

# Safety Instructions

## Micropilot FMR20

4-20 mA HART, Modbus RS485

0Ex ia IIC T4...T1 Ga X

Ga/Gb Ex ia IIC T4...T1 X





# Micropilot FMR20

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**Associated documentation**

This document is an integral part of the following Operating Instructions:

HART  
BA01578F/00  
  
Modbus  
BA01931F/00

**Supplementary documentation**

Explosion-protection brochure: CP00021Z/11

The Explosion-protection brochure is available:

- In the download area of the Endress+Hauser website:  
[www.endress.com](http://www.endress.com) -> Downloads -> Brochures and Catalogs -> Text Search: CP00021Z
- On the CD for devices with CD-based documentation

**Manufacturer's certificates****Certificate of Conformity TP TC 012/2011**

Inspection authority:  
NANIO CCVE (ООО «НАНИО ЦСВЭ»)

Certificate number:  
ЕАЭС RU C-DE.AA87.B.00709/21

Affixing the certificate number certifies conformity with the following standards (depending on the device version):

- GOST 31610.0-2014 (IEC 60079-0:2011)
- GOST 31610.11-2014 (IEC 60079-11:2011)
- GOST 31610.26-2012/IEC 60079-26:2006

**Manufacturer address**

Endress+Hauser SE+Co. KG  
Hauptstraße 1  
79689 Maulburg, Germany  
Address of the manufacturing plant: See nameplate.

**Extended order code**

The extended order code is indicated on the nameplate, which is affixed to the device in such a way that it is clearly visible. Additional information about the nameplate is provided in the associated Operating Instructions.

## Structure of the extended order code

FMR20	–	*****	+	A*B*C*D*E*F*G*..
<i>(Device type)</i>		<i>(Basic specifications)</i>		<i>(Optional specifications)</i>

\* = Placeholder

At this position, an option (number or letter) selected from the specification is displayed instead of the placeholders.

### *Basic specifications*

The features that are absolutely essential for the device (mandatory features) are specified in the basic specifications. The number of positions depends on the number of features available.

The selected option of a feature can consist of several positions.

### *Optional specifications*

The optional specifications describe additional features for the device (optional features). The number of positions depends on the number of features available. The features have a 2-digit structure to aid identification (e.g. JA). The first digit (ID) stands for the feature group and consists of a number or a letter (e.g. J = Test, Certificate). The second digit constitutes the value that stands for the feature within the group (e.g. A = 3.1 material (wetted parts), inspection certificate).

More detailed information about the device is provided in the following tables. These tables describe the individual positions and IDs in the extended order code which are relevant to hazardous locations.

## Extended order code: Micropilot



The following specifications reproduce an extract from the product structure and are used to assign:

- This documentation to the device (using the extended order code on the nameplate).
- The device options cited in the document.

### *Device type*

FMR20

*Basic specifications*

Position 1, 2 (Approval)		
Selected option		Description
FMR20	GA	EAC 0Ex ia IIC T4..T1 Ga X
	GB	EAC Ga/Gb Ex ia IIC T4..T1 X

Position 3 (Power supply, Output, Operation)		
Selected option		Description
FMR20	A	2-wire, 4-20 mA HART; HART configuration
	P	2-wire; 4-20mA HART; HART/Bluetooth (App) configuration
	R	4-wire; Modbus RS485

Position 4, 5 (Antenna, Max. Measuring Range)		
Selected option		Description
FMR20	BM	40mm/1-1/2"; 10m liquid -40°C...80°C/-40...176°F
	BN	80mm/3"; 20m liquid -40°C...80°C/-40...176°F

Position 6, 7, 8 (Process Connection Rear Side, Material)		
Selected option		Description
FMR20	VCE	Thread ASME MNPT1; PVDF; FNPT1/2 conduit connection
	WDE	Thread G1 ISO228; PVDF

Position 9, 10, 11 (Process Connection Front Side, Material)		
Selected option		Description
FMR20	RPF	UNI slip on flange 3"/DN80/80; PP max 4bar abs./58psia, suitable for 3" 150lbs/DN80 PN16/10K 80
	RRF	UNI slip on flange 4"/DN100/100; PP max 4bar abs./58psia, suitable for 4" 150lbs/DN100 PN16/10K 100
	RSF	UNI slip on flange 6"/DN150/150; PP max 4bar abs./58psia, suitable for 6" 150lbs/DN150 PN16/10K 150
	VEE	Thread ASME MNPT1-1/2; PVDF
	VFE	Thread ASME MNPT2; PVDF
	WFE	Thread ISO228 G1-1/2; PVDF
	WGE	Thread ISO228 G2; PVDF
	XRO	Mounting customer side w/o flange

Position 12 (Cable Length)		
Selected option		Description
FMR20	A	..... ft
	1	5m
	2	10m
	3	20m
	8	..... m

### Optional specifications

ID Rx (Accessory Enclosed)		
Selected option		Description
FMR20	RA	UNI flange 2"/DN50/50, PP, front side max 4bar abs./58psia, suitable for NPS 2" 150lbs/DN50 PN16/10K 50
	RB	UNI flange 2"/DN50/50, PP, rear side max 4bar abs./58psia, suitable for NPS 2" 150lbs/DN50 PN16/10K 50
	RD	UNI flange 3"/DN80/80, PP, front side max 4bar abs./58psia, suitable for NPS 3" 150lbs/DN80 PN16/10K 80
	RE	UNI flange 3"/DN80/80, PP, rear side max 4bar abs./58psia, suitable for NPS 3" 150lbs/DN80 PN16/10K 80
	RG	UNI flange 4"/DN100/100, PP, front side max 4bar abs./58psia, suitable for NPS 4" 150lbs/DN100 PN16/10K 100
	RH	UNI flange 4"/DN100/100, PP, rear side max 4bar abs./58psia, suitable for NPS 4" 150lbs/DN100 PN16/10K 100
	RK	Swivelling mounting bracket for installation in manhole above sewer
	RL	Horizontal mounting bracket for installation in limited space in sewer shaft
	R1	Weather protection cover, PVDF
	R2	Ceiling mounting bracket, 316L
	R3	Mounting bracket adjustable, 316L
	R5	Remote Display RIA 15, ex= explosion proof approval, field enclosure
	R6	HART communication resistor Ex / non Ex
	R7	Flooding protection tube, metallized PBT-PC, suitable for 40mm/1-1/2" antenna with G1-1/2 front side connection
	R8	Flooding protection tube, metallized PBT-PC, suitable for 80mm/3" antenna

**Safety  
instructions:  
General**

- Staff must meet the following conditions for mounting, electrical installation, commissioning and maintenance of the device:
  - Be suitably qualified for their role and the tasks they perform
  - Be trained in explosion protection
  - Be familiar with national regulations
- Install the device according to the manufacturer's instructions and national regulations.
- Do not operate the device outside the specified electrical, thermal and mechanical parameters.
- Only use the device in media to which the wetted materials have sufficient durability.
- Avoid electrostatic charging:
  - Of plastic surfaces (e.g. enclosure, sensor element, special varnishing, attached additional plates, ..)
  - Of isolated capacities (e.g. isolated metallic plates)
- Modifications to the device can affect the explosion protection and must be carried out by staff authorized to perform such work by Endress+Hauser.

**Safety  
instructions:  
Special conditions**

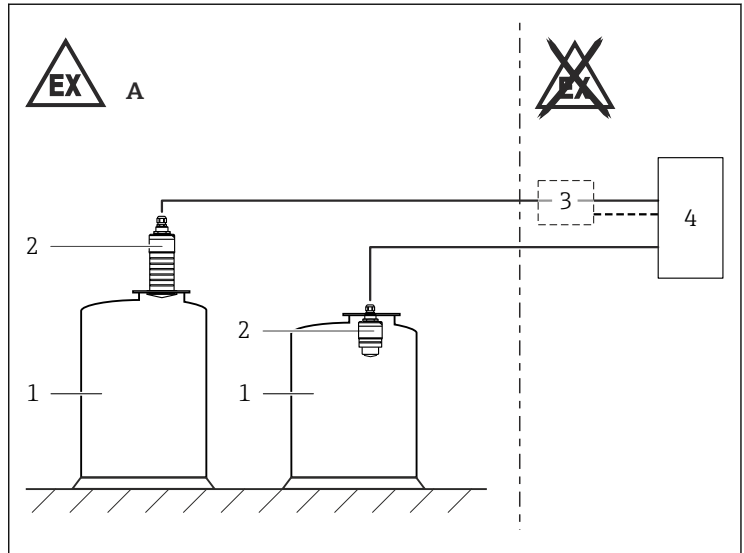
Permitted ambient temperature range at the electronics enclosure:  
For temperature classes T4..T1:  $-40\text{ °C} \leq T_a \leq +80\text{ °C}$

Permitted process temperature range:  
For temperature classes T4..T1:  $-40\text{ °C} \leq T_p \leq +80\text{ °C}$

- Avoid electrostatic charging of the enclosure (e.g. friction, cleaning, maintenance, strong medium flow).
- In the case of process connections made of polymeric material or with polymeric coatings, avoid electrostatic charging of the plastic surfaces.
- In the event of additional or alternative special varnishing on the enclosure or other metal parts:
  - Observe the danger of electrostatic charging and discharge.
  - Do not rub surfaces with a dry cloth.



## Safety instructions: Installation



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- A Zone 0, Zone 1  
 1 Tank; Zone 0, Zone 1  
 2 Micropilot FMR20  
 3 Terminal box (optional)  
 4 Controlling unit

- After aligning (rotating) the enclosure, retighten the fixing screw (see Operating Instructions).
- Install the device to exclude any mechanical damage or friction during the application. Pay particular attention to flow conditions and tank fittings.
- Continuous service temperature of the connecting cable:  $-40\text{ }^{\circ}\text{C}$  to  $\geq +80\text{ }^{\circ}\text{C}$ .

### **Intrinsic safety**

- The device is only suitable for connection to certified, intrinsically safe equipment with explosion protection Ex ia / Ex ib.
- The intrinsically safe input power circuit of the device is isolated from ground. If the device is only equipped with one input, the dielectric strength of the input is at least  $500 V_{\text{rms}}$ . If the device is equipped with more than one input, the dielectric strength of each individual input to ground is at least  $500 V_{\text{rms}}$ , and the dielectric strength of the inputs vis-à-vis one another is also at least  $500 V_{\text{rms}}$ .
- Observe the pertinent guidelines when interconnecting intrinsically safe circuits.
- When the device is connected to certified intrinsically safe circuits of Category Ex ib for Equipment Groups IIC and IIB, the type of protection changes to Ex ib IIC and Ex ib IIB. Do not operate the antenna in Zone 0 if connecting to an intrinsically safe circuit of Category Ex ib.
- When the intrinsically safe Ex ia circuits of the device are connected to certified intrinsically safe circuits of Category Ex ib for Equipment Groups IIC or IIB, the type of protection changes to Ex ib [ia] IIC or Ex ib [ia] IIB. Regardless of the power supply, all the internal circuits correspond to Ex ia IIC type of protection (e.g. service interface, external display, sensor).

### **Connection to Modbus RS485**

- Comply with the installation and safety instructions in the Operating Instructions.
- The bus and the devices must be galvanically isolated from each other.

**Safety instructions:**  
**Zone 0**

- In the event of potentially explosive vapor/air mixtures, only operate the device under atmospheric conditions.
  - Temperature: -40 to +80 °C
  - Pressure: 80 to 110 kPa (0.8 to 1.1 bar)
  - Air with normal oxygen content, usually 21 % (V/V)
- If no potentially explosive mixtures are present, or if additional protective measures have been taken, the device may also be operated under non-atmospheric conditions in accordance with the manufacturer's specifications.
- Associated devices with galvanic isolation between the intrinsically safe and non-intrinsically safe circuits are preferred.
- Only use the device in media to which the SilGel 612 EH potting compound of the electronic insert and the enclosure made of PVDF Kynar 720 have sufficient durability.
- If there is a risk of dangerous potential differences within Zone 0 (e.g. through the occurrence of atmospheric electricity), implement suitable measures for intrinsically safe circuits in Zone 0.

**Connection data**

When using the internal overvoltage protection: No changes to the connection values.

**Ex ia**

Power supply and signal circuit with protection type: intrinsic safety  
Ex ia IIC, Ex ia IIB.

*Basic specification, Position 3 = A, P*

**Cable blue (-), brown (+)**

Power supply:

$$U_1 = 30 \text{ V}$$

$$I_1 = 100 \text{ mA}$$

$$P_1 = 750 \text{ mW}$$

effective inner inductance  $L_1 = 35 \text{ } \mu\text{H}$

effective inner capacitance  $C_1 = 15 \text{ nF}$

*Basic specification, Position 3 = R*

<b>Cable blue (-), brown (+), white (D0), black (D1)</b>	
Power supply	RS485
$U_i = 30 \text{ V}$	$U_i = U_o = 4.2 \text{ V}$
$I_i = 100 \text{ mA}$	$I_i = 4.8 \text{ A}$
$P_i = 650 \text{ mW}$	$I_o = 149 \text{ mA}$
effective inner inductance $L_i = 20 \text{ } \mu\text{H}$	effective inner inductance $L_i = \text{negligible}$
effective inner capacitance $C_i = 10 \text{ nF}$	effective inner capacitance $C_i = 97 \text{ } \mu\text{F}$
cable inductance $L_{\text{cable}} = 0.8 \text{ } \mu\text{H/m}$	cable inductance $L_{\text{cable}} = 0.8 \text{ } \mu\text{H/m}$
cable capacitance $C_{\text{cable}} = 45 \text{ pF/m}$	cable capacitance $C_{\text{cable}} = 45 \text{ pF/m}$









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