01.01.zz (Device firmware)

Products Solutions

utions Services

Operating Instructions Levelflex FMP53 PROFIBUS PA

Guided wave radar







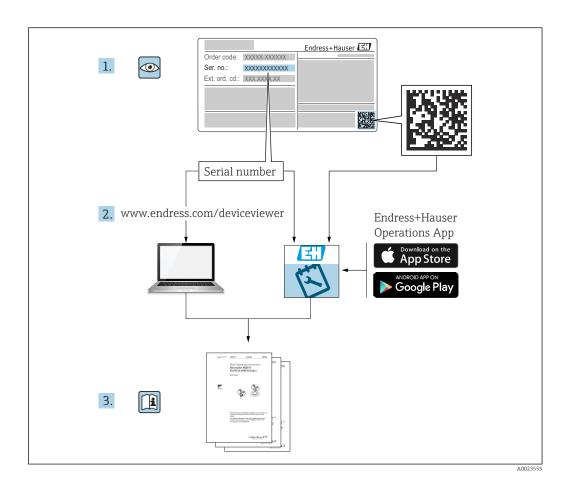


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1 Important document information

1.1 Purpose of this document

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

1.2 Symbols

1.2.1 Safety symbols

A DANGER

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

WARNING

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

A CAUTION

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

NOTICE

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

1.2.2 Electrical symbols



Alternating current



Direct current and alternating current



Direct current



Ground connection

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

Protective earth (PE)

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

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

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

1.2.3 Tool symbols



Phillips head screwdriver



Flat blade screwdriver



Torx screwdriver



Allen key



Open-ended wrench

1.2.4 Symbols for certain types of information and graphics

✓ Permitted

Procedures, processes or actions that are permitted

✓ ✓ Preferred

Procedures, processes or actions that are preferred

X Forbidden

Procedures, processes or actions that are forbidden

Tip

Indicates additional information

1

Reference to documentation

M

Reference to graphic



Notice or individual step to be observed

1., 2., 3.

Series of steps

Result of a step

(1)

Visual inspection



Operation via operating tool



Write-protected parameter

1, 2, 3, ...

Item numbers

A, B, C, ...

Views

$\triangle \rightarrow \square$ Safety instructions

Observe the safety instructions contained in the associated Operating Instructions

Temperature resistance of the connection cables

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

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)

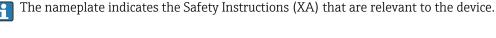
Guide that takes you quickly to the 1st measured value

Functional Safety Manual (FY)

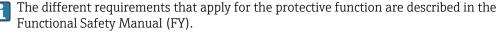
The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

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.



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.



1.4 Terms and abbreviations

BA

1.3.4

Document type "Operating Instructions"

KA

Document type "Brief Operating Instructions"

ΤI

Document type "Technical Information"

SD

Document type "Special Documentation"

XA

Document type "Safety Instructions"

PI

Nominal pressure

MWP

Maximum working pressure

The MWP is indicated on the nameplate.

ToF

Time of Flight

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

Relative dielectric constant

PLC

Programmable logic controller (PLC)

CDI

Common Data Interface

BD

Blocking Distance; no signals are analyzed within the BD.

PLC

Programmable logic controller (PLC)

CDI

Common Data Interface

PFS

Pulse Frequency Status (Switch output)

1.5 Registered trademarks

PROFIBUS®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

Bluetooth®

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TEFLON®

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

TRI-CLAMP®

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

2 Basic safety instructions

2.1 Requirements for the personnel

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

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

The operating personnel must fulfill the following requirements:

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

2.2 Intended use

Application and media

The measuring device described in this manual is intended only for the level 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
- ► 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

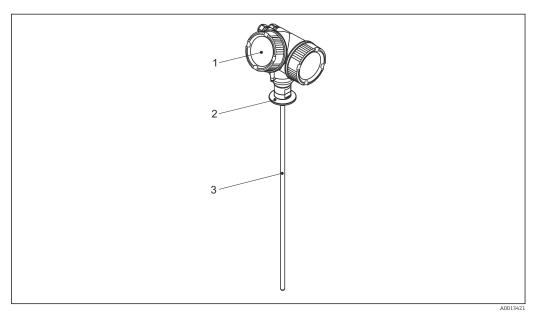
The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied.

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

3 Product description

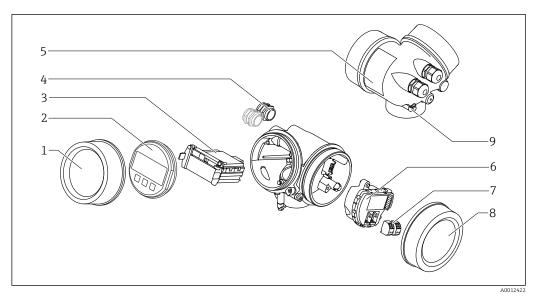
3.1 Product design

3.1.1 Levelflex FMP53



- 1 Electronics housing
- 2 Process connection
- 3 Rod 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

4 Incoming acceptance and product identification

4.1 Incoming acceptance

Check the following during incoming acceptance:

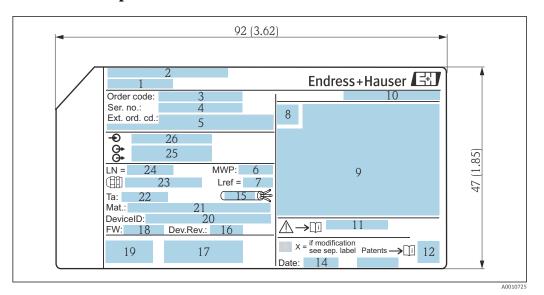
- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): are the Safety Instructions (XA) provided?
- If one of these conditions is not met, please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

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).

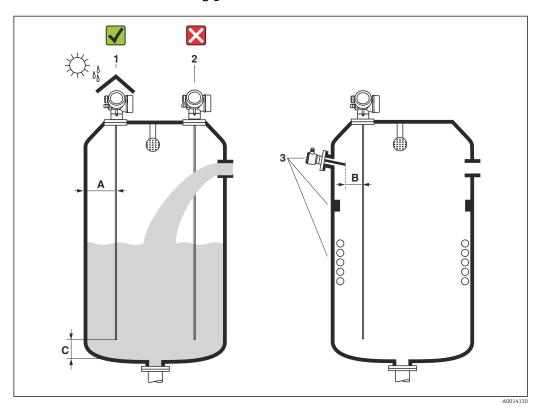


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6 Mounting

6.1 Mounting requirements

6.1.1 Suitable mounting position



■ 4 Installation conditions for Levelflex

Spacing requirements when mounting

- Distance (A) between the vessel wall and rod probes:
 - For smooth metallic walls: > 50 mm (2 in)
 - For plastic walls: > 300 mm (12 in) to metallic parts outside the vessel
- Distance (B) between rod probes and internal fittings (4): > 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: > 10 mm (0.4 in)

Additional conditions

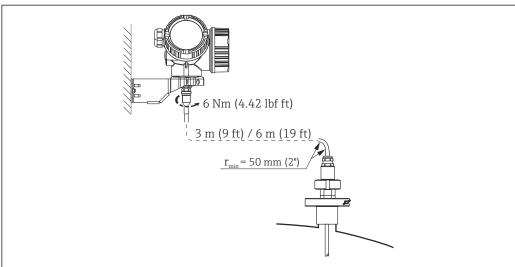
- When mounting outdoors, a weather protection cover (1) can be used to protect the device against extreme weather conditions.
- Do not mount the probe in the filling curtain (2).

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

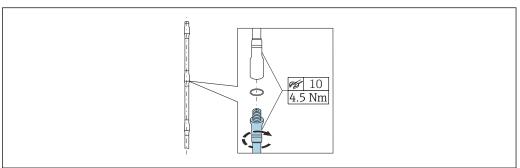
The device version with a remote probe is suitable for applications with restricted mounting space (product structure: probe design). In this case, the electronics housing is mounted at a separate position from the probe.



A0015103

- The connecting cable is connected to the probe upon delivery.
 - Length: 3 m (9 ft) or 6 m (18 ft)
 - Minimum bending radius: 50 mm (2 inch)
- The mounting bracket for the electronics housing is included in the delivery with this version. Mounting options:
 - Wall mounting
 - Mounting on DN32 to DN50 (1-1/4 to 2 inch) post or pipe
- The probe with the connection cable and the electronics are mutually compatible and bear a common serial number. Only components with the same serial number may be connected to one another.

Separable probes



A0014166

The use of separable rod probes (\emptyset 8 mm) is advisable in confined mounting conditions (limited distance to the ceiling).

- Max. probe length 6 m (19.68 ft)
- Max. lateral loading capacity 10 Nm
- Probes can be separated several times, with the individual parts having the following lengths:
 - 500 mm (20 in)
 - 1000 mm (40 in)
- The connection points are sealed gap-free by an O-ring.

To avoid damage to the surface of the probe: use fitting pliers with a plastic surface to mount the probe rod.

20

6.1.3 Notes on the mechanical load of the probe

Lateral loading capacity (flexural strength) of rod probes

FMP53

Rod 8mm (0.31") 316L

10 Nm

Rod 8mm (0.31") 316L separable

10 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:

c_w: coefficient of friction

 ρ [kq/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

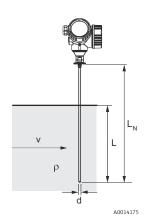
Sample calculation

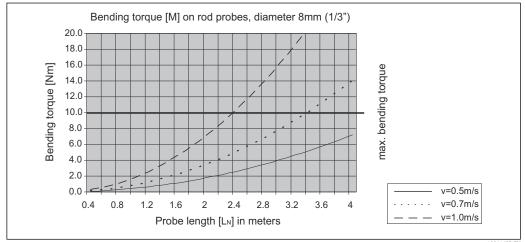
Coefficient of friction c_w 0.9 (assuming turbulent flow - high Reynolds number)

Density $\rho \; [kg/m^3] \; 1000$ (e.g. water)

Probe diameter d [m] 0.008

 $L = L_N$ (unfavorable conditions)

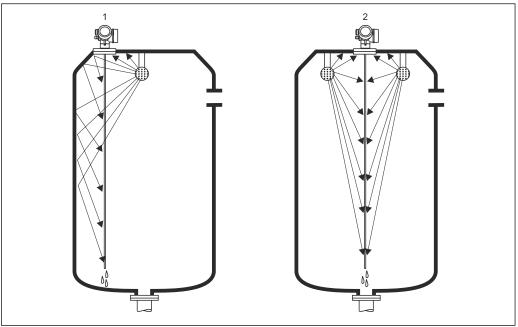




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6.1.4 Special installation situations

Tanks with spray ball for probe cleaning



A0014131

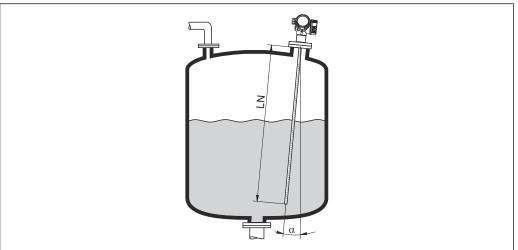
Mounting close to vessel wall

Mounting the probe close to the vessel wall improves the cleaning effect when a spray ball is used. The cleaning jet is directed onto the probe via the vessel wall. As a result, the probe is also cleaned in places the spray ball jet would normally not reach. You only require one spray ball for this probe arrangement.

Mounting in the center of the vessel

If the probe is mounted in the center of the vessel, the use of a second spray ball may be necessary. These balls should then be mounted to the left and right of the probe.

Mounting at an angle

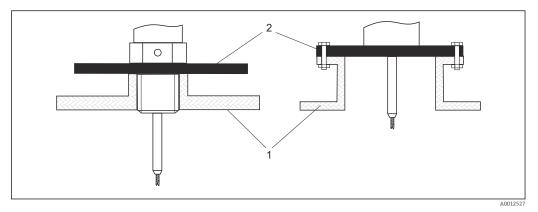


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- For mechanical reasons, the probe should be installed as vertically as possible.
- If the probe is installed at an angle, the length of the probe must be reduced depending on the angle of installation.

 - 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

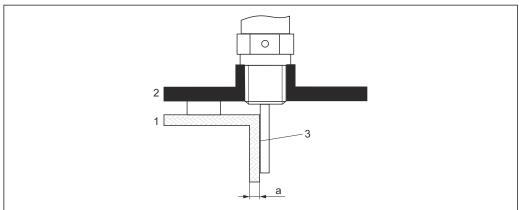


- 1 Non-metal vessel
- 2 Metal sheet or metal flange

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

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.



A001/4150

- 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

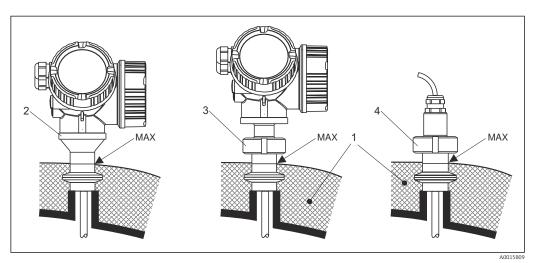
If it is necessary to actually compensate for a gas phase, the gas phase compensation function is not available for the correction of external mounting. The calibration parameters (**Empty calibration** and **Full calibration**) must be adjusted in this case. Furthermore, a value that is greater than 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.

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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.

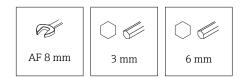


■ 5 Hygienic process connections

- 1 Vessel insulation
- 2 Compact device
- 3 Compact device, detachable
- 4 Sensor, remote

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 "Sensor, remote" version

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

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

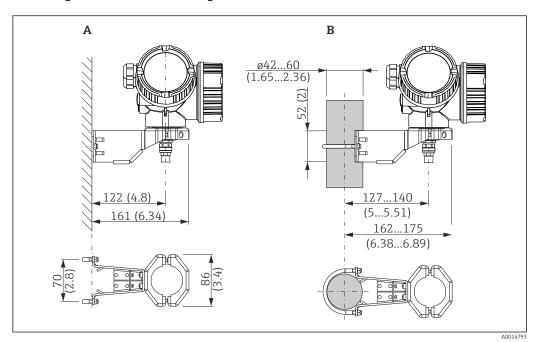
- The probe with process connection and connecting cable (3 m (9 ft) or 6 m (18 ft))
- The electronics housing
- The mounting bracket for mounting the electronics housing on a wall or post
- The connecting cable is connected to the probe upon delivery.
- The probe with the connection cable and the electronics are mutually compatible and bear a common serial number. Only components with the same serial number may be connected to one another.

A CAUTION

Mechanical stress can damage the plug of the connection cable or cause it 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: 50 mm (2 in).
- ► Torque of the union nut at the plug on the electronics side: 6 Nm
- ► Torque of the union nut at the plug on the sensor side: 20 Nm
- In the event of strong vibrations, a locking compound, e.g. Loctite 243, can also be used on the plug on the electronics side.

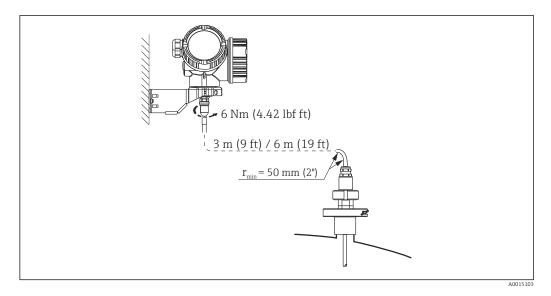
Mounting the electronics housing



- \blacksquare 6 Mounting the electronics housing with the mounting bracket. Unit of measurement mm (in)
- A Wall mounting
- B Post mounting

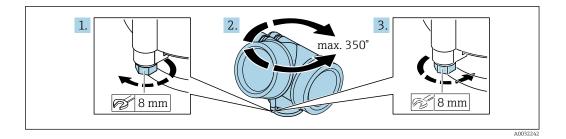
Connecting the connecting cable





6.2.3 Turning the transmitter housing

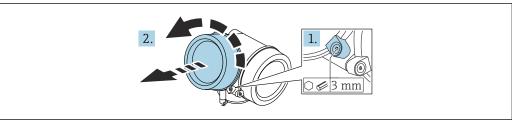
To provide easier access to the connection compartment or display module, the transmitter housing can be turned:



- 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).

6.2.4 Turning the display

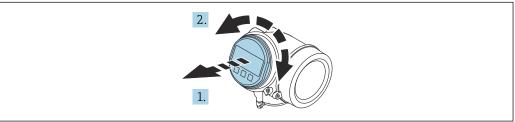
Opening the cover



A002143

- 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

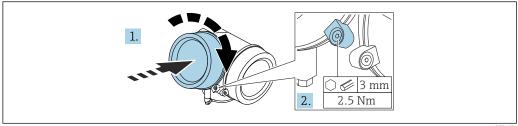


A0036401

- 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.

Levelflex FMP53 PROFIBUS PA

Closing the cover of the electronics compartment



- 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

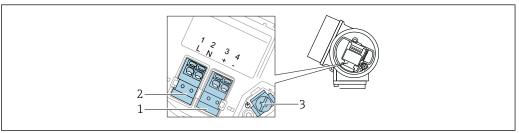
- \square Is the device undamaged (visual inspection)?
- ☐ Does the device comply with the measuring point specifications?
- Process temperature
- Process pressure
- Ambient temperature range
- Measuring range
- ☐ Are the measuring point identification and labeling correct (visual inspection)?
- ☐ Is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



A00365

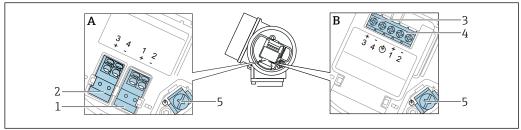
- \blacksquare 7 Terminal assignment, 4-wire: 4 to 20 mAHART (90 to 253 V_{AC})
- 1 Connection 4 to 20 mA HART (active): terminals 3 and 4
- 2 Connection, supply voltage: terminals 1 and 2
- 3 Terminal for cable shield

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).

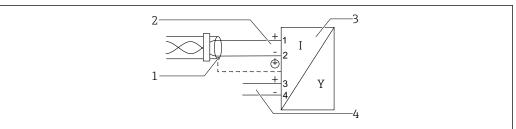
Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus



A0036500

- 8 Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus
- A Without integrated overvoltage protection
- *B* With integrated overvoltage protection
- 1 Connection, PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, without integrated overvoltage protection
- 2 Connection, switch output (open collector): terminals 3 and 4, without integrated overvoltage protection
- 3 Connection, switch output (open collector): terminals 3 and 4, with integrated overvoltage protection
- 4 Connection, PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, with integrated overvoltage protection
- 5 Terminal for cable shield

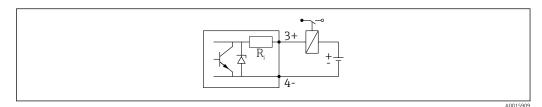
Block diagram PROFIBUS PA / FOUNDATION Fieldbus



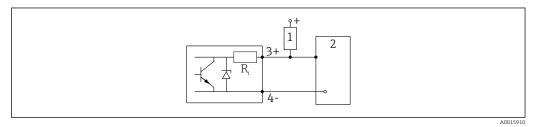
A0036530

- \blacksquare 9 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



■ 10 Connection of a relay



■ 11 Connection to a digital input

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

7.1.2 Cable specification

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

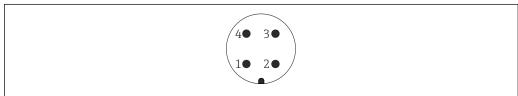
PROFIBUS

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

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

7.1.3 Device plug

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



A0011175

■ 12 Pin assignment of M12 plug

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

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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 μ s), an overvoltage protection module has to be installed.

Integrated overvoltage protection module

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

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

Technical data			
Resistance per channel	2 × 0.5 Ω max.		
Threshold DC voltage	400 to 700 V		
Threshold impulse voltage	< 800 V		
Capacitance at 1 MHz	< 1.5 pF		
Nominal arrest impulse voltage (8/20 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: TI01012KHAW569: TI01013K

7.2 Connecting the device

WARNING

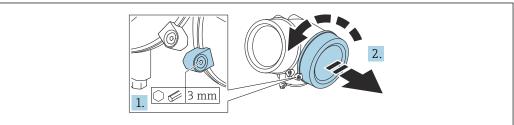
Explosion Hazard!

- ► 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.

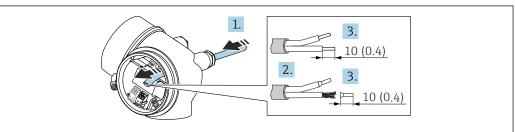
7.2.1 Opening cover



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.

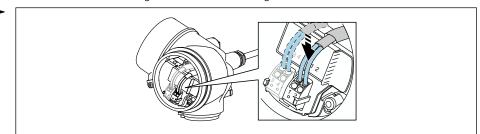
7.2.2 Connecting



A0036418

- 13 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.

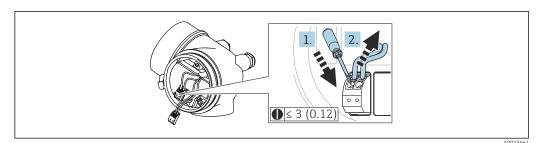
5. Connect the cable according to the terminal assignment.



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.

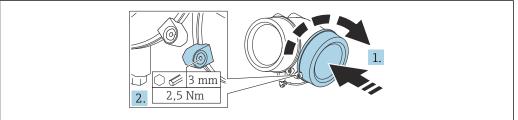


🗷 14 Engineering unit: mm (in)

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?

☐ 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?
☐ 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?

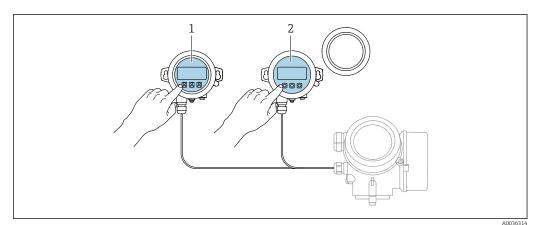
8 Operation methods

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 event of device error
	Format for displaying measured variables and st	
	Permitted ambient temperature for the display: The readability of the display may be impaired a range.	
Operating elements	local operation with 3 push buttons (±, ⊡, 區)	external operation via touch control; 3 optical keys: 🛨, 🖃, 🗉
	Operating elements also accessible in various ha	izardous areas
Additional functionality	Data backup function The device configuration can be saved in the dis	play module.
	Data comparison function The device configuration saved in the display moton configuration.	odule can be compared to the current device
	Data transfer function The transmitter configuration can be transmitte	d to another device using the display module.

8.1.2 Operation with remote display and operating module FHX50

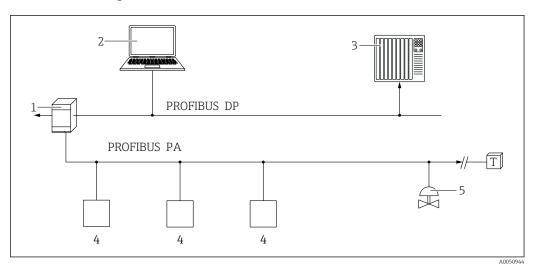


■ 15 FHX50 operating options

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

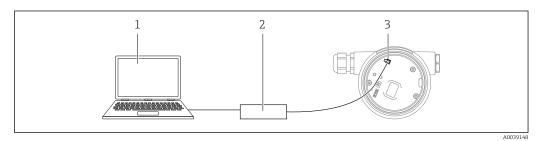
8.1.3 Remote operation

Via PROFIBUS PA protocol



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

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)

Endress+Hauser

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8.2 Structure and function of the operating menu

8.2.1 Structure of the operating menu

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

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

- 1) If you are operating via operating tools (e.g. FieldCare), the "Language" parameter is located under "Setup 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

- Navigate to: Setup → Advanced setup → Administration → Define access code
 Define access code
- 2. Define a max. 4-digit numeric code as an access code.
- 3. Repeat the numeric code in the **Confirm access code** parameter to confirm it.
 - ► The 🗈-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 → 🖺 44.
- In the "Description of Device Parameters" documents, each write-protected parameter is identified with the 🛍-symbol.

Disabling write protection via access code

If the a 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 $\Rightarrow \textcircled{a}$ 43.

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

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

Deactivation of the write protection via access code

Via local display

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

Via an operating tool (e.g. FieldCare)

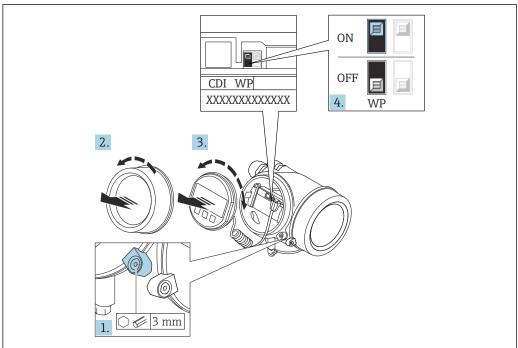
- 1. Navigate to: Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Define access code
- 2. Enter **0000**.
 - The write protection is deactivated. Parameters can be changed without entering an access code.

Write protection via write protection switch

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

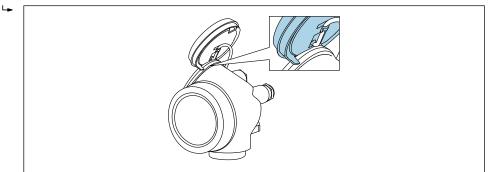
The parameter values are now read only and cannot be edited any more (exception "Contrast display" parameter):

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



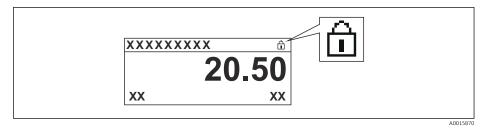
1000/155

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



A0036086

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



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

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

Enabling and disabling the keypad lock

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

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

Switching on the keypad lock

SD03 display module only

The keypad lock is switched on automatically:

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

To activate the keylock manually:

1. The device is in the measured value display.

Press E for at least 2 seconds.

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

Switching off the keypad lock

1. The keypad lock is switched on.

Press

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.

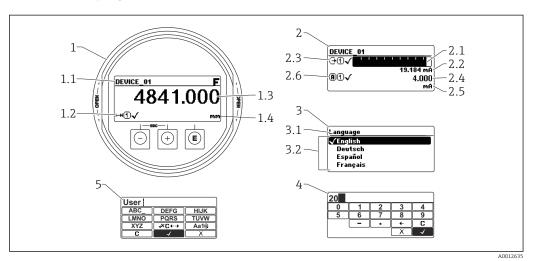
Bluetooth® wireless technology

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



■ 16 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
- $2.5 \quad \textit{Unit for measured value 2}$
- 2.6 Measured value symbols for measured value 2
- 3 Parameter display (here: parameter with picklist)
- 3.1 Header containing parameter name and error symbol (if an error is active)
- 3.2 Picklist; \square marks the current parameter value.
- 4 Input matrix for numbers
- 5 Input matrix for alphanumeric and special characters

Display symbols for the submenus

Symbol	Meaning
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.

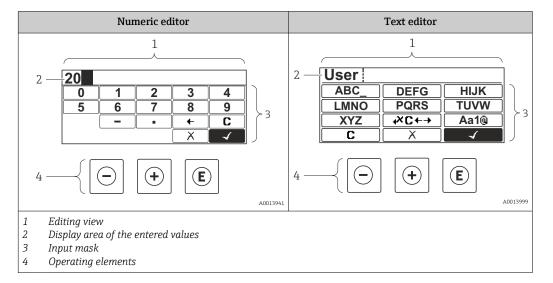
Measured value symbols

Symbol		Meaning
Measured values	3	
~~		Level
	A0032892	
→	A0032893	Distance
(Current output
	A0032908	
(A)		Measured current
	A0032894	
W		Terminal voltage
	A0032895	
		Electronics or sensor temperature
	A0032896	
Measuring chann	nels	
(1)		Measuring channel 1
	A0032897	
2		Measuring channel 2
	A0032898	
Status of the mea	asured	value
		"Alarm" status
	A0018361	The measurement is interrupted. The output assumes the defined alarm condition. A diagnostic message is generated.
\wedge		"Warning" status
<u> </u>	A0018360	The device continues to measure. A diagnostic message is generated.

8.3.2 Operating elements

Key	Meaning
	Minus key
	In a menu, submenu Moves the selection bar upwards in a picklist.
A0018330	In the text and numeric editor In the input mask, moves the selection bar to the left (backwards).
	Plus key
+	In a menu, submenu Moves the selection bar downwards in a picklist.
A0018329	In the text and numeric editor In the input mask, moves the selection bar to the right (forwards).
	Enter key
	For measured value display ■ Pressing the key briefly opens the operating menu. ■ Pressing the key for 2 s opens the context menu.
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)
A0032910	Reduces the contrast (brighter setting).
++E A0032911	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

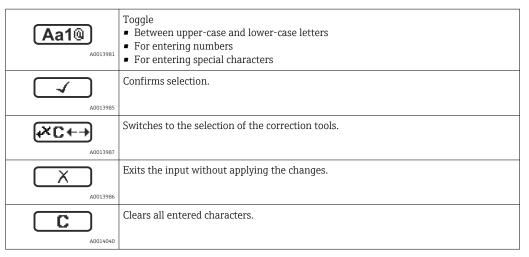
The following input and operating symbols are available in the input mask of the numeric and text editor:

Numeric editor

Symbol	Meaning
0	Selection 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.
C	Clears all entered characters.

Text editor

Symbol	Meaning
ABC_	Selection of letters from A to Z
XYZ	
A0013997	



Text correction under ₹C←∃

Symbol	Meaning
C	Clears all entered characters.
A0032907	
-	Moves the input position one position to the right.
A0018324	
4	Moves the input position one position to the left.
A0018326	
₹ X	Deletes one character immediately to the left of the input position.
A0032906	

8.3.4 Opening the context menu

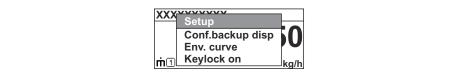
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- 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

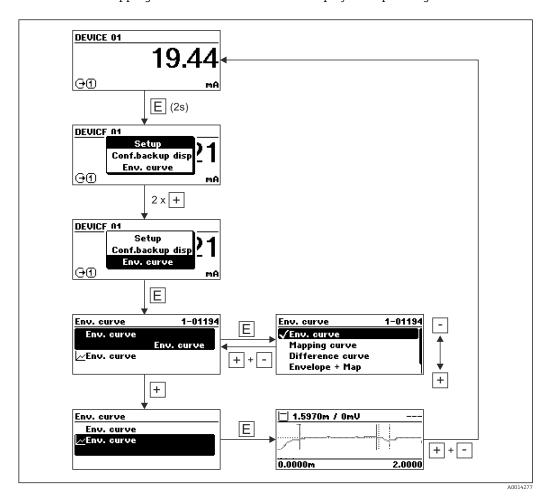
- 1. Open the context menu.
- 2. Press 🛨 to navigate to the desired menu.

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:

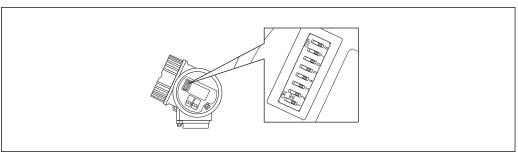


9 Integration into a PROFIBUS network

9.1 Overview of device master file (GSD)

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

Setting the device address 9.2



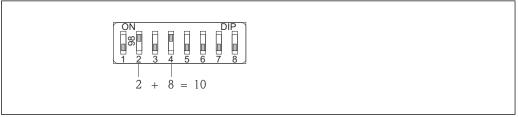
Address switch in the connection compartment

9.2.1 Hardware addressing

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

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

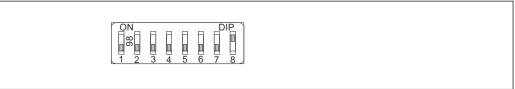
Switch	1	2	3	4	5	6	7
Value in "ON" position	1	2	4	8	16	32	64
Value in "OFF" position	0	0	0	0	0	0	0



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

9.2.2 Software addressing

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

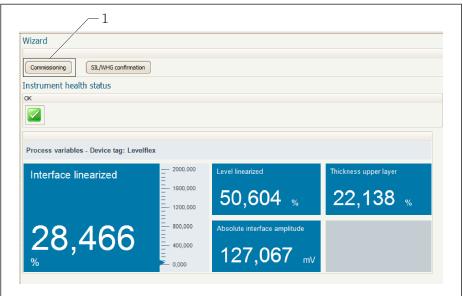


Example of software addressing; switch 8 is set to the "ON" position; the address is defined in the operating menu (Setup \rightarrow Device address).

10 Commissioning using the Commissioning Wizard

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

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



A002586

- 1 "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.

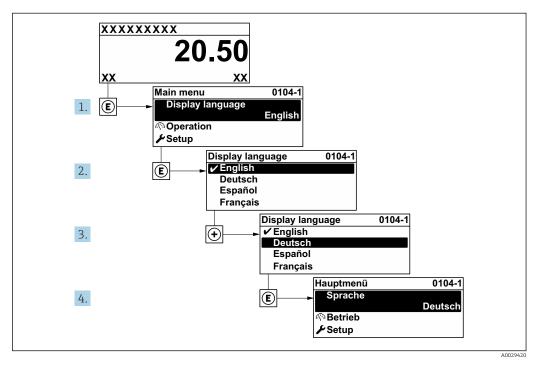
11 Commissioning via operating menu

11.1 Function check

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

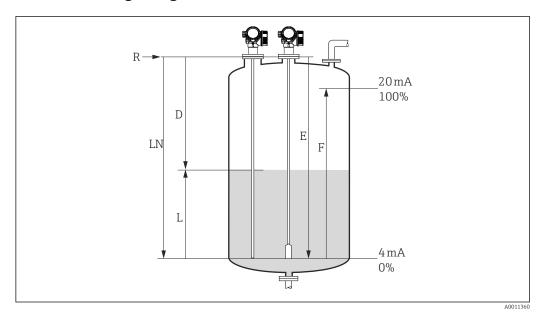
11.2 Setting the operating language

Factory setting: English or ordered local language



20 Taking the example of the local display

11.3 Configuring level measurement



■ 21 Configuration parameters for level measurement in liquids

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

- 11. Navigate to: Setup \rightarrow Signal quality
 - ► Displays the signal quality of the analyzed level echo.
- 12. Operation via local display:

Navigate to: Setup \rightarrow Mapping \rightarrow Confirm distance

- Compare the distance displayed with the actual value to start recording an interference echo map (where applicable).
- 13. Operation via operating tool:

Navigate to: Setup → Confirm distance

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

11.4 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.



■ 22 "Load Reference Curve" function

11.5 Configuring the local display

11.5.1 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

11.5.2 Adjusting the local display

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

11.6 Configuration management

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

11.7 Protecting settings from unauthorized access

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

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

12 Diagnostics and troubleshooting

12.1 General troubleshooting

12.1.1 General errors

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

12.1.2 Parametrization errors

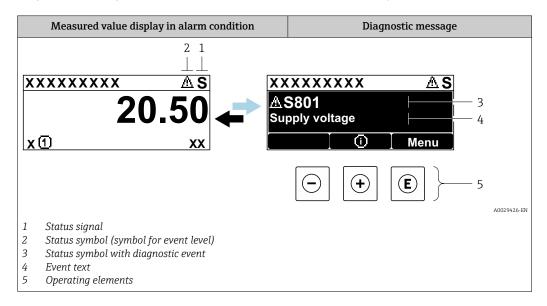
Parametrization errors for level measurements

Problem	Possible cause	Remedy
Measured value is incorrect	If measured distance (Setup → Distance) matches the real distance: Calibration error	 Check the Empty calibration parameter (→ □ 103) and correct if necessary. Check the Full calibration parameter (→ □ 103) and correct if necessary. Check the linearization and correct if necessary (Linearization submenu (→ □ 119)).
	If measured distance (Setup → Distance) does not match the real distance: An interference echo is present.	Carry out mapping (Confirm distance parameter (→ 🖺 106)).
No change of measured value on filling/emptying	An interference echo is present.	Carry out mapping (Confirm distance parameter ($\rightarrow \triangleq 106$)).
	Buildup at the probe.	Clean the probe.
	Error in the echo tracking.	Deactivate echo tracking (Expert → Sensor → Echo tracking → Evaluation mode = History off).
Echo lost diagnostic message appears after the supply voltage is switched on.	Echo threshold too high.	Check the Medium group parameter $(\rightarrow \boxminus 102)$. If necessary, select a more detailed setting with the Medium property parameter $(\rightarrow \boxminus 113)$.
	Level echo suppressed.	Delete the map and record it again if necessary (Record map parameter (→ 🖺 107)).
Device displays a level when the tank is empty.	Incorrect probe length	Perform probe length correction (Confirm probe length parameter (→ 🖺 134)).
	Interference echo	Carry out mapping over the entire probe length when the tank is empty (Confirm distance parameter (→ 🖺 106)).
Wrong slope of the level over the entire measuring range	Wrong tank type selected.	Select the correct Tank type parameter $(\rightarrow \stackrel{\text{\tiny le}}{=} 101)$.

12.2 Diagnostic information on local display

12.2.1 Diagnostic message

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



Status signals

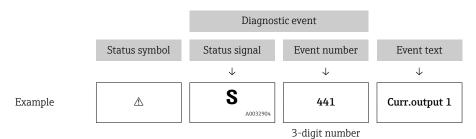
A0032902	"Failure (F)" option A device error has occurred. The measured value is no longer valid.
C	"Function check (C)" option The device is in the service mode (e.g. during a simulation).
S	 "Out of specification (S)" option The device is operated: Outside of its technical specifications (e.g. during startup or a cleaning) Outside of the configuration performed by the user (e.g. level outside the configured range)
A0032905	"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.
\triangle	"Warning" status The device continues to measure. A diagnostic message is generated.

Diagnostic event and event text

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



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



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

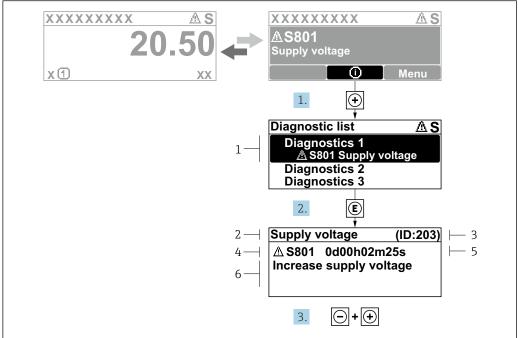
- On the local display:
- In the **Event logbook** submenu
- In FieldCare:

Via the "Event List /HistoROM" function.

Operating elements

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

12.2.2 Calling up remedial measures



A0029431-EN

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

The user is in the diagnostic message.

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

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

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

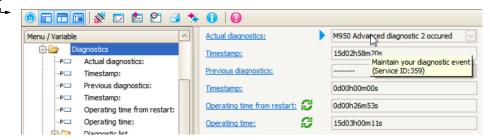
12.3 Diagnostic event in the operating tool

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

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

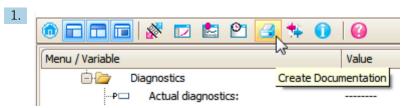
A: Via the operating menu

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

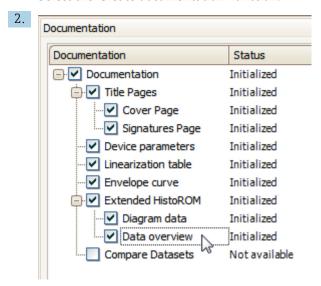


A tool tip with remedial measures for the diagnostic event appears.

B: Via the "Create documentation" function



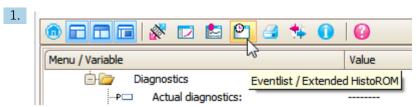
Select the "Create documentation" function.



Make sure "Data overview" is marked.

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

C: Via the "Eventlist / Extended HistoROM" function



Select the "Eventlist / Extended HistoROM" function.



Select the "Load Eventlist" function.

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

12.4 Diagnostic list

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

Navigation path

Diagnostics → Diagnostic list

Calling up and closing the remedial measures

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

12.5 List of diagnostic events

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

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

¹⁾ Diagnostic behavior can be changed.

12.6 Event logbook

12.6.1 Event history

A chronological overview of the event messages that have occurred is provided in the $\bf Event \ list \ submenu \ ^{2)}.$

²⁾ This submenu is only available for operation via local display. In the case of operation via FieldCare, the event list can be displayed with the "Event List / HistoROM" functionality of FieldCare.

Navigation path

Diagnostics \rightarrow Event logbook \rightarrow Event list

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

Die Ereignishistorie umfasst Einträge zu:

- Diagnostic events
- Information events

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

- Diagnostic event
 - ②: 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 $= + \pm$ simultaneously.
 - ► The message about the remedial measures closes.

12.6.2 Filtering the event logbook

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

Navigation path

Diagnostics \rightarrow Event logbook \rightarrow Filter options

Filter categories

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

12.6.3 Overview of information events

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

74

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

12.7 Firmware history

Date	Firmware				
	version		Operating Instructions	Description of Device Parameters	Technical Information
07.2011	01.00.zz	Original software	BA01007F/00/EN/10.10	GP01001F/00/EN/10.10	TI01002F/00/EN/13.11
02.2015	01.01.zz	 Support of SD03 Additional languages HistoROM functionality enhanced "Advanced Diagnostics" function block integrated Improvements and bugfixes 	BA01007F/00/EN/14.14 BA01007F/00/EN/15.16 ¹⁾	GP01001F/00/EN/13.14	TI01002F/00/EN/17.14 TI01002F/00/EN/20.16 ¹⁾

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

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

13 Maintenance

No special maintenance work is required.

13.1 Exterior cleaning

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

13.2 General cleaning instructions

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

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

13.3 Cleaning the probe

13.3.1 Cleaning the probe in the vessel

If a suitable mounting position has been selected, the probe can be cleaned by a spray ball in the vessel $\rightarrow \stackrel{\triangle}{=} 22$.

13.3.2 Cleaning the probe outside the vessel

The probe can be removed for better cleaning.

The following tool is required for cleaning:

- Vise with fiber jaws (surface protection for the polished rod probe)
- Hook wrench with lug ϕ 54 mm (2.1 in)
- Open-ended wrench AF27/AF32 with torque setting up to 20 Nm

Caution!

- Before starting work, make sure that the power supply for the device is switched off.
- When unscrewing the slotted nut (1), make sure to provide counter-support at the process connection ring (5) with an open-ended wrench. Otherwise the adapter (3) will become detached from the flange.

Disassembling the electronics housing

- Unscrew the slotted nut (1) with the hook wrench.
- Remove the loosened housing (2), together with the housing holder, from the adapter (3) of the process connection towards the top. The housing holder remains connected to the housing. Put the housing to one side. In the case of the "Remote sensor" version, only the cable adapter must be removed.

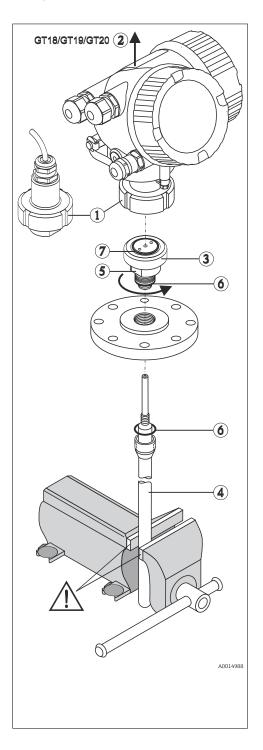
Disassembling the rod probe

- Unscrew the adapter (3) from the process connection (the flange in the example): at the wrench flats unscrew the adapter with an openended wrench (AF27) and remove from the vessel together with the probe rod (max. 4 m).
- Clamp the probe rod (4) at the wrench flats or use fitting pliers.
 - **Caution**: Protect the surface of the polished probe rod! It must not be damaged by scratches or denting.
- Unscrew the adapter (3) from the probe rod (approx. 12 turns in the counter-clockwise direction) and remove it (plug-in connection). The probe rod is screwed into the insulating bush with 4.5 Nm.
- The O-ring seals (6) of the probe rod and adapter are now freely accessible and can be exchanged if necessary. The probe rod and adapter can be autoclaved.

Probe mounting

Assembly is the reverse of the disassembly sequence:

- Screw the adapter (3) onto the probe rod (4) with 4.5 Nm.
- Screw the adapter together with the probe rod into the vessel process connection and tighten with 20 Nm
- Fit the housing (2) along with the housing holder onto the adapter and screw together with the slotted nut (1); torque 20 Nm.



14 Repair

14.1 General information

14.1.1 Repair concept

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

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

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

14.1.2 Repair of Ex-certified devices

A WARNING

Incorrect repair can compromise electrical safety!

Explosion Hazard!

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

14.1.3 Replacing electronics modules

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

14.1.4 Replacing a device

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

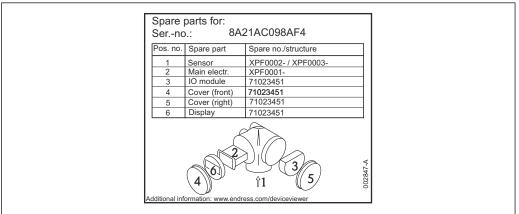
- Using the display module
 Prerequisite: The configuration of the old device was saved previously to the display module.
- Via FieldCare
 Prerequisite: The configuration of the old device was saved previously to the computer using FieldCare.

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

14.2 Spare parts

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

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



A001497

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

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

14.3 Return

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

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

14.4 Disposal



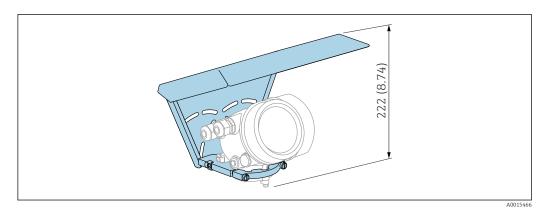
If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return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

15 Accessories

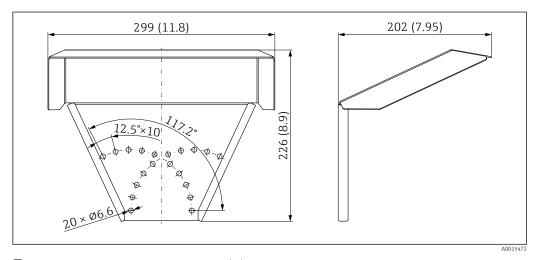
15.1 Device-specific accessories

15.1.1 Weather protection cover

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



🔁 25 Height. Unit of measurement mm (in)



26 Dimensions. Unit of measurement mm (in)

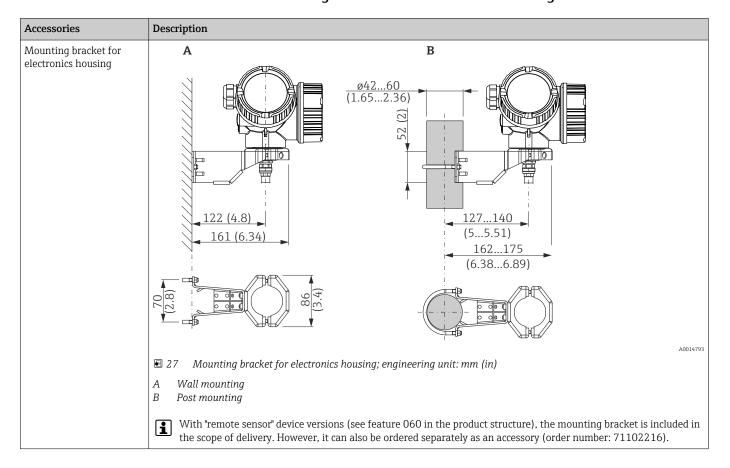
Material

316L

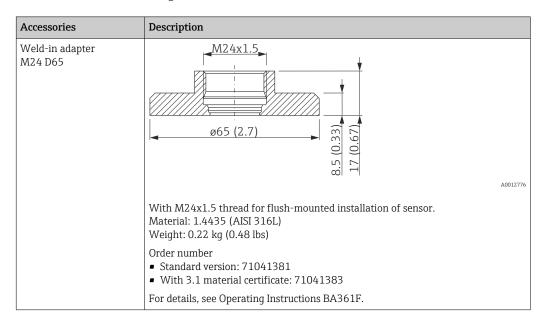
Order number for accessories:

71162242

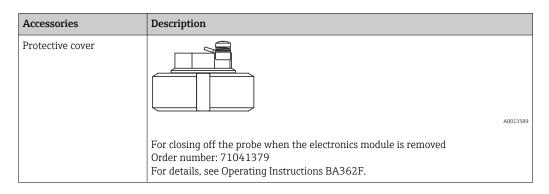
15.1.2 Mounting bracket for electronics housing



15.1.3 Weld-in adapter



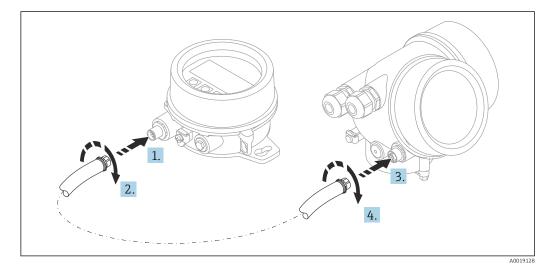
15.1.4 Protective cover



15.1.5 Calibration kit

Accessories	Description
Calibration kit	The calibration kit is used for regular testing of the accuracy and reproducibility of the Levelflex FMP53 level measurement device. Order number: 71041382 For details, see Operating Instructions SD01003F.

15.1.6 Remote display FHX50



Technical data

- Material:
 - Plastic PBT
 - 316L/1.4404
 - Aluminum
- \bullet Degree of protection: IP68 / NEMA 6P and IP66 / NEMA 4x
- Suitable for display modules:
 - SD02 (push buttons)
 - SD03 (touch control)

- Connecting cable:
 - Cable supplied with device up to 30 m (98 ft)
 - Standard cable supplied by customer up to 60 m (196 ft)
- Ambient temperature: -40 to 80 °C (-40 to 176 °F)
- Ambient temperature (option): -50 to 80 °C (-58 to 176 °F) $^{3)}$

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

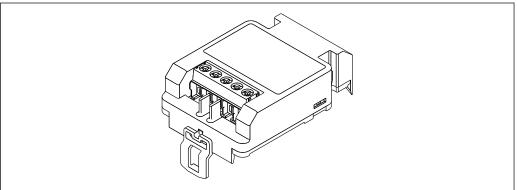
For details, see the "Special Documentation" SD01007F

15.1.7 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



Technical data

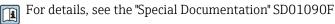
• Resistance per channel: $2 \times 0.5 \Omega_{max}$ ■ Threshold DC voltage: 400 to 700 V ■ Threshold surge voltage: < 800 V

³⁾ 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.

- 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)

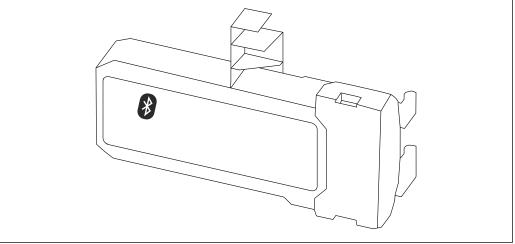
If retrofitting:

- 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: 71185516 Housing GT19: 71185518
- Housing GT20: 71185517



Bluetooth module BT10 for HART devices 15.1.8

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



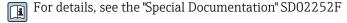
Technical data

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

If retrofitting:

Order number: 71377355

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



15.2 Communication-specific accessories

Commubox FXA291

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



For details, see "Technical Information" TI00405C

15.3 Service-specific accessories

DeviceCare SFE100

Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus field devices



Technical Information TI01134S

FieldCare SFE500

FDT-based plant asset management tool

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



Technical Information TI00028S

15.4 System components

Memograph M graphic data manager

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



Technical Information TI00133R and Operating Instructions BA00247R

16 Operating menu

Navigation

16.1 Overview of the operating menu (display module)

Operating menu

Language **ℱ** Setup → 🖺 101 Device tag → 🖺 101 Device address → 🖺 101 → 🖺 101 Distance unit → 🖺 101 Tank type → 🖺 102 Tube diameter → 🖺 102 Medium group Empty calibration → 🖺 103 Full calibration → 🖺 103 Level → 🖺 104 Distance → 🖺 104 → 🖺 105 Signal quality → 🖺 108 ► Mapping → 🖺 108 Confirm distance Mapping end point → 🖺 108 Record map → 🖺 108 Distance → 🖺 108 ► Analog inputs ► Analog input 1 to 6 → 🖺 109 Channel → 🖺 109

$ PV \ filter \ time \\ \hspace*{2cm} \rightarrow$	₿ 109
	110
	1 10
► Advanced setup	111
Locking status →	111
Access status display →	112 ■ 112
	1 12 1 12
▶ Level →	113
Medium type →	113
Medium property →	113
	114
	115
	1 16 1 16
	116
	117 117 117
► Linearization →	1 19
	121 ■ 121
	122 ■ 122
	1 23 1 23
	124 124
	124 124
	125 125 1
	1 25 1 25 1 25

	► Edit table		
		Level	
			J
		Customer value	
	Activate table		→ 🖺 127
► Safety setting	s		→ 🖺 128
	Output echo lost		→ 🖺 128
	Value echo lost		→ 🖺 128
	Ramp at echo lost		→ 🖺 129
	Blocking distance		→ 🖺 116
► WHG confirma	ation		→ 🖺 131
► Deactivate WI	HG		→ 🖺 132
	Reset write protect	ion	→ 🖺 132
	Code incorrect		→ 🖺 132
▶ Probe settings	3		→ 🖺 133
	Probe grounded		→ 🖺 133
	► Probe length co	rrection	→ 🖺 135
		Confirm probe length	→ 🖺 135
		Present probe length	→ 🖺 135
► Switch output]	→ 🖺 136
	Switch output func	tion	→ 🖺 136
	Assign status		→ 🖺 136
	Assign limit		→ 🖺 137
	Assign diagnostic b	pehavior	→ 🖺 137
	Switch-on value		→ 🖺 138
	Switch-on delay		→ 🖺 139

	Switch-off value	→ 🖺 139
	Switch-off delay	→ 🖺 140
	Failure mode	→ 🖺 140
	Switch status	→ 🖺 140
	Invert output signal	→ 🖺 140
•	Display	→ 🖺 142
	Language	→ 🖺 142
	Format display	→ 🖺 142
	Value 1 to 4 display	→ 🖺 144
	Decimal places 1 to 4	→ 🖺 144
	Display interval	→ 🖺 144
	Display damping	→ 🖺 145
	Header	→ 🖺 145
	Header text	→ 🖺 145
	Separator	→ 🖺 146
	Number format	→ 🖺 146
	Decimal places menu	→ 🗎 146
	Backlight	→ 🖺 147
	Contrast display	→ 🖺 147
•	Configuration backup display	→ 🗎 148
	Operating time	→ 🖺 148
	Last backup	→ 🖺 148
	Lust outrup	, 5 140

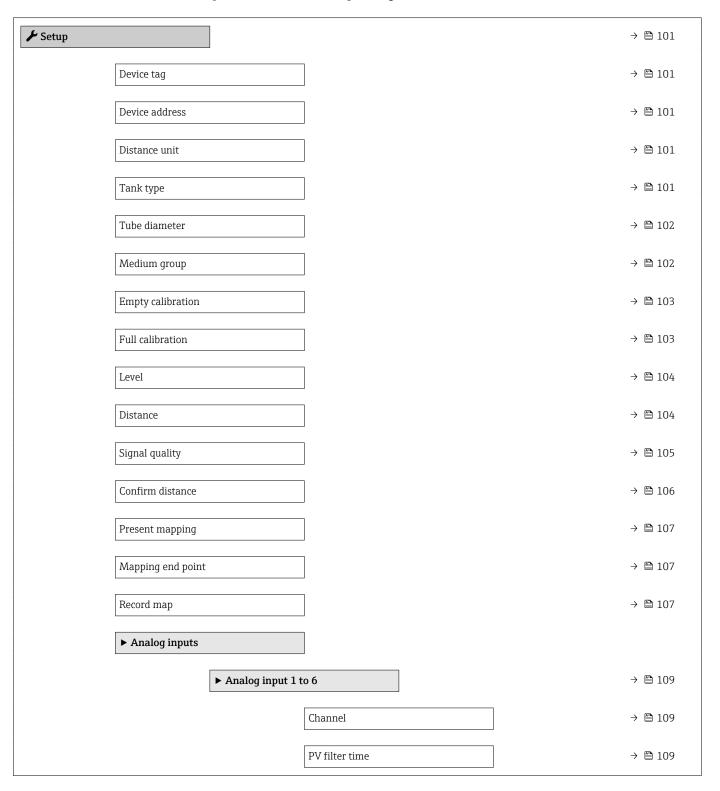
			Configuration mana	agement		→ 🖺 148
			Comparison result			→ 🖺 149
		► Administration				→ 🖺 151
			► Define access co	de		→ 🖺 153
				Define access code		→ 🖺 153
				Confirm access code	:	→ 🖺 153
			Device reset			→ 🖺 151
♥ Diagnostics						→ 🖺 154
	Actual diagnostics					→ 🖺 154
_	<u> </u>					
	Previous diagnostics	•				→ 🖺 154
	Operating time from	restart				→ 🖺 155
	Operating time					→ 🖺 148
	▶ Diagnostic list					→ 🖺 156
		Diagnostics 1 to 5				→ 🖺 156
	► Event logbook					→ 🖺 157
		Filter options	-			
		► Event list]		→ 🖺 157
			n			
	► Device informati	on				→ 🖺 158
		Device tag				→ 🖺 158
		Serial number				→ 🖺 158
		Firmware version				→ 🖺 158
		Device name				→ 🖺 158
		Order code				→ 🖺 159
		Extended order code	e 1 to 3			→ 🖺 159

	Status PROFIBUS M	aster Config	→ 🖺 159
	PROFIBUS ident nur	whom	→ 🖺 159
	PROFIBUS Ident nur	noer	7 目 139
► Measured valu	es		→ 🖺 160
	Distance		→ 🖺 104
	Level linearized		→ 🖺 124
	Terminal voltage 1		→ 🖺 161
	Switch status		→ 🖺 140
► Analog inputs			
	► Analog input 1 to	0 6	→ 🗎 162
		Channel	→ 🖺 109
		Out value	→ 🖺 162
		Out status	→ 🖺 163
		Out status HEX	→ 🖺 163
► Data logging			→ 🖺 164
	Assign channel 1 to	4	→ 🖺 164
	Logging interval		→ 🖺 164
	Clear logging data		→ 🖺 165
	► Display channel	1 to 4	→ 🗎 166
► Simulation			→ 🖺 168
	Assign measuremen	ut variable	→ 🖺 169
	Value process variab	ole	→ 🖺 169
	Switch output simul	ation	→ 🖺 169
	Switch status		→ 🖺 170
	Simulation device al	arm	→ 🖺 170

	Diagnostic event category	
	Simulation diagnostic event	→ 🖺 170
▶ Device check		→ 🖺 171
	Start device check	→ 🖺 171
	Result device check	→ 🖺 171
	Last check time	→ 🖺 171
	Level signal	→ 🖺 172
	Launch signal	→ 🖺 172

16.2 Overview of the operating menu (operating tool)

Navigation © Operating menu



	Fail safe type	→ 🖺 110
	Fail safe value	→ 🖺 110
► Advanced setup		→ 🗎 111
Locking sta	tus	→ 🖺 111
Access state	us tooling	→ 🗎 111
Enter acces	s code	→ 🖺 112
▶ Level		→ 🖺 113
	Medium type	→ 🖺 113
	Medium property	→ 🖺 113
	Process property	→ 🖺 114
	Advanced process conditions	→ 🗎 115
	Level unit	→ 🖺 116
	Blocking distance	→ 🖺 116
	Level correction	→ 🖺 117
▶ Lineariza	ation	→ 🗎 119
	Linearization type	→ 🖺 121
	Unit after linearization	→ 🖺 122
	Free text	→ 🖺 123
	Level linearized	→ 🖺 124
	Maximum value	→ 🖺 124
	Diameter	→ 🖺 124
	Intermediate height	→ 🖺 125
	Table mode	→ 🖺 125
	Table number	→ 🖺 126
	Level	→ 🖺 126

	Level	→ 🖺 127
	Customer value	→ 🖺 127
	Activate table	→ 🖺 127
► Safety settings		→ 🖺 128
	Output echo lost	→ 🖺 128
	Value echo lost	→ 🖺 128
	Ramp at echo lost	→ 🖺 129
	Blocking distance	→ 🖺 116
► WHG confirma	tion	→ 🗎 131
► Deactivate WH	G	→ 🖺 132
	Reset write protection	→ 🖺 132
	Code incorrect	→ 🖺 132
▶ Probe settings		→ 🖺 133
	Probe grounded	→ 🖺 133
	Present probe length	→ 🖺 133
	Confirm probe length	→ 🖺 134
► Switch output		→ 🖺 136
	Switch output function	→ 🗎 136
	Assign status	→ 🗎 136
	Assign limit	→ 🖺 137
	Assign diagnostic behavior	→ 🖺 137
	Switch-on value	→ 🖺 138
	Switch-on delay	→ 🖺 139
	Switch-off value	→ 🗎 139
	Switch-off delay	→ 🖺 140

	Failure mode	→ 🖺 140
	Switch status	→ 🖺 140
	Invert output signal	→ 🖺 140
► Display		→ 🗎 142
	Language	→ 🗎 142
	Format display	→ 🖺 142
	Value 1 to 4 display	→ 🖺 144
	Decimal places 1 to 4	→ 🖺 144
	Display interval	→ 🖺 144
	Display damping	→ 🖺 145
	Header	→ 🖺 145
	Header text	→ 🖺 145
	Separator	→ 🖺 146
	Number format	→ 🖺 146
	Decimal places menu	→ 🖺 146
	Backlight	→ 🖺 147
	Contrast display	→ 🖺 147
► Configuration		→ 🖺 148
, comigutation	outside display	110
	Operating time	→ 🗎 148
	Last backup	→ 🖺 148
	Configuration management	→ 🖺 148

		Backup state	→ 🖺 149
		Comparison result	→ 🖺 149
	► Administration		→ 🖺 151
		Define access code	
		Device reset	→ 🖺 151
억 Diagnostics]		→ 🖺 154
Actual diagnostics	_		→ 🗎 154
Timestamp			→ 🖺 154
Previous diagnostic	rs		→ 🖺 154
Timestamp			→ 🖺 155
Operating time from	m restart		→ 🖺 155
Operating time			→ 🖺 148
▶ Diagnostic list			→ 🗎 156
	Diagnostics 1 to 5		→ 🗎 156
	Timestamp 1 to 5		→ 🖺 156
▶ Device informat	ion		→ 🖺 158
	Device tag		→ 🖺 158
	Serial number		→ 🖺 158
	Firmware version		→ 🖺 158
	Device name		→ 🖺 158
	Order code		→ 🖺 159
	Extended order cod	e 1 to 3	→ 🖺 159
	Status PROFIBUS M	laster Config	→ 🖺 159
	PROFIBUS ident nu	mber	→ 🖺 159

► Measured val	lues		
	Distance		
	Level linearized		
	Terminal voltage	1	
	Switch status		
► Analog input	s		
		to 6	
	► Analog input 1	. 10 0	
		Channel	
		Out value	
		Out status	
		Out status HEX	
► Data logging			
	Assign channel 1	to 4	
	Logging interval		
	Clear logging data		
► Simulation			
- January III			
	Assign measurem	ent variable	
	Value process vari	able	
	Switch output sim	ulation	
	Switch status		
	Simulation device	alarm	
	Simulation diagno	ostic event	
► Device check			
	Start device check		

Last check time	→ 🖺 171
Level signal	→ 🖺 172
Launch signal	→ 🖺 172
► Heartbeat	→ 🗎 173

100

Tank type

Navigation

Prerequisite

Description

16.3 "Setup" menu



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

■ ■ Setup Navigation

Device tag			
Navigation	圆 □ Setup → Dev	ice tag	
Description	Enter tag for meas	uring point.	
User entry	Up to 32 alphanum	nerical characters	
			a
Device address			
Navigation		ice address	
Description	 for Address mode = Software: Enter bus address. for Address mode = Hardware: Displays bus address. 		
User entry	0 to 126		
Distance unit			ñ
Navigation	圆 □ Setup → Dist	ance unit	
Description	Length unit for distance calculation.		
Selection	SI units ■ mm ■ m	US units ■ ft ■ in	

Endress+Hauser 101

Select tank type.

Medium type ($\rightarrow \equiv 113$) = Liquid

Selection

- Metallic
- Bypass / pipe
- Non metallic
- Mounted 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 $\blacksquare \Box$ Setup \rightarrow Tube diameter

Prerequisite Tank type ($\rightarrow \triangleq 101$) = Bypass / pipe

Description Specify diameter of bypass or stilling well.

User entry 0 to 9.999 m

Medium group	
--------------	--

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

Prerequisite Medium type ($\rightarrow \equiv 113$) = 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 ($\rightarrow \implies 113$).

The **Medium group** parameter presets the **Medium property** parameter ($\rightarrow \triangleq 113$) as follows:

Medium group	Medium property (→ 🖺 113)	
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

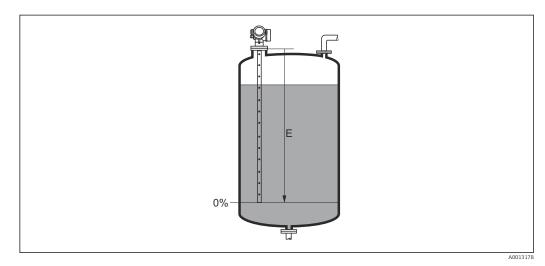
Navigation $\blacksquare \Box$ Setup \rightarrow Empty calibr.

Description Distance process connection to min. level.

User entry Depending on the probe

Factory setting Depending on the probe

Additional information



 \blacksquare 28 Empty calibration (E) for level measurements in liquids

Full calibration

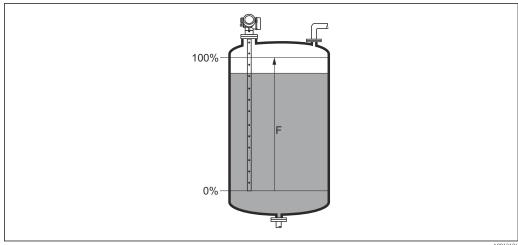
Navigation $\blacksquare \Box$ Setup \rightarrow Full calibr.

Description Span: max. level - min level.

User entry Depending on the probe

Factory setting Depending on the probe

Additional information



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

A0013186

Level

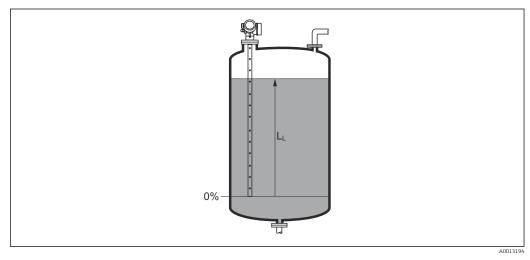
Navigation

Setup → Level

Description

Displays measured level L_L (before linearization).

Additional information



■ 30 Level in case of liquid measurements

The unit is defined in the **Level unit** parameter ($\Rightarrow \triangleq 116$).

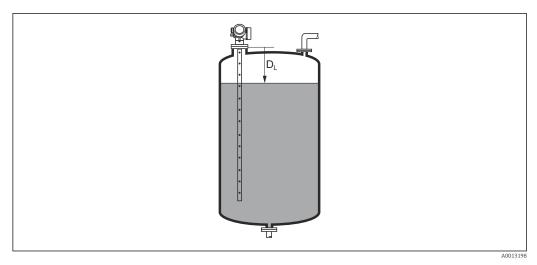
Distance

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



■ 31 Distance for liquid measurements

The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 101$).

Signal quality

Navigation

Description

Displays the signal quality of the evaluated echo.

Additional information

Meaning of the display options

Strong

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

Medium

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

Weak

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

No signal

The device does not find a usable echo.

The signal quality indicated in this parameter always refers to the currently evaluated echo: either the level/interface echo ⁴⁾ or the end-of-probe echo. To differentiate between these two, the quality of the end-of-probe echo is always displayed in brackets.

- In case of a lost echo (**Signal quality = No signal**) the device generates the following error message:
 - F941, for Output echo lost (\rightarrow 🗎 128) = Alarm.
 - S941, if another option has been selected in **Output echo lost** (→ **□ 128**).

⁴⁾ Of these two echos the one with the lower quality is indicated.

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

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 ($\Rightarrow \implies 107$). 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 5)

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

■ Tank empty

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

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

Factory map

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

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

Visibility depends on order options or device settings

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

Present mapping

Navigation

Setup → Present mapping

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

Mapping end point

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

Prerequisite Confirm distance (→ 🖺 106) = Manual map or Distance too small

Description Specify new end of the mapping.

User entry 0 to 200 000.0 m

Additional information

This parameter defines up to which distance the new mapping is to be recorded. The distance is measured from the reference point, i.e. from the lower edge of the mounting flange or the threaded connection.



For reference purposes the **Present mapping** parameter ($\rightarrow \boxminus 107$) is displayed together with this parameter. It indicates up to which distance a mapping has already been recorded.

Record map

Navigation \square Setup \rightarrow Record map

Prerequisite Confirm distance (→ 🖺 106) = Manual map or Distance too small

Description Start recording of the map.

Selection • No

Record mapDelete map

Additional information

Meaning of the options

■ No

The map is not recorded.

Record map

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

■ Delete map

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

16.3.1 "Mapping" wizard

- The **Mapping** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the mapping are located directly in the **Setup** menu (→ ≅ 101).
- 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		<u> </u>
Navigation	Setup → Mapping → Confirm distance	
Description	→ 🖺 106	
Mapping end point		?
Navigation	Setup → Mapping → Map. end point	
Description	→ 🖺 107	
Record map		^
Navigation	Setup → Mapping → Record map	
Description	→ 🖺 107	
Distance		
Navigation	Setup → Mapping → Distance	
	_	

108

Description

→ 🖺 104

16.3.2 "Analog input 1 to 6" submenu

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

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

Navigation Expert → Analog inputs → Analog input 1 to 6

Channel **Navigation** Expert \rightarrow Analog inputs \rightarrow Analog input 1 to 6 \rightarrow Channel Description Standard parameter **CHANNEL** of the Analog Input Block according to the PROFIBUS Profile. Selection Level linearized Distance Interface linearized ■ Interface distance Thickness upper layer *

- Terminal voltage ■ Electronic temperature Measured capacitance
- Absolute echo amplitude ■ Relative echo amplitude
- Absolute interface amplitude ⁷ Relative interface amplitude ■ Absolute EOP amplitude
- Noise of signal ■ EOP shift
- Calculated DC value * Sensor debug
- Analog output adv. diagnostics 1 Analog output adv. diagnostics 2

Additional information

Allocates a measured value to the AI block.

PV filter time **Navigation** \blacksquare Expert → Analog inputs → Analog input 1 to 6 → PV filter time

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

profile.

User entry Positive floating-point number

Visibility depends on order options or device settings

Additional information

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

Fail safe type	
Navigation	
Description	Standard parameter FSAFE_TYPE of the Analog Input Block according to the PROFIBUS profile.
Selection	Fail safe valueFallback valueOff
Additional information	 Meaning of the options This parameter specifies the output value of the Analog Input block in the event of an error. Fail safe value The output value in the event of an error is defined in the Fail safe value parameter (→ ≧ 110). Fallback value The last output value that was valid before the error occurred is retained. Off The output value follows the current measured value. The status is set to BAD.

Fail safe value	
Navigation	
Prerequisite	Fail safe type (→ 🖺 110) = Fail safe value
Description	Standard parameter FSAFE_VALUE of the Analog Input Block according to the PROFIBUS profile.
User entry	Signed floating-point number
Additional information	This parameter defines the output value of the Analog Input Block in case of an error.

16.3.3 "Advanced setup" submenu

Navigation \square Setup \rightarrow Advanced setup

Locking status

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

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

User interface ■ Hardware locked

- SIL locked
- WHG locked
- Temporarily locked

Additional information

Meaning and priorities of the types of write protection

■ Hardware locked (priority 1)

The DIP switch for hardware locking is activated on the main electronics module. This locks write access to the parameters.

■ SIL locked (priority 2)

The SIL mode is activated. Writing access to the relevant parameters is denied.

WHG locked (priority 3)

The WHG mode is activated. Writing access to the relevant parameters is denied.

Temporarily locked (priority 4)

Write access to the parameters is temporarily locked on account of internal processes in progress in the device (e.g. data upload/download, reset etc.). The parameters can be modified as soon as the processes are complete.

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

Access status tooling

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

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

Additional information

The access authorization can be changed via the **Enter access code** parameter $(\rightarrow \boxminus 112)$.

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 ($\Rightarrow \implies 111$).

Access status display

Navigation

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 $(\rightarrow \implies 112)$.

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 ($\rightarrow \implies 111$).

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
 (→ ≦ 151) must be entered for local operation.
- If an incorrect access code is entered, users retain their current access authorization.
- The write protection affects all parameters marked with the 🗈 symbol in the document. On the local display, the 🗈 symbol in front of a parameter indicates that the parameter is write-protected.
- If no key is pressed for 10 minutes or the user goes from the navigation and editing mode back to the measured value display mode, the device automatically locks the write-protected parameters after another 60 s.
- Please contact your Endress+Hauser Sales Center if you lose your access code.

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"Level" submenu

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

Medium type

Navigation 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

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

Prerequisite EOP level evaluation ≠ Fix DC

Selection ■ Unknown ■ DC 1.4 ... 1.6

■ DC 1.4 ... 1.6 ■ DC 1.6 ... 1.9

■ DC 1.9 ... 2.5

■ DC 2.5 ... 4

■ DC 4 ... 7

■ DC 7 ... 15

■ DC > 15

Factory setting Depends on the Medium type ($\rightarrow \equiv 113$) and Medium group ($\rightarrow \equiv 102$) parameters.

Additional information

Dependency of "Medium type" and "Medium group"

Medium type (→ 🗎 113)	Medium group (→ 🗎 102)	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. 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

A

Navigation

Description

Specify additional process conditions (if required).

Selection

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

Additional information

Meaning of the options

Oil/Water condensate (only Medium type = Liquid)

Makes sure that in the case of two-phase media only the total level is detected (example: oil/condensate application).

■ Probe near tank bottom (only for Medium type = Liquid)

Improves the empty detection, especially if the probe is mounted close to the tank bottom.

Build up

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

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

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

Optimizes the signal evaluation in applications with foam formation.

Level unit **Navigation** Description Select level unit. Selection SI units US units **-** % ■ ft

■ m

■ in

■ mm

Additional information

The level unit may differ from the distance unit defined in the **Distance unit** parameter (→ 🖺 101):

- The unit defined in the **Distance unit** parameter is used for the basic calibration (**Empty** calibration ($\rightarrow \equiv 103$) and Full calibration ($\rightarrow \equiv 103$)).
- The unit defined in the **Level unit** parameter is used to display the (unlinearized) level.

Blocking distance	

Navigation

Description Specify upper blocking distance UB.

0 to 200 m User entry

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

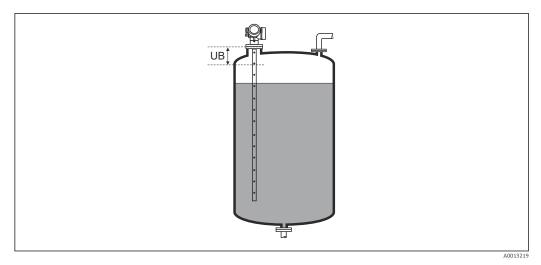
Additional information

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 \rightarrow Sensor \rightarrow Gas phase compensation \rightarrow GPC mode= **On**, **Without correction** or External correction

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

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



■ 32 Blocking distance (UB) for liquid measurements

Level correction

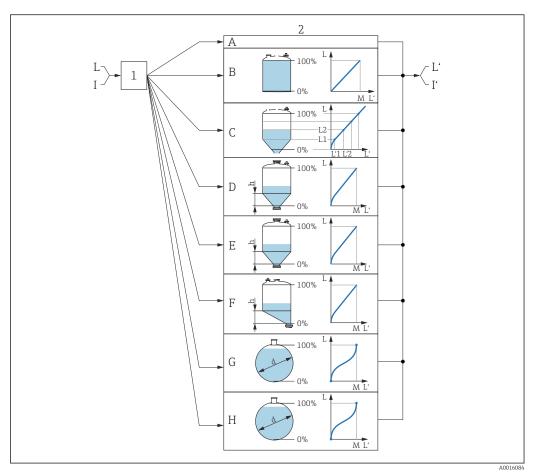
Navigation Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Level correction

Description Specify level correction (if required).

User entry -200 000.0 to 200 000.0 %

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

"Linearization" submenu



■ 33 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
- Configuration of the linearization 2
- Α
- Linearization type ($\rightarrow \stackrel{\triangle}{=} 121$) = None Linearization type ($\rightarrow \stackrel{\triangle}{=} 121$) = Linear В
- Linearization type ($\rightarrow \blacksquare 121$) = Table С
- Linearization type ($\Rightarrow = 121$) = Pyramid bottom
- Linearization type ($\rightarrow = 121$) = Conical bottom Ε
- F Linearization type ($\rightarrow \equiv 121$) = Angled bottom
- Linearization type ($\rightarrow \triangleq 121$) = Horizontal cylinder G
- *Linearization type* ($\rightarrow \equiv 121$) = *Sphere* Н
- For "Operating mode" = "Interface" or "Interface with capacitance": interface before linearization (measured in Ι the level unit)
- For "Operating mode" = "Interface" or "Interface with capacitance": interface after linearization (corresponds to volume or weight)
- Level before linearization (measured in level unit) L
- L' Level linearized ($\rightarrow = 124$) (corresponds to volume or weight)
- Maximum value (→ 🖺 124) Μ
- Diameter (\rightarrow \blacksquare 124) d
- Intermediate height ($\rightarrow \equiv 125$) h

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Structure of the submenu on the local display

► Linearization			
	Linearization type		
[Unit after linearizati	ion	
[Free text		
	Maximum value		
	Diameter		
	Intermediate height		
	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

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

Description of the parameters

Navigation

Linearization type

Navigation

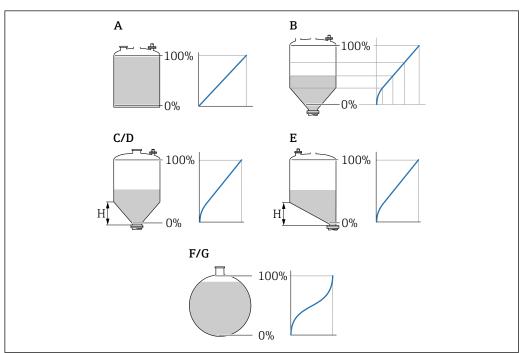
Description Select linearization type.

Selection None

Linear

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

Additional information



- 34 Linearization types
- Α None
- В Table
- С Pyramid bottom
- D Conical bottom
- Е Angled bottom
- Sphere
- 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:

- Maximum value (→ 🖺 124): 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 (→ 🗎 125)
- For every point in the table: **Level** (\rightarrow 🖺 **126**)
- For every point in the table: **Customer value** (\rightarrow 🗎 127)
- Activate table (\rightarrow 🗎 127)

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** (→ 🗎 124): maximum volume or weight
- **Intermediate height (→ 🗎 125)**: 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 (→ 🗎 124): maximum volume or weight
- **Intermediate height (→** 🖺 **125)**: 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:

- Unit after linearization ($\rightarrow \triangleq 122$)
- Maximum value (→ 🗎 124): maximum volume or weight
- **Intermediate height (→** 🗎 **125)**: 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 (→ 🖺 124): maximum volume or weight
- **■** Diameter (→ 🗎 124)

Sphere

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

- Maximum value (→ 🖺 124): maximum volume or weight
- **■** Diameter (→ 🗎 124)

Unit after linearization

Navigation

Prerequisite

Linearization type (→ 🖺 121) ≠ None

122

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.]
- $-1043 = [ft^3]$
- $1571 = [cm^3]$
- \bullet 1035 = [dm³]
- $-1034 = [m^3]$
- 1038 = [l]
- 1041 = [hl]
- **1**342 = [%]
- 1010 = [m]
- 1012 = [mm]
- 1018 = [ft]
- 1019 = [inch]
- 1351 = [l/s]
- 1001 [1/3]
- 1352 = [l/min]
- 1353 = [l/h]
- $\blacksquare 1347 = [m^3/s]$
- \blacksquare 1348 = [m³/min]
- $1349 = [m^3/h]$
- $1356 = [ft^3/s]$
- $1357 = [ft^3/min]$
- $1358 = [ft^3/h]$
- 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 ($\rightarrow \implies 123$).

Free text

Navigation

Prerequisite

Unit after linearization (→ 🖺 122) = Free text

Description

Enter unit symbol.

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

Level linearized

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

Description Displays linearized level.

Additional information

Maximum value

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

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

■ Linear

- Pyramid bottomConical bottomAngled bottom
- Horizontal cylinder

Sphere

User entry -50 000.0 to 50 000.0 %

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

Prerequisite Linearization type ($\rightarrow \triangleq 121$) 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 ($\rightarrow \triangleq 101$).

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Diameter

Intermediate height

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

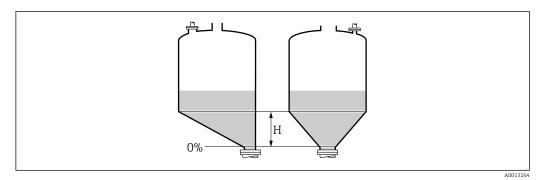
Prerequisite Linearization type ($\rightarrow \triangleq 121$) has one of the following values:

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 ($\rightarrow \triangleq 101$).

Table mode

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

Prerequisite Linearization type (→ 🗎 121) = Table

Description Select editing mode of the linearization table.

Selection • Manual

Semiautomatic *Clear table

■ Sort table

Additional information

Meaning of the options

Manual

The level and the associated linearized value are entered manually for each linearization point.

Semiautomatic

The level is measured by the device for each linearization point. The associated linearized value is entered manually.

Clear table

Deletes the existing linearization table.

Sort table

Rearranges the linerization points into an ascending order.

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

Conditions the linearization table must meet:

- The table may consist of up to 32 pairs of values "Level Linearized Value".
- The table must be monotonic (monotonically increasing or decreasing).
- The first linearization point must refer to the minimum level.
- The last linearization point must refer to the maximum level.
- Before entering a linearization table, the values for **Empty calibration** ($\rightarrow \equiv 103$) and **Full calibration** ($\rightarrow \equiv 103$) must be set correctly.

How to enter the table

- Via FieldCare
 - The table points can be entered via the **Table number** (\rightarrow 🖺 126), Level (\rightarrow 🖺 126) and **Customer value** (\rightarrow 🖺 127) 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 $(\rightarrow \implies 116)$ beforehand.

Table number		
Navigation		
Prerequisite	Linearization type (→ 🖺 121) = Table	
Description	Select table point you are going to enter or change.	
User entry	1 to 32	
Level (Manual)		Â
Navigation		
Prerequisite	 ■ Linearization type (→ 🗎 121) = Table ■ Table mode (→ 🖺 125) = Manual 	
Description	Enter level value of the table point (value before linearization).	
User entry	Signed floating-point number	

Level (Semiautomatic	c)
Navigation	
Prerequisite	 ■ Linearization type (→ 🗎 121) = Table ■ Table mode (→ 🖺 125) = Semiautomatic
Description	Displays measured level (value before linearization). This value is transmitted to the table.
Customer value	
Navigation	
Prerequisite	Linearization type (→ 🗎 121) = Table
Description	Enter linearized value for the table point.
User entry	Signed floating-point number
Activate table	
Navigation	
Prerequisite	Linearization type (→ 🗎 121) = Table

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

Disable Selection ■ Enable

Additional information

Meaning of the options

Disable

The measured level is not linearized.

If **Linearization type** (→ 🗎 121) = **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 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 ⁶⁾

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 ($\rightarrow \implies 129$).

■ Value echo lost 6)

In the case of a lost echo the output assumes the value defined in the **Value echo lost** parameter ($\Rightarrow \triangleq 128$).

Alarm

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

Value echo lost

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

Prerequisite Output echo lost $(\rightarrow \triangle 128) =$ Value echo lost

Description Output value in case of a lost echo

User entry 0 to 200 000.0 %

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

■ without linearization: **Level unit** (→ 🗎 116)

• with linearization: Unit after linearization (\rightarrow \cong 122)

128

Only visible if "Linearization type ($\rightarrow \stackrel{\triangle}{=} 121$)" = "None"

Ramp at echo lost

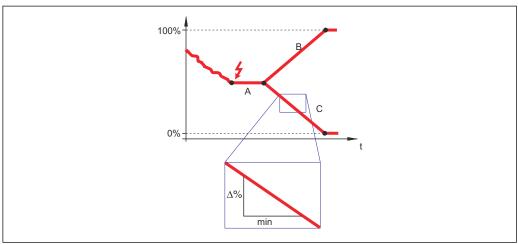
Navigation Setup \rightarrow Advanced setup \rightarrow Safety sett. \rightarrow Ramp echo lost

Prerequisite Output echo lost ($\rightarrow \triangleq 128$) = 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 (→ 🖺 129) (positive value)
- Ramp at echo lost ($\rightarrow = 129$) (negative value)
- The unit for the slope of the ramp is "percentage of the measuring range per minute" (%/
- For a negative slope of the ramp: The measured value is continuously decreased until it reaches 0%.
- For a positive slope of the ramp: The measured value is continuouly increased until it reaches 100%.

Blocking distance	

Navigation

Description Specify upper blocking distance UB.

0 to 200 m User entry

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

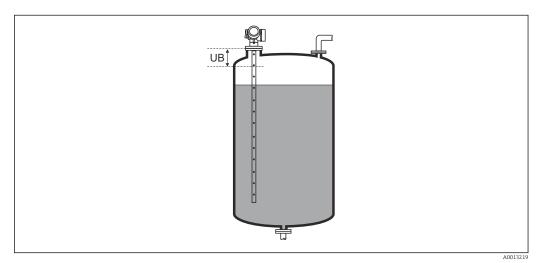
Additional information Signals in the upper blocking distance are only evaluated if they have been outside the blocking distance when the device was switched on and move into the blocking distance

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

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

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

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



■ 35 Blocking distance (UB) for liquid measurements

"WHG confirmation" wizard

i

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

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

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow WHG confirmation

"Deactivate WHG" wizard

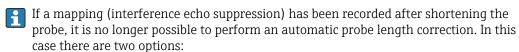
The **Deactivate WHG** wizard ($\rightarrow \boxminus 132$) is only visible if the device is WHG-locked. For details refer to the "Functional Safety Manual" of the respective device.

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

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

"Probe settings" submenu

The **Probe settings** submenu helps to ensure that the end of probe signal within the envelope curve is correctly assigned by the evaluation algorithm. The assignment is correct if the length of probe indicated by the device matches the acutal length of the probe. The automatic probe length correction can only be performed if the probe is installed in the vessel and is completely uncovered (no medium). For partially filled vessels and if the probe length is known, select **Confirm probe length** ($\rightarrow \implies 134$) = **Manual input** in order to enter the value manually.



- Delete the map using the **Record map** parameter ($\rightarrow \boxminus 107$) before performing the automatic probe length correction. After the probe length correction, a new map can be recorded using the **Record map** parameter ($\rightarrow \boxminus 107$).
- Alternative: Select Confirm probe length (→ 134) = Manual input and enter the probe length manually into the Present probe length parameter → 133.
- An automatic probe length correction is only possible after the correct option has been selected in the **Probe grounded** parameter ($\rightarrow \implies 133$).

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

Probe grounded		
Navigation	$ □ $ Setup \rightarrow Advanced setup \rightarrow Probe settings \rightarrow Probe grounded	
Prerequisite	Operating mode = 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 (→ 🗎 134) = 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 $\rightarrow \triangleq 133$ 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 $\rightarrow \implies 133$. This procedure has to be repeated until the displayed value matches the actual length of the probe.

Probe length too big

To be selected if the displayed length is bigger than the actual length of the probe. A different end of probe signal is allocated and the newly calculated length is indicated in the **Present probe length** parameter $\rightarrow \implies 133$. 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 $\rightarrow \implies 133^{7}$.

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.

[•]

⁷⁾ 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.

Description

"Probe length correction" wizard

The **Probe length correction** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the probe length correction are located directly in the **Probe settings** submenu ($\rightarrow \blacksquare$ 133).

Navigation

→ 🖺 133

Confirm probe length			
Navigation		$Setup \to Advanced \ setup \to Probe \ settings \to Prob.length \ corr \to Confirm \ length$	
Description	→ 🖺	134	
Present probe length			<u> </u>
Navigation		$Setup \to Advanced \ setup \to Probe \ settings \to Prob.length \ corr \to Pres. \ length$	

"Switch output" submenu

The **Switch output** submenu ($\rightarrow \triangleq 136$) is only visible for devices with switch output. ⁸⁾

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

Switch output function

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

Description Select function for switch output.

Selection ■ Off ■ On

Diagnostic behavior

■ Limit

■ Digital Output

Additional information

Meaning of the options

Off

The output is always open (non-conductive).

On

The output is always closed (conductive).

Diagnostic behavior

The output is normally closed and is only opened if a diagnostic event is present. The **Assign diagnostic behavior** parameter ($\rightarrow \implies 137$) determines for which type of event the output is opened.

Limit

The output is normally closed and is only opened if a measured variable exceeds or falls below a defined limit. The limit values are defined by the following parameters:

- Switch-on value ($\rightarrow \triangleq 138$)
- **■** Switch-off value (→ 🖺 139)
- 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 ($\rightarrow \stackrel{\triangle}{=} 136$).

 \blacksquare 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 (→ 🗎 136) = Digital Output

Description Select device status for switch output.

136

⁸⁾ Ordering feature 020 "Power supply; Output", option B, E or G

Selection

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

Digital output 3Digital output 4

Additional information

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

Assign limit

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

Prerequisite Switch output function ($\rightarrow \triangleq 136$) = Limit

Selection ■ Off

■ Level linearized

Distance

■ Interface linearized

Interface distance *

Thickness upper layer *

■ Terminal voltage

■ Electronic temperature

Measured capacitance

■ Relative echo amplitude

Relative interface amplitude *

■ Absolute echo amplitude

Absolute interface amplitude *

Assign diagnostic behavior

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

Prerequisite Switch output function (→ 🗎 136) = 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 (→ 🗎 136) = Limit

Description Enter measured value for the switch-on point.

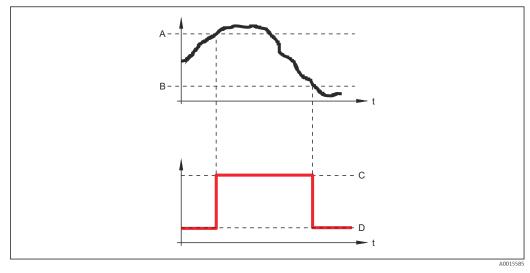
User entry Signed floating-point number

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

Switch-on value > Switch-off value

Switch-off value parameters:

- 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**.

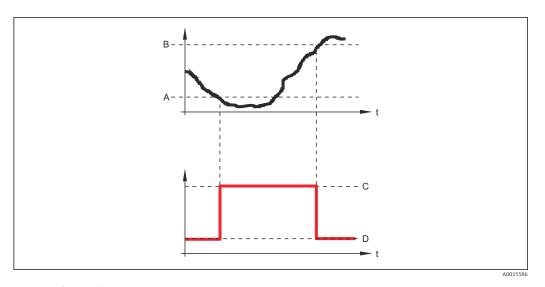


- A Switch-on value
- B Switch-off value
- C Output closed (conductive)
- D Output opened (non-conductive)

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**.

138



- 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 (→ 🗎 136) = Limit ■ Assign limit (→ 🗎 137) ≠ Off

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

User entry 0.0 to 100.0 s

Switch-off value	

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

Prerequisite Switch output function ($\Rightarrow \implies 136$) = 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

(→ 🖺 138).

Switch-off delay		
Navigation		
Prerequisite	 Switch output function (→ 🗎 136) = Limit Assign limit (→ 🖺 137) ≠ 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 ($\rightarrow \triangleq 136$) = 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	Setup → Advanced setup → Switch output → Invert outp.sig.	
Description	Invert the output signal.	
Selection	No	

Yes

Additional information

Meaning of the options

■ No

The behavior of the switch output is as described above.

Yes

The states **Open** and **Closed** are inverted as compared to the description above.

"Display" submenu

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

Navigation

Language

Navigation

Description

Set display language.

Selection

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

Factory setting

The language selected in feature 500 of the product structure.

If no language has been selected: English

Additional information

Format display

Navigation

Description

Select how measured values are shown on the display.

Selection

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

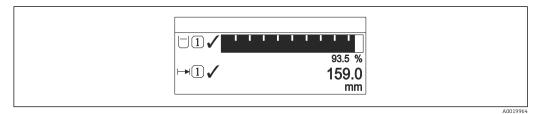
142

Visibility depends on order options or device settings

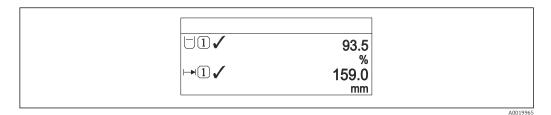
Additional information



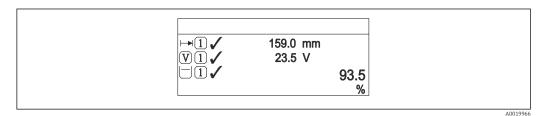
■ 36 "Format display" = "1 value, max. size"



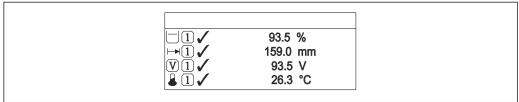
■ 37 "Format display" = "1 bargraph + 1 value"



■ 38 "Format display" = "2 values"

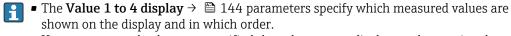


■ 39 "Format display" = "1 value large + 2 values"



.

₫ 40 "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 ($\rightarrow \equiv 144$).

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 ⁷ ■ Terminal voltage ■ Electronic temperature Measured capacitance Analog output 1 Analog output 2 Analog output 3 Analog output 4 Analog output adv. diagnostics 1 ■ Analog output adv. diagnostics 2 **Factory setting** For level measurements ■ Value 1 display: Level linearized Value 2 display: Distance

Decimal places 1 to 4		
Navigation		
Description	Select the number of decimal places for the display value.	
Selection	■ X ■ X.X ■ X.XX ■ X.XXX	
Additional information	The setting does not affect the measuring or computational accuracy of the device.	

Value 3 display: Current output 1

■ Value 4 display: None

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

144

Description

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

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 $\blacksquare \square$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Display damping

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

User entry 0.0 to 999.9 s

Header 🖺

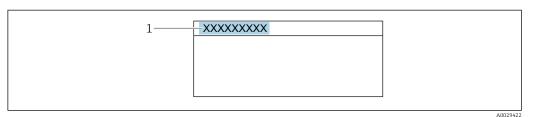
Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Header

Description Select header contents on local display.

Selection ■ Device tag

■ Free text

Additional information



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 ($\rightarrow \triangleq 145$).

Header text

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

Prerequisite Header (→ 🗎 145) = Free text

Description Enter display header text.

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

	-				•	•	•					
Δл	П	1†1	A1	าว		ır	11	\mathbf{n}	m	3	tior	1

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

Separator	
**	

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

Description Select decimal separator for displaying numerical values.

Selection • .

■ ,

Number format	
Number format	

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

Description Choose number format for the display.

Selection • Decimal

■ ft-in-1/16"

Additional information

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

Decimal places menu Navigation Setup → Advanced setup → Display → Dec. places menu

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

menu.

Selection • x

X.XX.XX

x.xxx.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** → 🖺 144 parameters.

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

Backlight

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

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

Description Switch the local display backlight on and off.

Selection • Disable

■ Enable

Additional information Meaning of the options

Disable

Switches the backlight off.

Enable

Switches the backlight on.

Regardless of the setting in this parameter the backlight may be automatically switched off by the device if the supply voltage is too low.

Contrast display

Navigation Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Contrast display

Description Adjust local display contrast setting to ambient conditions (e.g. lighting or reading angle).

User entry 20 to 80 %

Factory setting Dependent on the display.

Additional information

Setting the contrast via push-buttons:

- Darker: press the 🔘 📵 buttons simultaneously.
 - \bullet Brighter: press the \boxdot \boxdot 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.

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

\sim		. •
()	perating	time

Navigation \blacksquare 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 $\blacksquare \Box$ 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 $\blacksquare \square$ 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

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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 ($\rightarrow \implies 149$).

Clear backup data

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

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

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

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

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.

- If the transmitter configuration has been duplicated from a different device by Configuration management (→ 🗎 148) = Duplicate, the new device configuration in the HistoROM is only partially identical to the configuration stored in the display module: Sensor specific properties (e.g. the mapping curve) are not duplicated. Thus, the result of the comparison will be Settings not identical.

"Administration" submenu

Navigation \square Setup \rightarrow Advanced setup \rightarrow Administration

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

Description Define release code for write access to parameters.

User entry 0 to 9 999

Additional information

- If the factory setting is not changed or if "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 symbol in the document. On the local display, the 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 $(\rightarrow \implies 112)$.
- 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 ($\rightarrow \implies 153$).

Device reset	a

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

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

Selection • Cancel

To factory defaultsTo delivery settings

Of customer settings

To transducer defaults

Restart device

Additional information

Meaning of the options

Cancel

No action

To factory defaults

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

To delivery settings

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

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

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.

User entry

"Define access code" wizard

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

Navigation

0 to 9999

 $\mathsf{Setup} \to \mathsf{Advanced} \ \mathsf{setup} \to \mathsf{Administration} \to \mathsf{Def.} \ \mathsf{access} \ \mathsf{code}$

Define access code		1
Navigation		.e
Description	→ 🖺 151	
Confirm access code		
Navigation		
Description	Confirm the entered access code.	

16.4 "Diagnostics" menu

Actual diagnostics	
Navigation	
Description	Displays current diagnostic message.
Additional information	The display consists of: Symbol for event behavior Code for diagnostic behavior Operating time of occurrence Event text
	If several messages are active at the same time, the messages with the highest priority is displayed.
	Information on what is causing the message, and remedy measures, can be viewed via the ① symbol on the display.
Timestamp	
Navigation	☐ Diagnostics → Timestamp
Previous diagnostics	
Navigation	□ Diagnostics → Prev.diagnostics
Description	Displays the last diagnostic message which has been active before the current message.
Additional information	The display consists of: Symbol for event behavior Code for diagnostic behavior Operating time of occurrence Event text
	The condition displayed may still apply. Information on what is causing the message, and remedy measures, can be viewed via the ① symbol on the display.

154

Timestamp

Navigation □ Diagnostics → Timestamp

Operating time from restart

Navigation \Box Diagnostics \rightarrow Time fr. restart

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

Operating time

Navigation \square Diagnostics \rightarrow Operating time

Description Indicates how long the device has been in operation.

Additional information *Maximum time*

9999 d (≈ 27 years)

16.4.1 "Diagnostic list" submenu

Navigation \square Diagnostics \rightarrow Diagnostic list

Diagnostics 1 to 5

Navigation \Box 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 behavior

Operating time of occurrence

Event text

Timestamp 1 to 5

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

16.4.2 "Event logbook" submenu



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

Navigation

Diagnostics → Event logbook

Filter options

Navigation

Diagnostics → Event logbook → Filter options

Selection

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

Additional information



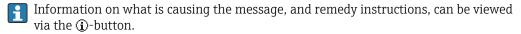
- This parameter is only used for operation via the local display.
- The status signals are categorized according to NAMUR NE 107.

"Event list" submenu

The **Event list** submenu displays the history of past events of the category selected in the **Filter options** parameter ($\rightarrow \implies 157$). 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



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 \blacksquare Diagnostics \rightarrow Event logbook \rightarrow Event list

Endress+Hauser

16.4.3 "Device information" submenu

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

Device tag

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

Description Enter the name for the measuring point.

User interface Character string comprising numbers, letters and special characters

Serial number

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

Description Shows the serial number of the measuring device.

Additional information

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

Firmware version

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

Description Shows the device firmware version installed.

User interface xx.yy.zz

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

Device name

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

Description Shows the name of the transmitter.

158

Order code

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

Description Shows the device order code.

User interface Character string comprising numbers, letters and special characters

Additional information The order code is generated from the extended roder code, which defines all device

features of the product structure. In contrast, the device features can not be read directly

from the order code.

Extended order code 1 to 3

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

Description Display the three parts of the extended order code.

User interface Character string comprising numbers, letters and special characters

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

and thus uniquely identifies the device.

Status PROFIBUS Master Config

Navigation □ Diagnostics → Device info → Stat Master Conf

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

User interface ■ Active

Not active

PROFIBUS ident number

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

Description Indicates the ident number of the device.

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

16.4.4 "Measured values" submenu

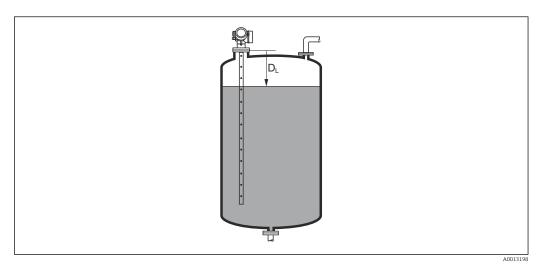
Navigation \Box Diagnostics \rightarrow Measured val.

Distance

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

or threaded connection) and the level.

Additional information



 \blacksquare 41 Distance for liquid measurements

The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 101$).

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 $\rightarrow \triangleq 122$.

Terminal	voltage 1	
----------	-----------	--

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

Switch status

Description Shows the current switch output status.

"Analog input 1 to 6" submenu 16.4.5

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

Navigation

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

Signed floating-point number

162

User entry

Visibility depends on order options or device settings

Additional information

■ For Mode block actual = Man:

Enter the output value of the Analog Input Block.

■ Else:

Displays the output value of the Analog Input Block.

Out status

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

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

the PROFIBUS Profile.

User interface ■ Good

UncertainBad

Additional information

Only the two quality bits are evaluated in this parameter.

Out status HEX

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

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

PROFIBUS Profile.

User entry 0 to 255

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

this parameter.

16.4.6 "Data logging" submenu

Assign channel 1 to 4

Navigation

Selection

- Off
- Level linearized
- Distance
- Unfiltered distance
- Interface linearized *
- Interface distance
- Unfiltered interface distance
- Thickness upper layer ³
- Terminal voltage
- Electronic temperature
- Measured capacitance
- Absolute echo amplitude
- Relative echo amplitude
- Absolute interface amplitude *
- Relative interface amplitude
- Absolute EOP amplitude
- EOP shift
- Noise of signal
- Calculated DC value *
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2

Additional information

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

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

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

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

Logging interval

Navigation

- Diagnostics → Data logging → Logging interval

User entry

1.0 to 3600.0 s

164

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

Additional information

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

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

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

The logged data are deleted if this parameter is changed.

Example

When using 1 logging channel

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

Clear logging data	

Navigation

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

Selection

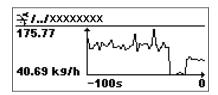
- Cancel
- Clear data

"Display channel 1 to 4" submenu



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

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



- x-axis: depending on the number of selected channels, 250 to 1000 measured values of a process variable are displayed.
- y-axis: covers the approximate measured value span and constantly adapts this to the measurement.
- To return to the operating menu, press \pm and \Box simultaneaously.

Navigation

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

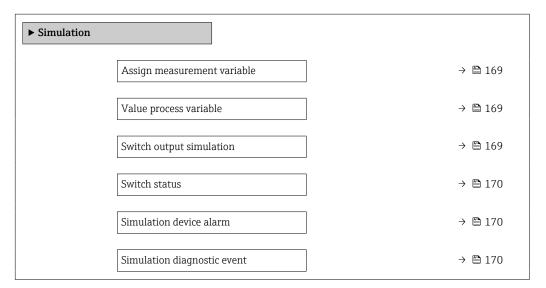
16.4.7 "Simulation" submenu

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

Conditions which can be simulated

Condition to be simulated	Associated parameters
Specific value of a process variable	 Assign measurement variable (→ 🗎 169) Value process variable (→ 🖺 169)
Specific state of the switch output	 Switch output simulation (→ 🖺 169) Switch status (→ 🖺 170)
Existence of an alarm	Simulation device alarm (→ 🖺 170)
Existence of a specific diagnostic message	Simulation diagnostic event (→ 🖺 170)

Structure of the submenu



Description of parameters

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

Assign measurement variable

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

Selection ■ Off

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

Additional information

- The value of the variable to be simulated is defined in the **Value process variable** parameter ($\rightarrow \bowtie 169$).
- If **Assign measurement variable** ≠ **Off**, a simulation is active. This is indicated by a diagnotic message of the *Function check (C)* category.

Value process variable

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

Prerequisite Assign measurement variable ($\rightarrow \triangleq 169$) $\neq 0ff$

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

Prerequisite Switch output simulation ($\rightarrow \triangleq 169$) = On

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

Selection ■ Open

Closed

Additional information The switch status assumes the value defined in this parameter. This helps to check correct

operation of connected control units.

Simulation device alarm

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

Description Switch the device alarm on and off.

Selection ■ Off

On

Additional information When selecting the **On** option, the device generates an alarm. This helps to check the

correct output behavior of the device in the case of an alarm.

An active simulation is indicated by the **&C484 Simulation failure mode** diagnostic

message.

Simulation diagnostic event

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

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

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

categories (Diagnostic event category parameter).

16.4.8 "Device check" submenu

Navigation \Box 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	CIA	าวเ
TCACI	SIUI	ıaı

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 \Box 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.

16.4.9 "Heartbeat" submenu

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

Detailed description SD01872F

Navigation \square Diagnostics \rightarrow Heartbeat

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