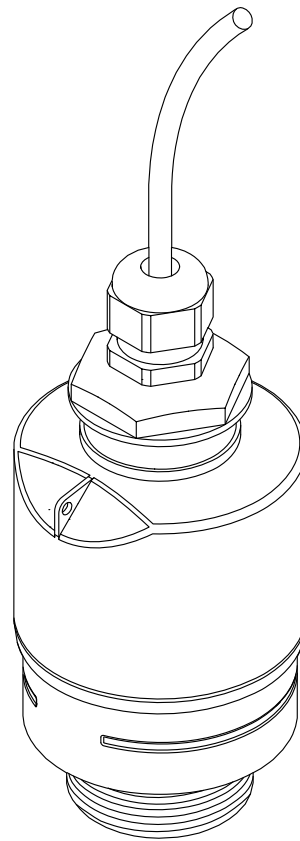
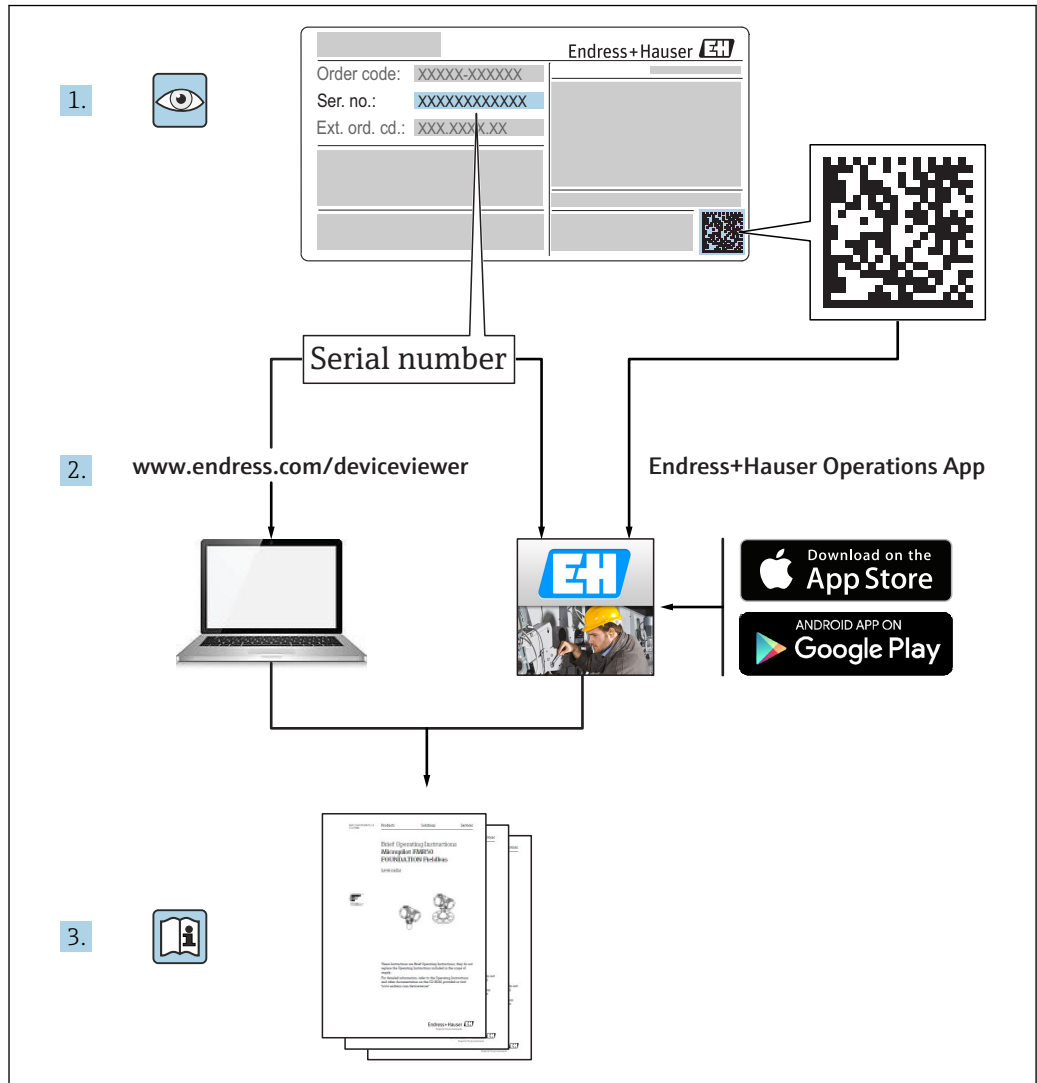


Operating Instructions

Micropilot FMR10

Free space radar
















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1 Document information


1.1 Symbols for certain types of information



Symbol	Meaning
	Permitted Procedures, processes or actions that are permitted.
	Preferred Procedures, processes or actions that are preferred.
	Forbidden Procedures, processes or actions that are forbidden.
	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Series of steps
	Result of a step
	Help in the event of a problem
	Visual inspection

1.2 Safety symbols

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

1.3 Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections

Symbol	Meaning
	Hazardous area Indicates a hazardous area.
	Safe area (non-hazardous area) Indicates the non-hazardous area.

2 Terms and abbreviations

Term/abbreviation	Explanation
BA	Document type "Operating Instructions"
KA	Document type "Brief Operating Instructions"
TI	Technical Information
SD	Document type "Special Documentation"
XA	Document type "Safety Instructions"
PN	Nominal pressure
MWP	Maximum Working Pressure The MWP can also be found on the nameplate.
ToF	Time of Flight
DK	Relative dielectric constant ϵ_r
Operating tool	The term "operating tool" is used in place of the following operating software: SmartBlue (app), for operation using an Android or iOS smartphone or tablet.
BD	Blocking Distance; no signals are analyzed within the BD.

3 Basic safety instructions

3.1 Requirements for 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.

3.2 Designated use

Application and media

The measuring device described in these Operating Instructions is intended for continuous, non-contact level measurement in liquids. Because of its operating frequency of approx. 26 GHz, a maximum radiated pulsed power of 5.7 mW and an average power output of 0.015 mW, use outside of closed, metallic vessels is also permitted. For operation outside of closed vessels the device must be installed according to the instructions mentioned in the chapter "Installation" →  16. Operation does not pose a risk to health or the environment.

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: distance
- ▶ Calculated process variables: volume or mass in vessels of any shape; flow through measuring weirs or flumes (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 against which the process-wetted materials are adequately resistant.
- ▶ Observe the limit values in "Technical data".

Incorrect use

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

Verification for borderline cases:

- ▶ For special 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 dissipation within the electronics, the temperature of the electronics housing and the assemblies contained therein may rise to 80 °C (176 °F) during operation. When in operation, the sensor can reach a temperature close to the medium temperature.

Danger of burns from contact with surfaces!

- ▶ For elevated fluid temperature, ensure protection against contact to prevent burns.

3.3 Workplace safety

For work on and with the device:

- ▶ Wear the required personal protective equipment according to federal/national regulations.

3.4 Operational safety

Risk of injury.

- ▶ Operate the device in proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for interference-free operation of the device.

Conversions to the device

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

- ▶ If, despite this, modifications are required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability,

- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to repair of an electrical device.
- ▶ Use original spare parts and accessories from the manufacturer only.

Hazardous area

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

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

3.5 Product safety

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

3.5.1 CE mark

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

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

4 Registered trademarks

Bluetooth®

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

Apple®

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

Android®

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

5 Supplementary documentation

The following document types are available in the Download Area of the Endress+Hauser Internet site: www.endress.com → Download:

5.1 Standard documentation

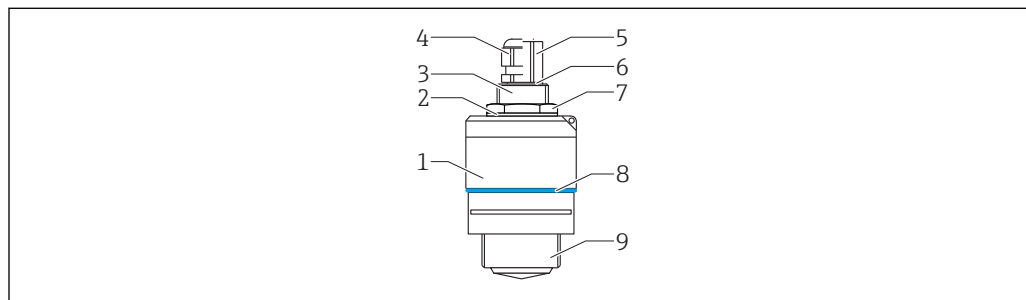
Device	Document type	Document code
FMR10	Brief Operating Instructions	KA01247F

Device	Document type	Document code
FMR10	Technical Information	TI01266F

6 Product description

6.1 Product design

6.1.1 Micropilot FMR10



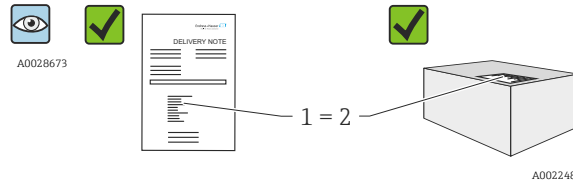
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1 Design of the Micropilot FMR10 (26 GHz)

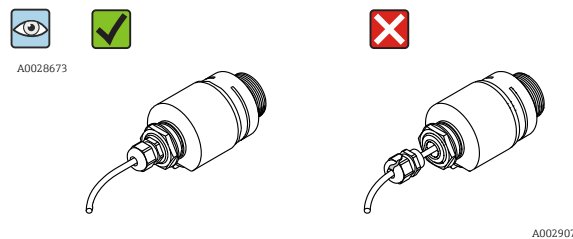
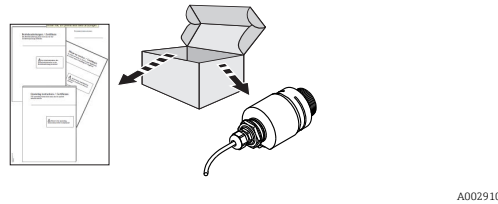
- 1 Sensor housing
- 2 Seal
- 3 Process connection rear side
- 4 Cable gland
- 5 Pipe adapter
- 6 O-ring
- 7 Counter nut
- 8 Design ring
- 9 Process connection front side

7 Incoming acceptance and product identification

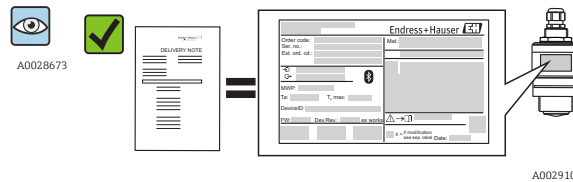
7.1 Incoming acceptance




Are the order codes on the delivery note (1) and the product sticker (2) identical?



Are the goods undamaged?



Do the nameplate data match the ordering information on the delivery note?

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

7.2 Product identification

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

- Nameplate specifications
- Extended order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer): All information about the measuring device and an overview of the scope of the associated Technical Documentation is displayed.
- Enter the serial number from the nameplates into the *Endress+Hauser Operations App*, or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*: All information about the measuring device and an overview of the scope of the associated Technical Documentation is displayed.

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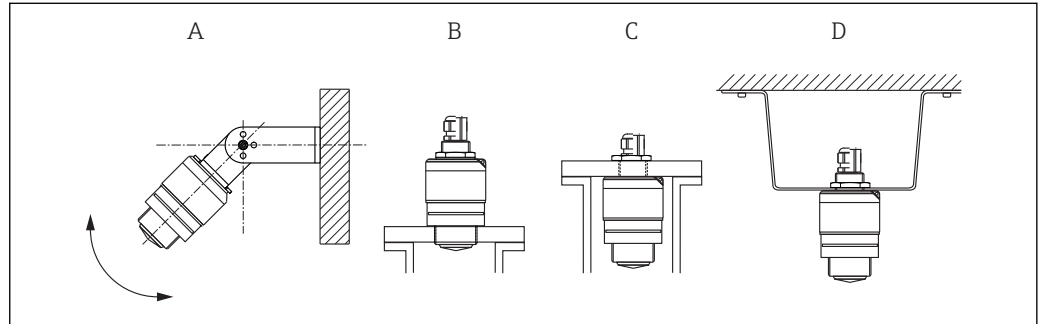
2 Nameplate of Micropilot

- 1 Manufacturer's address
- 2 Device name
- 3 Order code
- 4 Serial number (ser. no.)
- 5 Extended order code (Ext. ord. cd.)
- 6 Supply voltage
- 7 Signal outputs
- 8 Process pressure
- 9 Permitted ambient temperature (T_a)
- 10 Maximum process temperature
- 11 Device ID
- 12 Firmware version (FW)
- 13 Device revision (Dev.Rev.)
- 14 CE mark
- 15 Additional information about the device version (certificates, approvals)
- 16 C-Tick
- 17 Materials in contact with process
- 18 Degree of protection: e.g. IP, NEMA
- 19 Certificate symbol
- 20 Certificate and approval relevant data
- 21 Document number of the Safety Instructions: e.g. XA, ZD, ZE
- 22 Modification mark
- 23 2-D matrix code (QR code)
- 24 Manufacturing date: year-month

8 Installation

8.1 Installation conditions

8.1.1 Installation types



3 Wall, ceiling or nozzle installation

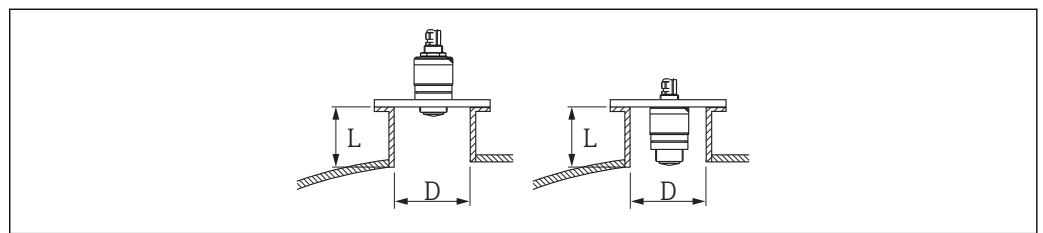
- A Wall or ceiling mount, adjustable
- B Mounted at front thread
- C Mounted at rear thread
- D Ceiling installation with counter nut (included in delivery)

i **Caution!**

The sensor cable is not designed as supporting cable. Do not use as a suspension wire.

8.1.2 Nozzle installation

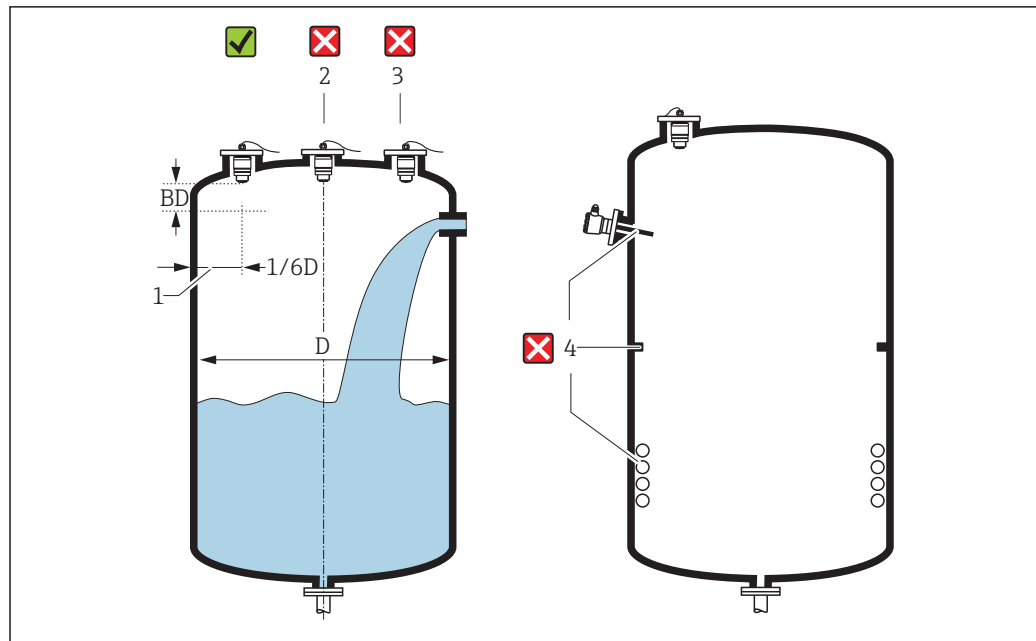
The antenna should be just out of the nozzle for optimum measurement. The interior of the nozzle must be smooth and may not contain any edges or welded joints. The edge of the nozzle should be rounded if possible. The maximum nozzle length **L** depends on the nozzle diameter **D**. Please note the specified limits for the diameter and length of the nozzle.



4 FMR10 nozzle installation

	40 mm (1.5 in) Antenna, outside nozzle	40 mm (1.5 in) Antenna, inside nozzle
D	min. 40 mm (1.5 in)	min. 80 mm (3 in)
L	max. D x 1.5	max. 140 mm (5.5 in) + D x 1.5

8.1.3 Orientation



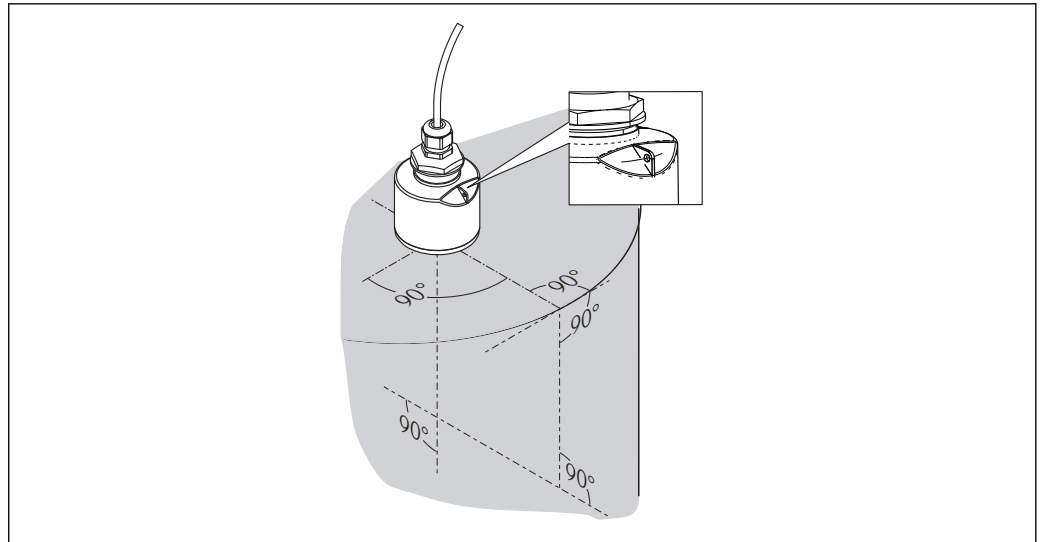
5 Tank installation position

A0028410

- If possible install the sensor so that its lower edge projects into the vessel.
- Do not install the sensor in the middle of the tank (2). We recommend leaving a distance (1) between the sensor and the tank wall measuring 1/6 of the tank diameter. Recommended distance **A** wall - nozzle outer edge: $\sim 1/6$ of the tank diameter **D**. However, the device must not under any circumstances be mounted closer than 15 cm (5.91 in) to the tank wall.
- Avoid measurements through the filling curtain (3).
- Avoid equipment (4) such as limit switches, temperature sensors, baffles, heating coils etc.
- Multiple devices can be operated in one tank without influencing each other.
- No signals are analyzed within the Blocking distance. It can therefore be used to suppress interference signals (e.g. the effects of condensate) close to the antenna. By default an automatic Blocking distance of at least 0.1 m (0.33 ft) is preset. However it can be manually overwritten (even 0 m (0 ft) is allowed).
Automatic calculation:
Blocking distance = Empty calibration - Full calibration - 0.2 m (0.656 ft).
The **Blocking distance** parameter is recalculated according to this formula every time a new value is entered into the **Empty calibration** parameter or **Full calibration** parameter.
If this calculation results in a value < 0.1 m (0.33 ft), the blocking distance of 0.1 m (0.33 ft) is used instead.

8.1.4 Alignment

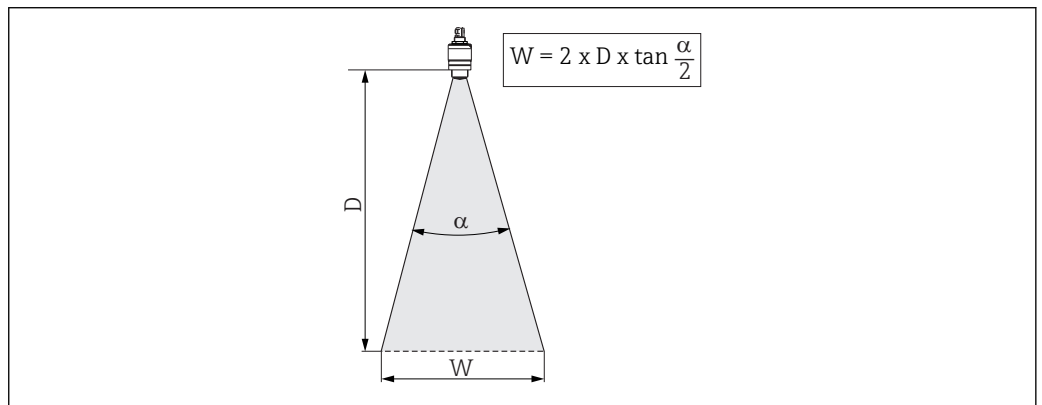
- Align the antenna vertically to the product surface.
- Align the eyelet with the mounting eye as well as possible towards the tank wall.



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6 Sensor alignment when mounting in tank

8.1.5 Beam angle



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7 Relationship between beam angle α , distance D and beamwidth diameter W

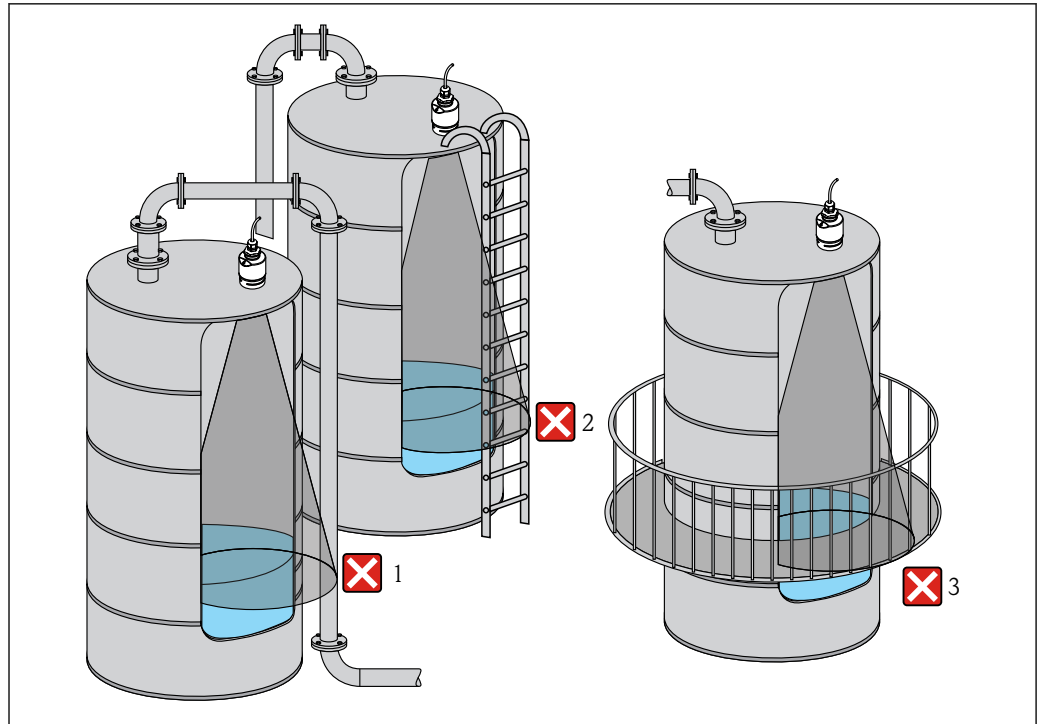
The beam angle is defined as the angle α at which the power density of the radar waves reaches half the value of the maximum power density (3dB width). Microwaves are also emitted outside the signal beam and can be reflected off interfering installations.

Beam diameter W as a function of beam angle α and measuring distance D .

FMR10	
Antenna size	40 mm (1.5 in)
Beam angle α	30°
Distance (D)	Beamwidth diameter W
3 m (9.8 ft)	1.61 m (5.28 ft)
5 m (16.4 ft)	2.68 m (8.79 ft)

8.1.6 Measurement in plastic vessels

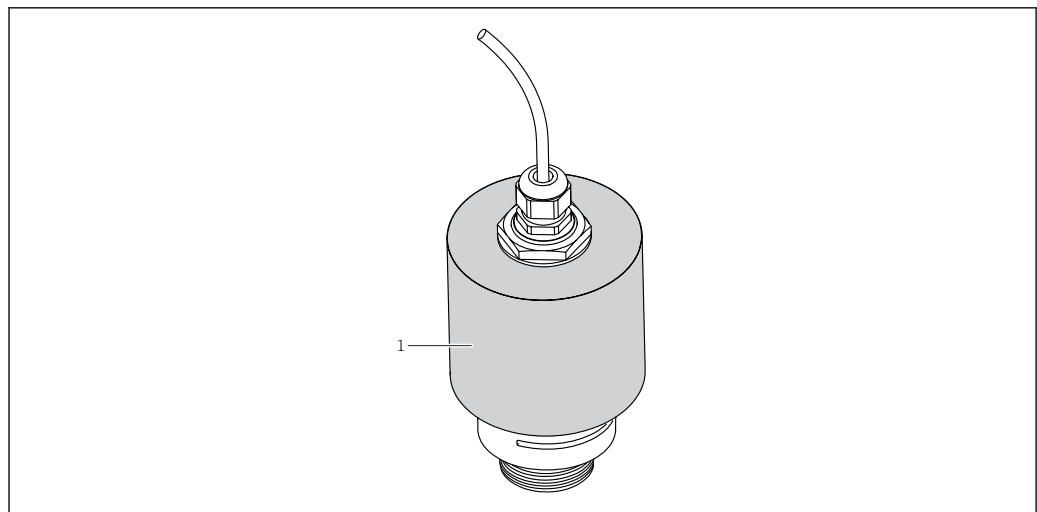
If the outer wall of the vessel is made of a non-conductive material (e.g. GFR) microwaves can also be reflected off interfering installations outside of the vessel (e.g. metallic pipes (1), ladders (2), grates (3), ...). Therefore there should be no such interfering installations in the signal beam. For more information, please contact Endress+Hauser.



8 Measurement in a plastic vessel

8.1.7 Weather protection cover

For outdoor use, the use of a weather protection cover(1) is recommended



9 Weather protection cover, e.g with 40 mm (1.5") antenna

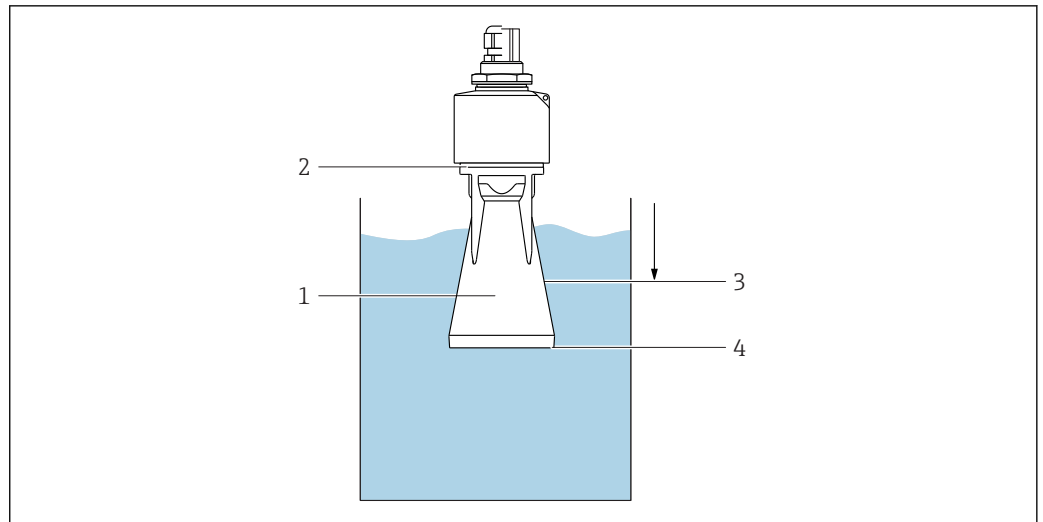
i The sensor is not completely covered.

The weather protection cover is available as an accessory. → 34

8.1.8 Free-field measurement with flooding protection tube

The flooding protection tube guarantees a definitive analysis of the maximum level even in the event that the sensor is completely flooded.

In free-field installations and / or in applications where there is a risk of flooding, it is recommended to use a flooding protection tube



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10 Function of flooding protection tube

- 1 Air pocket
- 2 O-ring (EPDM) seal
- 3 Blocking distance
- 4 Max. Level

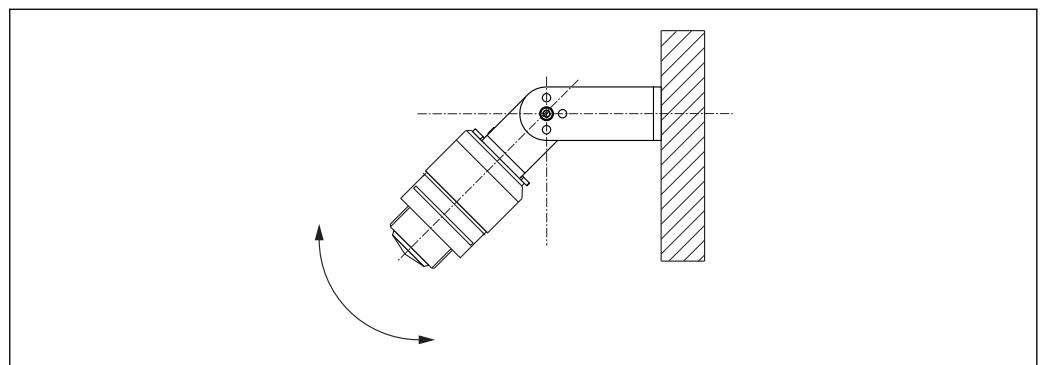
i The flooding protection tube is available as an accessory. → **34**

The tube is screwed directly onto the sensor and seals off the system by means of an O-ring (2) making it air-tight. In the event of flooding, the air pocket (1) that develops in the tube ensures a definitive detection of the maximum level (4) directly at the end of the tube. Due to the fact that the Blocking distance (3) is inside the tube, multiple echoes are not analyzed.

Configuring the blocking distance when using the flooding protection tube

- ▶ Navigate to: Main menu → Setup → Advanced setup → Blocking distance
 - ↳ Enter 100 mm (4 in).

8.1.9 Installation with mounting bracket, adjustable



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11 Installation with mounting bracket, adjustable

- Wall or ceiling installation is possible.
- Using the mounting bracket, position the antenna so that it is perpendicular to the product surface.

NOTICE

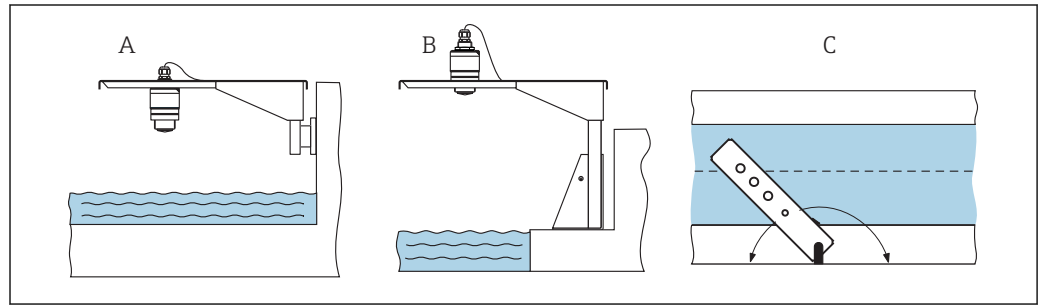
There is no conductive connection between the mounting bracket and transmitter housing.

Risk of electrostatic charge.


- ▶ Integrate the mounting bracket in the local potential equalization system.

i The mounting bracket is available as an accessory. →  34

8.1.10 Cantilever installation, with pivot



A0028412

 12 Cantilever installation, with pivot

A Installation with cantilever and wall bracket

B Installation with cantilever and mounting frame

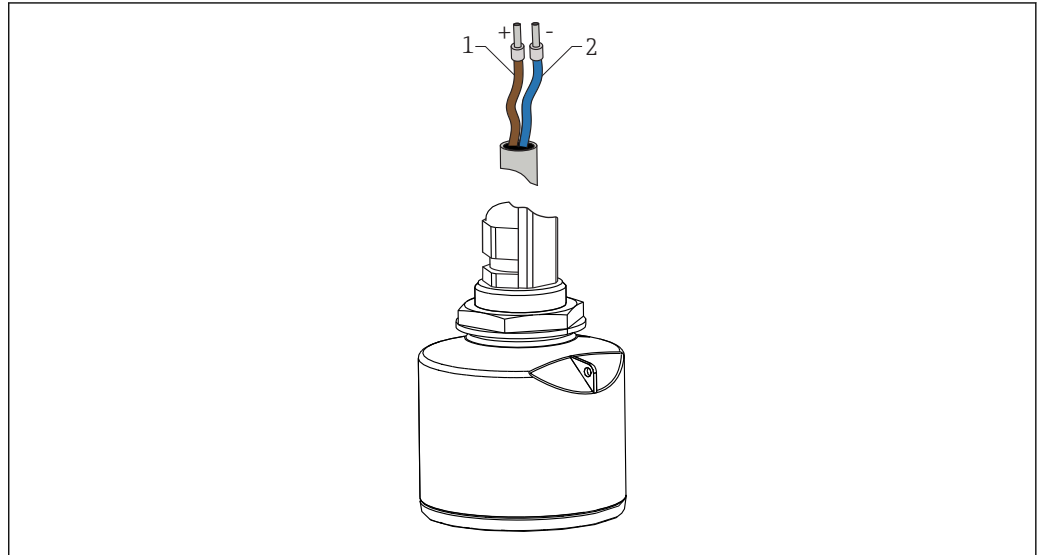
C The cantilever can be turned (e.g. in order to position the sensor over the center of the channel, for example)

8.1.11 Post-installation check

<input type="checkbox"/>	Is the device undamaged (visual inspection)?
<input type="checkbox"/>	Is the device adequately protected from wet conditions and direct sunlight?
<input type="checkbox"/>	Is the device properly secured?

9 Electrical connection

9.1 Cable assignment



A0028954

13 Cable assignment

- 1 Plus, brown wire
- 2 Minus, blue wire

9.2 Supply voltage

An external power supply is necessary.

Terminal voltage U at device	Maximum load R, depending on supply voltage U ₀ of power supply unit
10.5 to 30 V _{DC} 2-wire	<p>The graph plots Maximum load R [Ω] on the y-axis (0 to 500) against supply voltage U₀ [V] on the x-axis (10 to 30). The load is 0 Ω for U₀ = 10.5 V, increases linearly to 500 Ω at U₀ = 21.75 V, and remains constant at 500 Ω for U₀ up to 30 V.</p>

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Potential equalization

No special measures for potential equalization are required.

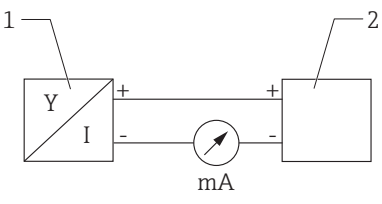
i Various power supply units can be ordered from Endress+Hauser.

i Battery operation

The sensor's *Bluetooth*[®] wireless technology communication can be disabled to increase the operating life of the battery.

→ 29

9.3 Connection 4 to 20 mA

	Circuit diagram / Description
FMR10 connection with voltage source and 4 to 20 mA display	 <p>A0028907</p> <p>14 FMR10 block diagram</p> <p>1 Micropilot FMR10, 4 to 20 mA</p> <p>2 Power supply</p>

9.4 Post-connection check

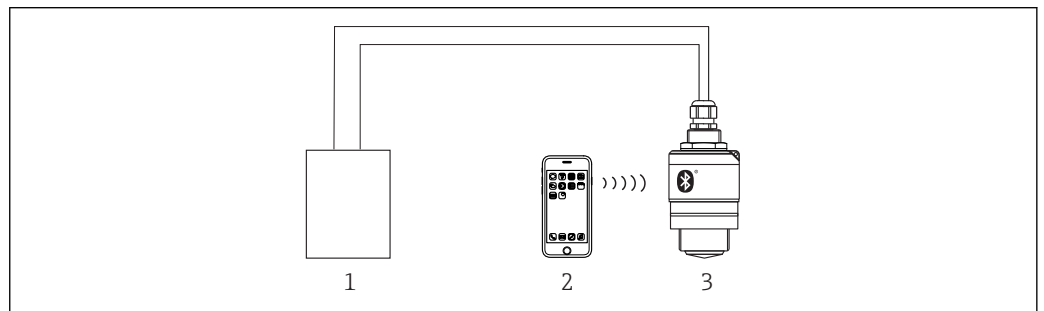
<input type="checkbox"/>	Is the device or cable undamaged (visual check)?
<input type="checkbox"/>	Do the cables have adequate strain relief?
<input type="checkbox"/>	Are the cable glands mounted and firmly tightened?
<input type="checkbox"/>	Does the supply voltage match the specifications on the nameplate?
<input type="checkbox"/>	No reverse polarity, is terminal assignment correct?

10 Operability

10.1 Operating concept

- 4 to 20 mA
- SmartBlue (app) via *Bluetooth*[®] wireless technology
- Menu guidance with brief explanations of the individual parameter functions in the operating tool

10.2 Via *Bluetooth*[®] wireless technology



A0028895

15 Possibilities for remote operation via *Bluetooth*[®] wireless technology

- 1 Transmitter power supply unit
- 2 Smartphone / tablet with SmartBlue (app)
- 3 Transmitter with *Bluetooth*[®] wireless technology

11 Commissioning and operation

11.1 Installation and function check

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

11.2 Operation and settings via SmartBlue (app)

SmartBlue is available as download for Android devices from the Google Play Store and for iOS devices from the iTunes Store.

If you scan the QR code, you will be brought directly to the app:



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 16 Download Links

System requirements

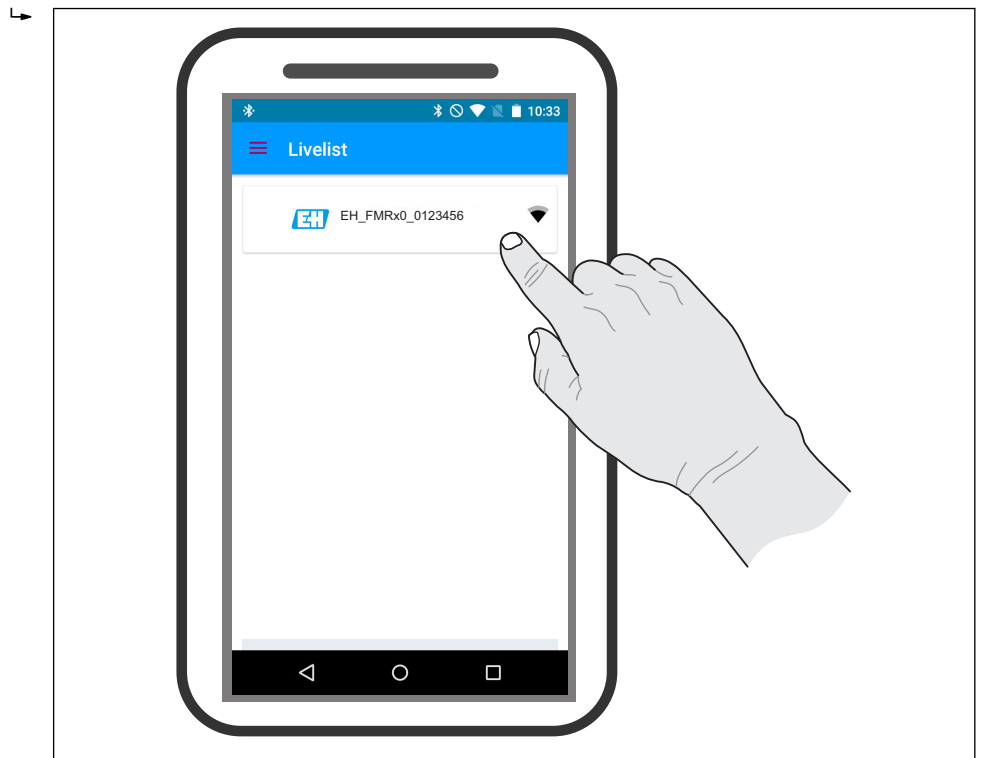
- iOS devices: iPhone 4S or higher from iOS9.0; iPad2 or higher from iOS9.0; iPod Touch 5. Generation or higher from iOS9.0
- Android devices: from Android 4.4 KitKat and *Bluetooth*® 4.0

1. Download and install SmartBlue
2. Start SmartBlue



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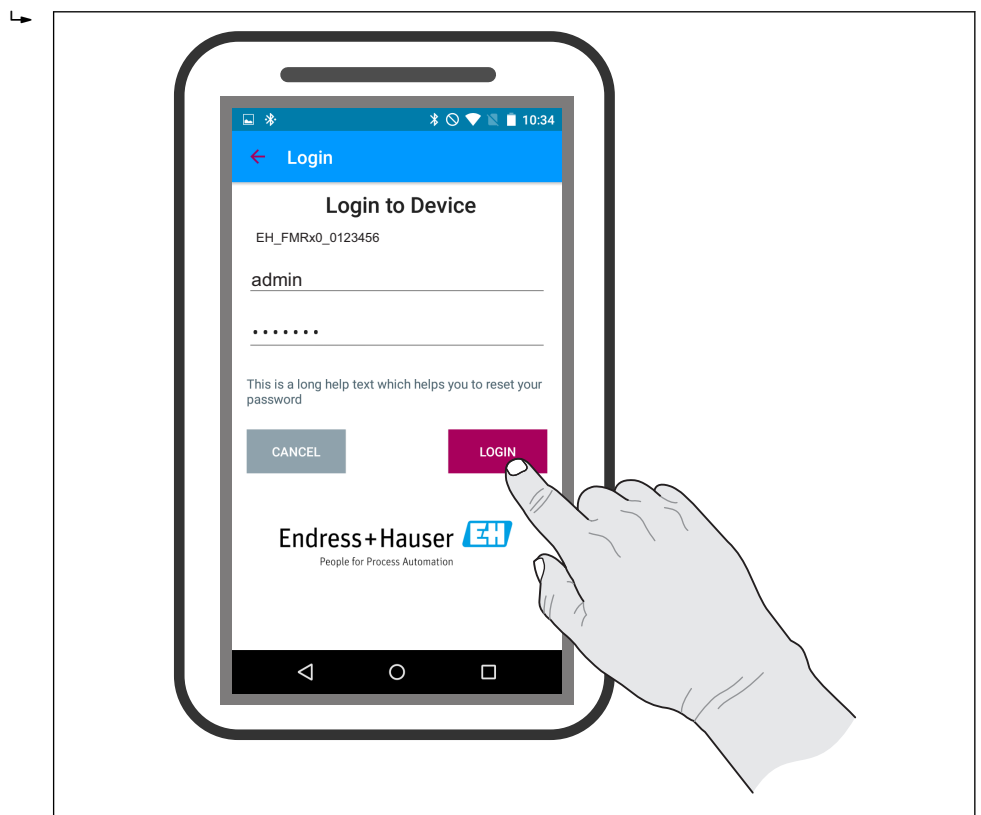
3. Select device from livelist. All available devices are displayed.



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17 Livelist

4. Perform login

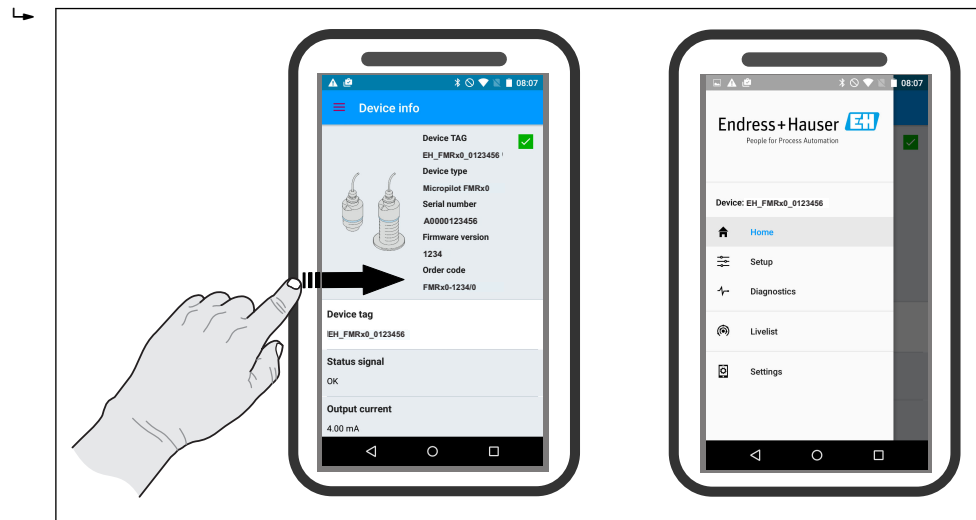


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18 Login

5. Enter user name -> admin
6. Enter initial password -> device serial number
7. Change the password after logging in for the first time

8. You can drag additional information (e.g. main menu) onto the screen by swiping across the screen.



19 Main menu

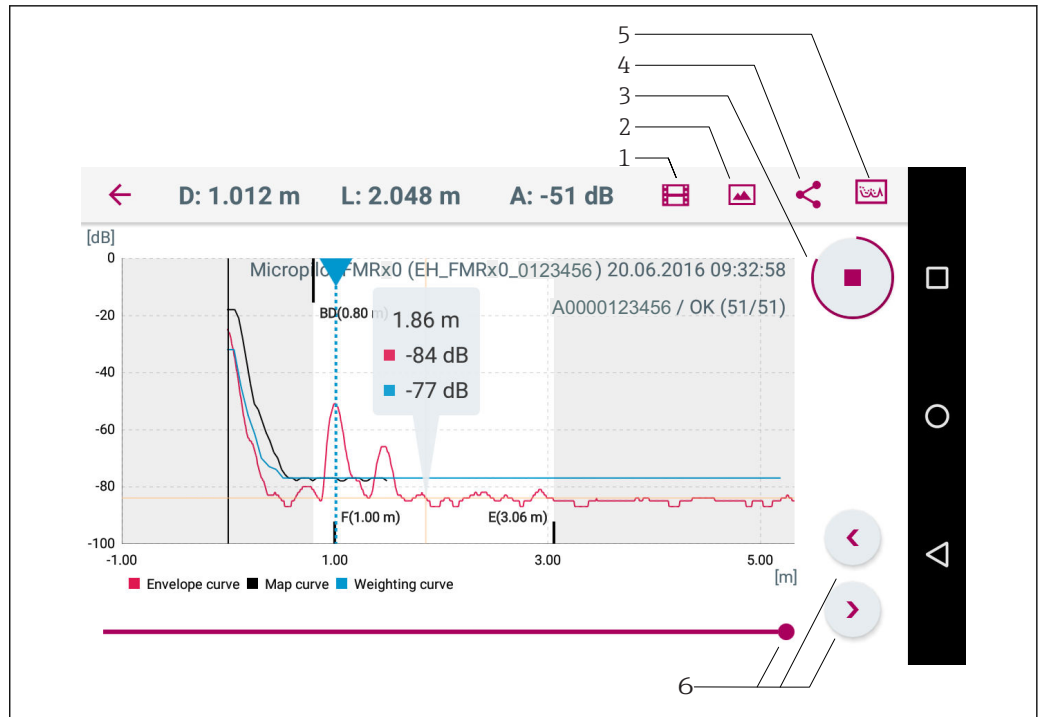
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i Envelope curves can be displayed and recorded

Additionally to the envelope curve, the following values are displayed:

- D = Distance
- L = Level
- A = Absolute amplitude
- At screenshots, the displayed section (zoom function) is saved
- In video sequences, always the whole area without zoom function is saved

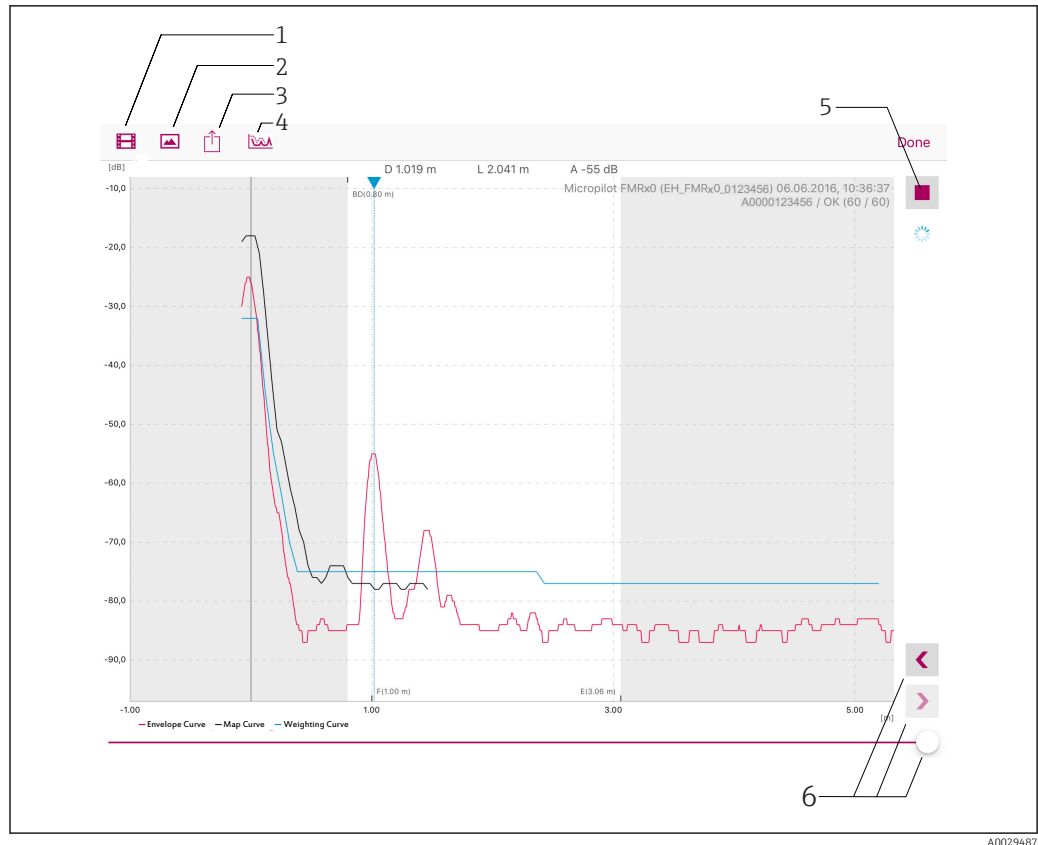
It is also possible to send envelope curves (video sequences) using the relevant smartphone or tablet functions



A0029486

20 Android view

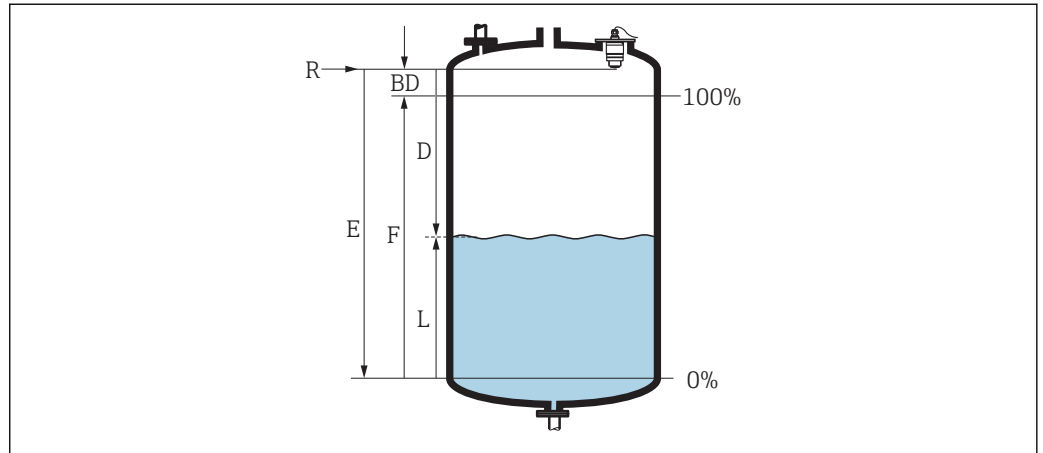
- 1 Record video
- 2 Create screenshot
- 3 Start / stop video recording
- 4 Send video
- 5 Navigate to mapping menu
- 6 Move time on time axis



21 iOS view

- 1 Record video
- 2 Create screenshot
- 3 Send video
- 4 Navigate to mapping menu
- 5 Start / stop video recording
- 6 Move time on time axis

11.3 Configuring level measurement via operating software



22 Configuration parameters for level measurement in liquids

- R Reference point of measurement
- D Distance
- L Level
- E Empty calibration (= zero point)
- F Full calibration (= span)
- BD Blocking distance

1. Navigate to: Setup → Device tag
 - ↳ Enter device tag
2. Navigate to: Setup → Distance unit
 - ↳ Select unit of length for distance calculation
3. Navigate to: Setup → Empty calibration
 - ↳ Specify empty distance E (distance from reference point R to minimum level)
4. Navigate to: Setup → Full calibration
 - ↳ Specify full distance F (span: max. level - min. level)
5. Navigate to: Setup → Distance
 - ↳ Shows the distance D that is currently measured from the reference point (lower edge of flange / last thread of the sensor) to the level
6. Navigate to: Setup → Level
 - ↳ Shows the level L measured
7. Navigate to: Setup → Signal quality
 - ↳ Displays the signal quality of the analyzed level echo
8. Navigate to: Setup → Confirm distance
 - ↳ Compare the distance displayed with the actual value to start recording an interference echo map
9. Navigate to: Setup → Mapping end point
 - ↳ This parameter determines the distance up to which the new mapping is to be recorded
10. Navigate to: Setup → Present mapping
 - ↳ Displays the distance up to which a mapping has already been recorded

11.3.1 Displaying level value as %

In combination Full calibration with Empty calibration and given 4 to 20 mA output signal, the level value for 4 mA (=Empty) and the level value for 20 mA (=Full) can be determined directly in the unit of length used.

The Full calibration can be used to calculate a standardized signal proportionate to the level e.g. 0 to 100 % level. The two basic values of 0 % and 100 % can in turn be assigned directly to the analog output values 4 mA and 20 mA.

X	Level in m	Y	Output signal as %
X1	0.00 m (0.00 ft)	Y1	0 %
X2	Value F (=Full)	Y2	100 %

Configuration using SmartBlue

1. Navigate to: Main menu → Setup → Advanced setup → Linearization type
↳ Select table as the linearization type
2. Select linearization table
3. X1 = Specify level value in m / ft for 0 %
4. X2 = Specify level value in m / ft for 100 %
5. Activate linearization table

11.4 Data access - Security

11.4.1 Software locking via access code in SmartBlue

The configuration data can be write-protected using an access code (software locking).

- ▶ Navigate to: Setup → Advanced setup → Administration → Administration1 → Define access code → Confirm access code

The entered code must be different from "0000" and the last release code.

Once the access code has been defined, write-protected devices can be switched to maintenance mode only if the access code is entered in the **Enter access code** parameter. If the factory setting is not changed or if 0000 is entered, the device is in maintenance mode and its configuration data are therefore **not** write-protected and can be changed at any time.

11.4.2 Unlocking via SmartBlue

- ▶ Navigate to: Setup → Advanced setup → Zugriffsrechte Bedienssoftware → Enter access code

11.4.3 Bluetooth® wireless technology

Signal transmission via Bluetooth® wireless technology is done by an encryption method tested by the Fraunhofer-Institut (Third Party).

- Without the SmartBlue App, the device is not visible via *Bluetooth*® wireless technology
- Only one point-to-point connection between **one** sensor and **one** smartphone or tablet is established.
- The *Bluetooth*® wireless technology interface can be deactivated in SmartBlue

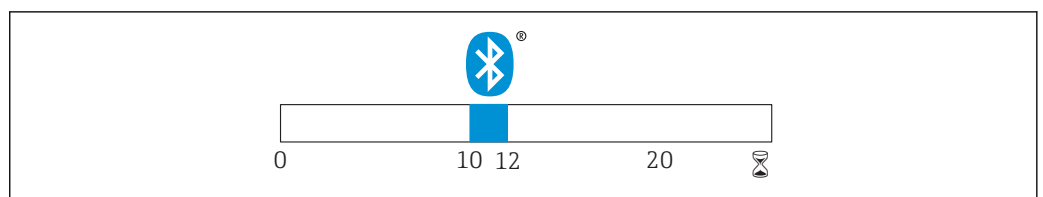
Deactivate Bluetooth® wireless technology interface

- ▶ Navigate to: Setup → Communication → Bluetooth configuration → Bluetooth mode
 - ↳ Switch off *Bluetooth*® wireless technology interface. "Off" position disables remote access via app

Re-activate Bluetooth® wireless technology interface

If *Bluetooth*® wireless technology interface was disabled, it can be re-activated only after performing the following recovery sequence:

1. Connect device to voltage supply
 - ↳ After a waiting time of 10 minutes, a time window of 2 minutes opens
2. During this time window it is possible to re-activate the FMR10 *Bluetooth*® wireless technology interface using SmartBlue (app)
3. Navigate to: Setup → Communication → Bluetooth configuration → Bluetooth mode
 - ↳ Switch on *Bluetooth*® wireless technology interface. "On" position enables remote access via app



23 Timeline for Bluetooth® wireless technology recovery sequence, time in minutes

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12 Diagnostics and troubleshooting

12.1 General trouble shooting

12.2 General errors

Error	Possible cause	Remedy
Device is not responding.	Supply voltage does not match the value indicated on the nameplate	Apply correct voltage
	The polarity of the supply voltage is wrong	Correct the polarity
	Connecting cables are not in contact with the terminals	Check the connection of the cables and correct if necessary
Device measures incorrectly	Configuration error	<ul style="list-style-type: none"> ▪ Check and correct the parameter configuration ▪ Perform mapping
Linearized output value not plausible	Linearization error	SmartBlue : Check linearization table
Device not accessible via SmartBlue	No Bluetooth connection	Enable Bluetooth function on smartphone or tablet
		Bluetooth function of sensor disabled, perform recovery sequence
		Device already linked to another smartphone / tablet
Login via SmartBlue not possible	Device is being put into operation for the first time	Enter initial password (device serial number) and change.
Device cannot be operated via SmartBlue	Incorrect password entered	Enter correct password
	Password forgotten	Contact Endress+Hauser Service

12.3 Diagnostic event

12.3.1 Diagnostic event in the operating tool

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

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

Calling up remedy information

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 remedy information for the diagnostic event appears

12.4 List of diagnostic events

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
Diagnostic of electronic				
270	Main electronic failure	Exchange device	F	Alarm
271	Main electronic failure	1. Restart device 2. If failure remains, exchange device.	F	Alarm
272	Main electronic failure	1. Restart device 2. Check enviroment for strong EMC fields 3. If failure remains, exchange device.	F	Alarm
283	Memory content	1. Transfer data or reset device 2. Contact service	F	Alarm
Diagnostic of configuration				
410	Data transfer	1. Check connection 2. Retry data transfer	F	Alarm
411	Up-/download active	Up-/download active, please wait	C	Warning
435	Linearization	Check linearization table	F	Alarm
438	Dataset	1. Check data set file 2. Check device configuration 3. Up- and download new configuration	M	Warning
441	Current output 1	1. Check process 2. Check current output settings	S	Warning
491	Current output 1 simulation	Deactivate simulation	C	Warning
585	Simulation distance	Deactivate simulation	C	Warning

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
586	Record map	Recording of mapping please wait	C	Warning
Diagnostic of process				
801	Energy too low	Increase supply voltage	S	Warning
825	Operating temperature	1. Check ambient temperature 2. Check process temperature	S	Warning
941	Echo lost	Check parameter 'Evaluation sensitivity'	S	Warning
941	Echo lost		F	Alarm

13 Maintenance

No special maintenance work is required.

13.1 Exterior cleaning

When cleaning the exterior, always use cleaning agents that do not attack the device surfaces or the seals.

13.2 Seals

The process seals of the sensor (at the process connection) should be replaced periodically. The interval between changes depends on the frequency of the cleaning cycles, the cleaning temperature and the medium temperature.

14 Repair

14.1 General notes

14.1.1 Repair concept

The Endress+Hauser repair concept is devised in such a way that repairs can only be carried out through device replacement.

14.1.2 Replacing a device

Once the device has been replaced, parameters must be reconfigured and interference echo suppression or linearization may need to be carried out once again.

14.1.3 Return

The measuring device must be returned if the wrong device has been ordered or delivered. As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium. To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at <http://www.endress.com/support/return-material>


14.1.4 Disposal

When disposing, separate and recycle the device components based on the materials.


15 Accessories

15.1 Overview




Device-specific accessories

Accessories	Description	Order number
Weather protection cover	Material: PVDF  The sensor is not completely covered.	52025686
Securing nut G1-1/2	Suitable for use with devices with G 1-1/2 and MNPT 1-1/2 process connection. Material: PC	52014146
Flooding protection tube	Material: metallized PBT-PC	71325090
Mounting bracket, adjustable	Consists of: <ul style="list-style-type: none"> ▪ Mounting bracket: 316L (1.4404) ▪ Angle bracket: 316L (1.4404) ▪ Screws: A4 ▪ Retaining rings: A4 	71325079

Device-specific accessories - flanges

Accessories	Description	Order number
Flanges	Material: miscellaneous  For details, see Technical Information TI00426F	

System components

Accessories	Description	Reference
RMA42	Digital process transmitter for monitoring and visualizing analog measured values	 For details, see Technical Information TI00150R and Operating Instructions BA00287R
RIA452	Digital process meter RIA452 in panel mounted housing for monitoring and displaying analog measured values with pump control and batch functions and flow calculation	 For details, see Technical Information TI113R and Operating Instructions BA00254R
HAW562	Surge arrester for DIN rail according to IEC 60715, used to protect electronic components from being destroyed by overvoltage	 For details, see Technical Information TI01012K

 For additional suitable accessories, see Technical Information TI01267F (FMR20)

16 Operating menu



16.1 Overview operating menue (SmartBlue)

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16.2 "Setup" menu

-   : Indicates how to navigate to the parameter using operating tools
-  : Indicates parameters that can be locked via the access code.

Navigation  Setup

Device tag						
Navigation	 Setup → Device tag					
Description	Enter a unique name for the measuring point to identify the device quickly within the plant.					
Factory setting	EH_FMR10_##### (last 7 digits of the device serial number)					
Distance unit						
Navigation	 Setup → Distance unit					
Description	Used for the basic calibration (Empty / Full).					
Selection	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center;"><i>SI units</i></td> <td style="text-align: center;"><i>US units</i></td> </tr> <tr> <td style="text-align: center;">m</td> <td style="text-align: center;">ft</td> </tr> </table>	<i>SI units</i>	<i>US units</i>	m	ft	
<i>SI units</i>	<i>US units</i>					
m	ft					
Factory setting	m					
Empty calibration						
Navigation	 Setup → Empty calibr.					
Description	Distance between process connection and minimum level (0%).					
User entry	0.0 to 5 m					
Factory setting	5 m					
Full calibration						
Navigation	 Setup → Full calibr.					
Description	Distance between minimum level (0%) and maximum level (100%).					

User entry 0.0 to 5 m

Factory setting 4.8 m

Distance

Navigation  Setup → Distance

Description Displays the current measured distance D from the reference point (lower edge of the flange / last thread of the sensor) to the level.

User interface 0.0 to 5 m

Level

Navigation  Setup → Level

Description Displays the measured level L (before linearization). The unit is defined in the 'Distance unit' parameter (factory setting = m).

User interface -99 999.9 to 200 000.0 m

Factory setting 0.0 m

Signal quality

Navigation  Setup → Signal quality

Description Displays the signal quality of the level echo. Meaning of the display options - Strong: The evaluated echo exceeds the threshold by at least 10 dB. - Medium: The evaluated echo exceeds the threshold by at least 5 dB. - Weak: The evaluated echo exceeds the threshold by less than 5 dB. - No signal: The device does not find an usable echo. The signal quality indicated in this parameter always refers to the currently evaluated echo, either the level echo or the tank bottom echo. In case of a lost echo ('Signal quality' = No signal) the device generates the following error message: 'Diagnostic echo lost' = Warning (factory setting) or Alarm, if the other option has been selected in 'Diagnostic echo lost'.

User interface

- Strong
- Medium
- Weak
- No signal

Confirm distance


Navigation  Setup → Confirm distance

Description Does the measured distance match the real distance? Select one of the options: - Manual map To be selected if the range of mapping is to be defined manually in the 'Mapping end point' parameter. A comparison between actual and indicated distance is not required in this case. - 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. - 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.

Selection

- Manual map
- Distance ok
- Distance unknown
- Factory map

Factory setting Distance unknown

Mapping end point


Navigation  Setup → Map. end point

Description 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 sensor.

User entry 0 to 20 m

Factory setting 0 m

Present mapping

Navigation  Setup → Present mapping


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

User interface 0 to 100 m


16.2.1 "Advanced setup" submenu

Navigation  Setup → Advanced setup


Access status tooling

Navigation	 Setup → Advanced setup → Access stat.tool
Description	Shows the access authorization to the parameters via the operating tool.
User interface	<ul style="list-style-type: none"> ■ Operator ■ Maintenance ■ Service ■ Production ■ Development
Factory setting	Maintenance

Enter access code

Navigation	 Setup → Advanced setup → Ent. access code
Description	To change from operator to maintenance, the customer-specific access code, which has been defined in the Define access code parameter has to be entered. If an incorrect access code is entered, the device remains in the Operator Mode. Please contact your Endress+Hauser Sales Center if you lose your access code.
User entry	0 to 9 999
Factory setting	0

Evaluation sensitivity

Navigation	 Setup → Advanced setup → Evaluation sens.
Description	Selection of the evaluation sensitivity Options to select from: - Low The weighting curve is high for low evaluation sensitivity. Interferers but also small level signals are not recognized. - Medium The weighting curve is in a medium region. - High The weighting curve is low for high evaluation sensitivity. Interferers but also small level signals can be reliably detected.
Selection	<ul style="list-style-type: none"> ■ Low ■ Medium ■ High
Factory setting	Medium

Changing velocity



Navigation	Setup → Advanced setup → Changing vel.
Description	Selection of the expected draining or filling speed of the measured level.
Selection	<ul style="list-style-type: none"> ■ Slow <10 cm (0,4 in)/min ■ Standard <1 m (40 in)/min ■ Fast >1 m (40 in)/min ■ No filter / test
Factory setting	Standard <1 m (40 in)/min


First Echo sensitivity


Navigation	Setup → Advanced setup → First Echo sens.
Description	This parameter describes the band for First Echo evaluation. Is measured / calculated down from the peak of the current level echo. Options to select from: - Low The band for the first echo evaluation is very narrow. The evaluation stays longer at the found echo respectively does not jump to the next Echo or distortion signal. - Medium The band for the first echo evaluation has an average width. - High The band for the first echo evaluation is broad. The evaluation jumps earlier to the next echo or distortion signal.
Selection	<ul style="list-style-type: none"> ■ Low ■ Medium ■ High
Factory setting	Medium


Output mode


Navigation	Setup → Advanced setup → Output mode
Description	Select output mode between: Ullage = The remaining space in the tank or silo is indicated. or Level linearized = The level is indicated (more precisely: the linearized value if a linearization has been activated).
Selection	<ul style="list-style-type: none"> ■ Ullage ■ Level linearized
Factory setting	Level linearized


Blocking distance


Navigation	 Setup → Advanced setup → Blocking dist.
Description	Specify blocking distance (BD). No signals are evaluated within the blocking distance. Therefore, BD can be used to suppress interference signals in the vicinity of the antenna. Note: The measuring range should not overlap with the blocking distance.
User entry	0.0 to 5 m
Factory setting	By default an automatic Blocking distance of at least 0.1 m (0.33 ft) is preset. However it can be manually overwritten (even 0 m (0 ft) is allowed). Automatic calculation of the Blocking distance = Empty calibration - Full calibration - 0.2 m (0.656 ft). The Blocking distance parameter is recalculated according to this formula every time a new value is entered into the Empty calibration parameter or Full calibration parameter. If this calculation results in a value <0.1 m (0.33 ft), the blocking distance of 0.1 m (0.33 ft) is used instead.

Level correction


Navigation	 Setup → Advanced setup → Level correction
Description	The measured level is corrected by this value to compensate for a constant level error. Level correction > 0: The level is increased by this value. Level correction < 0: The level is decreased by this value.
User entry	-25 to 25 m
Factory setting	0.0 m

Evaluation distance


Navigation	 Setup → Advanced setup → Evaluation dist.
Description	Extended signal search area. Is generally greater than the empty distance. If the signal is found below the empty distance, '0' (empty) is indicated as measured value. Only for signals, detected below the 'Evaluation distance', the error 'Echo Lost' is issued. e.g. flow measurement in overflow weirs.
User entry	0 to 20 m
Factory setting	7.5 m

Linearization type
**Navigation**

Setup → Advanced setup → Lineariz. type

Description**Linearization types**

Meaning of the options:

- None:
The level is transmitted in the level unit without linearization.
- Table:
The relationship between the measured level L and the output value(volume/flow/weight) is given by a linearization table consisting of up to 32 pairs of values "level - volume" or "level - flow" or "level - weight", respectively.
- Remark:
To create / modify a linearization table please open the linearization module in SmartBlue.

Selection

- None
- Table

Factory setting

None

Level linearized
Navigation

Setup → Advanced setup → Level linearized


Description


Currently measured level.


User interface

Signed floating-point number

"Safety settings" submenu

Navigation  Setup → Advanced setup → Safety sett.

Delay time echo lost **Navigation**

 Setup → Advanced setup → Safety sett. → Delay echo lost

Description


Define the delay time in the case of an echo loss. After an echo loss, the device waits for the time specified in this parameter before reacting as specified in the Diagnostic echo lost parameter. This helps to avoid interruptions of the measurement by short-term interferences.


User entry

0 to 600 s

Factory setting

300 s

Diagnostics echo lost **Navigation**

 Setup → Advanced setup → Safety sett. → Diagn. echo lost

Description

At this parameter it can be set if in case of a lost echo a warning or an alarm is issued.



Selection

- Warning
- Alarm


Factory setting

Warning

"Current output" submenu

Navigation   Setup → Advanced setup → Curr.output


Output current

Navigation  Setup → Advanced setup → Curr.output → Output curr.

Description Shows the actual calculated value of the output current.

User interface 3.59 to 22.5 mA

Damping output


Navigation  Setup → Advanced setup → Curr.output → Damping out.

Description Define time constant τ for the damping of the output current. Fluctuations of the measured value affect the output current with an exponential delay, the time constant τ of which is defined in this parameter. With a small time constant the output reacts immediately to changes of the measured value. With a big time constant the reaction of the output is more delayed. For $\tau = 0$ there is no damping.

User entry 0.0 to 300 s

Factory setting 1.0 s

Turn down

Navigation  Setup → Advanced setup → Curr.output → Turn down

Description Using the turn down functionality it is possible to map a section of the measuring range to the total range of the output current (4-20mA). The section is defined by the '4 mA value' and '20 mA value' parameters. Without the turn down, the complete measuring range (0 to 100%) is mapped to the current output (4 to 20mA).

Selection

- Off
- On

Factory setting Off

4 mA value

**Navigation**

Setup → Advanced setup → Curr.output → 4 mA value

Description

Value for 4-mA at 'Turn down parameter' = On Using the turn down functionality it is possible to map a section of the measuring range to the total range of the output current (4-20mA). The section is defined by the '4 mA value' and '20 mA value' parameters. Without the turn down, the complete measuring range (0 to 100%) is mapped to the current output (4 to 20mA). Note: If '20 mA value' is smaller than '4 mA value', the current output is inverted, which means that an increase of the process variable results in a decrease of the output current.

User entry

Signed floating-point number

Factory setting

0 m

20 mA value

**Navigation**

Setup → Advanced setup → Curr.output → 20 mA value

Description

Value for 20-mA at 'Turn down' parameter = On Using the turn down functionality it is possible to map a section of the measuring range to the total range of the output current (4-20mA). The section is defined by the '4 mA value' and '20 mA value' parameters. Without the turn down, the complete measuring range (0 to 100%) is mapped to the current output (4 to 20mA). Note: If '20 mA value' is smaller than '4 mA value', the current output is inverted, which means that an increase of the process variable results in a decrease of the output current.

User entry

Signed floating-point number

Factory setting

5 m

Trim

**Navigation**

Setup → Advanced setup → Curr.output → Trim

Description

Select action for the recalibration of the current output. The trim can be used to compensate a drift of the current output (which might be caused by very long cables or by a connected Ex barrier, for example). Steps of the trim: 1. Select 'Trim' = 4 mA. 2. Measure the output current with a gauged multimeter. If it is not equal to 4 mA: Enter measured value in the 'Trim value low' parameter. 3. Select 'Trim' = 20 mA. 4. Measure the output current with a gauged multimeter. If it is not equal to 20 mA: Enter the measured current into the 'Trim value high' parameter. 5. Select 'Trim' = Calculate. The device calculates the new scaling of the output current and stores it in the RAM.

Selection	<ul style="list-style-type: none"> ■ Off ■ 4 mA ■ 20 mA ■ Calculate ■ Reset
------------------	--

Factory setting	Off
------------------------	-----

Trim value high


Navigation	Setup → Advanced setup → Curr.output → Trim value high
-------------------	--

Description	Enter upper measured value for the trim (around 20 mA). After this value has been entered: Select 'Trim' = Calculate. This initiates the recalibration of the current output.
--------------------	---

User entry	18.0 to 22.0 mA
-------------------	-----------------

Factory setting	20.0 mA
------------------------	---------

Trim value low



Navigation	Setup → Advanced setup → Curr.output → Trim value low
-------------------	---


Description	Enter lower measured value for the trim (around 4 mA). After this value has been entered: Select 'Trim' = Calculate. This initiates the recalibration of the current output.
--------------------	--


User entry	3.0 to 5.0 mA
-------------------	---------------

Factory setting	4.0 mA
------------------------	--------

"Administration" submenu

Navigation  Setup → Advanced setup → Administration

Define access code **Navigation**

 Setup → Advanced setup → Administration → Def. access code

Description


Define release code for changing device operation mode. If the factory setting is not changed or 0000 is defined as the access code, the device works in maintenance mode without write-protection and the configuration data of the device can then always be modified. Once the access code has been defined, write-protected devices can only be changed to maintenance mode if the access code is entered in the 'Enter access code' parameter. The new access code is only valid after it has been confirmed in the 'Confirm access code' parameter. Please contact your Endress+Hauser Sales Center if you lose your access code.


User entry

0 to 9 999

Factory setting

0

Confirm access code **Navigation**

 Setup → Advanced setup → Administration → Confirm code

Description


Re-enter the entered access code to confirm.


User entry

0 to 9 999

Factory setting

0

Device reset **Navigation**

 Setup → Advanced setup → Administration → Device reset

Description

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


Selection

- Cancel
- To factory defaults

Factory setting

Cancel

Free field special**Navigation**

 Setup → Advanced setup → Administration → Free field spec.

Description

Switch the free field option on or off. This parameter can be switched on for free field applications (e.g. below bridges). Caution: The customer map (if one exists) is reset to the factory map!.

Selection

- Off
- On



Factory setting

Off


16.2.2 "Communication" submenu

Navigation   Setup → Communication

"Bluetooth configuration" submenu

Navigation   Setup → Communication → Bluetooth conf.

Bluetooth mode

Navigation	 Setup → Communication → Bluetooth conf. → Bluetooth mode
Description	Enable or disable Bluetooth function.. Remark: Switching to position 'Off' will disable remote access via the app with immediate effect. To re-establish a Bluetooth connection via the app: Please follow the advices in the manual.
Selection	<ul style="list-style-type: none"> ■ Off ■ On
Factory setting	On

16.3 "Diagnostics" submenu

Navigation   Diagnostics

Actual diagnostics

Navigation  Diagnostics → Actual diagnos.

Description Displays current diagnostic message. If several messages are active at the same time, the messages with the highest priority is displayed.

Previous diagnostics

Navigation  Diagnostics → Prev.diagnostics

Description Displays the last diagnostic message, with its diagnostic information, which has been active before the current message. The condition displayed may still apply.

Delete previous diagnostic

Navigation  Diagnostics → Del. prev. diag.

Description Delete previous diagnostic message? It is possible that the diagnostic message remains valid.

Selection

- No
- Yes

Factory setting No

Signal quality

Navigation  Diagnostics → Signal quality

Description Displays the signal quality of the level echo. Meaning of the display options - Strong: The evaluated echo exceeds the threshold by at least 10 dB. - Medium: The evaluated echo exceeds the threshold by at least 5 dB. - Weak: The evaluated echo exceeds the threshold by less than 5 dB. - No signal: The device does not find an usable echo. The signal quality indicated in this parameter always refers to the currently evaluated echo, either the level echo or the tank bottom echo. In case of a lost echo ('Signal quality' = No signal) the device generates the following error message: 'Diagnostic echo lost' = Warning (factory setting) or Alarm, if the other option has been selected in 'Diagnostic echo lost'.

User interface

- Strong
- Medium
- Weak
- No signal

16.3.1 "Device information" submenu

Navigation   Diagnostics → Device info

Device name

Navigation  Diagnostics → Device info → Device name

Description Shows the name of the transmitter.


Factory setting Micropilot FMR10

Firmware version

Navigation  Diagnostics → Device info → Firmware version


Description Shows the device firmware version installed.

Extended order code 1

Navigation  Diagnostics → Device info → Ext. order cd. 1

Description Shows the 1st part of the extended order code.

Extended order code 2

Navigation  Diagnostics → Device info → Ext. order cd. 2


Description Shows the 2nd part of the extended order code.

Extended order code 3

Navigation  Diagnostics → Device info → Ext. order cd. 3


Description Shows the 3rd part of the extended order code.

Order code

Navigation  Diagnostics → Device info → Order code

Description Shows the device order code.

Serial number

Navigation  Diagnostics → Device info → Serial number

Description Shows the serial number of the measuring device.

ENP version

Navigation  Diagnostics → Device info → ENP version

Description Shows the version of the electronic nameplate (ENP).

16.3.2 "Simulation" submenu

Navigation   Diagnostics → Simulation

Simulation

Navigation  Diagnostics → Simulation → Simulation

Description Select process variable to be simulated. The Simulation is used to simulate specific measuring values or other conditions. This helps to check the correct configuration of the device and connected control units.

Selection

- Off
- Current output
- Distance

Factory setting Off

Value current output


Navigation  Diagnostics → Simulation → Value curr.out 1

Description Defines the value of the simulated output current.

User entry 3.59 to 22.5 mA

Factory setting 3.59 mA

Process variable value

Navigation  Diagnostics → Simulation → Proc. var. value

Description Value of the simulated process variable. 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.

User entry 0 to 20 m

Factory setting 0 m

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