

Safety Instructions

Micropilot FMR20

4-20 mA HART, Modbus RS485

Control Drawing IS



Micropilot FMR20

4-20 mA HART, Modbus RS485

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About this document

This document has been translated into several languages. Legally determined is solely the English source text.

Associated documentation

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

HART
BA01578F/00

Modbus
BA01931F/00

Manufacturer's certificates**CSA C/US certificate**

Certificate number:
CSA 16CA70105943

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	CB	CSA C/US IS Cl. I Div. 1 Gr. A-D, Zone 0, AEx/Ex ia IIC T4...T1
	CC	CSA C/US Cl. I Div. 2 Gr. A-D, T4...T1

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 + Bluetooth

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 housing
	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

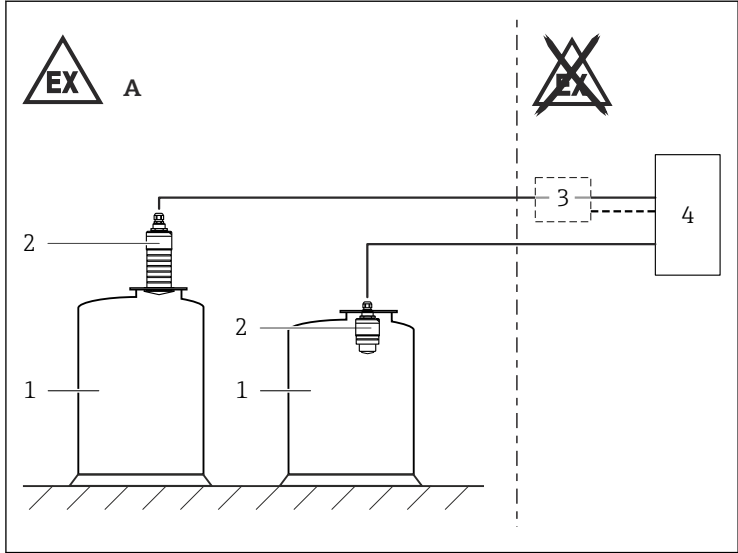
- Staff must meet the following conditions for mounting, electrical installation, commissioning and maintenance of the device:
 - Be suitably qualified for their role and the tasks they perform
 - Be trained in explosion protection
 - Be familiar with national regulations
- Install the device according 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**

- Because of the risk of discharge the non-metallic parts of the equipment and of all non-metallic accessories have to be protected from electrostatic charging during installation and operation (e.g. only wipe with damp cloth and do not expose to high voltage fields).
- The equipment is for use under atmospheric conditions only, the permissible pressure range is 0.8 to 1.1 bar (80 to 110 kPa) and the permissible normal oxygen content is typically 21 % (V/V).
- The end user shall ensure appropriate earthing of the metallic NPT adapter and all metallic accessories upon installation.
- The optional horn extension of the FMR20 contains surfaces that can become electrostatically charged. For this reason, this antenna must be arranged in such a way that it can not have contact to a flowing medium. If the optional horn extension is mounted in an accessible position it must be protected as described in the first condition of safe use.

Safety instructions: Installation



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

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

- In the case of process connections made of polymeric material or with polymeric coatings, avoid electrostatic charging of the plastic surfaces.
- 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 °C to $\geq +80\text{ °C}$.

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.

Intrinsic safety

Intrinsically safe, Class I, Div. 1, Groups A, B, C, D, Zone 0, AEx ia IIC T4...T1/Ex ia IIC T4...T1 Ga

Entity installation

- Use an intrinsic safety barrier or other associated equipment that is approved for the country in use and satisfies the following conditions:
 $U_o (V_{oc}) \leq U_i (V_{max}), I_o (I_{sc}) \leq I_i (I_{max}), C_o (C_a) \geq C_i + C_{cable},$
 $L_o (L_a) \geq L_i + L_{cable}$ and $P_o \leq P_i.$
- For transmitter parameters: See "Connection data" section.
- Control room equipment may not use or generate over 250 V_{rms}.
- Install per National Electrical Code (NFPA70) or Canadian Electrical Code, Part I (C22.1), as applicable.
- WARNINGS: Substitution of components may impair intrinsic safety.
- If the accessory RIA15 is connected to the FMR20 liquid level sensor, the RIA15 must not be supplied by its original supply parameters but with the supply parameters of the FMR20 liquid level sensor ($U_i / V_{max} = 30 \text{ V}, I_i / I_{max} = 100 \text{ mA}, P_i / P_{max} = 750 \text{ mW}$) and the supply must be suitable to be connected to the accumulated internal capacitance (C_i) and inductance (L_i) of the FMR20 liquid level sensor and the accessory RIA15.
- Always follow the installation instructions provided by the intrinsic safety barrier manufacturer when installing this equipment.

Class I, Div. 2, Groups A-D

Device type FMR20 is suitable for installation in Class I, Division 2 when either standard wiring installation or NIFW installation is applied.

Nonincendive Field Wiring (NIFW) installation

- The Nonincendive Field Wiring circuit concept allows interconnection of nonincendive field wiring apparatus with associated nonincendive field wiring apparatus or associated apparatus not specifically examined in combination as a system using any of the wiring methods permitted for unclassified locations, when the following conditions are met: $U_o (V_{oc}) \leq U_i (V_{max}), I_o (I_{sc}) \leq I_i (I_{max}),$
 $C_o (C_a) \geq C_i + C_{cable}, L_o (L_a) \geq L_i + L_{cable}.$
- For detailed parameters: See "Connection data" section.
- Control room equipment may not use or generate over 250 V_{rms}.
- Install per National Electrical Code (NFPA70) or Canadian Electrical Code, Part I (C22.1), as applicable.

- **WARNINGS:** Substitution of components may impair suitability for Class I, Div. 2.
- If the accessory RIA15 is connected to the FMR20 liquid level sensor, the RIA15 must not be supplied by its original supply parameters but with the supply parameters of the FMR20 liquid level sensor ($U_i / V_{\max} = 30 \text{ V}$, $I_i / I_{\max} = 100 \text{ mA}$, $P_i / P_{\max} = 750 \text{ mW}$) and the supply must be suitable to be connected to the accumulated internal capacitance (C_i) and inductance (L_i) of the FMR20 liquid level sensor and the accessory RIA15.
- Always follow the installation drawing provided by the associated apparatus manufacturer. The configuration of the associated apparatus must be approved for the country in use.

Standard Wiring installation

- Install per National Electrical Code (NFPA70) or Canadian Electrical Code, Part I (C22.1), as applicable.
- Use wiring methods appropriate for the location.
- Associated apparatus not required.
- For the maximum supply voltage: See "Connection data" section.
- **WARNINGS:** Explosion hazard - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
- **WARNINGS:** Substitution of components may impair suitability for Class I, Div. 2.
- If the accessory RIA15 is connected to the FMR20 liquid level sensor using standard Division 2 wiring, it must be installed in the non-hazardous area.

Connection data

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

IS: Class I, Div. 1; Class I, Zone 0, AEx ia/Ex ia

NIFW: Class I, Div. 2

Basic specification, Position 3 = A, P

Cable blue (-), brown (+)
Power supply $U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 750 \text{ mW}$ effective inner inductance $L_i = 35 \text{ } \mu\text{H}$ effective inner capacitance $C_i = 15 \text{ nF}$

Basic specification, Position 3 = R

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

Class I, Div. 2 (Standard wiring)

Basic specification, Position 3 = A, P

Cable blue (-), brown (+)
Input voltage = 30 V Input current = 25 mA

Basic specification, Position 3 = R

Cable blue (-), brown (+), white (D0), black (D1)	
Power supply	RS485
Input voltage = 30 V Input current = 25 mA	Input voltage = 4.2 V Input current = 149 mA

Remote display*Optional specification, ID Rx = R5*

- Only in connection with *Basic specification, Position 3 = A, P*.
- Since the RIA15 may have parameters that exceed those of the FMR20 as listed above, it is important to ensure the output parameters of the associated device do not exceed the allowable input parameters of the FMR20.
- For additional installation instructions of the RIA15, refer to Safety Instructions (XA): XA01056K or XA01368K.



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