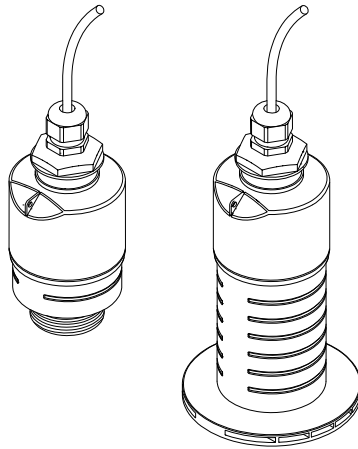


Brief Operating Instructions

Micropilot FMR20

HART

Free space radar

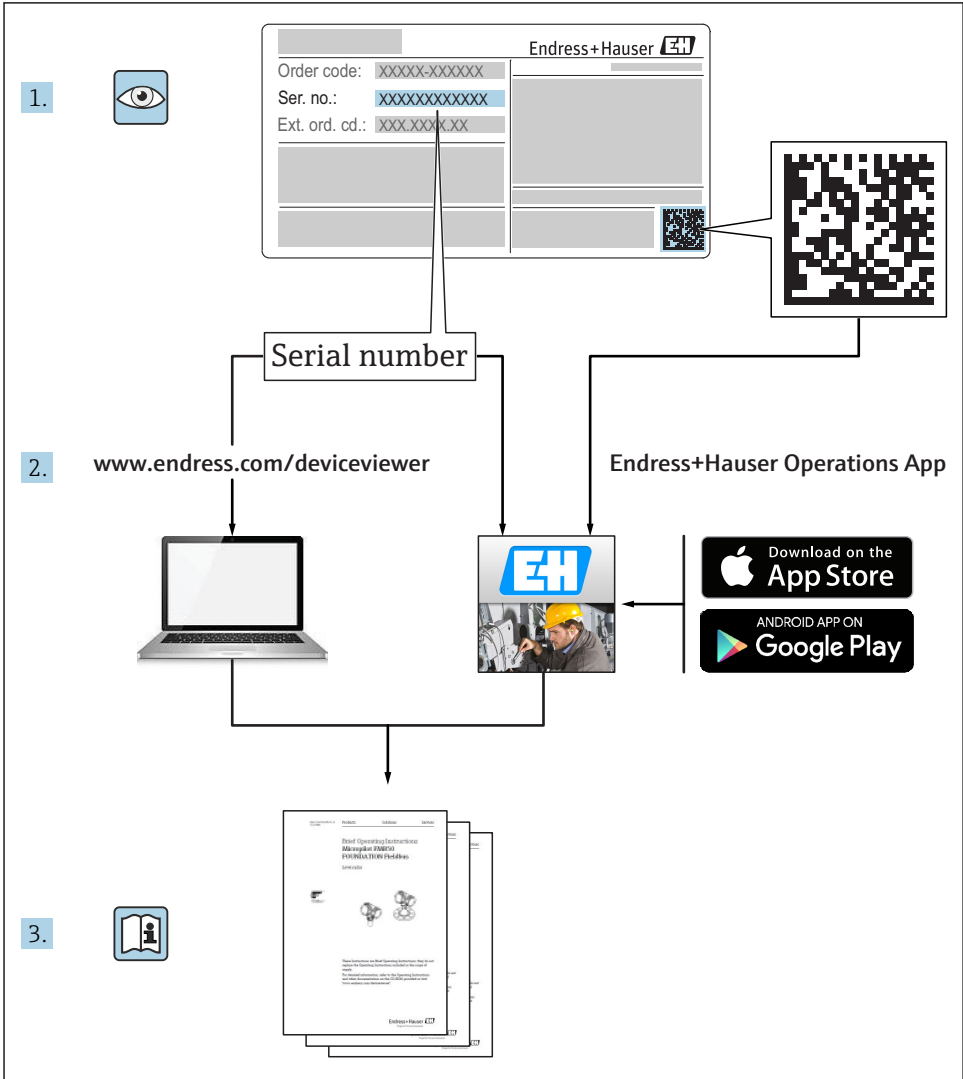


These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

For detailed information, refer to the Operating Instructions and other documentation.

Available for all device versions via:

- Internet: www.endress.com/deviceviewer
- Smart phone/Tablet: Endress+Hauser Operations App













A0023555

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1 Document information


1.1 Symbols for certain types of information



Symbol	Meaning	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		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
FieldCare	Scalable software tool for device configuration and integrated plant asset management solutions
DeviceCare	Universal configuration software for Endress+Hauser HART, PROFIBUS, FOUNDATION Fieldbus and Ethernet field devices
DTM	Device Type Manager
DD	Device Description for HART communication protocol
DK	Relative dielectric constant ϵ_r
Operating tool	The term "operating tool" is used in place of the following operating software: <ul style="list-style-type: none"> ■ SmartBlue (app), for operation using an Android or iOS smartphone or tablet. ■ FieldCare / DeviceCare, for operation via HART communication and PC
BD	Blocking Distance; no signals are analyzed within the BD.

3 Registered trademarks



Registered trademark of the FieldComm Group, Austin, USA

 Bluetooth®

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

Apple®

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

Android®

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

4 Basic safety instructions


4.1 Requirements for personnel

The personnel must fulfill the following requirements for its tasks:

- ▶ 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.

4.2 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" →  19. 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.

4.3 Workplace safety

For work on and with the device:

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

4.4 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.

4.5 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.

4.5.1 CE mark

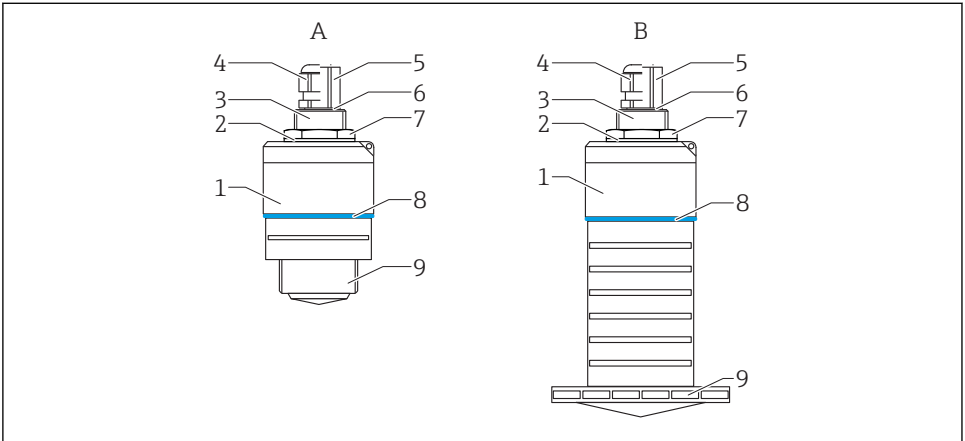
The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied.

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

5 Product description

5.1 Product design

5.1.1 Micropilot FMR20



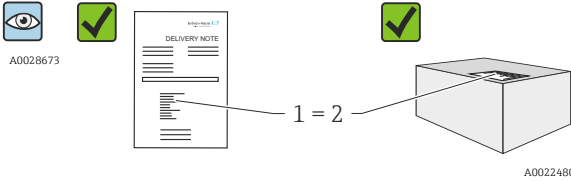
A0028416

1 Design of the Micropilot FMR20 (26 GHz)

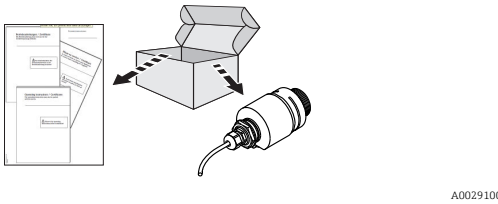
- A FMR20 with 40 mm antenna
- B FMR20 with 80 mm antenna
- 1 Sensor housing
- 2 Seal
- 3 Process connection rear side
- 4 Cable gland
- 5 Pipe adapter
- 6 O-ring
- 7 Counter nut
- 8 Design ring
- 9 Process connection front side

6 Incoming acceptance and product identification

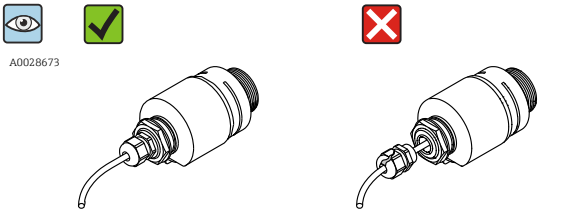
6.1 Incoming acceptance



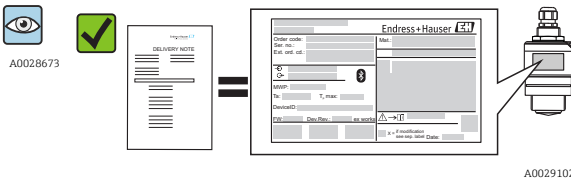
Are the order codes on the delivery note (1) and the product sticker (2) identical?



A0029100

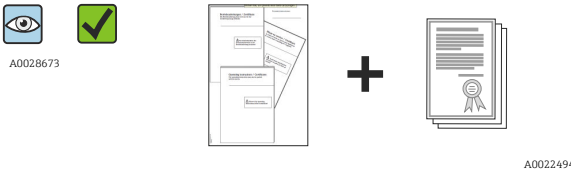


Are the goods undamaged?




A0029102

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



A0022494

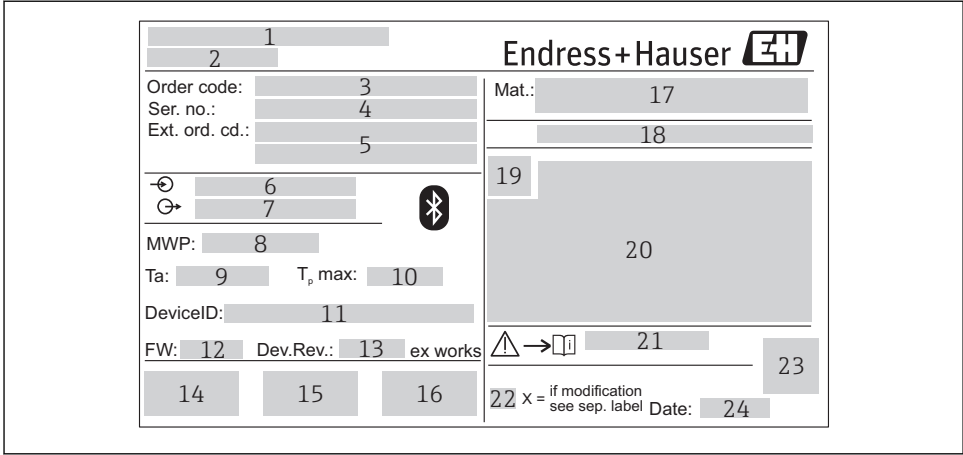
Is the DVD with the operating tool present?
If required (see nameplate): Are the safety instructions (XA) present?

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

6.2 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.



A0029096

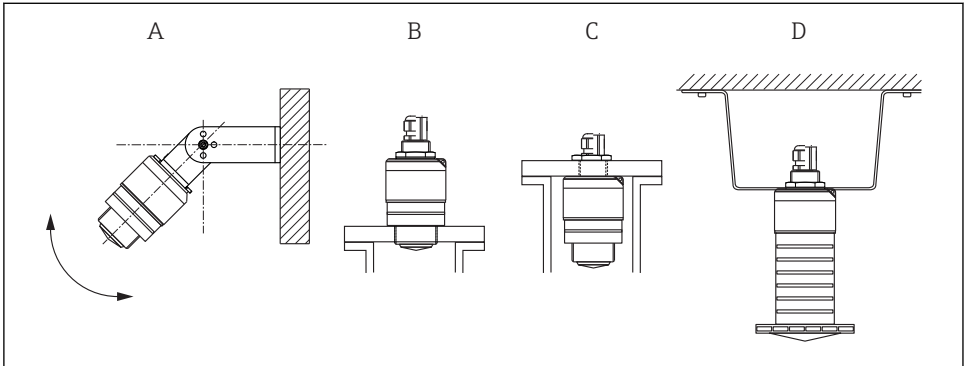
2 Nameplate of Micropilot

- 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

7 Installation

7.1 Installation conditions

7.1.1 Installation types



A0030605

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)

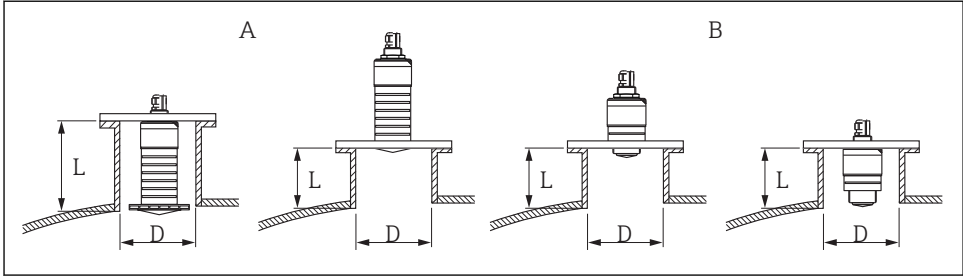


Caution!

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

7.1.2 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.



A0028413

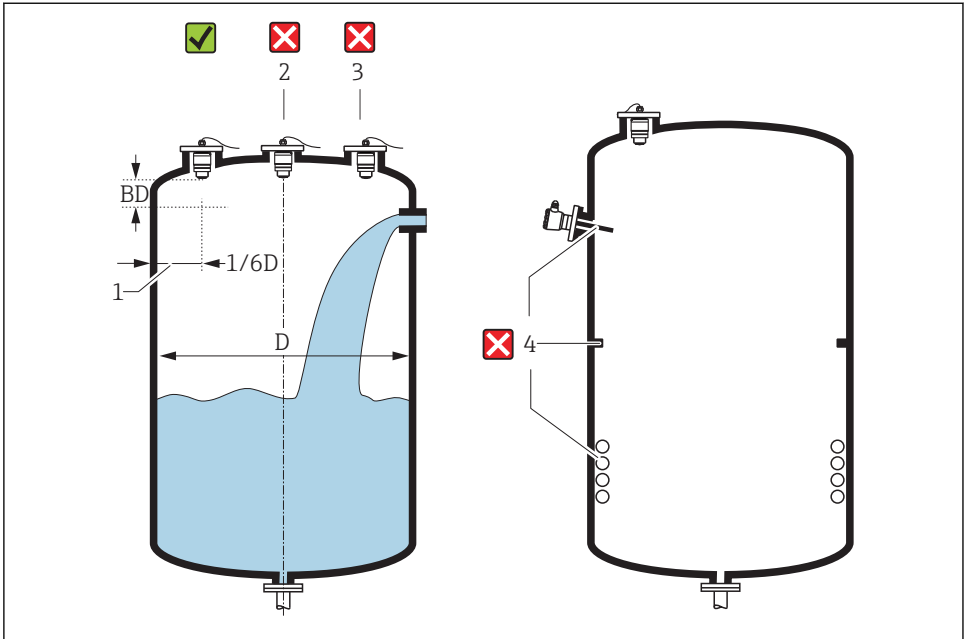
4 FMR20 nozzle installation

A FMR20 80 mm (3 in) antenna

B FMR20 40 mm (1.5 in) antenna

	80 mm (3 in) Antenna, inside nozzle	80 mm (3 in) Antenna, outside nozzle	40 mm (1.5 in) Antenna, outside nozzle	40 mm (1.5 in) Antenna, inside nozzle
D	min. 120 mm (4.72 in)	min. 80 mm (3 in)	min. 40 mm (1.5 in)	min. 80 mm (3 in)
L	max. 205 mm (8.07 in) + D x 4.5	max. D x 4.5	max. D x 1.5	max. 140 mm (5.5 in) + D x 1.5

7.1.3 Orientation



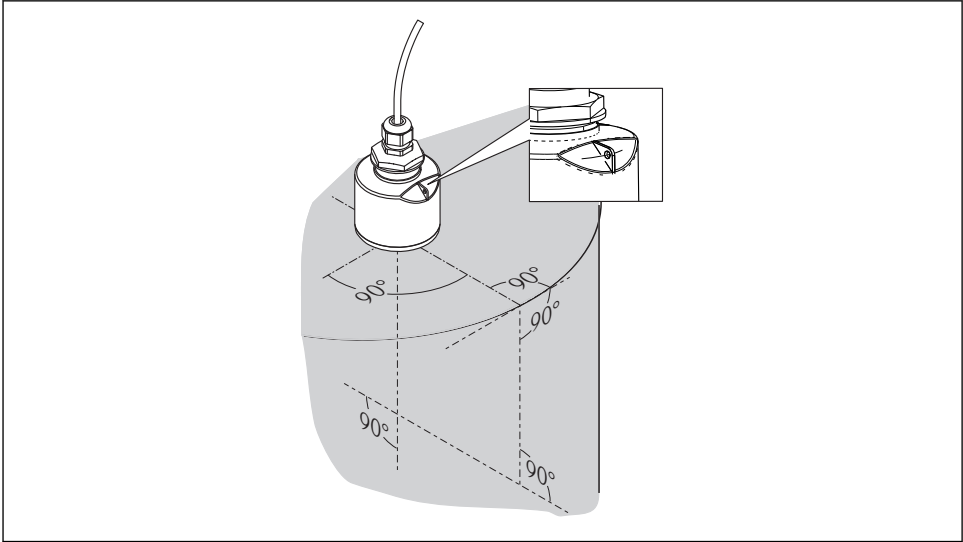
A0028410

5 Tank installation position

- 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.

7.1.4 Alignment

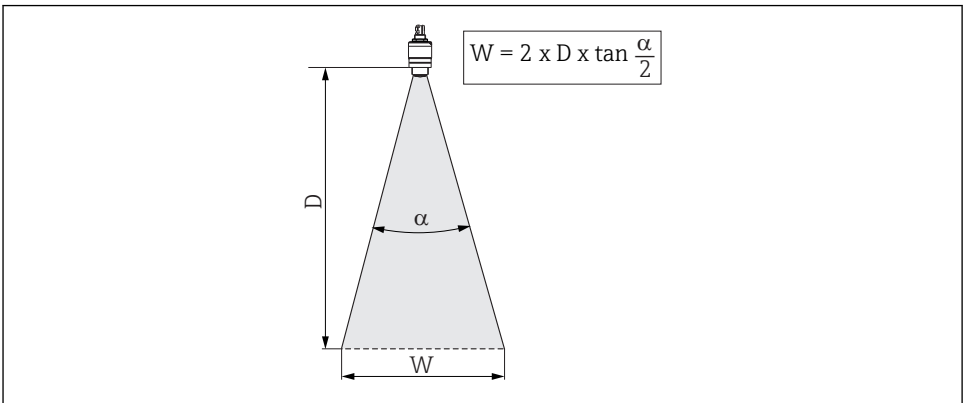
- Align the antenna vertically to the product surface.
- Align the eyelet with the mounting eye as well as possible towards the tank wall.



A0028927

6 Sensor alignment when mounting in tank

7.1.5 Beam angle



A0029053-EN

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

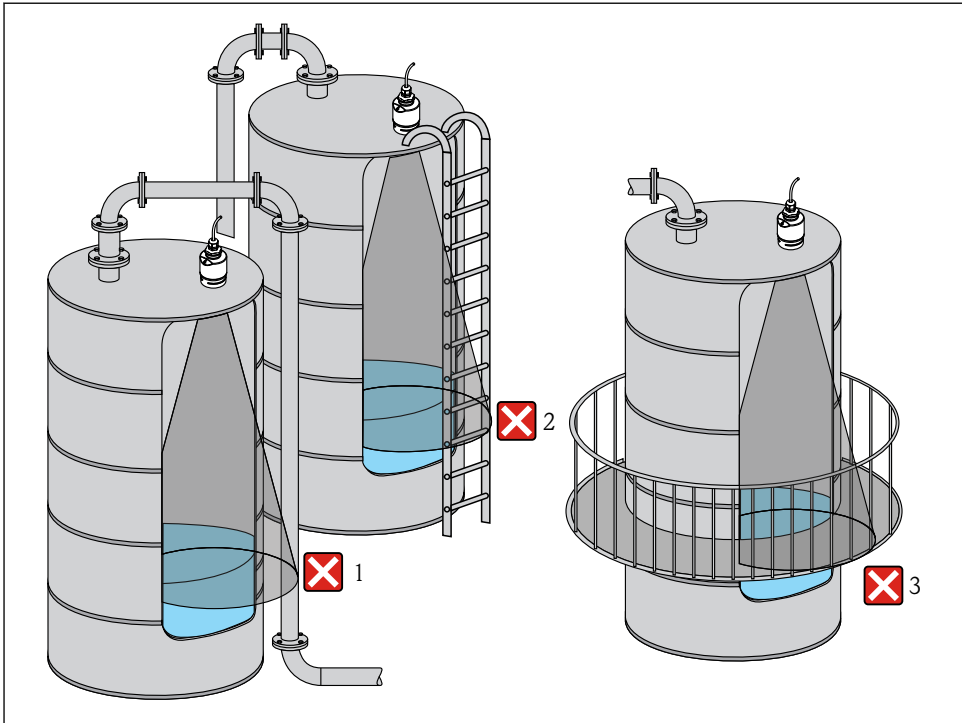
The beam angle is defined as the angle α at which the power density of the radar waves reaches half the value of the maximum power density (3dB width). Microwaves are also emitted outside the signal beam and can be reflected off interfering installations.

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

FMR20		
Antenna size	40 mm (1.5 in)	80 mm (3 in)
Beam angle α	30°	12°
Distance (D)	Beamwidth diameter W	
3 m (9.8 ft)	1.61 m (5.28 ft)	0.63 m (2.1 ft)
5 m (16.4 ft)	2.68 m (8.79 ft)	1.05 m (3.45 ft)
10 m (33 ft)	5.36 m (17.59 ft)	2.1 m (6.9 ft)
15 m (49 ft)		3.15 m (10.34 ft)
20 m (66 ft)		4.2 m (13.79 ft)

7.1.6 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.

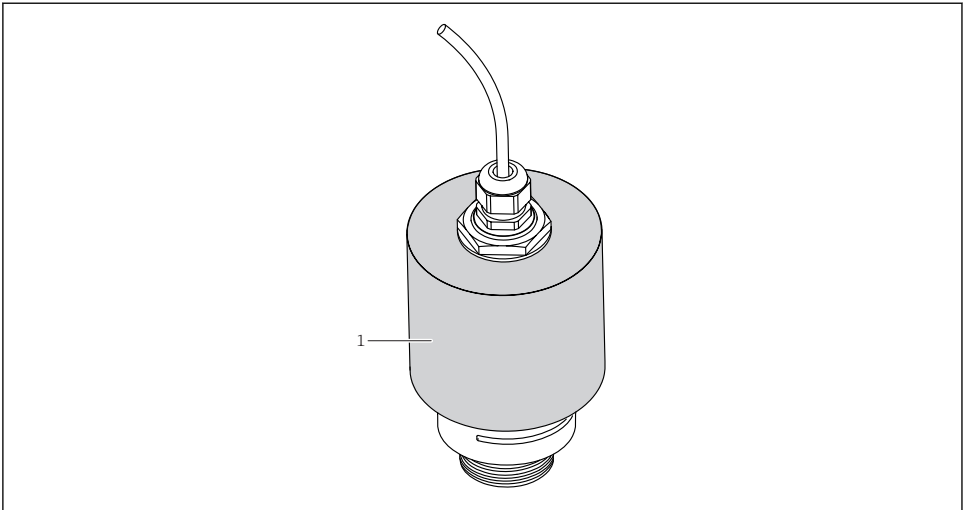


A0029540


8 Measurement in a plastic vessel


7.1.7 Weather protection cover

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



A0031277

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

 The weather protection cover can be ordered with the device (product structure, feature 620 "Accessory enclosed", option R1 "weather protection cover").

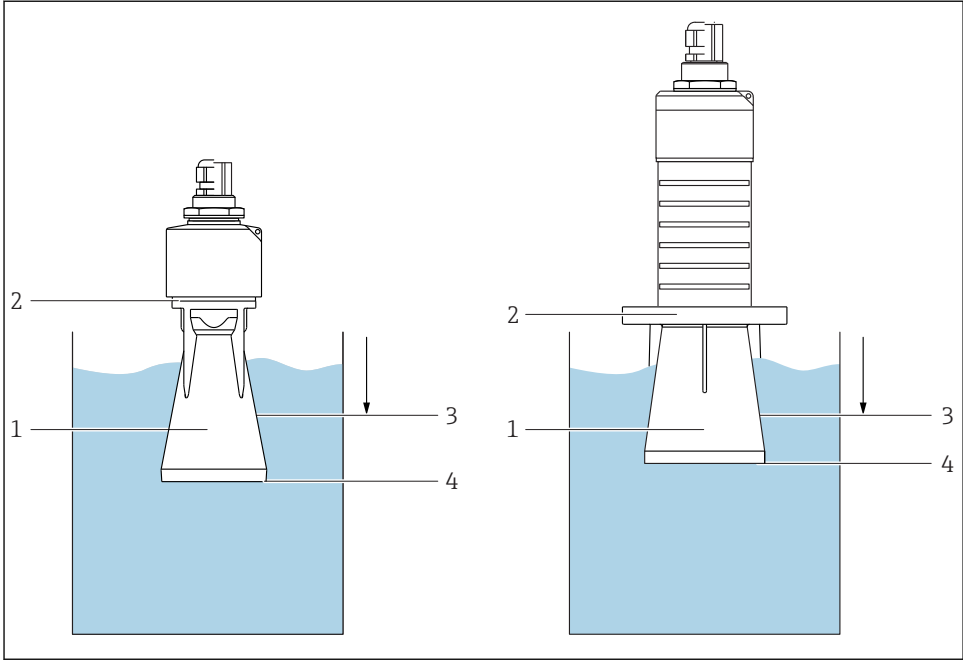
Alternatively it can be ordered separately as an accessory; order number 52025686.

The sensor is not completely covered in the case of the 40 mm (1.5 in) antenna or the 80 mm (3 in) antenna.

7.1.8 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



A0031093

10 Function of flooding protection tube

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

Flooding protection tube 40 mm (1.5 in) antenna, metallized PBT-PC:

For use with devices in product structure, feature 100 "Process connection front", option WFE "Thread ISO228 G1-1/2".

The flooding protection tube can be ordered with the device. Product structure, feature 620 "Accessory enclosed", option R7 "Flooding protection tube, metallized PBT-PC suitable for 40 mm (1.5 in) antenna with G1-1/2 process connection on front".

Alternatively available as an accessory; order number 71325090.

Flooding protection tube 80 mm (3 in) antenna, metallized PBT-PC:

For use with devices in product structure, feature 100 "Process connection front", option XR0 "Mounting customer side w/o flange".

The flooding protection tube can be ordered with the device. Product structure, feature 620 "Accessory enclosed", option R8 "Flooding protection tube, metallized PBT-PC suitable for 80 mm (3 in) antenna.

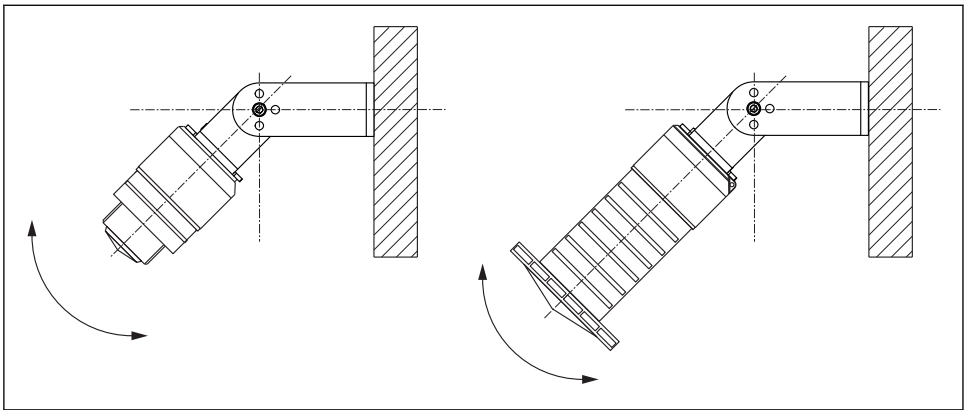
Alternatively available as an accessory; order number 71327051.

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).

7.1.9 Installation with mounting bracket, adjustable



A0030606

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.

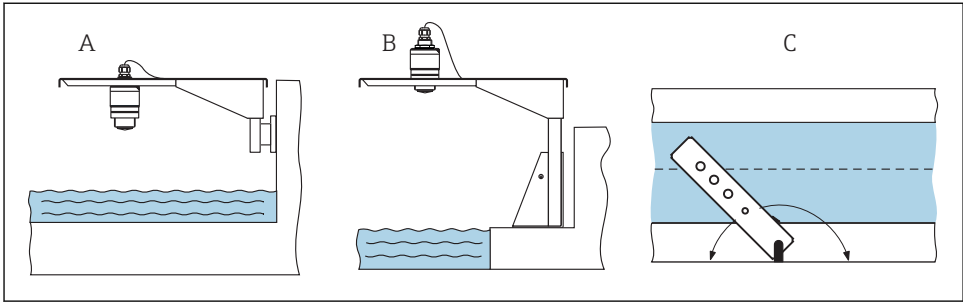
Risk of electrostatic charge.

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

i The mounting bracket can be ordered with the device (product structure, feature 620 "Accessory enclosed", option R3 "Mounting bracket adjustable, 316L").

Alternatively, it is available as an accessory, order number 71325079.

7.1.10 Cantilever installation, with pivot



A0028412

12 *Cantilever installation, with pivot*

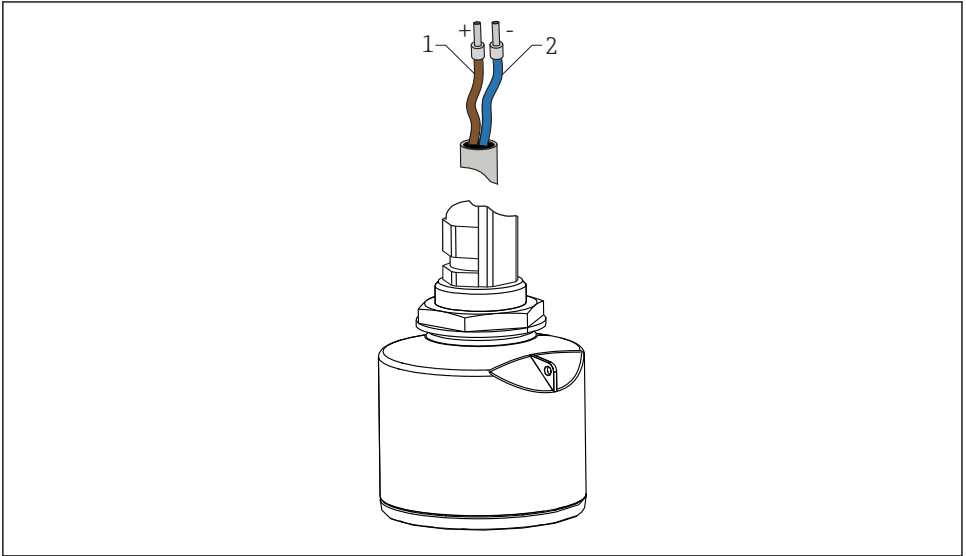
- A *Installation with cantilever and wall bracket*
- B *Installation with cantilever and mounting frame*
- C *The cantilever can be turned (e.g. in order to position the sensor over the center of the channel, for example)*

7.1.11 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?

8 Electrical connection

8.1 Cable assignment



A0028954

13 Cable assignment

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

8.2 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 the maximum load resistance R in Ohms (Ω) on the y-axis against the supply voltage U_0 in Volts (V) on the x-axis. The y-axis has markers at 0 and 500. The x-axis has markers at 10, 10.5, 20, 21.75, and 30. The relationship is as follows:</p> <ul style="list-style-type: none"> For U_0 between 10.5 V and 21.75 V, R increases linearly from 0 Ω to 500 Ω. For U_0 between 21.75 V and 30 V, R is constant at 500 Ω.

A0029226

Potential equalization

No special measures for potential equalization are required.

In the case of a device for the hazardous area, please comply with the safety instructions in the separate "Safety Instructions" (XA, ZD) document.



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



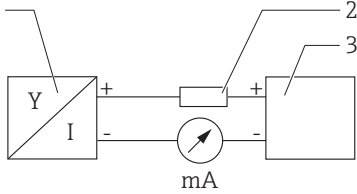
Battery operation

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

→ 44

8.3 Connection

8.3.1 FMR20, 4 to 20 mA HART

	Circuit diagram / Description
FMR20 connection with HART communication, voltage source and 4 to 20 mA display	 <p data-bbox="941 874 995 887">A0028908</p> <p data-bbox="431 900 770 924"> 14 <i>FMR20 block diagram, HART</i></p> <p data-bbox="431 940 641 963">1 <i>Micropilot FMR20</i></p> <p data-bbox="431 965 624 989">2 <i>HART resistance</i></p> <p data-bbox="431 991 596 1015">3 <i>Power supply</i></p>



The HART communication resistor of 250 Ω in the signal line is always necessary in the case of a low-impedance power supply.

The voltage drop to be taken into account is:

Max. 6 V with 250 Ω communication resistor

8.3.2 FMR20 with RIA15



The RIA15 remote display can be ordered together with the device.

Product structure, feature 620 "Accessory enclosed":

- Option R4 "Remote display RIA15 non-hazardous area, field housing"
- Option R5 "Remote display RIA15 Ex= explosion protection approval, field housing"



Alternatively it can be ordered separately as an accessory, for details: Technical Information TI01043K and Operating Instructions BA01170K



The RIA15 process display unit is loop-powered and does not require any external power supply.

The voltage drop to be taken into account is:

- ≤ 1 V in the standard version with 4 to 20 mA communication
- ≤ 1.9 V with HART communication
- and an additional 2.9 V if display light is used

Circuit diagram / Description	
<p>FMR20 connection, HART communication and RIA15 without backlight</p>	<p style="text-align: right; font-size: small;">A0019567</p> <p>15 FMR20 block diagram, HART with RIA15 process display unit without light</p> <p>1 Micropilot FMR20 2 Power supply 3 HART resistance</p>
<p>FMR20 connection, HART communication and RIA15 with backlight</p>	<p style="text-align: right; font-size: small;">A0019568</p> <p>16 FMR20 block diagram, HART with RIA15 process display unit with light</p> <p>1 Micropilot FMR20 2 Power supply 3 HART resistance</p>

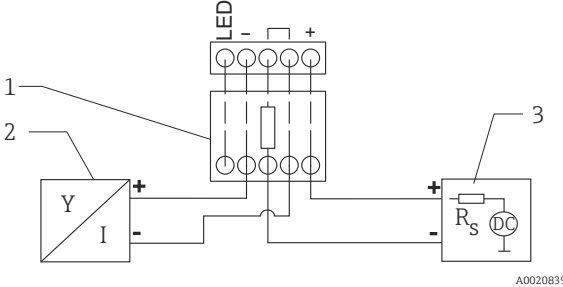
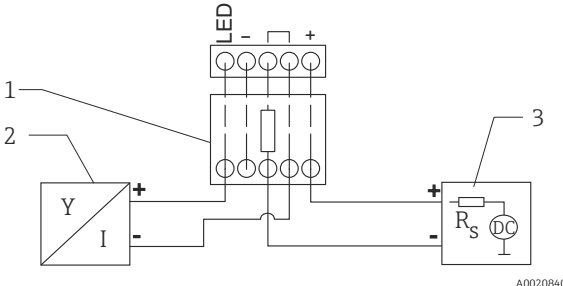
8.3.3 FMR20, RIA15 with installed HART communication resistor module

i The HART communication module for installation in the RIA15 can be ordered together with the device.

Product structure, feature 620 "Accessory enclosed":

- Option R6 "HART communication resistor hazardous / non-hazardous area"
- The **voltage drop** to be taken into account is max. **7 V**

i Alternatively it can be ordered separately as an accessory, for details: Technical Information TI01043K and Operating Instructions BA01170K

	Circuit diagram / Description
FMR20 connection and RIA15 without backlight	 <p style="text-align: right;">A0020839</p> <p>17 FMR20 block diagram, RIA15 without light, HART communication resistor module</p> <p>1 HART communication resistor module 2 Micropilot FMR20 3 Power supply</p>
FMR20 connection and RIA15 with backlight	 <p style="text-align: right;">A0020840</p> <p>18 FMR20 block diagram, RIA15 with light, HART communication resistor module</p> <p>1 HART communication resistor module 2 Micropilot FMR20 3 Power supply</p>

8.4 Post-connection check

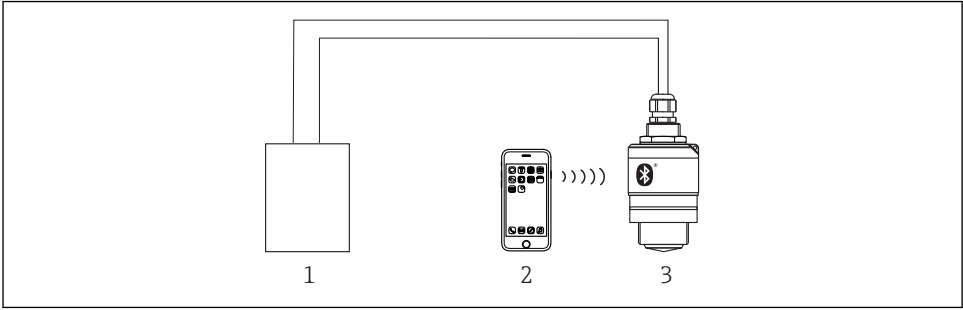
<input type="checkbox"/>	Is the device or cable undamaged (visual check)?
<input type="checkbox"/>	Do the cables have adequate strain relief?
<input type="checkbox"/>	Are the cable glands mounted and firmly tightened?
<input type="checkbox"/>	Does the supply voltage match the specifications on the nameplate?
<input type="checkbox"/>	No reverse polarity, is terminal assignment correct?
<input type="checkbox"/>	Has the voltage drop across the process display unit and communication resistor been taken into account?

9 Operability

9.1 Operating concept

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

9.2 Via *Bluetooth*® wireless technology

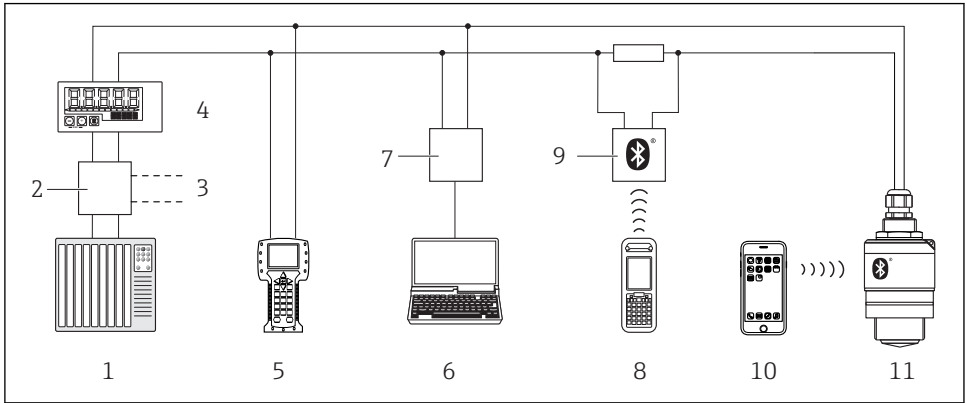


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19 Possibilities for remote operation via *Bluetooth*® wireless technology

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

9.3 Via HART protocol



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20 Options for remote operation via HART protocol

- 1 PLC (programmable logic controller)
- 2 Transmitter power supply unit, e.g. RN221N (with communication resistor)
- 3 Connection for Commubox FXA195 and Field Communicator 375, 475
- 4 RIA15 loop-powered process display unit
- 5 Field Communicator 475
- 6 Computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM)
- 7 Commubox FXA195 (USB)
- 8 Field Xpert SFX350/SFX370
- 9 VIATOR with Bluetooth® wireless technology modem
- 10 Smartphone / tablet with SmartBlue (app)
- 11 Transmitter with Bluetooth® wireless technology

10 Commissioning and operation

10.1 Installation and function check

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

10.2 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:



A0031189-EN

21 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



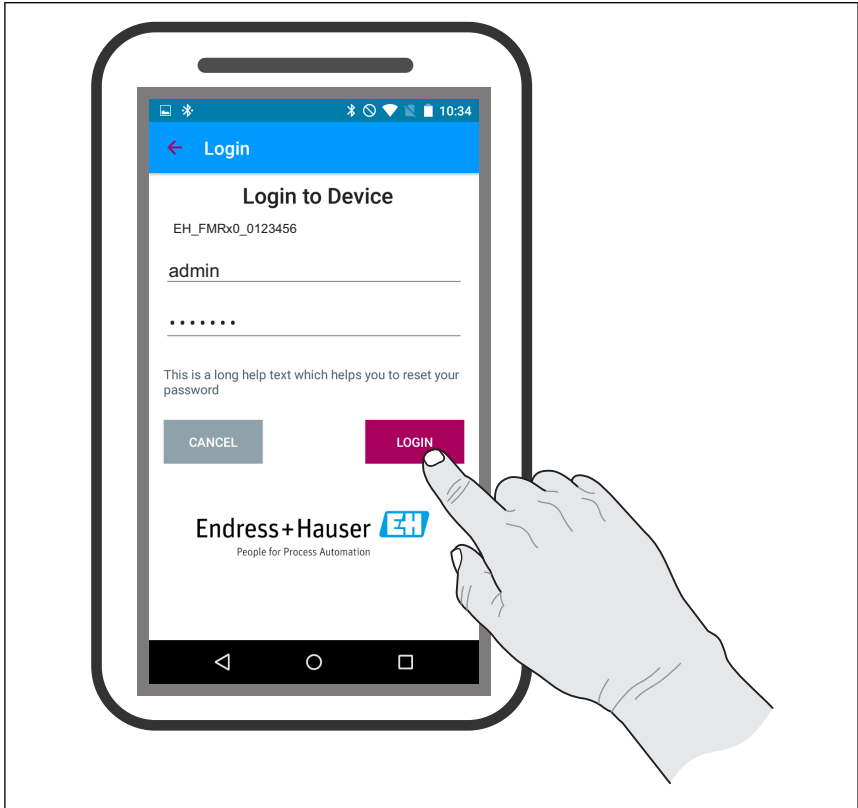
A0029747

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



A0029502

 22 *Livelist*

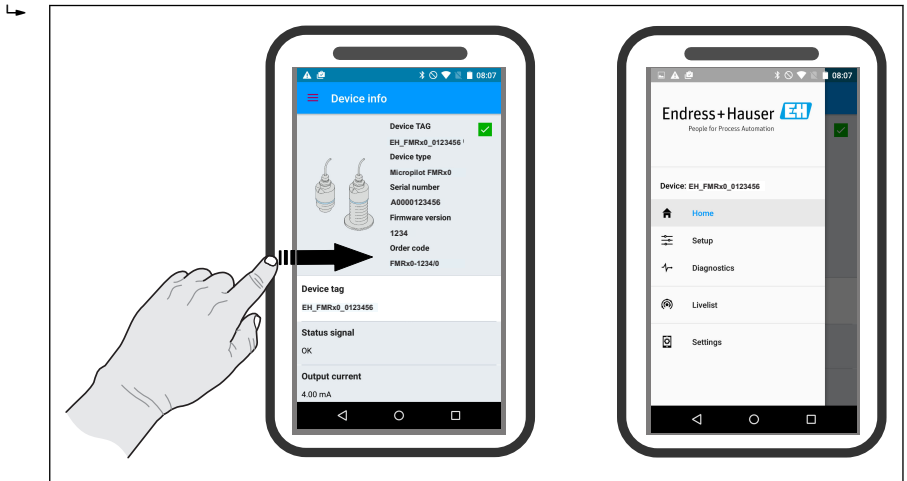
4. Perform login

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 23 *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.



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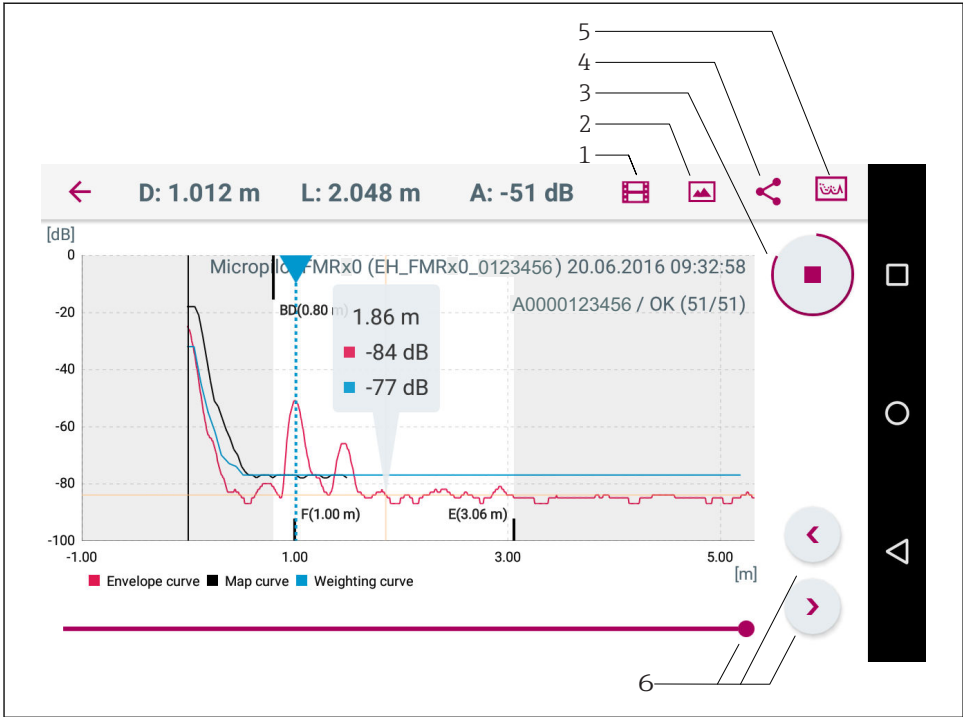
 24 *Main menu*

 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

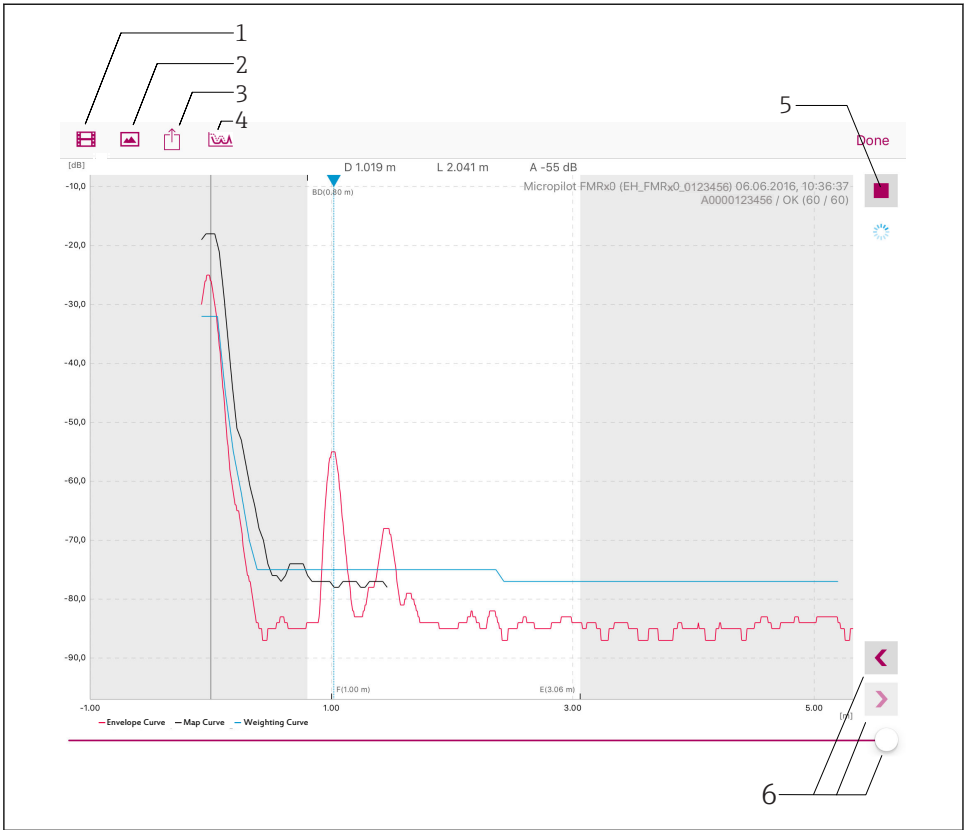
It is also possible to send envelope curves (video sequences) using the relevant smartphone or tablet functions



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25 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



A0029487

26 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

10.3 System integration via HART protocol

10.3.1 Overview of the Device Description Files (DD)

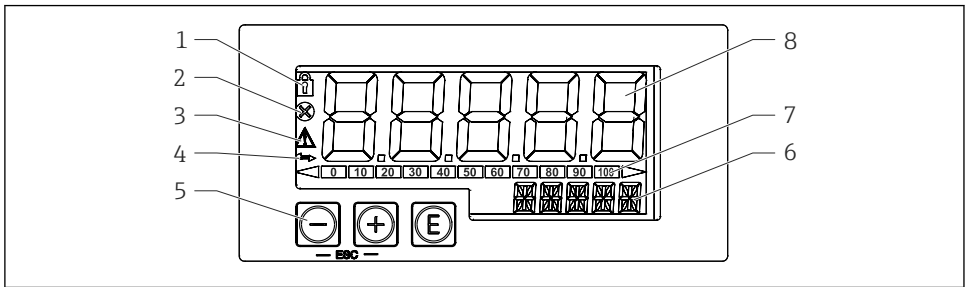
Manufacturer ID	17 (0x11)
Device type ID	44 (0x112c)
HART specification	7.0
DD files	Information and files under: <ul style="list-style-type: none"> ▪ www.endress.com ▪ www.hartcomm.org

10.3.2 Measured variables via HART protocol

The following measured values are assigned to the HART variables:

HART variable	Measured value
Primary variable (PV)	Level linearized (PV)
Secondary variable (SV)	Distance (SV)
Tertiary variable (TV)	Relative echo amplitude (TV)
Quaternary variable (QV)	Temperature (QV)

10.4 Operation and settings via RIA15






A0017719

27 Display and operating elements of the process display unit

- 1 Symbol: operating menu disabled
- 2 Symbol: error
- 3 Symbol: warning
- 4 Symbol: HART communication active
- 5 Operating keys "-", "+", "E"
- 6 14-segment display for unit/TAG
- 7 Bar graph with indicators for under range and over range
- 8 5-digit 7-segment display for measured value, digit height 17 mm (0.67 in)

The device is operated using three operating keys on the front of the housing. The device setup can be disabled with a 4-digit user code. If the setup is disabled, a padlock symbol appears on the display when an operating parameter is selected.

 <small>A0017716</small>	Enter key; calling up the operating menu, confirming the option/setting parameters in the operating menu
 <small>A0017715</small>	Selecting and setting/changing values in the operating menu; pressing the '-' and '+' keys simultaneously takes the user back up a menu level. The configured value is not saved.
 <small>A0017714</small>	

10.4.1 Operating functions

The operating functions of the process display unit are divided into the following menus. The individual parameters and settings are described in the "Commissioning" section.



If the operating menu is disabled by means of a user code, the individual menus and parameters can be displayed but not changed. To change a parameter, the user code must be entered. As the display unit can only display digits in the 7-segment display and not alphanumeric characters, the procedure for number parameters is different to that for text parameters. If the operating position contains only numbers as parameters, the operating position is displayed in the 14-segment display and the configured parameter is displayed in the 7-segment display. To edit, press the 'E'-button followed by the user code. If the operating position contains text parameters, only the operating position is initially displayed in the 14-segment display. If the 'E' button is pressed again, the configured parameter is displayed in the 14-segment display. To edit, press the '+' button followed by the user code.

Setup (SETUP)	Basic device settings
Diagnostics (DIAG)	Device information, display of error messages
Expert (EXPERT)	Expert settings for device setup. The Expert menu is protected from editing by an access code (default 0000).

10.4.2 Operating modes

The process display unit can be used in two different operating modes:

- 4 to 20 mA mode:

In this operating mode, the process display unit is incorporated into the 4 to 20 mA current loop and measures the transmitted current. The variable calculated based on the current value and range limits is displayed in digital form on the 5-digit LCD. In addition, the associated unit and a bar graph can be displayed. In this mode of operation, the measured value corresponds to 0 to 100 %.

- HART mode:

The display unit is powered via the current loop.

The FMR20 can be adjusted under the "Setup Level" menu (see operating matrix). The measured value displayed corresponds to the distance measured or, if linearization is enabled, to a percentage value.

HART communication operates according to the master/slave principle.

In the HART loop, the process display unit has the option of functioning either as a primary master or as a secondary master (default). When it functions as a master, the device can read process values from the measuring device and display them.


In HART mode, the process display unit can show up to four device variables of a multivariable measuring device. These variables are referred to as the Primary Variable (PV), Secondary Variable (SV), Tertiary Variable (TV) and Quaternary Variable (QV). These variables are placeholders for measured values that can be retrieved using HART communication.




As a general rule, the sensor is a slave and transmits information only if a request has been made by the master. A HART loop can have a maximum of two HART masters at any one time. With these HART masters, a distinction is made between the primary master (e.g. the distributed control system) and the secondary master (e.g. handheld terminal for local operation of the measuring devices). The two masters in the loop/in the network cannot be masters of the same type, e.g. they cannot be two "secondary masters". If a third HART master is added to the network, one of the other masters must be disabled; otherwise a collision occurs in the network. If the process display unit (RIA15) is operating as a "secondary master", for example, and another "secondary master" (e.g. a handheld device) is added to the network, the device interrupts HART communication as soon as it detects the presence of another "secondary master". The display alternates between error message C970 "Multi master collision" and "- - -". A measured value is not displayed in this case. The device leaves the HART loop for 30 seconds and then tries to re-establish HART communication once again. Once the additional "secondary master" is removed from the network, the device continues communication and displays the measured values of the sensor/actor once more.

10.4.3 Operating matrix

After power-up:

- ▶ Activate the  key x2
 - ↳ The menu "Level" is available

MENU SETUP -> LEVEL		
Parameters	Values	Description
UNIT	m	Select the displayed unit
	FT	
EMPTY	Numeric value 0 to 100 m, default 2 m	Empty calibration using keys -,+,E. Enter distance from process connection to min. level
FULL	Numerical value 0.001 to 100 m, default 2 m	Full calibration using keys -,+,E. Enter span from max. level to min. level
DIST	Measured value (distance measured)	
MAP	DI OK	To be selected if the distance displayed matches the actual distance. The device then records a mapping.
	MAN	To be selected if the range of mapping is to be defined manually in the 'Mapping end point' parameter. A comparison between the distance displayed and the actual distance is not necessary in this case. It takes about 20 s until the mapping is active.
	DI UN	To be selected if the actual distance is unknown. No mapping is recorded.

MENU SETUP -> LEVEL		
Parameters	Values	Description
	FACT	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.
	 The end point of the current mapping is not indicated in the RIA 15. If a new mapping is recorded ("DI OK" or "MAN"), the new mapping is superimposed on the existing mapping. In order to bring about a defined state, perform a factory mapping ("FACT") if required. This deletes any previous mapping.	

Using the following operating matrix, a display in percent can be set. To do this, select "Mode" parameter => 4-20 and "Unit" parameter => %

MENU SETUP			
Parameters	Values	visible at	Description
MODE	4-20 HART		Select the operating mode for the display unit 4-20: The circuit's 4 to 20 mA signal is displayed. HART: Up to four HART variables (PV, SV, TV, QV) per sensor/actuator can be displayed in the loop.
DECIM	0 DEC 1 DEC 2 DEC 3 DEC 4 DEC	MODE = 4-20	Number of decimal places for display
SC__4	Numerical value -19 999...99 999 Default: 0.0	MODE = 4-20	5-digit value (number of decimal places as configured under DECIM) for scaling the measured value at 4 mA Example: SC__4 = 0.0 => 0.0 displayed for 4 mA measuring current The unit selected under UNIT is used to display the value.
SC_20	Zahlenwert -19 999...99 999 Default: 100.0	MODE = 4-20	5-digit value (number of decimal places as configured under DECIM) for scaling the measured value at 20 mA Example: SC__20 = 100.0 => 100.0 displayed for 20 mA measuring current The unit selected under UNIT is used to display the value.

MENU SETUP			
Parameters	Values	visible at	Description
UNIT	% °C °F K USER	MODE = 4-20	Use this function to select the unit for displaying the value. If "USER" is selected, a user-defined unit can be entered in the TEXT parameter.
TEXT	Customized text, 5-digit	MODE = 4-20	User-defined unit, only visible if the "USER" option has been selected under UNIT.

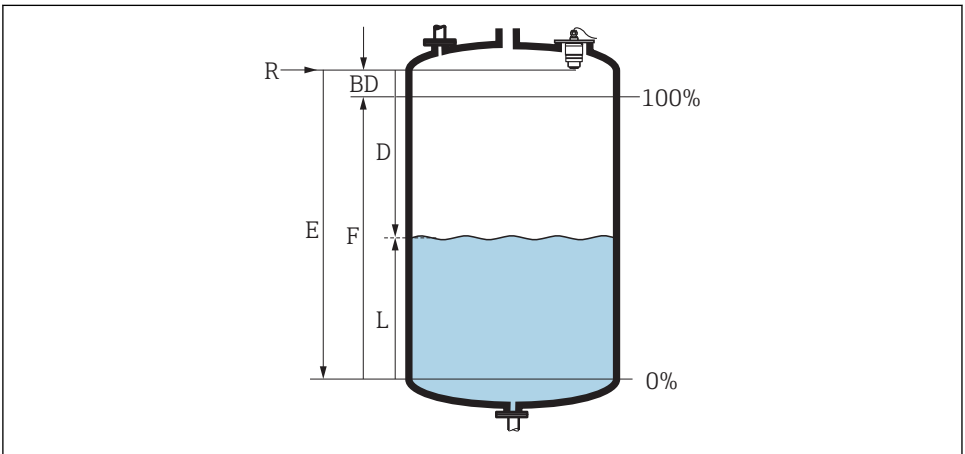


Any additional settings such as linearizations must be made using FieldCare, DeviceCare or SmartBlue.



Additional information is available in the RIA15 Operating Instructions BA01170K.

10.5 Configuring level measurement via operating software



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28 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

10.5.1 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 DeviceCare or FieldCare

1. Navigate to: Setup → Advanced setup
 - ↳ Select table as the linearization type
2. Call up the linearization table
3. X1 = Specify level value in m / ft for 0 %

4. $X2 = X1$ = Specify level value in m / ft for 100 %
5. Confirm table as the linearization type

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

10.6 Data access - Security

10.6.1 Software locking via access code in FieldCare / DeviceCare

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

- ▶ Navigate to: Setup → Advanced setup → Administration → 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.

10.6.2 Unlocking via FieldCare / DeviceCare

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

10.6.3 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.

10.6.4 Unlocking via SmartBlue

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

10.6.5 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, FieldCare and DeviceCare

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

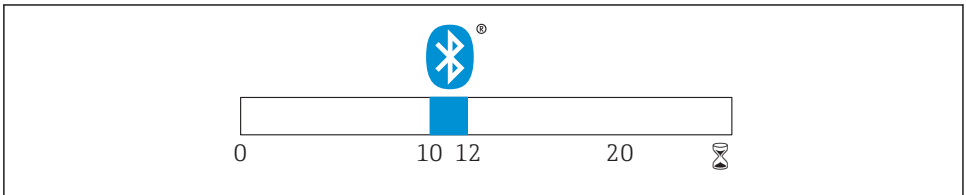
Re-activate Bluetooth® wireless technology interface

If *Bluetooth*® wireless technology interface was disabled, it can be re-activated anytime via FieldCare / DeviceCare

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

The *Bluetooth*® wireless technology interface can also be re-enabled 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 FMR20*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



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📄 29 Timeline for *Bluetooth*® wireless technology recovery sequence , time in minutes

10.6.6 Locking RIA15

The device setup can be disabled with a 4-digit user code



Additional information is available in the RIA15 Operating Instructions BA01170K

11 Supplementary documentation

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

11.1 Standard documentation

Device	Document type	Document code
FMR20	Operating Instructions	BA01578F

Device	Document type	Document code
FMR20	Technical Information	TI01267F

11.2 Supplementary documentation

Device	Document type	Document code
RIA15	Technical Information	TI01043K
	Operating Instructions	BA01170K

11.3 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.

Feature 020 "Power Supply; Output"	Approval	Available for
		A ¹⁾ , P ²⁾
BA	ATEX: II 1 G Ex ia IIC T4 Ga	XA01443F
BB	ATEX: II 1/2 G Ex ia IIC T4 Ga/Gb	
IA	IEC: Ex ia IIC T4 Ga	
IB	IEC: Ex ia IIC T4 Ga/Gb	
CB	CSA C/US IS Cl.I Div.1 Gr.A-D, AEx ia / Ex ia T4	XA01445F

1) 2-Draht; 4-20 mA HART

2) 2-Draht; 4-20 mA HART /Bluetooth®



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

www.addresses.endress.com
