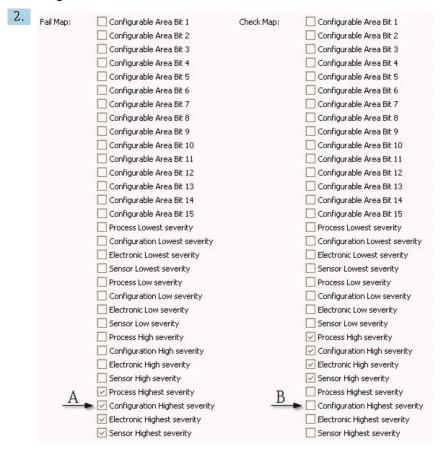
Example

The **Highest weighting / configuration error** group contains the events **410**: **Data transfer**, **411**: **Upload/download**, **435**: **Linearization** and **437**: **Configuration**



incompatible. These should be categorized as **Function check (C)** and no longer as **Failure (F)**.

In the FieldCare navigation window, navigate to **Expert** \rightarrow **Communication** \rightarrow **Field** diagnostics \rightarrow Alarm detection enable.



 \blacksquare 33 The "Fail Map" and "Check Map" columns in the as-delivered state

In the **Fail Map** column, look for the **Configuration Highest Severity** group and uncheck the corresponding check box (A). Check the relevant check box in the **Check Map** (B) column. Note that you must press the Enter key to confirm every entry.

✓ Process Highest severity	Process Highest severity
── Configuration Highest severity	Configuration Highest severity
Electronic Highest severity	Electronic Highest severity
Sensor Highest severity	Sensor Highest severity

■ 34 The "Fail Map" and "Check Map" columns after the change

- Please ensure that the corresponding bit is set in at least one of the assignment parameters for each event group. Otherwise no category will be transmitted with the event over the bus, and the control system will therefore generally ignore the presence of the event.
- The detection of diagnostic events is parameterized on the **Alarm detection enable** FieldCare page but the transmission of messages over the bus is not. The latter is performed on the **Alarm broadcast enable** page. The operation of this page is identical to the operation of the **Alarm detection enable** page. The Resource Block must be in the **Auto** mode for the status information to be transmitted over the bus.

12.10.3 Configurable area

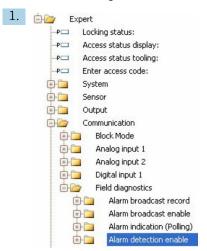
The event category can be individually defined for the following events - irrespective of the event group they are assigned to in the default setting:

- **F941**: Lost echo
- **S942:** In safety distance

To change the event category, the event first has to be assigned to one of the bits 1 to 15. The FF912 ConfigArea_1 to FF912ConfigArea_15 parameters in the DIAGNOSTIC (TRDDIAG) Block are used for this purpose. Then the corresponding bit can be set from 0 to 1 in the desired assignment parameter.

Example

Error 942 "In safety distance" should no longer be categorized as Out of specification (S) and should be categorized as Function check (C) instead.



In the FieldCare navigation window, navigate to **Expert** \rightarrow **Communication** \rightarrow **Field** diagnostics \rightarrow **Alarm** detection enable.



In the default setting, all bits in the **Configurable Area Bits** column have the value **not used**.



Select one of these bits (here for example: **Configurable Area Bit 1**) and select the **In safety distance** option from the corresponding selection list. Press Enter to confirm the option selected.



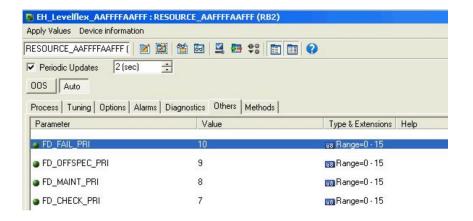
Go to the **Offspec Map** column and check the check box for the corresponding bit (here: **Configurable Area Bit 1**). Press ENTER to confirm your entries.

A change to the **In safety distance** error category does not affect an error that already exists. The new category is only assigned if this error occurs again after the change has been made.

12.10.4 Transmission of event messages over the bus

Event priority

Event messages are only transmitted over the bus if their priority is between 2 and 15. Priority 1-events are displayed but are not transmitted over the bus. Priority 0-events are ignored. In the factory setting, the priority of all events is 0. The priority can be individually changed for the four assignment parameters. The following four parameters of the Resource Block are used for this purpose:



Suppression of certain events

It is possible to suppress certain events during transmission over the bus using a mask. While these events are displayed they are not transmitted over the bus. This mask is in FieldCare under $\mathbf{Expert} \to \mathbf{Communication} \to \mathbf{Field}$ diagnostics $\to \mathbf{Alarm}$ broadcast enable. The mask is a negative selection mask, i.e. if a field is selected the associated events are **not** transmitted over the bus.

12.11 Protecting settings from unauthorized access

The settings can be protected from unauthorized access in the following ways:

- Locking via write protection switch (hardware locking)
- Locking via the operating menu (software locking)
- Locking via block operation:
 - Block: **DISPLAY (TRDDISP)**; parameter: **Define access code**
 - Block: EXPERT_CONFIG (TRDEXP); parameter: Enter access code

13 Diagnostics and troubleshooting

13.1 General troubleshooting

13.1.1 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.		
Device measures incorrectly.	Parameter configuration error	Check and correct the parameter configuration.	

13.1.2 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 (→ ≜ 164) and correct if necessary. Check the Full calibration parameter (→ ≜ 165) and correct if necessary. Check the linearization and correct if necessary (Linearization submenu (→ ≜ 192)). 	
	If measured distance (Setup → Distance) does not match the real distance: An interference echo is present.	Carry out mapping (Confirm distance parameter ($\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	
No change of measured value on filling/emptying	An interference echo is present.	Carry out mapping (Confirm distance parameter ($\rightarrow \implies 172$)).	
	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 (→ 🖺 163). If necessary, select a more detailed setting with the Medium property parameter (→ 🖺 180).	
	Level echo suppressed.	Delete the map and record it again if necessary (Record map parameter (→ 🖺 174)).	
Device displays a level when the tank is empty.	Incorrect probe length	Perform probe length correction (Confirm probe length parameter (→ 206)).	
	Interference echo	Carry out mapping over the entire probe length when the tank is empty (Confirm distance parameter (→ 🖺 172)).	
Wrong slope of the level over the entire measuring range	Wrong tank type selected.	Select the correct Tank type parameter $(\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	

Parametrization errors for interface measurements

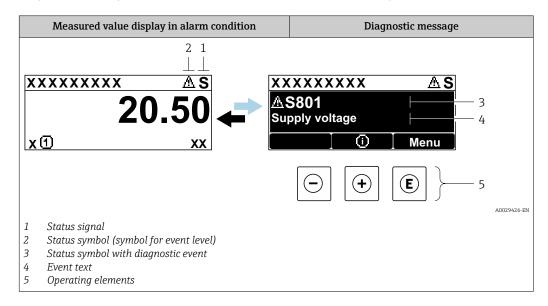
Problem	Possible cause	Remedy	
With the setting Tank level = Fully flooded , the interface	The total level is detected outside the upper blocking distance.	Increase the blocking distance (Blocking distance parameter ($\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	
level displayed jumps to higher values when the tank is emptied.		Set Tank level parameter (→ 🖺 169) = Partially filled .	
With the setting Tank level = Partially filled , the total level displayed jumps to lower values when the tank is filled.	The total level goes to the upper blocking distance.	Reduce the blocking distance (Blocking distance parameter ($\rightarrow \implies 183$)).	
Incorrect slope of the interface measured value	The dielectric constant (DC value) of the upper medium is incorrectly set.	Enter the correct dielectric constant (DC value) of the upper medium (DC value parameter ($\rightarrow \blacksquare 170$)).	
The measured value for the interface and the total level are identical.	The echo threshold for the total level is too high due to an incorrect dielectric constant.	Enter the correct dielectric constant (DC value) of the upper medium (DC value parameter ($\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.

13.2 Diagnostic information on local display

13.2.1 Diagnostic message

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



Status signals

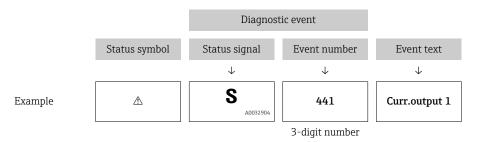
A0032902	"Failure (F)" option A device error has occurred. The measured value is no longer valid.			
C	"Function check (C)" option The device is in the service mode (e.g. during a simulation).			
S	 "Out of specification (S)" option The device is operated: Outside of its technical specifications (e.g.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

Status symbol (symbol for event level)

8	"Alarm" status The measurement is interrupted. The signal outputs adopt the defined alarm condition. A diagnostic message is generated.
Δ	"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:

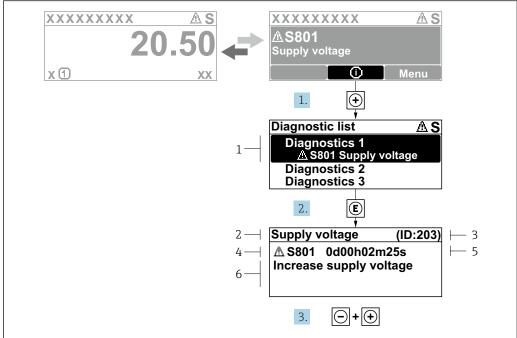
- On the local display:
- In the **Event logbook** submenu
- In FieldCare:

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.		

13.2.2 Calling up remedial measures



A0029431-EN

- 35 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.

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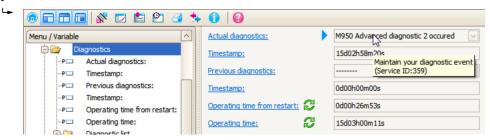
13.3 Diagnostic event in the operating tool

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

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

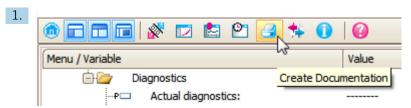
A: Via the operating menu

- 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.

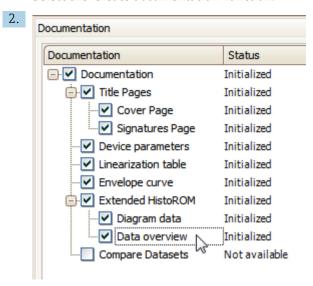


A tool tip with remedial measures for the diagnostic event appears.

B: Via the "Create documentation" function



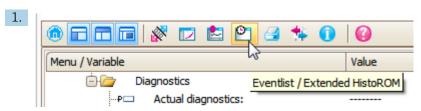
Select the "Create documentation" function.



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.

13.4 Diagnostic messages in the DIAGNOSTIC Transducer Block (TRDDIAG)

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

13.5 Diagnostic list

In the **Diagnostic list** submenu 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.

13.6 Event logbook

13.6.1 Event history

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

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
 - ①: 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.

13.6.2 Filtering the event logbook

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

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

13.6.3 Overview of information events

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

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.

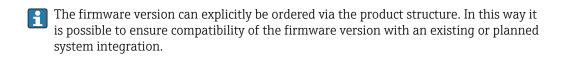
Info number	Info name		
I1092	Trend data deleted		
I1110	Write protection switch changed		
I1137	Electronic changed		
I1151	History reset		
I1154	Reset terminal voltage min/max		
I1155	Reset electronic temperature		
I1156	Memory error trend		
I1157	Memory error event list		
I1185	Display backup done		
I1186	Restore via display done		
I1187	Settings downloaded with display		
I1188	Display data cleared		
I1189	Backup compared		
I1256	Display: access status changed		
I1264	Safety sequence aborted		
I1335	Firmware changed		
I1397	Fieldbus: access status changed		
I1398	CDI: access status changed		
I1512	Download started		
I1513	Download finished		
I1514	Upload started		
I1515	Upload finished		

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13.7 Firmware history

Date	Firmware	Modifications	Documentation (FMP51, FMP52, FMP54, FOUNDATION Fieldbus)		
	version		Operating Instructions	Description of Device Parameters	Technical Information
04.2012	01.00.zz	Original software	BA01052F/00/EN/01.12	GP01015F/00/EN/01.12	TI01001F/00/EN/15.12
05.2015	01.01.zz	 Support of SD03 Additional languages HistoROM functionality enhanced "Advanced Diagnostics" function block integrated Improvements and bugfixes 	BA01052F/00/EN/03.15 BA01052F/00/EN/04.16 ¹⁾	GP01015F/00/EN/02.15	TI01001F/00/EN/19.15 TI01001F/00/EN/22.16 1)

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



14 Maintenance

No special maintenance work is required.

14.1 Exterior cleaning

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

14.2 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.

15 Repair

15.1 General information

15.1.1 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.

15.1.2 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.

15.1.3 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.

15.1.4 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:

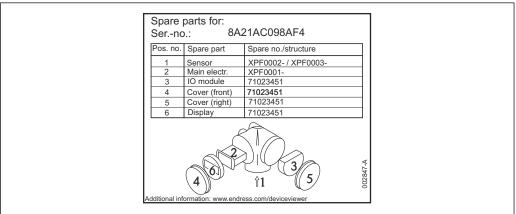
- Using the display module
 Prerequisite: The configuration of the old device was saved previously to the display module.
- Via FieldCare
 Prerequisite: The configuration of the old device was saved previously to the computer using FieldCare.

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

15.2 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.



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■ 36 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.

15.3 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.

15.4 Disposal



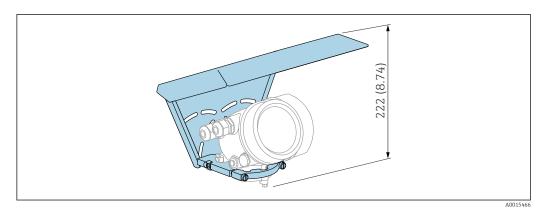
If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return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

16 Accessories

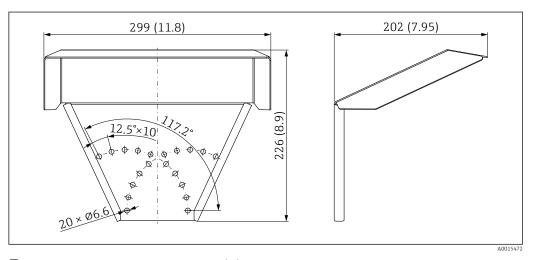
16.1 Device-specific accessories

16.1.1 Weather protection cover

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



🖪 37 Height. Unit of measurement mm (in)



■ 38 Dimensions. Unit of measurement mm (in)

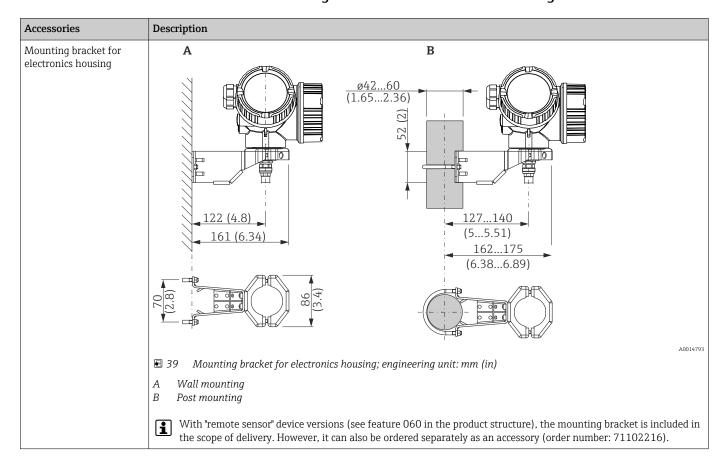
Material

316L

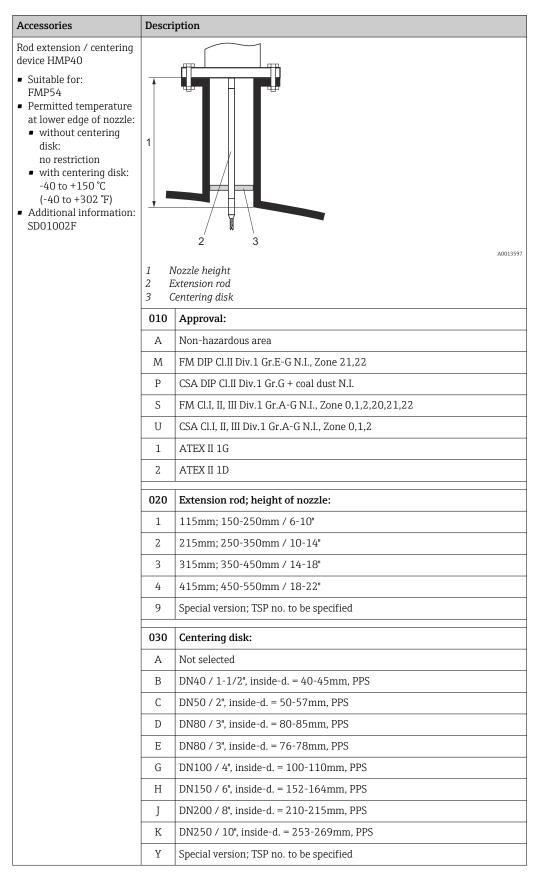
Order number for accessories:

71162242

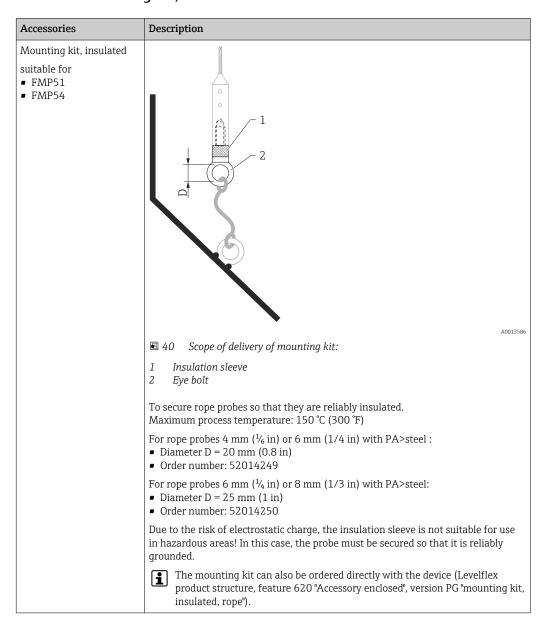
16.1.2 Mounting bracket for electronics housing



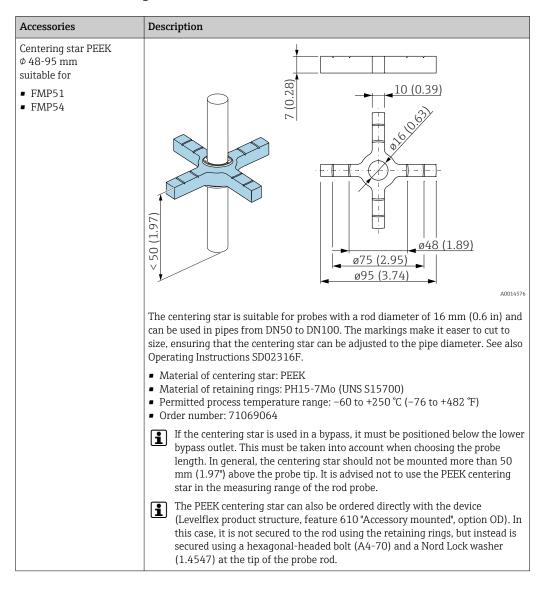
16.1.3 Rod extension / centering device



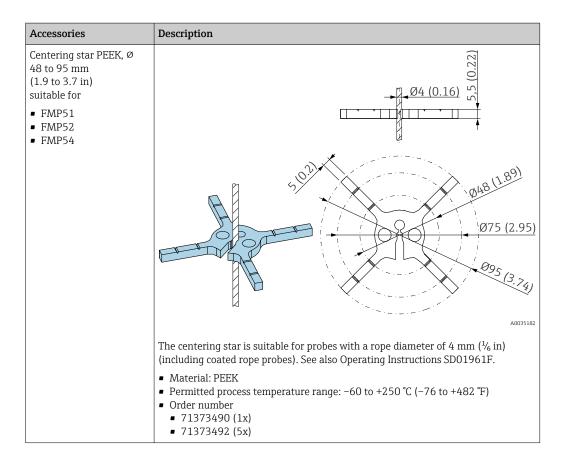
16.1.4 Mounting kit, insulated



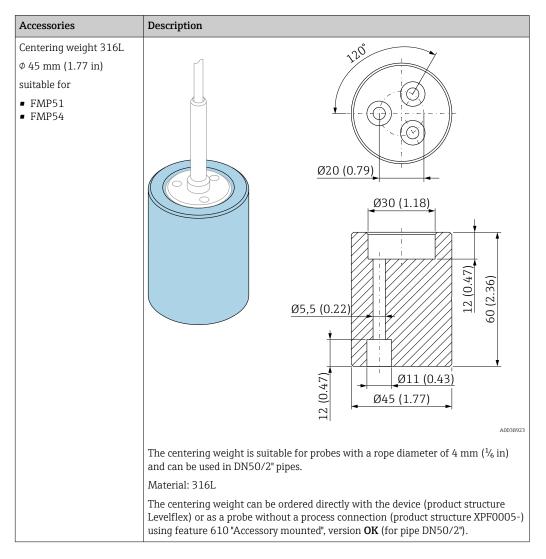
16.1.5 Centering star

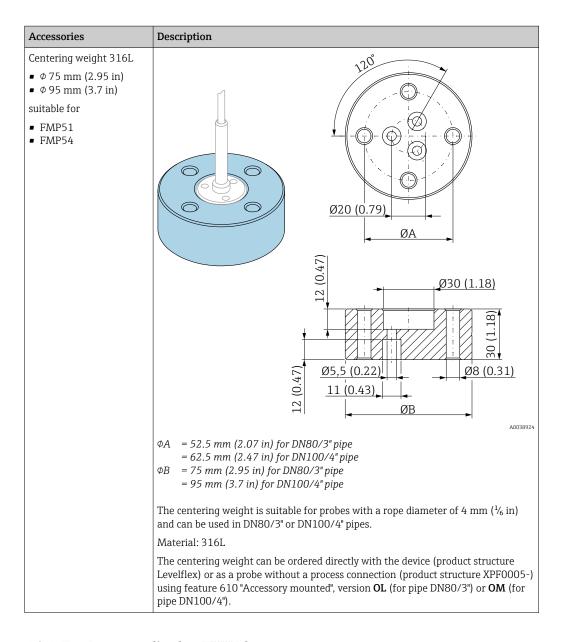


Accessories Description Centering star PFA (0.39)• \$\phi\$ 16.4 mm (0.65 in) ■ Ø 37 mm (1.46 in) suitable for ■ FMP51 ■ FMP52 ■ FMP54 A:ø16.4 (0.65) B: ø37 (1.46) A0014577 For probe 8 mm (0.3 in) For probes 12 mm (0.47 in) and 16 mm (0.63 in) The centering star is suitable for probes with a rod diameter 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).

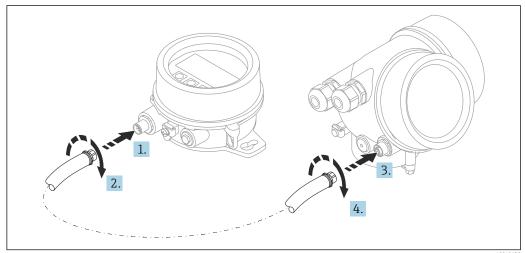


16.1.6 Centering weight





16.1.7 Remote display FHX50



Endress+Hauser 143

A0019128

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 $^{\circ}$ C (-40 to 176 $^{\circ}$ 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.

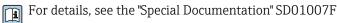
For the FHX50, the option "Prepared for display FHX50" must be selected under "Measuring device version".

- 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



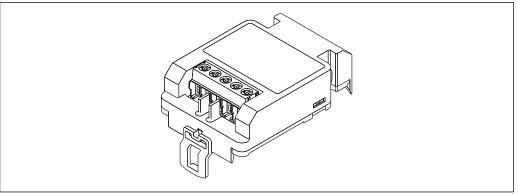
16.1.8 Overvoltage protection

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 V

■ Capacitance 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:

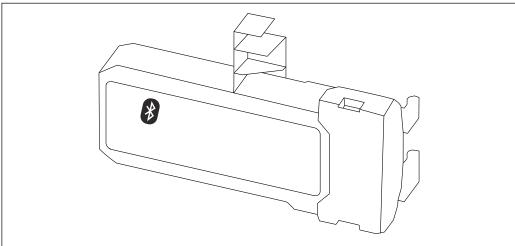
Housing GT18: 71185516Housing GT19: 71185518Housing GT20: 71185517



For details, see the "Special Documentation" SD01090F

16.1.9 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.



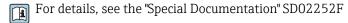
A003649

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.



16.2 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

Field Xpert SFX350

Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the non-Ex area.



For details, see Operating Instructions BA01202S

Field Xpert SFX370

Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the **non-Ex area** and the **Ex area**.



For details, see Operating Instructions BA01202S

16.3 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

16.4 **System components**

Memograph M graphic data manager

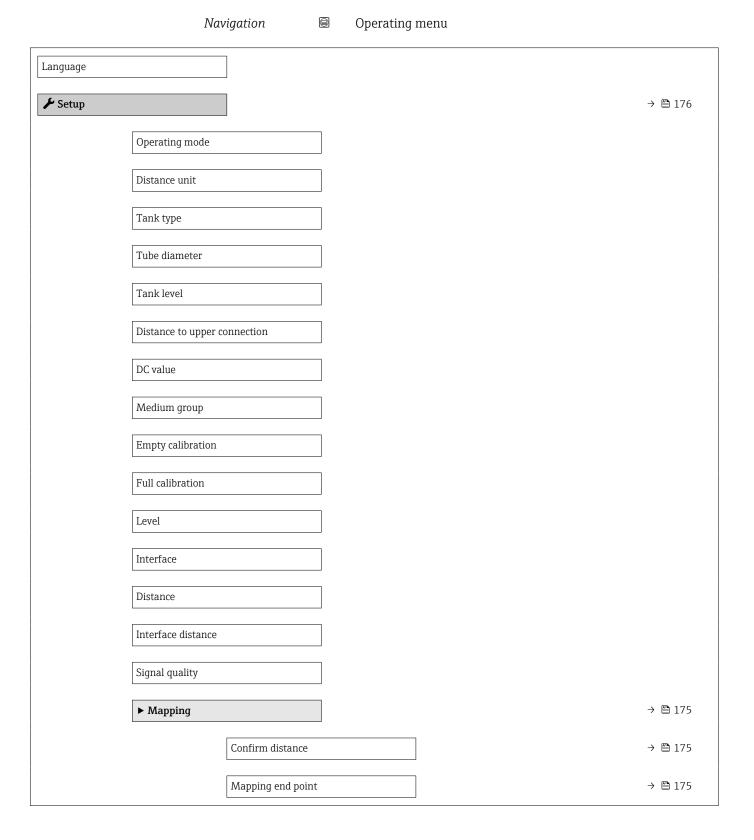
The Memograph M graphic data manager provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.



Technical Information TI00133R and Operating Instructions BA00247R

17 Operating menu

17.1 Overview of the operating menu (display module)



	Record map		→ 🖺 175
	Distance		→ 🖺 175
► Analog inputs			
			_
	► Analog input 1	to 5	→ 🖺 176
		Block tag	→ 🗎 176
		Channel	→ 🖺 176
		Process Value Filter Time	→ 🖺 177
► Advanced setup			→ 🖺 178
	Locking status		→ 🖺 178
	Access status displa	ау	→ 🗎 178
	Enter access code		→ 🗎 179
	▶ Level		→ 🗎 180
		Medium type	→ 🗎 180
		Medium property	→ 🗎 180
		Process property	→ 🗎 181
		Advanced process conditions	→ 🗎 182
		Level unit	→ 🗎 183
		Blocking distance	→ 🖺 183
		Level correction	→ 🗎 184
	► Interface		→ 🗎 185
		Process property	→ 🖺 185
		DC value lower medium	→ 🖺 185
		Level unit	→ 🖺 186

	Level correction	→ 🖺 187
	► Automatic DC calculation	→ 🖺 190
	Manual thickness upper layer	→ 🖺 190
	DC value	→ 🖺 190
	Use calculated DC value	→ 🖺 190
► Linearization		→ 🖺 192
	Linearization type	→ 🖺 194
	Unit after linearization	→ 🖺 195
	Free text	→ 🖺 196
	Maximum value	→ 🖺 197
	Diameter	→ 🖺 197
	Intermediate height	→ 🖺 198
	Table mode	→ 🖺 198
	► Edit table	
	Level	
	Customer value	
	Activate table	→ 🖺 200
► Safety settings		→ 🖺 202
	Output echo lost	→ 🖺 202
	Value echo lost	→ 🖺 202
	Ramp at echo lost	→ 🖺 203
	Blocking distance	→ 🖺 183

► Probe settings			→ 🖺 205
	Probe grounded		→ 🖺 205
	► Probe length co	rrection	→ 🖺 207
		Confirm probe length	→ 🖺 207
		Present probe length	→ 🖺 207
► Switch output			→ 🖺 208
	Switch output func	tion	→ 🖺 208
	Assign status		→ 🖺 208
	Assign limit		→ 🖺 209
	Assign diagnostic b	pehavior	→ 🖺 209
	Switch-on value		→ 🖺 210
	Switch-on delay		→ 🖺 211
	Switch-off value		→ 🖺 211
	Switch-off delay		→ 🖺 212
	Failure mode		→ 🗎 212
	Switch status		→ 🖺 212
	Invert output signa	ıl	→ 🖺 212
► Display]	→ 🖺 214
	Language		→ 🖺 214
	Format display		→ 🖺 214
	Value 1 to 4 display	у	→ 🖺 216
	Decimal places 1 to) 4	→ 🗎 216
	Display interval		→ 🖺 217
	Display damping		→ 🖺 217
	Header		→ 🖺 217

	Header text		→ 🖺 218
	Separator		→ 🖺 218
	Number format		→ 🖺 218
	Decimal places menu		→ 🖺 219
	Backlight		→ 🖺 219
	Contrast display		→ 🖺 219
•	Configuration backup display		→ 🖺 221
	Operating time		→ 🖺 221
	Last backup		→ 🖺 221
	Configuration manager	ment	→ 🖺 221
	Comparison result		→ 🖺 222
•	Administration		→ 🖺 224
	► Define access code		→ 🖺 226
	De	efine access code	→ 🖺 226
	Co	onfirm access code	→ 🖺 226
	Device reset		→ 🖺 224
억 Diagnostics			→ 🖺 227
A -41 3!			\
Actual diagnostics			→ 🖺 227
Previous diagnostics			→ 🖺 227
Operating time from re	start		→ 🖺 228
Operating time			→ 🖺 221
▶ Diagnostic list			→ 🖺 229
D	agnostics 1 to 5		→ 🖺 229

▶ Device information → □ Device tag	230 231 231 231
▶ Event list ▶ Device information Device tag	3 231
▶ Device information → □ Device tag	3 231
Device tag → (∄ 231
	∄ 231
Serial number → ®	
Firmware version → €	∄ 231
Device name → €	∄ 232
Order code → €	∄ 232
Extended order code 1 to 3 → 1	∄ 232
► Measured values → □	1 233
Distance → €	167
Level linearized → €	∄ 197
	∄ 172
	∄ 197
Thickness upper layer → ₽	₾ 235
Terminal voltage 1 \rightarrow 1	∄ 235
► Analog inputs	
► Analog input 1 to 5	∄ 235
Block tag → ®	∄ 176
Channel → €	∄ 176
Status → 1	∄ 236
Value → €	∄ 237
$\boxed{ \text{Units index} } \qquad \rightarrow \ \mathbb{I}$	∄ 237

▶ Data logging		→ 🖺 238
35 5		
	Assign channel 1 to 4	→ 🖺 238
	Logging interval	→ 🖺 239
	Clear logging data	→ 🖺 239
	▶ Display channel 1 to 4	→ 🖺 240
▶ Simulation		→ 🖺 243
	Assign measurement variable	→ 🖺 244
	Process variable value	→ 🖺 244
	Switch output simulation	→ 🖺 244
	Switch status	→ 🖺 245
	Simulation device alarm	→ 🗎 245
► Device check		→ 🖺 246
	Start device check	→ 🖺 246
	Result device check	→ 🖺 246
	Last check time	→ 🖺 246
	Level signal	→ 🖺 247
	Launch signal	→ 🖺 247
	Interface signal	→ 🖺 247
	meriae oigna	. = 21/

17.2 Overview of the operating menu (operating tool)

	Navigation		Operating menu	
≁ Setup				→ 🖺 176
	Operating mode			
	Distance unit			
	Tank type			
	Tube diameter			
	Medium group			
	Empty calibration			
	Full calibration			
	Level			
	Distance			
	Signal quality			
	Tank level			
	Distance to upper connection			
	DC value			
	Interface			
	Interface distance			
	Confirm distance			
	Present mapping			
	Mapping end point			
	Record map			
	► Analog inputs			
	► Analog inp	out 1 to 5		→ 🖺 176
		Blog	rk tag	→ 🖺 176

		Channel	→ 🖺 176
		Process Value Filter Time	→ 🖺 177
► Advan	ced setup		→ 🖺 178
	Locking status		→ 🖺 178
	Access status to	oling	→ 🖺 178
	Enter access coo	de	→ 🖺 179
	▶ Level		→ 🖺 180
		Medium type	→ 🖺 180
		Medium property	→ 🖺 180
		Process property	→ 🖺 181
		Advanced process conditions	→ 🖺 182
		Level unit	→ 🗎 183
		Blocking distance	→ 🗎 183
		Level correction	→ 🗎 184
	► Interface		→ 🗎 185
		Process property	→ 🗎 185
		DC value lower medium	→ 🖺 185
		Level unit	→ 🗎 186
		Blocking distance	→ 🗎 186
		Level correction	→ 🗎 187
		Manual thickness upper layer	→ 🗎 187
		Measured thickness upper layer	→ 🗎 188
		DC value	→ 🗎 188
		Calculated DC value	→ 🗎 188
		Use calculated DC value	→ 🖺 189

► Linearization			→ 🖺 192
	Linearization type		→ 🖺 194
	Unit after linearization		→ 🖺 195
	Free text		→ 🖺 196
	Level linearized		→ 🖺 197
	Interface linearized		→ 🖺 197
	Maximum value		→ 🗎 197
	Diameter		→ 🖺 197
	Intermediate height		→ 🖺 198
	Table mode		→ 🖺 198
	Table number		→ 🖺 199
	Level		→ 🖺 200
	Level		→ 🖺 200
	Customer value		→ 🖺 200
	Activate table		→ 🖺 200
► Safety settings			→ 🖺 202
	Output echo lost		→ 🖺 202
	Value echo lost		→ 🖺 202
	Ramp at echo lost		→ 🖺 203
	Blocking distance		→ 🗎 183
► Probe settings			→ 🗎 205
	Probe grounded		→ 🖺 205
	Present probe length		→ 🖺 205
	Confirm probe length		→ 🖺 206
		•	

► Switch o	utput	→ 🗎 208
	Switch output function	→ 🖺 208
	Assign status	→ 🖺 208
	Assign limit	→ 🖺 209
	Assign diagnostic behavior	→ 🖺 209
	Switch-on value	→ 🖺 210
	Switch-on delay	→ 🖺 211
	Switch-off value	→ 🖺 211
	Switch-off delay	→ 🖺 212
	Failure mode	→ 🗎 212
	Switch status	→ 🖺 212
	Invert output signal	→ 🖺 212
▶ Display		→ 🖺 214
	Language	→ 🖺 214
	Format display	→ 🖺 214
	Value 1 to 4 display	→ 🗎 216
	Decimal places 1 to 4	→ 🗎 216
	Display interval	→ 🖺 217
	Display Interval	→ 🖺 217
	Header	→ 🖺 217
	Header text	→ 🖺 218
	Separator	→ 🖺 218
	Number format	→ 🖺 218
	Decimal places menu	→ 🖺 219

			Backlight	→ 🖺 219
			Contrast display	→ 🖺 219
		► Configuration b	ackup display	→ 🖺 221
			Operating time	→ 🖺 221
			Last backup	→ 🖺 221
			Configuration management	→ 🖺 221
			Backup state	→ 🖺 222
			Comparison result	→ 🖺 222
		► Administration		→ 🖺 224
			Define access code	
			Device reset	→ 🖺 224
♥ Diagnostics				→ 🖺 227
	Actual diagnostics			→ 🖺 227
	Timestamp			→ 🖺 227
	Previous diagnostics	s		→ 🖺 227
	Timestamp			→ 🖺 228
	Operating time from	n restart		→ 🖺 228
	Operating time			→ 🖺 221
	► Diagnostic list			→ 🖺 229
		Diagnostics 1 to 5		→ 🖺 229
		Timestamp 1 to 5		→ 🖺 229
	► Device informat	ion		→ 🖺 231
		Device tag		→ 🖺 231
		Serial number		→ 🖺 231
		Firmware version		→ 🖺 231

	Device name		→ 🗎 2	232
	Order code		→ 🖺 2	232
	Extended order code	1 to 3	→ 🗎 2	
		103		
► Measured value	es .		→ 🖺 2	433
	Distance		→ 1	167
	Level linearized		→ 🖺 1	197
	Interface distance		→ 🖺 1	172
	Interface linearized		→ 🖺 1	197
	Thickness upper lay	er	→ 🖺 2	235
	Terminal voltage 1		→ 🖺 2	235
► Analog inputs				
	► Analog input 1 t	0.5	→ 🖺 2	235
		Block tag	→ 🖺 1	176
		Channel	→ 🖺 1	176
		Status	→ 🗎 2	236
		Value	→ 🖺 2	237
		Units index	→ 2 2	237
► Data logging			→ 🖺 2	238
	Assign channel 1 to	4	→ \(\begin{aligned}	238
	Logging interval		→ \(\begin{aligned}	239
	Clear logging data		→ 🖺 2	239
► Simulation			→ 🖺 2	243
	Assign measuremen	t variable	→ 🖺 2	244
	Process variable val	ie	→ 🖺 2	244
	Switch output simul	ation	→ = 2	244

	Switch status	→ 🖺 245
	Simulation device alarm	→ 🖺 245
► Device check		→ 🖺 246
	Start device check	→ 🖺 246
	Result device check	→ 🖺 246
	Last check time	→ 🖺 246
	Level signal	→ 🖺 247
	Launch signal	→ 🖺 247
	Interface signal	→ 🖺 247
► Heartbeat		→ 🖺 248

"Setup" menu 17.3



- 📔 🗟 : 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

Operating mode		
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	
Distance unit		
Navigation	Setup → Distance unit	

■ m	■ in	

US units

■ ft

Navigation

Length unit for distance calculation.

Prerequisite Medium type (→ 🗎 180) = Liquid

SI units

• mm

Description Select tank type.

162

Description

Selection

Tank type

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

Visibility depends on order options or device settings

Selection • Metallic

Bypass / pipeNon metallicMounted outside

■ Coaxial

Factory setting Depending on the probe

Additional information

- Depending on the probe some of the options mentioned above may not be available or there may be additional options.
- For coax probes and probes with metallic center washer **Tank type** parameter corresponds to the type of probe and cannot be changed.

Tube diameter		
Navigation		
Prerequisite	 Tank type (→	

Description Specify diameter of bypass or stilling well.

User entry 0 to 9.999 m

Medium group	

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

Prerequisite ■ For FMP51/FMP52/FMP54/FMP55: Operating mode (→ 🖺 162) = Level

■ Medium type (→ 🗎 180) = 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 ($\rightarrow \implies 180$).

The **Medium group** parameter presets the **Medium property** parameter ($\rightarrow \triangleq 180$) as follows:

Medium group	Medium property (→ 🗎 180)
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	
1 3	

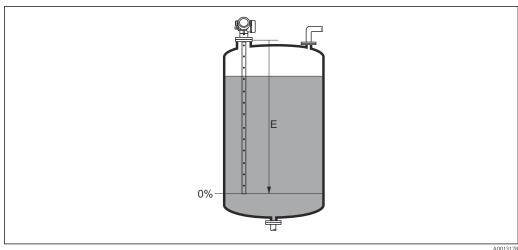
Navigation

Description Distance process connection to min. level.

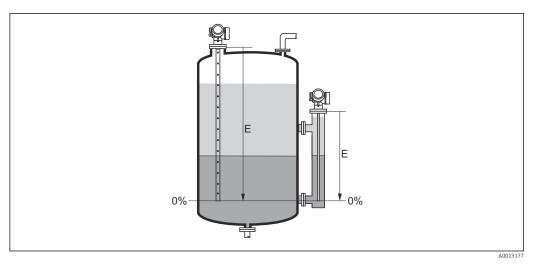
Depending on the probe User entry

Factory setting Depending on the probe

Additional information



Empty calibration (E) for level measurements in liquids



■ 42 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

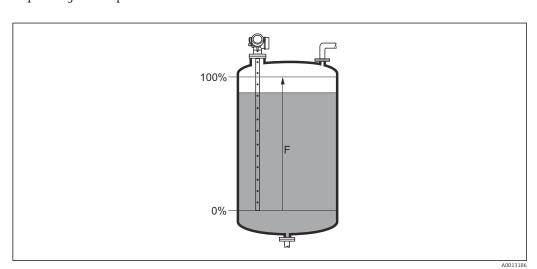
Navigation $\blacksquare \Box$ Setup \rightarrow Full calibr.

Description Span: max. level - min level.

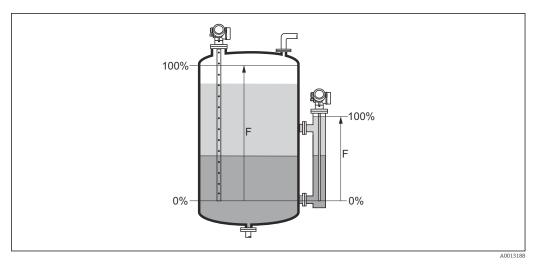
User entry Depending on the probe

Factory setting Depending on the probe

Additional information



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



■ 44 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

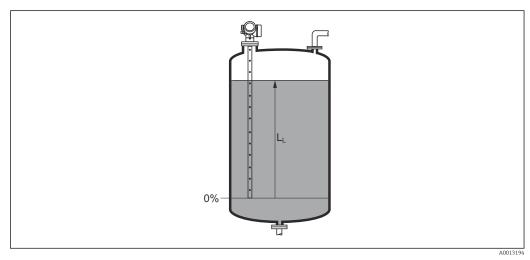
Navigation

Setup → Level

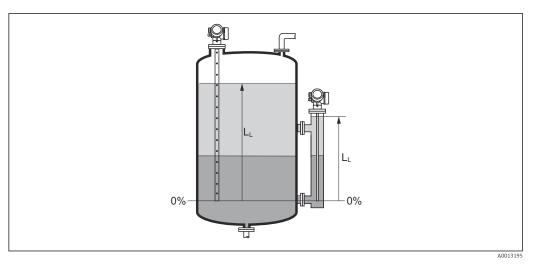
Description

Displays measured level $L_{\!\scriptscriptstyle L}$ (before linearization).

Additional information



■ 45 Level in case of liquid measurements



■ 46 Level in case of interface measurements

■ The unit is defined in the **Level unit** parameter ($\rightarrow \blacksquare 183$).

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

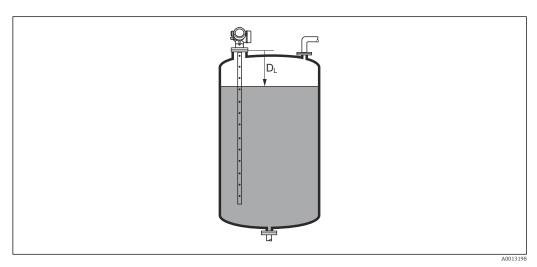
Distance

Navigation

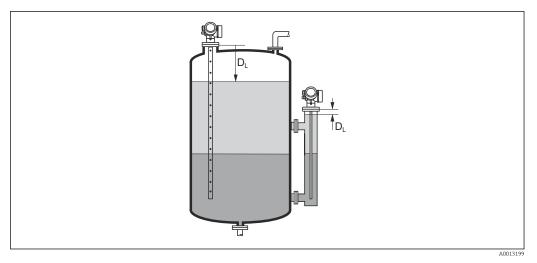
Description

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

Additional information



■ 47 Distance for liquid measurements



■ 48 Distance for interface measurements

The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 162$).

Signal quality

Navigation

Setup → Signal quality

Description

Displays the signal quality of the evaluated echo.

Additional information

Meaning of the display options

Strong

The evaluated echo exceeds the threshold by at least 10 mV.

Medium

The evaluated echo exceeds the threshold by at least 5 mV.

Weak

The evaluated echo exceeds the threshold by less than 5 mV.

No signal

The device does not find a usable echo.

The signal quality indicated in this parameter always refers to the currently evaluated echo: either the level/interface echo 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 🗎 202) = Alarm.
 - S941, if another option has been selected in **Output echo lost** (→ **□ 202**).

⁷⁾ Of these two echos the one with the lower quality is indicated.

Tank level

Navigation

Prerequisite Operating mode ($\rightarrow \triangleq 162$) = Interface

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

Selection Partially filled Fully flooded

Additional information

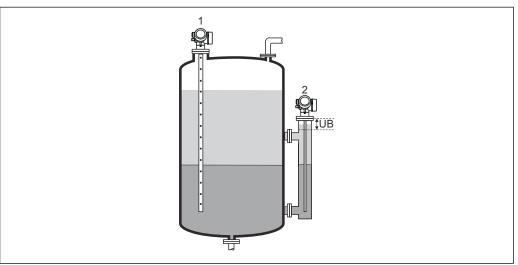
Meaning of the options

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
- Fully flooded
- UB Upper blocking distance

Distance to upper connection

Navigation

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

Description Specify distance D_U to upper connection.

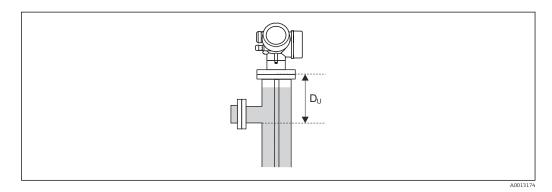
User entry 0 to 200 m

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

Factory setting

- For **Tank level (→ 🖺 169)** = **Partially filled**: 0 mm (0 in)
- For **Tank level (→ 🗎 169)** = **Fully flooded**: 250 mm (9.8 in)

Additional information



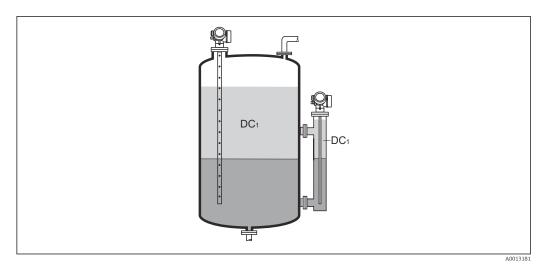
Dependence on the "Tank level" parameter

- Tank level (→ 🗎 169) = 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 (→ 🗎 169) = 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	Setup → DC value	
Prerequisite	The device has the "Interface measurement" application package 9).	
Description	Specify the relative dielectric constant $\epsilon_{\rm r}$ of the upper medium (DC $_{1}$).	
User entry	1.0 to 100	

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

Additional information



DC1 Relative dielectric constant of the upper medium.

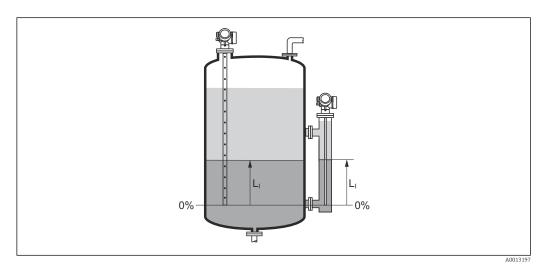
For the dielectric constants (DC values) of many media commonly used in industry, please refer to:

- Dielectric constant (DC value) Compendium CP01076F
- The Endress+Hauser "DC Values app" (available for Android and iOS)

Interface

Prerequisite Operating mode ($\rightarrow \triangleq 162$) = Interface or Interface with capacitance

Additional information



The unit is defined in the **Level unit** parameter ($\rightarrow \triangleq 183$).

Interface distance

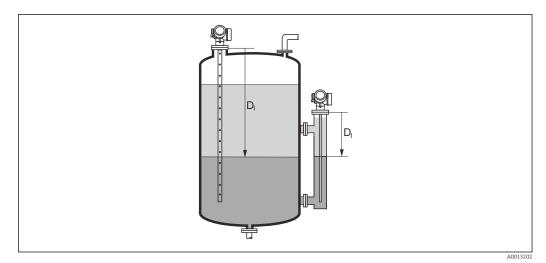
Navigation

Prerequisite

Description

Displays the measured distance D_{I} between the reference point (lower edge of flange or threaded connection) and the interface.

Additional information



The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 162$).

Confirm distance

Navigation

 \square Setup \rightarrow 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

Additional information

Meaning of the options

Manual map

To be selected if the range of mapping is to be defined manually in the **Mapping end point** parameter ($\Rightarrow \implies 174$). 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.

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

Setup → Present mapping

Description

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

¹⁰⁾ Only available for "Expert → Sensor → Echo tracking → **Evaluation mode** parameter" = "Short time history" or "Long time history"

 Mapping end point

 Navigation
 \blacksquare Setup \Rightarrow Map. end point

 Prerequisite
 Confirm distance (\Rightarrow \blacksquare 172) = 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.

i

For reference purposes the **Present mapping** parameter ($\rightarrow \implies 173$) is displayed together with this parameter. It indicates up to which distance a mapping has already been recorded.

Record map		
Navigation	Setup → Record map	
Prerequisite	Confirm distance (→ 🗎 172) = 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 .

17.3.1 "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 (→ ≅ 162).

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.

Confirm distance		Î
Navigation	Setup → Mapping → Confirm distance	
Description	→ 🖺 172	
Mapping end point		â
Navigation	Setup → Mapping → Map. end point	
Description	→ 🗎 174	
Record map		â
Navigation	Setup → Mapping → Record map	
Description	→ 🗎 174	
Distance		
Navigation	Setup → Mapping → Distance	
Description	→ 🖺 167	

17.3.2 "Analog input 1 to 5" submenu

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

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

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Analog inputs \rightarrow Analog input 1 to 5

Block tag	
Navigation	Setup → Analog inputs → Analog input 1 to 7 → Block tag
Description	Defined to be unique throughout the control system at one plant site. The tag may be changed using the FB_Tag service.
User entry	Character string comprising numbers, letters and special characters (32)
Channel	
Navigation	Setup → Analog inputs → Analog input 1 to 7 → Channel
Description	Use this function to select the input value that should be processed in the Analog Input function block.
Selection	 Uninitialized Level linearized Absolute echo amplitude Absolute EOP amplitude Absolute interface amplitude * Distance Electronic temperature EOP shift Interface linearized * Interface distance * Measured capacitance * Relative echo amplitude Relative interface amplitude * Noise of signal Terminal voltage Thickness upper layer * Calculated DC value * Analog output adv. diagnostics 2

Analog output adv. diagnostics 1

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

Process Value Filter Time

Navigation Setup \rightarrow Analog input 1 to 7 \rightarrow PV Filter Time

Description Use this function to enter the filter time specification for the filtering of the unconverted

input value (PV).

User entry Positive floating-point number

Additional information Factory setting

If the value 0 s is entered, filtering will not be performed.

17.3.3 "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

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 $(\rightarrow \implies 179)$.

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 ($\rightarrow \implies 178$).

Access status display

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow 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 $(\rightarrow \implies 179)$.

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 ($\rightarrow \implies 178$).

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
 (→ \exists 224) 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 ③ symbol in the document. On the local display, the ③ 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 writeprotected parameters after another 60 s.
- Please contact your Endress+Hauser Sales Center if you lose your access code.

"Level" submenu

Level submenu ($\rightarrow \triangleq 180$) is only visible for **Operating mode** ($\rightarrow \triangleq 162$) = **Level**

Navigation $\blacksquare \blacksquare$ 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

Solid

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

Additional information The Solid option is only available for Operating mode ($\rightarrow \equiv 162$) = 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 (→ 🖺 162) = 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 ... 1.9DC 1.9 ... 2.5

■ DC 2.5 ... 4

■ DC 2.5 ... 4 ■ DC 4 ... 7

■ DC 7 ... 15

■ DC > 15

Factory setting Depends on the **Medium type** ($\rightarrow \triangleq 180$) and **Medium group** ($\rightarrow \triangleq 163$) parameters.

180

Selection

Additional information

Dependency of "Medium type" and "Medium group"

Medium type (→ 🗎 180)	Medium group (→ 🗎 163)	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 (→ 🖺 170). 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
- 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

Navigation

Prerequisite

Operating mode ($\rightarrow \equiv 162$) = 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
 - 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 unit

Description Select level unit.

Selection SI units US units

%ftmin

Additional information

The level unit may differ from the distance unit defined in the **Distance unit** parameter $(\rightarrow \implies 162)$:

- The unit defined in the Distance unit parameter is used for the basic calibration (Empty calibration (→ □ 164) and Full calibration (→ □ 165)).
- The unit defined in the **Level unit** parameter is used to display the (unlinearized) level.

Blocking distance

Navigation $\blacksquare \Box$ 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.

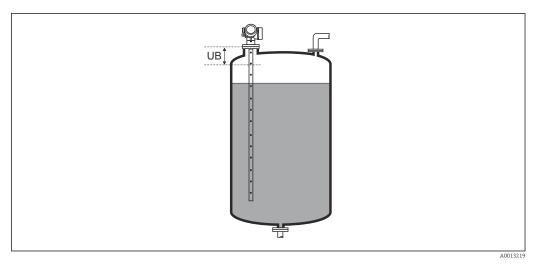
This behavior is only valid if the following two conditions are met:

- 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.

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"



■ 49 Blocking distance (UB) for liquid measurements

Level correction

Navigation \blacksquare 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 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 (→ 🖺 162) = 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).

Level unit		<u> </u>
Navigation	Setup → Ad	vanced setup → Interface → Level unit
Description	Select level unit.	
Selection	SI units "% "m "mm	US units ■ ft ■ in
Additional information	The level unit may (→ 🗎 162):	differ from the distance unit defined in the Distance unit parameter

Blocking distance

calibration ($\rightarrow \Box 164$) and Full calibration ($\rightarrow \Box 165$)).

■ The unit defined in the **Distance unit** parameter is used for the basic calibration (**Empty**

• The unit defined in the **Level unit** parameter is used to display the (unlinearized) level

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

and interface position.

Description Specify upper blocking distance UB.

User entry 0 to 200 m

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

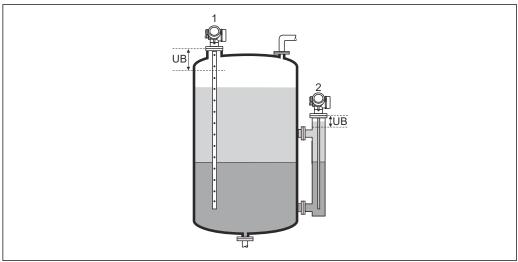
• For rod and rope probes up to 8 m (26 ft): 200 mm (8 in)

■ 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

Level correction	â
------------------	---

Navigation $\blacksquare \Box$ 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

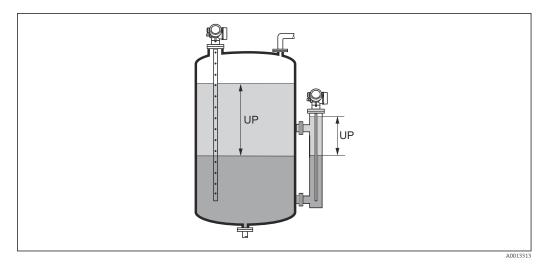
Description Specify the manually determined interface thickness UP (i.e. the thickness of the upper

medium).

User entry 0 to 200 m

Endress+Hauser

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 uppo	er layer	
Navigation		
Description	Displays the measured interface thickness. (Thickness UP of the upper medium).	
DC value		
Navigation		
Description	Displays relatvie dielectric constant $\epsilon_{\rm r}$ of the upper medium (DC1) before correction.	
Calculated DC value		
Navigation		
Description	Displays calculated (i.e. corrected) relative dielectric constant ε_r (DC1) of the upper	
1	medium.	

Use calculated DC value

Navigation \square 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 ($\Rightarrow \triangleq 188$) is displayed together with this parameter.

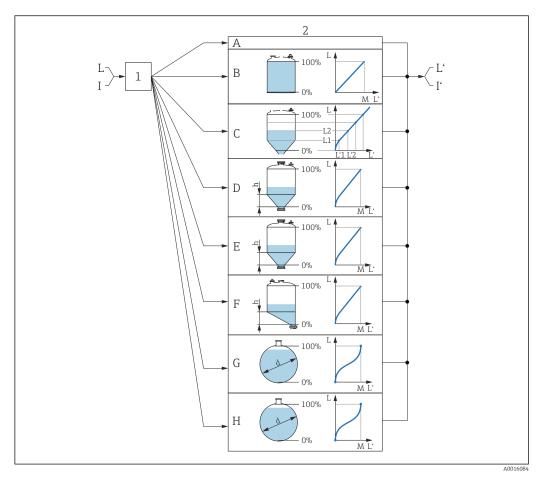
"Automatic DC calculation" wizard

- 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 (→ ≅ 185)
- 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		$Setup \to Advanced \ setup \to Interface \to Autom. \ DC \ calc. \to Man.thick.up.lay$	
Description	→ 🖺	187	
DC value			Î
Navigation		Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Autom. DC calc. \rightarrow DC value	
Description	→ 🖺	188	
Use calculated DC value			<u> </u>
Navigation		Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Autom. DC calc. \rightarrow Use calc. DC	
Description	→ 🖺	189	

"Linearization" submenu



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

- 1 Selection of linearization type and unit
- 2 Configuration of the linearization
- A Linearization type ($\rightarrow \blacksquare 194$) = None
- *B* Linearization type (\rightarrow 🖺 194) = Linear
- C Linearization type ($\Rightarrow \triangle 194$) = Table
- D Linearization type ($\rightarrow = 194$) = Pyramid bottom
- E Linearization type ($\rightarrow = 194$) = Conical bottom
- *F* Linearization type ($\rightarrow \equiv 194$) = Angled bottom
- *H* Linearization type (\rightarrow 🖺 194) = Sphere
- I For "Operating mode (\rightarrow \cong 162)" = "Interface" or "Interface with capacitance": interface before linearization (measured in the level unit)
- "For "Operating mode ($\rightarrow \stackrel{\triangle}{=} 162$)" = "Interface" or "Interface with capacitance": interface after linearization (corresponds to volume or weight)
- L Level before linearization (measured in level unit)
- L' Level linearized ($\rightarrow \equiv 197$) (corresponds to volume or weight)
- M Maximum value (→ 🖺 197)
- d Diameter ($\rightarrow \square$ 197)
- h 🛾 Intermediate height (→ 🖺 198)

Structure of the submenu on the local display

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Linearization

► Linearization	
Linearization type	
Unit after linearizat	tion
Free text	
Maximum value	
Diameter	
Intermediate heigh	t
Table mode	
► Edit table	
	Level
	Customer 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	n
	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

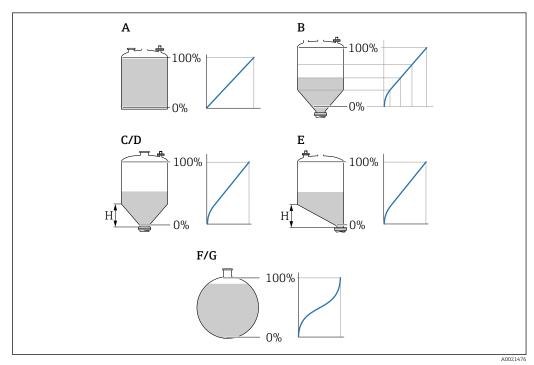
Navigation Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Lineariz. type

Description Select linearization type.

Selection ■ None

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

Additional information



■ 51 Linearization types

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

Meaning of the options

None

The level is 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 (→

 195)
- Maximum value (→ 🖺 197): 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 (→ 🗎 198)
- For every point in the table: **Customer value (→ 🖺 200)**

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** (→ 🗎 197): maximum volume or weight
- **Intermediate height (→ 🗎 198)**: 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** (→ 🗎 197): maximum volume or weight
- **Intermediate height (→** 🗎 **198)**: 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 (→ 🖺 197): maximum volume or weight
- **Intermediate height (→** 🗎 **198)**: 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 (→ 🖺 197): maximum volume or weight
- **■** Diameter (→ 🗎 197)

Sphere

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

- Maximum value (→ 🖺 197): maximum volume or weight
- **■** Diameter (→ 🗎 197)

Unit after linearization

Navigation

Prerequisite

Linearization type (\rightarrow $\stackrel{\triangle}{=}$ **194**) ≠ 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.]
- $1043 = [ft^3]$
- $1571 = [cm^3]$
- \blacksquare 1035 = [dm³]
- $1034 = [m^3]$
- 1038 = [l]
- 1041 = [hl]
- **■** 1342 = [%]
- 1010 = [m]
- 1012 = [mm]
- 1018 = [ft]
- 1019 = [inch]
- 1351 = [l/s]
- 1352 = [l/min]
- 1353 = [l/h]
- $-1347 = [m^3/s]$
- $1348 = [m^3/min]$
- \blacksquare 1349 = $[m^3/h]$
- \blacksquare 1356 = [ft³/s]
- $1357 = [ft^3/min]$
- $1358 = [ft^3/h]$
- 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 ($\rightarrow \equiv 196$).

Free text

Navigation

Prerequisite

Unit after linearization ($\rightarrow \equiv 195$) = Free text

Description

Enter unit symbol.

Level linearize	hε	

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 $\rightarrow \triangleq 195$.

• 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 (→ 🖺 162) = Interface or Interface with capacitance

Description Displays the linearized interface height.

Additional information The unit is defined in the **Unit after linearization** parameter $\rightarrow \triangleq 195$.

Maximum value

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

Prerequisite Linearization type ($\rightarrow \triangleq 194$) has one of the following values:

Linear

Pyramid bottomConical bottomAngled bottomHorizontal cylinder

Sphere

User entry -50 000.0 to 50 000.0 %

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

Prerequisite Linearization type (→ 🗎 194) 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 ($\rightarrow \triangleq 162$).

Intermediate height

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

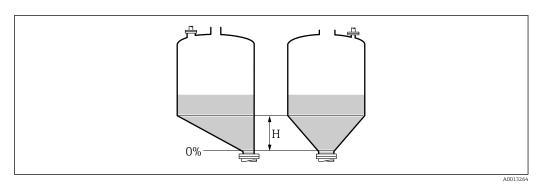
Prerequisite Linearization type $(\rightarrow \ \ \ \ \ \ \ \ \ \ \)$ has one of the following values:

Pyramid bottomConical bottom

Angled bottom

User entry 0 to 200 m

Additional information



H Intermediate height

The unit is defined in the **Distance unit** parameter ($\Rightarrow \triangleq 162$).

Table mode

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

Prerequisite Linearization type (→ 🗎 194) = Table

Description Select editing mode of the linearization table.

- Manual
 Semiautomatic *
 Clear table
- Sort table

198

Selection

^{*} 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** (→ 🗎 164) and **Full calibration** (→ 🗎 165) 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** $(\rightarrow B198) = Clear table$). Then enter a new table.

How to enter the table

■ Via FieldCare

The table points can be entered via the **Table number** (\rightarrow \cong **199**), **Level** (\rightarrow \cong **200**) and **Customer value** (\rightarrow \cong **200**) 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 $(\rightarrow \implies 183)$ beforehand.

Table number		<u> </u>
Navigation		
Prerequisite	Linearization type (→ 🗎 194) = Table	
Description	Select table point you are going to enter or change.	
User entry	1 to 32	

Level (Manual)	
Navigation	
Prerequisite	 Linearization type (→ 🖺 194) = Table Table mode (→ 🖺 198) = Manual
Description	Enter level value of the table point (value before linearization).
User entry	Signed floating-point number
Level (Semiautomatic)	
Navigation	
Prerequisite	 Linearization type (→ 🖺 194) = Table Table mode (→ 🖺 198) = Semiautomatic
Description	Displays measured level (value before linearization). This value is transmitted to the table.
Customer value	
Navigation	
Prerequisite	Linearization type (→ 🗎 194) = Table
Description	Enter linearized value for the table point.
User entry	Signed floating-point number
Activate table	<u>@</u>
Navigation	
Prerequisite	Linearization type (→ 🗎 194) = 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 \rightleftharpoons **194**) = **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 ($\rightarrow \triangleq 203$).

■ Value echo lost ¹²⁾

In the case of a lost echo the output assumes the value defined in the **Value echo lost** parameter ($\Rightarrow \triangleq 202$).

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 (→ 🗎 202) = 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:

¹²⁾ Only visible if "Linearization type ($\rightarrow \triangleq 194$)" = "None"

Ramp at echo lost

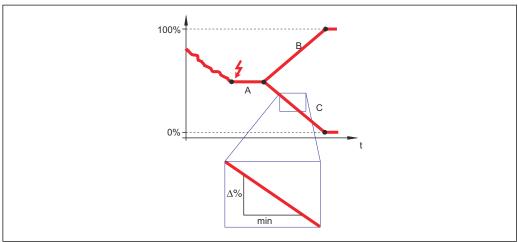
Navigation Setup \rightarrow Advanced setup \rightarrow Safety sett. \rightarrow Ramp echo lost

Prerequisite Output echo lost ($\rightarrow \triangleq 202$) = Ramp at echo lost

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

User entry Signed floating-point number

Additional information



- Delay time echo lost
- В Ramp at echo lost (→ 🖺 203) (positive value)
- Ramp at echo lost ($\rightarrow \triangleq 203$) (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%.

Disching distance	
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

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

100 mm (3.9 in) for all antenna types

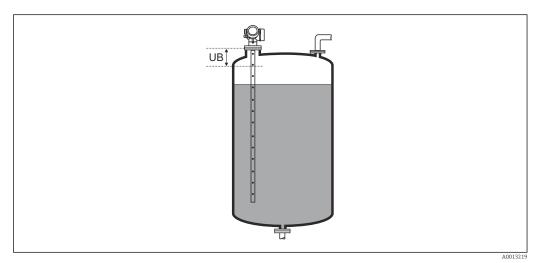
Additional information

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.

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

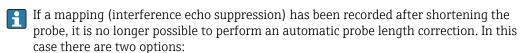


■ 52 Blocking distance (UB) for liquid measurements

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

"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** ($\rightarrow \implies 206$) = **Manual input** in order to enter the value manually.



- Delete the map using the **Record map** parameter ($\rightarrow \boxminus 174$) before performing the automatic probe length correction. After the probe length correction, a new map can be recorded using the **Record map** parameter ($\rightarrow \boxminus 174$).
- Alternative: Select Confirm probe length (→ \(\beta \) 206) = Manual input and enter the probe length manually into the Present probe length parameter → \(\beta \) 205.
- An automatic probe length correction is only possible after the correct option has been selected in the **Probe grounded** parameter ($\rightarrow \triangleq 205$).

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

Probe grounded		<u> </u>
Navigation	Setup → Advanced setup → Probe settings → Probe grounded	
Prerequisite	Operating mode ($\rightarrow \equiv 162$) = 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 (→ ≅ 206) = 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 $\rightarrow \triangleq 205$ 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 $\rightarrow \implies 205$. 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 $\rightarrow \cong 205$. This procedure has to be repeated until the displayed value matches the actual length of the probe.

■ Probe covered

To be selected if the probe is (partially or completely) covered. A probe length correction is impossible in this case. The device quits the sequence.

Manual input

To be selected if no automatic probe length correction is to be performed. Instead, the actual length of the probe must be entered manually into the **Present probe length** parameter $\rightarrow \stackrel{\text{\tiny length}}{=} 205^{14}$.

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

i

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 ($\Rightarrow \triangleq 205$).

Navigation

Confirm probe length		
Navigation		Į.
Description	→ 🖺 206	
Present probe length		
Navigation		
Description	→ 🗎 205	

"Switch output" submenu

The **Switch output** submenu ($\rightarrow \triangleq 208$) is only visible for devices with switch output. ¹⁵⁾

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

Switch output function

Navigation

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 ($\rightarrow \triangleq 209$) 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 ($\rightarrow \stackrel{\triangle}{=} 210$)
- Switch-off value (→ 🖹 211)

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 ($\rightarrow \stackrel{\triangle}{=} 208$).

The **O**

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

Assign status

Navigation

 \blacksquare Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Assign status

Prerequisite

Switch output function (→ 🗎 208) = Digital Output

Selection

- Off
- Digital output AD 1
- Digital output AD 2

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

- Digital output 1
- Digital output 2
- Digital output 3
- Digital output 4
- Digital output 5
- Digital output 6
- Digital output 7
- Digital output 8

Additional information

The **Digital output AD 1** and **Digital output AD 2** options refer to the Advanced Diagnostic Blocks. A switch signal generated in these blocks can be transmitted via the switch output.

Assign limit

Navigation Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Assign limit

Prerequisite Switch output function ($\rightarrow \stackrel{\triangle}{=} 208$) = 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 *

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

Prerequisite Switch output function (→ 🗎 208) = Diagnostic behavior

Description Select diagnostic behavior for switch output.

Selection • Alarm

- Alarm or warning
- Warning

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

Switch-on value

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

Prerequisite Switch output function ($\rightarrow \triangleq 208$) = Limit

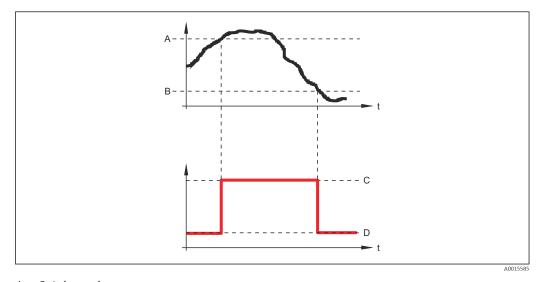
Description Enter measured value for the switch-on point.

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

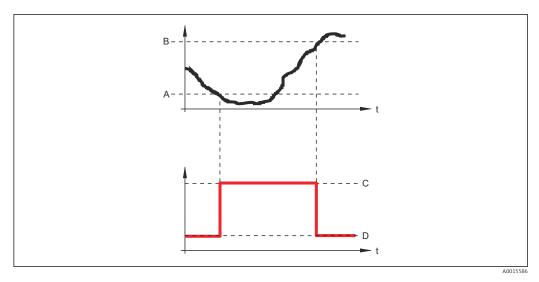
- The output is closed if the measured value is larger than **Switch-on value**.
- The output is opened if the measured value is smaller than **Switch-off value**.



- 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		
Navigation	$Setup \to Advanced \ setup \to Switch \ output \to Switch \text{-on delay}$	

Prerequisite ■ Switch output function (→ 🗎 208) = Limit ■ Assign limit (→ 🗎 209) ≠ Off

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

User entry 0.0 to 100.0 s

Switch-off value	

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

Prerequisite Switch output function (→ 🖺 208) = 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

 $(\rightarrow \stackrel{\triangle}{=} 210).$

Switch-off delay		
Navigation	⊗ □ Setup $→$ Advanced setup $→$ Switch output $→$ Switch-off delay	
Prerequisite	 Switch output function (→ \exists 208) = Limit Assign limit (→ \exists 209) ≠ Off 	
Description	Define delay for the switch-off of status output.	
User entry	0.0 to 100.0 s	
Failure mode		
Navigation		
Prerequisite	Switch output function ($\rightarrow \stackrel{\triangle}{=} 208$) = Limit or Digital Output	
Description	Define output behavior in alarm condition.	
Selection	Actual statusOpenClosed	
Additional information		
Switch status		
Navigation		
Description	Shows the current switch output status.	
Invert output signal		
Navigation		
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

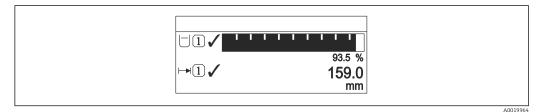
- 1 value, max. size
- 1 bargraph + 1 value
- 2 values
- 1 value large + 2 values
- 4 values

Visibility depends on order options or device settings

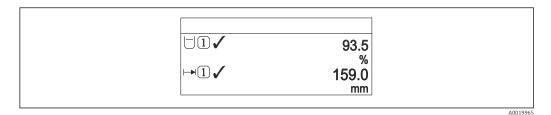
Additional information



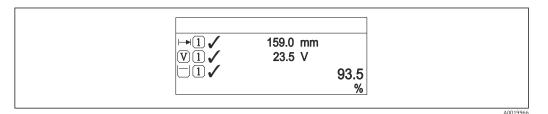
■ 53 "Format display" = "1 value, max. size"



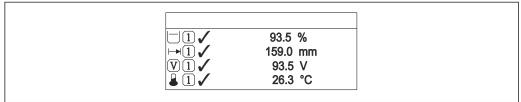
■ 54 "Format display" = "1 bargraph + 1 value"



■ 55 "Format display" = "2 values"

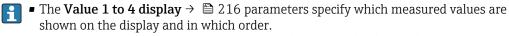


■ 56 "Format display" = "1 value large + 2 values"



A001996

₺ 57 "Format display" = "4 values"



■ 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 (\Rightarrow \cong 217).

Value 1 to 4 display

Navigation

Description

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

Selection

- Level linearized
- Distance
- Interface linearized *
- Interface distance
- Thickness upper layer *
- Terminal voltage
- Electronic temperature
- Measured capacitance
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2
- Analog output 1
- Analog output 2
- Analog output 3
- Analog output 4
- Analog output 5
- Analog output 6
- Analog output 7
- Analog output 8

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

Navigation

Description

Select the number of decimal places for the display value.

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

Selection ■ x

X.XX.XXX.XXXX.XXXX

Additional information

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

Display interval

Navigation $\blacksquare \Box$ 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 🗈

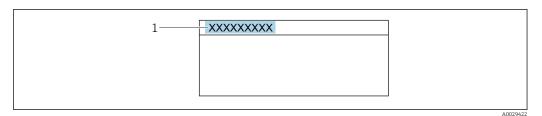
Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Header

Description Select header contents on local display.

Selection • Device tag

■ Free text

Additional information



1 Position of the header text on the display

Meaning of the options

Device tag

Is defined in the **Device tag** parameter.

■ Free text

Is defined in the **Header text** parameter ($\rightarrow \implies 218$).

Header text		A
Navigation		
Prerequisite	Header (→ 🖺 217) = 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		<u> </u>
Navigation		
Description	Select decimal separator for displaying numerical values.	
Selection	•. •,	

Number format		
Navigation		
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	
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 $\stackrel{\triangle}{=}$ 216 parameters.

• The setting does not affect the accuracy of the measurement or the calculations.

Backlight	
Navigation	Setup → Advanced setup → Display → Backlight
Prerequisite	The device has the SD03 local display (with optical keys).
Description	Switch the local display backlight on and off.
Selection	■ 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	
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 ($\Rightarrow \implies 162$)).

Navigation

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

_	. •	
()n	eratina	time
\mathbf{v}	CIGUIIU	uiiic

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
- Display incompatible

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 ($\rightarrow \implies 222$).

Clear backup data

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

- While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.
- If an existing backup is restored to a different device using the **Restore** option, it may occur that some device functionalities are no longer available. In some cases even a device reset will not restore the original status.

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

Backup state	
Navigation	Setup → Advanced setup → Conf.backup disp → Backup state
Description	Displays which backup action is currently in progress.
Comparison result	
Navigation	
Description	Comparison between present device data and display backup.

Additional information

Meaning of the display options

Settings identical

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

Settings not identical

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

No backup available

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

Backup settings corrupt

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

Check not done

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

■ Dataset incompatible

The data sets are incompatible and can not be compared.

To start the comparison, set **Configuration management** ($\rightarrow \triangleq 221$) = **Compare**.

If the transmitter configuration has been duplicated from a different device by Configuration management (→ 🗎 221) = 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

Define access code

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

Description Define release code for write access to parameters.

User entry 0 to 9999

Additional information

- If the factory setting is not changed or if "O" 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 $(\rightarrow \implies 179)$.
- 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 ($\Rightarrow \triangleq 226$).

Device reset

Navigation \square Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Device reset

Selection • Cancel

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

Additional information Mea

Meaning of the options

Cancel

No action

■ To factory defaults

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

To delivery settings

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

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

Of customer settings

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

■ To transducer defaults

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

Restart device

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

"Define access code" wizard

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

Define access code		A
Navigation		de
Description	→ 🖺 224	
Confirm access code		<u> </u>
Navigation		
Description	Confirm the entered access code.	
User entry	0 to 9 999	

17.4 "Diagnostics" menu

Actual diagnostics Navigation Diagnostics \rightarrow 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 (i) 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,

Endress+Hauser 227

and remedy measures, can be viewed via the (i) symbol on the display.

Tim	estamp
11111	estamo

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

Description Indicates how long the device has been in operation.

Additional information *Maximum time*

9999 d (≈ 27 years)

17.4.1 "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

17.4.2 "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 ($\rightarrow \implies 230$). 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

17.4.3 "Device information" submenu

Navigation \Box Diagnostics \rightarrow Device info

Device tag		
Navigation	 □ Diagnostics → Device info → Device tag □ Diagnostics → Device info → Device tag 	
Description	Enter tag for measuring point.	
User interface	Character string comprising numbers, letters and special characters	
Serial number		
Navigation	☐ Diagnostics → Device info → Serial number	
	Diagnostics → Device info → Serial number	
Additional information	 Uses of the serial number To identify the device quickly, e.g. when contacting Endress+Hauser. To obtain specific information on the device using the Device Viewer: www.endress.com/deviceviewer 	
	The serial number is also indicated on the nameplate.	

Firmware version	
Navigation	 □ Diagnostics → Device info → Firmware version □ Diagnostics → Device info → Firmware version
User interface	xx.yy.zz
Additional information	For firmware versions differing only in the last two digits ("zz") there is no difference concerning functionality or operation.

Device name				
Navigation		Diagnostics → Device info → Device name		
		Diagnostics \rightarrow Device info \rightarrow Device name		
Order code			<u> </u>	
Navigation		Diagnostics → Device info → Order code		
-		Diagnostics → Device info → 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		Diagnostics \rightarrow Device info \rightarrow Ext. order cd. 1		
		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.			

17.4.4 "Measured values" submenu

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

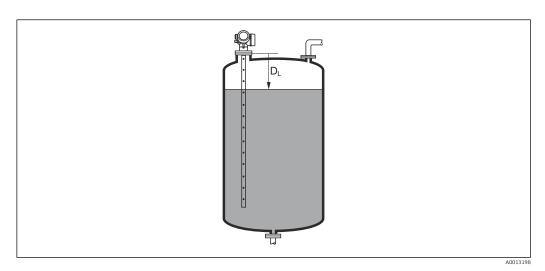
Distance

Navigation

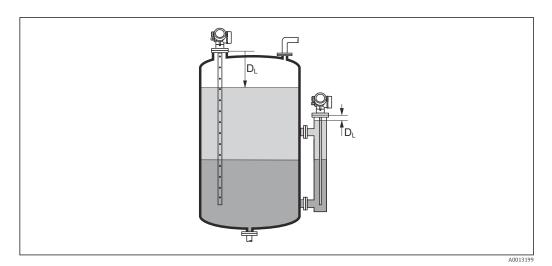
Description

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

Additional information



■ 58 Distance for liquid measurements



■ 59 Distance for interface measurements

The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 162$).

Level linearized

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

Description Displays linearized level.

Additional information The unit is defined by the **Unit after linearization** parameter $\rightarrow \triangleq 195$.

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

Interface distance

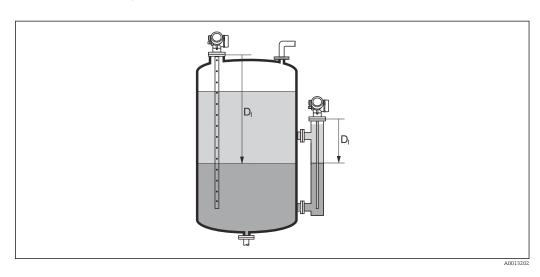
Navigation \blacksquare Diagnostics \rightarrow Measured val. \rightarrow Interface dist.

Prerequisite Operating mode (→ 🖺 162) = 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}$

threaded connection) and the interface.

Additional information



ho The unit is defined in the **Distance unit** parameter (ho ho 162).

Interface linearized

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

Prerequisite Operating mode (→ 🖺 162) = Interface or Interface with capacitance

Description Displays the linearized interface height.

Additional information The unit is defined in the **Unit after linearization** parameter $\rightarrow \triangleq 195$.

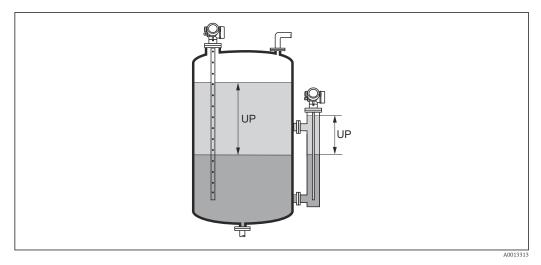
Thickness upper layer

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

Prerequisite Operating mode ($\rightarrow \equiv 162$) = 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 $\rightarrow \triangleq 195$.

Terminal voltage 1

Navigation

17.4.5 "Analog input 1 to 5" submenu

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

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

Navigation $\blacksquare \blacksquare$ Diagnostics \rightarrow Analog inputs \rightarrow Analog input 1 to 5

Block tag	
Navigation	
Description	Defined to be unique throughout the control system at one plant site. The tag may be changed using the FB_Tag service.
User entry	Character string comprising numbers, letters and special characters (32)
Channel	
Navigation	
Description	Use this function to select the input value that should be processed in the Analog Input function block.
Selection	 Uninitialized Level linearized Absolute echo amplitude Absolute EOP amplitude Absolute interface amplitude* Distance Electronic temperature EOP shift Interface linearized * Interface distance * Measured capacitance * Relative echo amplitude Relative interface amplitude * Noise of signal Terminal voltage Thickness upper layer * Calculated DC value * Analog output adv. diagnostics 2 Analog output adv. diagnostics 1

Status

Navigation \blacksquare Diagnostics \rightarrow Analog inputs \rightarrow Analog input 1 to 7 \rightarrow Status

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

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

Value	
Navigation	
Description	Indicates the output value of the AI block.
Units index	
Navigation	
Description	Indicates the unit of the output value.

17.4.6 "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
- Analog output 1
- Analog output 2
- Analog output 3
- Analog output 4

Additional information

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

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

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

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

Visibility depends on order options or device settings

Logging interval

Navigation

- \square Diagnostics \rightarrow Data logging \rightarrow Logging interval
- Diagnostics → Data logging → Logging interval

User entry

1.0 to 3600.0 s

Additional information

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

- 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

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

Clear logging data

Navigation

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

Selection

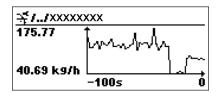
- Cancel
- Clear data

"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

"Simulation" submenu 17.4.7

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.

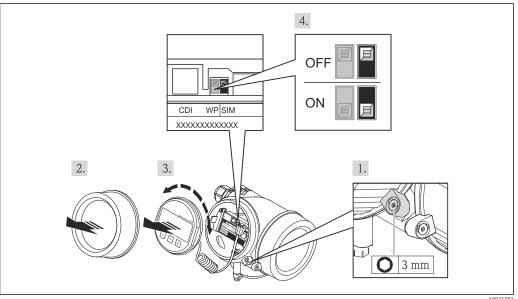
Conditions which can be simulated

Condition to be simulated	Associated parameters
Specific value of a process variable	 Assign measurement variable (→ 🖺 244) Process variable value (→ 🖺 244)
Specific state of the switch output	 Switch output simulation (→ □ 244) Switch status (→ □ 245)
Existence of an alarm	Simulation device alarm (→ 🖺 245)

Enable/disable simulation

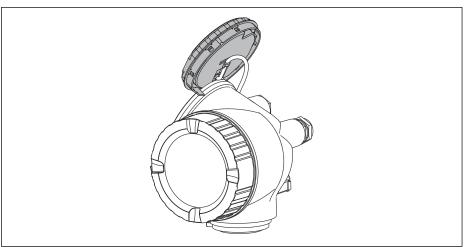
The simulation of measured values can be enabled or disabled via a hardware switch (SIM switch) at the electronics. Simulating a measured value is only possible if the SIM switch is in the ON position.

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



- 1. Loosen the securing clamp.
- 2. Unscrew the housing cover.

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

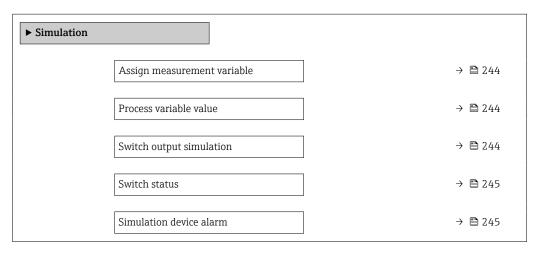


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- 4. SIM switch in the **ON** position: measured values can be simulated. SIM switch in the **OFF** position (factory setting): Simulation of measured values is disabled.
- 5. Feed the spiral cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment in the desired direction until it engages.
- 6. Screw the electronics compartment cover closed and tighten the securing clamp.

Structure of the submenu

Navigation \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 **Process variable value** parameter ($\rightarrow \triangleq 244$).
- If **Assign measurement variable** ≠ **Off**, a simulation is active. This is indicated by a diagnotic message of the *Function check (C)* category.

Process variable value	
Process variable value	

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Proc. var. value

Prerequisite Assign measurement variable ($\rightarrow \triangleq 244$) $\neq 0$ 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

Visibility depends on order options or device settings

Switch status

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

Prerequisite Switch output simulation ($\Rightarrow \triangleq 244$) = 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 $\blacksquare \Box$ 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.

Diagnostic event simulation

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Diag. event sim.

Description Select a diagnostic event to simulate this event.

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

categories (Diagnostic event category parameter).

17.4.8 "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

Level signal

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 Diagnostics \rightarrow Device check \rightarrow Interface signal

Prerequisite ■ Operating mode (→ 🖺 162) = 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

17.4.9 "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

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