# Brief Operating Instructions Micropilot FMR20 Modbus RS485

Free space radar For bulk solids



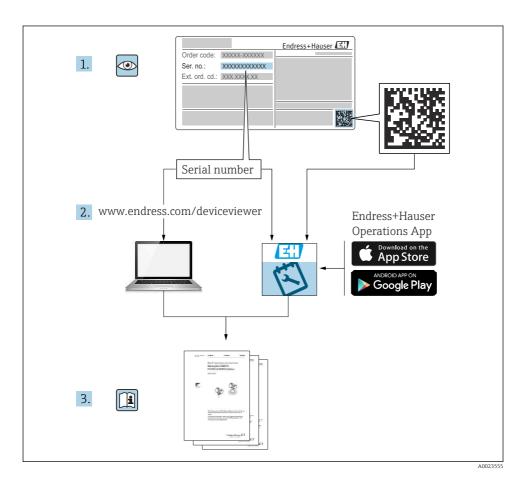
These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

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





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# 1 About this document

# 1.1 Symbols used

#### 1.1.1 Safety symbols

#### **⚠** DANGER

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

#### **WARNING**

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

#### A CAUTION

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

#### NOTICE

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

#### 1.1.2 Symbols for certain types of information and graphics

#### **✓** Permitted

Procedures, processes or actions that are permitted

#### **Forbidden**

Procedures, processes or actions that are forbidden

# 1 Tip

Indicates additional information



Reference to graphic



Notice or individual step to be observed

#### 1., 2., 3.

Series of steps



Result of a step

#### 1, 2, 3, ...

Item numbers

#### A, B, C, ...

Views

#### 1.2 Documentation

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



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

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

# 1.3 Supplementary documentation

#### BA02115F

Operating Instructions FMR20 Modbus for bulk solids

#### TI01043K

Technical Information RIA15

#### BA01170K

Operating Instructions RIA15

# 1.4 Registered trademarks

#### Modbus<sup>®</sup>

Registered trademark of SCHNEIDER AUTOMATION, INC.

#### Apple<sup>®</sup>

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.

#### 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.

# 2 Basic safety instructions

# 2.1 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.
- ▶ Personnel must be authorized by the plant owner/operator.
- ▶ Be familiar with federal/national regulations.

- ▶ Before starting work: personnel must read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- ▶ Personnel must follow instructions and comply with general policies.

The operating personnel must fulfill the following requirements:

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

#### 2.2 Intended use

#### Application and media

The measuring device described in these Operating Instructions is intended for continuous, non-contact level measurement of solids. 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. If operated outside of closed vessels, the device must be mounted in accordance with the instructions in the "Installation" section. The operation of the devices does not present any health risk.

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

- ► Measured process variables: distance
- ► Calculable process variables: volume or mass in any shape of vessel

To ensure that the measuring device remains in proper condition for the operation time:

- ► Use the measuring device only for media to which the process-wetted materials have an adequate level of resistance.
- ▶ Observe the limit values (see "Technical data").

#### Incorrect use

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

Clarification of borderline cases:

With regard to special media and media used for cleaning, please contact the manufacturer. Endress+Hauser will be happy to assist in clarifying the corrosion-resistant properties of 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  $80\,^{\circ}\text{C}$  (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!

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

# 2.3 Workplace safety

For work on and with the device:

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

# 2.4 Operational safety

Risk of injury!

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

#### Hazardous area

To eliminate the risk of danger to persons or the facility when the device is used in the approval-related area (e.g. explosion protection, pressure equipment safety):

- Check the nameplate to verify if the device ordered can be put to its intended use in the approval-related area.
- Observe the specifications in the separate supplementary documentation that is an integral part of this manual.

# 2.5 Product safety

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

#### 2.5.1 CE mark

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

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

# 2.5.2 EAC conformity

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

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

# 2.6 IT security

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

# 2.7 Device-specific IT security

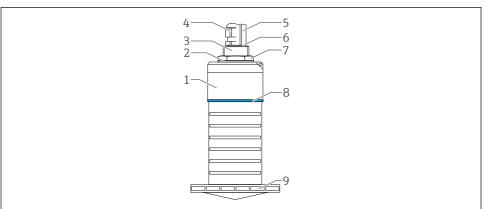
#### 2.7.1 Access via Bluetooth® wireless technology

Signal transmission via Bluetooth  $^{\tiny @}$  wireless technology uses a cryptographic technique tested by Fraunhofer AISEC

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

# 3 Product description

# 3.1 Product design



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#### ■ 1 Overview of materials

80 mm (3 in) antenna

- 1 Sensor housing; PVDF
- 2 Seal: EPDM
- 3 Process connection, rear side; PVDF
- 4 Cable gland; PA
- 5 Conduit adapter; CuZn nickel-plated
- 6 O-ring: EPDM
- 7 Counter nut; PA6.6
- 8 Design ring; PBT-PC
- 9 Process connection, front side; PVDF

# 4 Incoming acceptance and product identification

# 4.1 Goods acceptance

Check the following during goods acceptance:

- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): Are the safety instructions (XA) provided?
- If one of these conditions is not met, please contact the manufacturer's sales office.

#### 4.2 Product identification

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

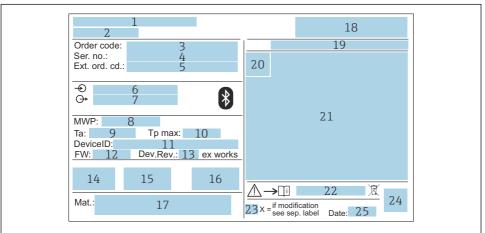
- Nameplate specifications
- Extended order code with breakdown of the device features on the delivery note
- ► Enter the serial number from the nameplates into *W@M Device Viewer* (www.endress.com/deviceviewer)
  - All the information about the measuring device and the scope of the associated Technical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

#### 4.3 Manufacturer address

Endress+Hauser SE+Co. KG Hauptstraße 1 79689 Maulburg, Germany

Place of manufacture: See nameplate.

# 4.4 Nameplate

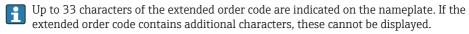


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#### ■ 2 Nameplate of Micropilot

- 1 Manufacturer 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 RCM
- 17 Materials in contact with process
- 18 Logo
- 19 Degree of protection: e.g. IP, NEMA
- 20 Certificate symbol
- 21 Certificate- and approval-specific data
- 22 Document number of the Safety Instructions: e.g. XA, ZD, ZE

- 23 Modification mark
- 24 2-D matrix code (QR code)
- 25 Date of manufacture: year-month

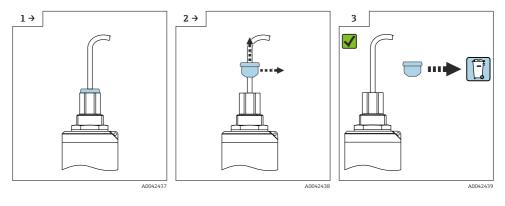


However, the complete extended order code can also be displayed via the device operating menu: Extended order code 1 to 3 parameter

# 5 Installation

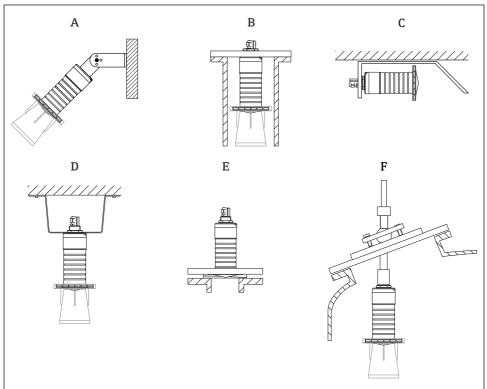
# Removing the cable transportation guard

In the case of devices with a rear-side process connection "FNPT1/2 conduit", the cable protective plug must be removed before installation.



# 5.1 Installation conditions

# 5.1.1 Installation types



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#### ■ 3 Wall, ceiling or nozzle installation

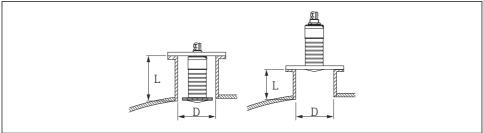
- A Wall or ceiling mounting, adjustable
- B Mounted at rear thread
- C Horizontal installation in cramped spaces
- D Ceiling installation with counter nut (included in delivery)
- E Installation with adjustable flange seal
- F Installation with FAU40 alignment unit

# Caution!

- The sensor cables are not designed as supporting cables. Do not use them for suspension purposes.
- Always operate the device in a vertical position in free-space applications.

#### 5.1.2 Nozzle installation

The antenna should project 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.



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#### ■ 4 Nozzle installation

The maximum nozzle length L depends on the nozzle diameter D.

Please note the limits for the diameter and length of the nozzle.

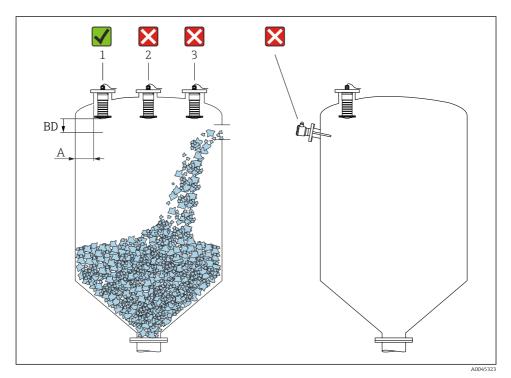
#### 80 mm (3 in) antenna, installation inside nozzle

- D: min. 120 mm (4.72 in)
- L: max. 205 mm (8.07 in) + D × 4.5

#### 80 mm (3 in) antenna, installation outside nozzle

- D: min. 80 mm (3 in)
- L: max. D × 4.5

#### 5.1.3 Position for installation on a vessel



■ 5 Installation position on a vessel

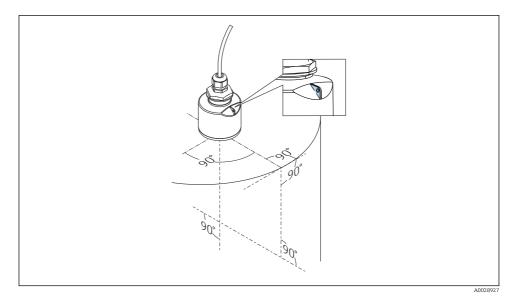
- If possible install the sensor so that its lower edge is inside the vessel.
- Recommended distance A wall nozzle outer edge: ~ ½ of the vessel diameter. Under no circumstances should the device be mounted closer than 15 cm (5.91 in) to the vessel wall.
- Do not install the sensor in the middle of the vessel.
- Avoid measurements through the filling curtain.
- Avoid internal fixtures such as limit switches.
- No signals are evaluated within the Blocking distance (BD). It can therefore be used to suppress interference signals (e.g. the effects of condensate) in the vicinity of the antenna. An automatic Blocking distance of at least 0.1 m (0.33 ft) is configured as standard. However, this can be overwritten manually (0 m (0 ft) is also permitted). Automatic calculation:

Blocking distance = Empty calibration - Full calibration - 0.2 m (0.656 ft). Each time a new entry is made in the **Empty calibration** parameter or **Full calibration** parameter, the **Blocking distance** parameter is recalculated automatically using this formula.

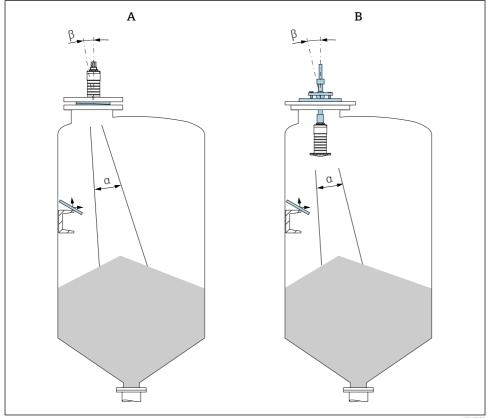
If the result of the calculation is a value <0.1 m (0.33 ft), the Blocking distance of 0.1 m (0.33 ft) will continue to be used.

#### 5.1.4 Device alignment for installation on a vessel

- Align the antenna so that it is perpendicular to the product surfaceAlign the eyelet with lug towards the vessel wall as well as possible

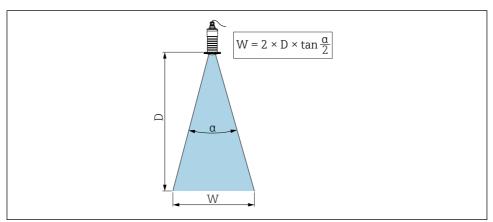


€ 6 Device alignment for installation on a vessel



- **№** 7 Aligning the sensor with the product cone
- Installation with adjustable flange seal Α
- Installation with FAU40 alignment unit В
- To avoid disturbance echoes, use metal plates installed at an angle (where necessary)

#### 5.1.5 Beam angle



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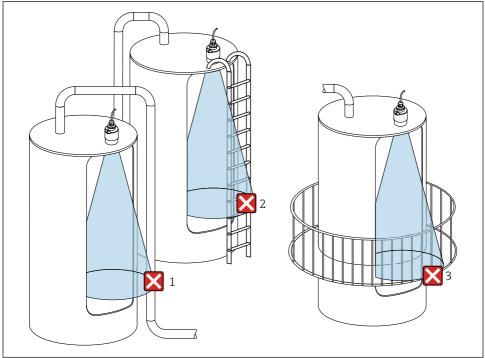
 $\blacksquare$  8 Relationship between beam angle  $\alpha$ , distance D and beamwidth diameter W

The beam angle is defined as the angle  $\alpha$  at which the power energy 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  $\alpha$  and distance **D**.

80 mm (3 in) antenna with or without a flooding protection tube,  $\alpha$  12  $^{\circ}$  W = D  $\times$  0.21

#### 5.1.6 Measurement in plastic vessels



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■ 9 Measurement in a plastic vessel with a metallic, interfering installation outside of the vessel

- 1 Pipe, tubing
- 2 Ladder
- 3 Grate, railing

If the outer wall of the vessel is made of a non-conductive material (e.g. GFR), microwaves can also be reflected by interfering installations outside of the vessel.

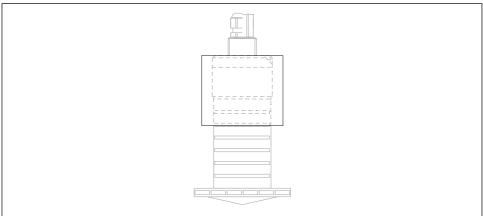
Please ensure there are no interfering installations made of a conductive material in the signal beam (see the beam angle section for information on calculating the beamwidth diameter).

Please contact the manufacturer for further information.

#### 5.1.7 Weather protection cover

A weather protection cover is recommended for outdoor use.

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



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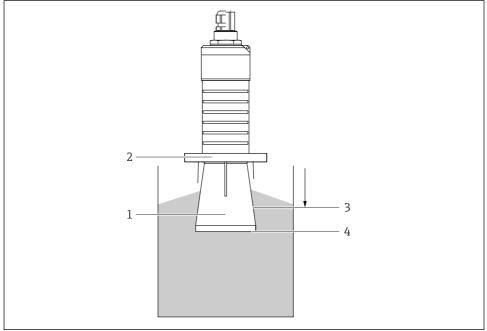
**■** 10 Weather protection cover



# 5.1.8 Use of flooding protection tube

In free-field installations and/or in applications where there is a risk of flooding, the flooding protection tube must be used.

The flooding protection tube can be ordered as an accessory or together with the device via the product structure "Accessory enclosed".



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■ 11 Function of flooding protection tube

- 1 Empty space
- 2 O-ring (EPDM) seal
- 3 Blocking distance
- 4 Max. level

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

#### Configuration parameters for flooding protection tube

# Configuring the blocking distance when using the flooding protection tube

- $\blacktriangleright\:\:$  Navigate to: Main menu  $\to$  Setup  $\to$  Advanced setup  $\to$  Blocking distance
  - ► Enter 100 mm (4 in).

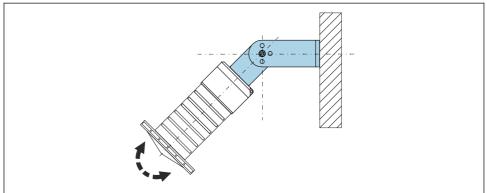
# Perform a mapping after the flooding protection tube has been installed and the blocking distance has been configured

- 1. Navigate to: Setup → Confirm distance
  - Compare the distance displayed with the actual value in order to start the recording of an interference echo map.

- 2. Navigate to: Setup → Mapping end point
  - This parameter determines the distance up to which the new mapping is to be recorded.
- 3. Navigate to: Setup → Present mapping
  - □ Displays the distance up to which a mapping has already been recorded.

# 5.1.9 Installation with mounting bracket, adjustable

The mounting bracket can be ordered as an accessory or together with the device via the product structure "Accessory enclosed".



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■ 12 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

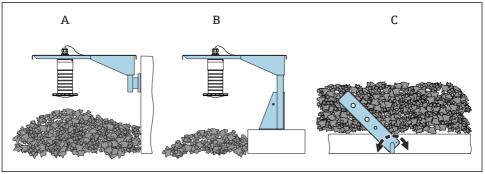
# There is no conductive connection between the mounting bracket and transmitter housing.

Electrostatic charging possible.

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

#### 5.1.10 Cantilever installation, with pivot

The cantilever, wall bracket and mounting frame are available as accessories.



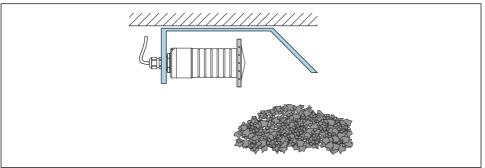
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■ 13 Cantilever installation, with pivot

- Cantilever with wall bracket Α
- Cantilever with mounting frame
- CCantilever, pivotable

#### Installation with the horizontal mounting bracket 5.1.11

The mounting bracket can be ordered together with the device via the product structure "Accessory enclosed".

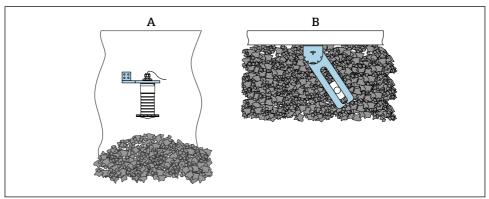


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**₽** 14 *Installation with the horizontal mounting bracket (without flooding protection tube)* 

#### 5.1.12 Installation with pivotable mounting bracket

The pivotable mounting bracket can be ordered together with the device via the product structure "Accessory enclosed".



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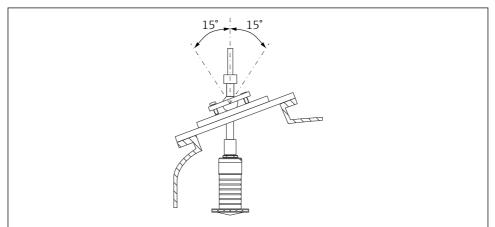
■ 15 Installation, pivotable and adjustable

- A Cantilever with wall bracket
- *B* Cantilever pivotable and adjustable (to align the device with the medium to be measured)

# 5.1.13 FAU40 alignment unit

An angle of inclination of up to  $15\,^\circ$  in all directions can be set for the antenna axis using the FAU40 alignment unit. The alignment unit is used to optimally direct the radar beam at the bulk solids.

The FAU40 alignment unit is available as an accessory.



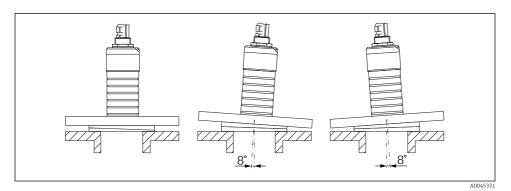
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■ 16 Micropilot FMR20 with alignment unit

#### 5.1.14 Adjustable flange seal

The radar beam can be optimally directed at the bulk solids using the adjustable flange seal.

The adjustable flange seal can be ordered together with the device via the product structure "Accessory enclosed".



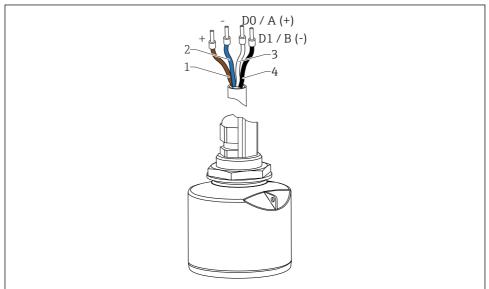
■ 17 Micropilot FMR20 with adjustable flange seal

# 5.2 Post-installation check

- ☐ Is the device or cable undamaged (visual inspection)?
- $\square$  Is the device adequately protected from wet conditions and direct sunlight?
- $\hfill \square$  Is the device properly secured?

# 6 Electrical connection

# 6.1 Cable assignment



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■ 18 FMR20 cable assignment, Modbus

- 1 Plus, brown wire
- 2 Minus, blue wire
- 3 Modbus D0/A (+), white wire
- 4 Modbus D1/B (-), black wire

# 6.2 Supply voltage

5 to 30  $V_{DC}$ 

An external power supply is necessary.

# **Battery operation**

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

# Potential equalization

No special measures for potential equalization are required.

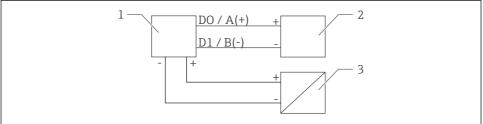


 $\label{thm:constraints} \mbox{Various power supply units can be ordered as an accessory from Endress+Hauser.}$ 

# 6.3 Connecting the device

# 6.3.1 Block circuit diagram for Modbus RS485 connection

The RS485 connection meets the requirements of the RS485-IS specification for use in hazardous environments.

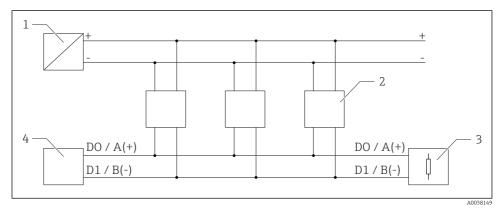


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■ 19 Block circuit diagram for Modbus RS485 connection

- 1 Device with Modbus communication
- 2 Modbus master/RTU
- 3 Power supply

Up to 32 users can be connected on the RS485 bus.



■ 20 Block circuit diagram for Modbus RS485 connection, multiple users

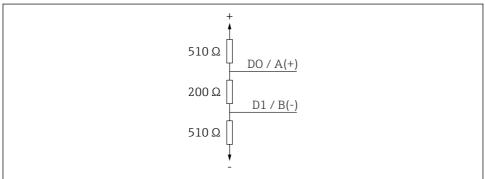
- 1 Power supply
- 2 Device with Modbus communication
- 3 Bus termination
- 4 Modbus master/RTU
- The bus cable should be a type-A fieldbus cable with a maximum length of 1200 m (3937 ft).

If the device is installed in a hazardous environment, the cable length may not exceed  $1\,000\,\mathrm{m}$  ( $3\,281\,\mathrm{ft}$ ).

A terminating resistor must be connected at both ends of the RS485 bus.

# 6.3.2 Modbus RS485 bus terminating resistor

The bus terminating resistor should be installed as per the RS485-IS specification.



■ 21 Representation of the bus terminating resistor as per the RS485-IS specification

Endress+Hauser 27

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# 6.4 Post-connection check

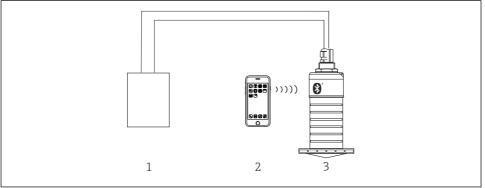
- ☐ Is the device or cable undamaged (visual inspection)?
- ☐ Do the mounted cables have adequate strain relief?
- ☐ Are the cable glands mounted and firmly tightened?
- ☐ Does the supply voltage match the specifications on the nameplate?
- ☐ No reverse polarity, is terminal assignment correct?

# 7 Operability

# 7.1 Operating concept

- Modbus
- SmartBlue (app) via *Bluetooth*® wireless technology
- Menu guidance with brief explanations of the individual parameter functions in the operating tool

# 7.2 Operation via Bluetooth® wireless technology

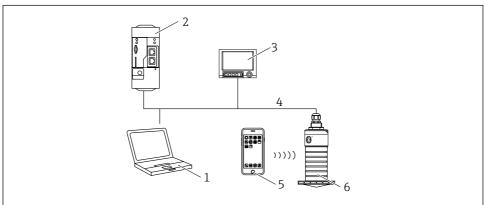


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■ 22 Possibilities for remote operation via Bluetooth® wireless technology

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

# 7.3 Remote operation via Modbus protocol



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■ 23 Options for remote operation via Modbus protocol

- 1 Computer with Modbus operating tool (customer application, terminal application, etc.)
- Remote Transmit Unit (RTU) with Modbus (e.g. Fieldgate FXA42)
- 3 Memograph M RSG45
- 4 Modbus RS485
- 5 Smartphone / tablet with SmartBlue (app)
- 6 Transmitter with Modbus and Bluetooth® wireless technology

# 8 System integration via Modbus protocol

# 8.1 Modbus RS485 information

#### 8.1.1 Modbus settings

The following settings can be customized via Bluetooth and Modbus.

Setting	Options	Default
Data bits	7,8	8
Parity	Even, odd, none	Even
Stop bits	1,2	1
Baud rate	1200, 2400, 4800, 9600, 19200	9600
Protocol	RTU, ASCII	RTU
Addressing	1 to 200	200
Minimum polling interval	500 ms	

# 8.1.2 Modbus function codes

Function code	Action	Register type	Command type
03 (0x03)	Single / multiple read	Holding Register	Standard
06 (0x06)	Single write	Holding Register	Standard
16 (0x10)	Multiple write	Holding Register	Standard

# 8.1.3 Modbus exceptions

Exception	Number	Description
MB_EX_ILLEGAL_FUNCTION	01 (0x01)	Function code is not supported
MB_EX_ILLEGAL_DATA_ADDRESS	02 (0x02)	Register address is not available
MB_EX_ILLEGAL_DATA_VALUE	03 (0x03)	Data value is not permitted (e.g. writing of a <b>float32</b> to a <b>char8</b> register). Also valid for writing to read-only registers.

# 8.1.4 Modbus special data types

Data type	Registers per parameter	Description				
float32 (IEEE754)	2	As a <b>float32</b> consists of four bytes, a parameter with float32 as the data type must be divided into two 16-bit words that are transmitted via Modbus. To read a float32-type parameter, two consecutive Modbus registers therefore must be read.				
		Modbus register [n]		Modbus register [n+1]		
		Byte A	Byte B	Byte C	Byte D	
		float32 value				
uint32 / int32	2	The same conditions that apply for float32 data types also apply for <b>uint32 / int32</b> data types.				
		Modbus register [n]		Modbus register [n+1]		
		Byte A	Byte B	Byte C	Byte D	
		uint32 / Int32 value				
string (char8 array)	0.5	As a single character of a character string only needs one byte, two characters are always packed into a Modbus register. Furthermore, the length of a parameter with <b>string</b> as the data type is limited to 60 characters.				
		Modbus register [n]		Modbus register [n+1]		
		char8 [n]	char8 [n+1]	char8 [n+2]	char8 [n+3]	

# 8.2 Measured variables via Modbus protocol

The 8 most important process parameters are mapped as burst parameters to the first addresses in the Modbus address range. This means that these parameters can be read out in one measurement transmission. All parameters are available in the Float32 format.



The register address must be incremented by one (register address +1) when using the Memograph M RSG45 or Fieldgate FXA30b Modbus master. This can also apply for other masters.

Modbus address	Parameter name	Description	SI unit
5000	MODB_PV_VALUE	Level linearized (PV)	Depends on the type of linearization
5002	MODB_SV_VALUE	Distance (SV)	m
5004	MODB_TV_VALUE	Relative echo amplitude (TV)	dB
5006	MODB_QV_VALUE	Temperature (QV)	°C
5008	MODB_SIGNALQUALITY	Signal quality	-
5010	MODB_ACTUALDIAGNOSTIC S	Current diagnostics number	-
5012	MODB_LOCATION_LONGITU DE	Longitude coordinate	•
5014	MODB_LOCATION_LATITUD E	Latitude coordinate	۰

# 9 Commissioning and operation

Perform the post-installation check and the post-connection check prior to commissioning the measuring point.

# 9.1 Commissioning via SmartBlue (App)

#### 9.1.1 Device requirements

Commissioning via SmartBlue is only possible if the device has Bluetooth capability (Bluetooth module installed at the factory prior to delivery or retrofitted).

#### 9.1.2 SmartBlue system requirements

#### SmartBlue system requirements

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

- Devices with iOS:
  - iPhone 4S or higher from iOS 9; iPad 2 or higher from iOS 9; iPod touch 5th generation or higher from iOS 9
- Devices with Android:
   From Android 4.4 KitKat and Bluetooth® 4.0

## 9.1.3 SmartBlue App

1. Scan the QR code or enter "SmartBlue" in the search field of the App Store.



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■ 24 Download link

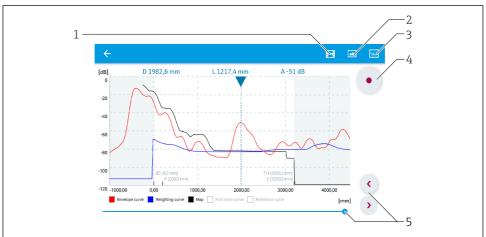
- 2. Start SmartBlue.
- 3. Select device from livelist displayed.
- 4. Enter the login data:
  - User name: admin
     Password: serial number of the device
- 5. Tap the icons for more information.
- After logging in for the first time, change the password!

# 9.1.4 Envelope curve display in SmartBlue

Envelope curves can be displayed and recorded in SmartBlue.

# In addition to the envelope curve, the following values are displayed:

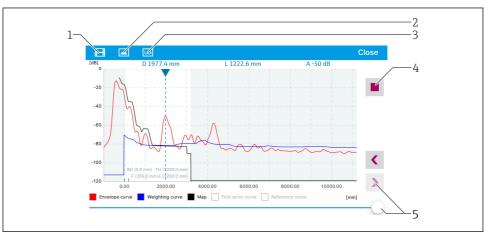
- D = Distance
- L = Level
- A = Absolute amplitude
- With screenshots, the displayed section (zoom function) is saved
- With video sequences, the whole area without zoom function is saved all the time



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#### ■ 25 Envelope curve display (sample) in SmartBlue for Android

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

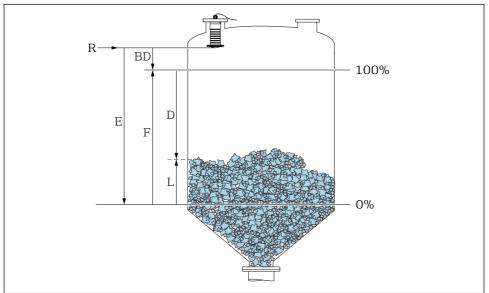


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#### ■ 26 Envelope curve display (sample) in SmartBlue for iOS

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

# 9.2 Configuring level measurement via operating software



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■ 27 Configuration parameters for level measurement in bulk solids

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

#### 9.2.1 Via SmartBlue

- 1. Navigate to: Setup → Distance unit
  - ightharpoonup Select unit of length for distance calculation
- 2. Navigate to: Setup  $\rightarrow$  Empty calibration
  - ► Specify empty distance E (distance from reference point R to minimum level)
- 3. Navigate to: Setup → Full calibration
  - ► Specify full distance F (span: max. level min. level)
- 4. Navigate to: Setup → Distance
  - Shows the distance D that is currently measured from the reference point (lower edge of flange / last sensor thread) to the level
- 5. Navigate to: Setup → Confirm distance
  - Compare the distance displayed with the actual value in order to start the recording of an interference echo map

- 6. Navigate to: Setup → Mapping end point
  - This parameter determines the distance up to which the new mapping is to be recorded
- 7. Navigate to: Setup → Present mapping
  - └ Displays the distance up to which a mapping has already been recorded
- 8. Setup → Confirm distance
- 9. Navigate to: Setup → Level
  - → Shows the level L measured
- 10. Navigate to: Setup → Signal quality
  - ► Displays the signal quality of the analyzed level echo

# 10 Diagnostics and troubleshooting

#### 10.1 General errors

Error	Possible cause	Remedy
Device does not respond	Supply voltage does not match the specification on the nameplate	Apply correct voltage
	The polarity of the supply voltage is wrong	Correct the polarity
	The cables do not contact the terminals properly	Ensure electrical contact between the cable and the terminal
Modbus communication not working	Modbus signals connected incorrectly	Connect the Modbus signals correctly
	Access code is activated	Enter access code
Device measures incorrectly	Configuration error	Check and correct the parameter configuration     Carry out mapping
Display values not plausible (linearization)	SmartBlue and Modbus active simultaneously	Log off Modbus and disconnect or Log off SmartBlue and disconnect (connection via SmartBlue has priority)
Linearized output value not plausible	Linearization error	Check the linearization table Check the vessel selection in the linearization module

# 10.2 Error - SmartBlue operation

Error	Possible cause	Remedy	
Device is not visible in the live list	No Bluetooth connection	Enable Bluetooth function on smartphone or tablet	
		Bluetooth function of sensor disabled, perform recovery sequence	
Device is not visible in the live list	The device is already connected with another smartphone/tablet	Only <b>one</b> point-to-point connection is established between a sensor and a smartphone or tablet	
Device is visible in the live list but cannot be accessed via SmartBlue	Android end device	Is the location function permitted for the app, was it approved the first time?	
		GPS or positioning function must be activated for certain Android versions in conjunction with Bluetooth	
		Activate GPS - close the app fully and restart - enable the positioning function for the app	
Device is visible in the live list but cannot be accessed via SmartBlue	Apple end device	Log in as standard Enter user name "admin" Enter initial password (device serial number) paying attention to lower/upper case	
Login via SmartBlue not possible	Device is being put into operation for the first time	Enter initial password (device serial number) and change. Pay attention to lower/upper case when entering the serial number.	
Device cannot be operated via SmartBlue	Incorrect password entered	Enter correct password	
Device cannot be operated via SmartBlue	Password forgotten	Contact the manufacturer's Service Department	
Device cannot be operated via SmartBlue	The sensor temperature is too high	If the ambient temperature results in an elevated sensor temperature of >60 °C (140 °F), Bluetooth communication may be disabled. Shield the device, isolate it and cool it down if necessary.	

# 10.3 Diagnostic event in the operating tool

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

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

# Calling up remedial measures

- ► Navigate to the **Diagnostics** menu





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