



# IECEX Certificate of Conformity

## INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification Scheme for Explosive Atmospheres

for rules and details of the IECEx Scheme visit [www.iecex.com](http://www.iecex.com)

Certificate No.: IECEx PTB 12.0044X Issue No: 2 Certificate history:  
Status: Current Issue No. 2 (2019-05-10)  
Date of Issue: 2019-05-10 Page 1 of 4 Issue No. 1 (2017-09-01)  
Applicant: Endress + Hauser SE+Co. KG Issue No. 0 (2012-12-07)  
Hauptstrasse 1, 79689 Maulburg  
Germany  
Equipment: Microwave unit Micropilot type series FMR/OFMR5x...  
Optional accessory:  
Type of Protection: General requirements, Flameproof Enclosures "d", Intrinsic safety "i", Equipment protection by type of protection "n",  
Equipment with equipment protection level (EPL) Ga, Equipment dust ignition protection by enclosure "t"  
Marking: For details see attachment 1.

Approved for issue on behalf of the IECEx  
Certification Body:

Dr.-Ing. Frank Lienesch

Position:

Department Head "Explosion Protection in Sensor Technology and  
Instrumentation"

Signature:  
(for printed version)

Date:

16-5-19

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the [Official IECEx Website](http://www.iecex.com).

Certificate issued by:

Physikalisch-Technische Bundesanstalt (PTB)  
Bundesallee 100  
38116 Braunschweig  
Germany





# IECEX Certificate of Conformity

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Date of Issue: 2019-05-10 Page 2 of 4  
Manufacturer: Endress+Hauser GmbH+Co.KG  
Hauptstrasse 1  
79689 Maulburg  
Germany

Additional Manufacturing location(s):  
Refer to attachment 2 for a list of manufacturing locations

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

#### STANDARDS:

The apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2011 Edition:6.0	Explosive atmospheres - Part 0: General requirements
IEC 60079-1 : 2014-06 Edition:7.0	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
IEC 60079-11 : 2011 Edition:6.0	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
IEC 60079-15 : 2010 Edition:4	Explosive atmospheres - Part 15: Equipment protection by type of protection "n"
IEC 60079-26 : 2014-10 Edition:3.0	Explosive atmospheres – Part 26: Equipment with Equipment Protection Level (EPL) Ga
IEC 60079-31 : 2013 Edition:2	Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"

*This Certificate does not indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

#### TEST & ASSESSMENT REPORTS:

*A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in*

##### Test Report:

[DE/PTB/ExTR12.0058/02](#)

##### Quality Assessment Report:

[DE/TUN/QAR06.0003/07](#)



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## Schedule

### EQUIPMENT:

*Equipment and systems covered by this certificate are as follows:*

The microwave units Micropilot, type series FMR/OFMR5x... are used for the contactless, continuous measurement of liquid and solid media in explosion hazardous areas with gas or dust atmospheres. The microwave units Micropilot consist of various types of housings, electronic modules with optional surge protection adapted to the supply and evaluating circuits, different RF modules with associated antennas.

For further details see attachment 1.

**SPECIFIC CONDITIONS OF USE: YES as shown below:**

Specific conditions for use details see attachment 1.



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## DETAILS OF CERTIFICATE CHANGES (for issues 1 and above):

The changes concern the company name and the extension of the type code by the type OFMR5x-... Further changes concern the optionally available Bluetooth module BT10 and a further flameproof-resistant feed through.

### Annex:

[Attachment 1 to IECEX PTB 12-0044 X issue 2.pdf](#)

[Attachment 2 to IECEX PTB 12-0044 X issue 2.pdf](#)



**Applicant:** Endress + Hauser SE+Co. KG  
Hauptstrasse 1  
79689 Maulburg, Germany

**Electrical Apparatus:** Microwave unit Micropilot type series FMR/OFMR5x-...

Description of equipment

The microwave units Micropilot, type series FMR/OFMR5x-... are used for the contact less, continuous measurement of liquid and solid media in explosion hazardous areas with gas or dust atmosphere. The microwave units Micropilot are suitable for use in explosion hazardous areas with gas atmosphere of EPLs Ga, Ga/Gb, Ga/Gb/Gc or Gc or for use in explosion hazardous areas with dust atmosphere of EPLs Da or Da/Db.

Short microwave pulses are radiated from the antenna, reflected by the medium surface and picked up again by the antenna. The delay time between radiation and receiving is measured and converted into a signal to calculate the level.

The microwave units Micropilot consist of various types of housings, electronic modules with optional surge protection adapted to the supply and evaluating circuits, different RF modules with associated antennas. The electronic versions provide different power and output signals (voltage values, voltage forms, protocols). There are mounting accessories available (e.g. mounting bracket, a mounting device and collar flanges in various sizes etc.).

As an option, the microwave units Micropilot may be operated with the Remote Display FHX50, with a surge protector module type OVP10 resp. OVP20 resp. with the Bluetooth module type BT10. Here-with, the data in the certificates resp. the Safety Instructions XA... are to be respected.

The relationship between the temperature classes and the maximum permissible ambient and process temperatures, depending on the used housing variants, I/O modules, RF modules and antennas as well as the use of a surge protection and the Remote Display FHX50 and the Bluetooth module type BT10 for the applied method of protection for explosion hazardous areas with gas or dust atmosphere is given in the temperature tables of the respective safety instructions XA... of the microwave units Micropilot types FMR/OFMR5x-... .

Type key		
Micropilot FMR/OFMRxx, type series FMR/OFMRxx-aabcdeffgghh*+ #		
xx		<b>Probe type</b> 50, 51, 52, 53, 54, 56 or 57
aa		<b>Approval code</b>
IA		IECEX Ex ia IIC T6...T1 Ga
IB		IECEX Ex ia IIC T6...T1 Ga/Gb
IC		IECEX Ex ia/db [ia Ga] IIC T6...T1 Ga/Gb
ID		IECEX Ex ia/ic [ia Ga] IIC T6...T1 Ga/Gb/Gc <sup>1)</sup>
IE		IECEX Ex ta IIIC T <sub>500</sub> XX°C Da <sup>2)</sup>
IF		IECEX Ex ta/tb IIIC T85°C Da/Db <sup>2)</sup>
IG		IECEX Ex nA IIC T6...T1 Gc <sup>2)</sup>
IH		IECEX Ex ic IIC T6...T1 Gc <sup>2)</sup>
IL		IECEX Ex ia/nA [ia Ga] IIC T6...T1 Ga/Gb/Gc <sup>1)</sup>



IK		IECEX Ex ia IIIC T <sub>500</sub> 85°C Da
I2		IECEX Ex ia IIC T6...T1 Ga/Gb ; IECEX Ex ia IIIC T85°C Da/Db
I3		IECEX Ex ia/db [ia Ga] IIC T6...T1 Ga/Gb ; IECEX Ex ta/tb IIIC T85°C Da/Db <sup>2</sup>
I4		IECEX Ex ia IIC T6...T1 Ga/Gb, IECEX Ex ia/db [ia Ga] IIC T6 Ga/Gb
<b>b Power Supply, Output</b>		
A		2-wire; 4-20mA HART
B		2-wire; 4-20mA HART, switch output
C		2-wire; 4-20mA HART, 4-20mA
E		2-wire; FOUNDATION Fieldbus, switch output
G		2-wire; 4-20mA PROFIBUS PA, switch output
K		4-wire 90-253VAC, 4-20mA HART
L		4-wire 10,4-48VDC, 4-20mA HART
Y		Special version not relevant for safety; e.g. adjustment
<b>c Display, Operation</b>		
A		W/o LCD, via communication
C		LCD SD02, push button + data backup function
E		LCD SD03, touch control + data backup function
L		Prepared for remote display FHX50 + M12 connection
M		Prepared for remote display FHX50 + custom connection
N		Prepared for display FHX50 + NPT1/2 thread, custom connection
Y		Special version not relevant for safety; e.g. adjustment
<b>d Housing</b>		
A		GT19 dual compartment, Plastics PBT
B		GT18 dual compartment, 316L
C		GT20 dual compartment, Alu coated
Y		Special version not relevant for safety; e.g. colour, coating, ...
<b>e Electrical Connection (cable glands)</b>		
A		Gland M20, IP66/68 Type 4X/6P Encl.
B		Thread M20, IP66/68 Type 4X/6P Encl.
C		Thread G1/2, IP66/68 Type 4X/6P Encl.
D		Thread NPT1/2, IP66/68 Type 4X/6P Encl.
I		Plug M12, IP66/68 Type 4X/6P Encl.
M		Plug 7/8", IP66/68 Type 4X/6P Encl.
Y		Special version not relevant for safety; e.g. adjustment
<b>ff Antenna</b>		
		Type specified in form, sizes, materials
<b>gg Seal</b>		
		If available for specified type, materials, sizes, ....; any single letter or number or com-



		bination
<b>hhh</b>		<b>Process Connection</b>
		triple combinations of numbers or characters representing ANSI DIN JIS flange, threads, hygienic or other standardized process connections
*		<b>Air Purge Connection</b>
		if available
<b>#</b>		<b>options</b>
		Options not mandatory (multiple selection possible)

Note:

In the case of EPLs Da/Db for application of ta/tb or ia IIIC, the marking for partition wall apparatus is applied analogously to EN 60079-26.

1) ID, IL only in combination with a gastight feed through

2) marking changes in combination with the display, operation mode: „L“, „M“ or „N“

Approval code	Power supply; output	Display; Operation (IECEX DEK12.0046X)	Marking
IE	x	L, M or N	IECEX Ex ta [ia Da] IIIC T500 xx°C Da c)
IF	x	L, M or N	IECEX Ex ta/tb [ia Da] IIIC T85°C Da/Db d)
IG	x	L, M or N	IECEX Ex nA [ia Ga] IIC T6...T1 Gc a)
IH	x	L, M or N	IECEX Ex ic [ia Ga] IIC T6 Gc b)
I3	x	L, M or N	IECEX Ex ia/db [ia Ga] IIC T6...T1 Ga/Gb, IECEX Ex ta/tb [ia Da] IIIC T85°C Da/Db d)

Note:

- a) Only for power supply, output / 020: B, C, E, G, K, L
- b) Only for power supply, output / 020: B, C, E, G
- c) The display circuit is suitable to be passed through the Zone 20. The display has only tested for Zone 21 as a Db-apparatus.
- d) In the case of EPLs Da/Db for application of ta/tb, the marking for partition wall apparatus is applied analogously to EN 60079-26.

Electrical data						
I/O Interface						
Approval Code	Power supply / Output (I/O Interface)			Type of protection	Electrical data/maximum values	
	Code	Mode (functional)	Module Transmission Code, TRC[. .]		Supply/output (terminals 1 and 2)	Supply/output (terminals 3 and 4)
IA, IB, I2,	A	4..20mA HART (IO210)	21, 31	Ex ia IIC Ex ia IIIC	for connection to an intrinsically safe circuit, with the following maximum values: U <sub>i</sub> = 30 V I <sub>i</sub> = 300 mA P <sub>i</sub> = 1 W L <sub>i</sub> = 0 µH C <sub>i</sub> = 12 nF	non-existent
IG				.Ex nA IIC	U <sub>nom</sub> = 35 V dc 2)	non-existent



					$I_{nom} = 4 \dots 20 \text{ mA}$ $P_{nom} \leq 847 \text{ mW}$	
IH				Ex ic IIC	for connection to an intrinsically safe circuit, with the following maximum values: $U_i = 35 \text{ V}$ $I_i = \text{N/A}$ (current controlled circuit) $P_i = \text{N/A}$ $L_i = 0 \mu\text{H}$ $C_i = 12 \text{ nF}$	non-existent
IK				Ex ia IIIC	Refer to Ex ia IIC, not exceeding max value <sup>5)</sup>	non-existent
I4 <sup>1)</sup>	A	4..20mA HART (IO211) (for application / certificates which need I/O-modules with galvanic separation and use of 4...20mA HART in 1 channel mode (switch terminals closed))	02	Ex ia IIC	for connection to an intrinsically safe circuit, with the following maximum values: $U_i = 30 \text{ V}$ $I_i = 300 \text{ mA}$ $P_i = 1 \text{ W}$ $L_i = 0 \mu\text{H}$ $C_i = 5 \text{ nF}$	Not used
ID, IH <sup>7)</sup>				Ex ia/ic [ia Ga] IIC Ex ic IIC	for connection to an intrinsically safe circuit, with the following maximum values: $U_i = 35 \text{ V}$ $I_i = \text{N/A}$ (current controlled circuit) $P_i = \text{N/A}$ $L_i = 0 \mu\text{H}$ $C_i = 5 \text{ nF}$	Not used
IK				Ex ia IIIC	Refer to Ex ia IIC, not exceeding max value <sup>5)</sup>	Not used
IC, I3, I4 <sup>1)</sup>	A	4..20mA HART (IO212)	03	Ex ia/db [ia Ga] IIC	$U_N = 35 \text{ V DC}^{2)}$ $U_m = 250 \text{ V}$ $I_{nom} = 4 \dots 20 \text{ mA}$ $I_{max} = 22 \text{ mA}$ $P_{nom} = 0,7 \text{ W}$	Not used
IE <sup>6)</sup> , IF, I3				Ex ta IIIC Ex ta/tb IIIC	$U_N = 35 \text{ V DC}^{2)}$ $U_m = 250 \text{ V}$ $I_{nom} = 4 \dots 20 \text{ mA}$ $I_{max} = 22 \text{ mA}$ $P_{nom} = 0,7 \text{ W}$	Not used
IG				Ex nA IIC	$U_N = 35 \text{ V DC}^{2)}$ $U_m = 250 \text{ V}$ $I_{nom} = 4 \dots 20 \text{ mA}$ $I_{max} = 22 \text{ mA}$ $P_{nom} = 0,7 \text{ W}$	Not used
IL				Ex ia/nA [ia Ga] IIC	$U_N = 35 \text{ V DC}^{2)}$ $U_m = 250 \text{ V}$ $I_{nom} = 4 \dots 20 \text{ mA}$ $I_{max} = 22 \text{ mA}$ $P_{nom} = 0,7 \text{ W}$	Not used
IE				Ex ta IIIC	Refer to Ex tb <sup>8)</sup> $I_{FAULT} = 54 \text{ mA}$	Not used
IA, IB, I2,	B	4..20mA	02	Ex ia IIC	for connection to an intrinsical-	for connection to an

I4 <sup>1)</sup>		HART+ switch (IO211)		Ex ia IIIC	ly safe circuit, with the following maximum values: $U_i = 30\text{ V}$ $I_i = 300\text{ mA}$ $P_i = 1\text{ W}$ $L_i = 0\text{ }\mu\text{H}$ $C_i = 5\text{ nF}$	intrinsically safe circuit, with the following maximum values: $U_i = 30\text{ V}$ $I_i = 300\text{ mA}$ $P_i = 0,7\text{W}/0,85\text{W}/1\text{W}^3)$ $L_i = 0\text{ }\mu\text{H}$ $C_i = 3\text{ nF}$ $C_i = 5,28\text{ nF}^9)$
ID, IH				Ex ia/ic [ia Ga] IIC Ex ic IIC	for connection to an intrinsically safe circuit, with the following maximum values: $U_i = 35\text{ V}$ $I_i = \text{N/A}$ (current controlled circuit) $P_i = \text{N/A}$ $L_i = 0\text{ }\mu\text{H}$ $C_i = 5\text{ nF}$	for connection to an intrinsically safe circuit, with the following maximum values: $U_i = 35\text{ V}$ $I_i = \text{N/A}$ (current controlled circuit) $P_i = 0.7\text{W}/0,85\text{W}/1\text{W}^3)$ $L_i = 0\text{ }\mu\text{H}$ $C_i = 3\text{ nF}$ $C_i = 5,28\text{ nF}^9)$
IK				Ex ia IIIC	Refer to Ex ia IIC, not exceeding max value <sup>5)</sup>	Refer to Ex ia IIC, not exceeding max value <sup>5)</sup>
IC, I3, I4 <sup>1)</sup>	B	4..20mA HART+ switch (IO212)	03	Ex ia/db [ia Ga] IIC	$U_N = 35\text{ V DC}^2)$ $U_m = 250\text{ V}$ $I_{nom} = 4 \dots 20\text{ mA}$ $I_{max} = 22\text{ mA}$ $P_{nom} = 0,7\text{ W}$	$U_N = 35\text{ V DC}^2)$ $U_m = 250\text{ V}$ $P_{nom} = 0,7\text{ W}$
IE <sup>6)</sup> , IF, I3				Ex ta IIIC Ex ta/tb IIIC	$U_N = 35\text{ V DC}^2)$ $U_m = 250\text{ V}$ $I_{nom} = 4 \dots 20\text{ mA}$ $I_{max} = 22\text{ mA}$ $P_{nom} = 0,7\text{ W}$	$U_N = 35\text{ V DC}^2)$ $U_m = 250\text{ V}$ $P_{nom} = 0,7\text{ W}$
IG				Ex nA IIC	$U_N = 35\text{ V DC}^2)$ $U_m = 250\text{ V}$ $I_{nom} = 4 \dots 20\text{ mA}$ $I_{max} = 22\text{ mA}$ $P_{nom} = 0,7\text{ W}$	$U_N = 35\text{ V DC}^2)$ $U_m = 250\text{ V}$ $P_{nom} = 0,7\text{ W}$
IL				Ex ia/nA [ia Ga] IIC	$U_N = 35\text{ V DC}^2)$ $U_m = 250\text{ V}$ $I_{nom} = 4 \dots 20\text{ mA}$ $I_{max} = 22\text{ mA}$ $P_{nom} = 0,7\text{ W}$	$U_N = 35\text{ V DC}^2)$ $U_m = 250\text{ V}$ $P_{nom} = 0,7\text{ W}$
IE				Ex ta IIIC	Refer to Ex tb <sup>8)</sup> $I_{FAULT} = 54\text{ mA}$	Refer to Ex tb <sup>8)</sup> $R_{iFAULT} = 380,3\text{ Ohms}^9)$
IA, IB, I2, I4 <sup>1)</sup>	C	4..20mA HART+ 4..20mA (IO214)	04, 24	Ex ia IIC Ex ia IIIC	for connection to intrinsically safe circuits, with the following maximum values: $U_i = 30\text{ V}$ $I_i = 300\text{ mA}$ $P_i = 1\text{ W}$ $L_i = 0\text{ }\mu\text{H}$ $C_i = 30\text{ nF}$	for connection to intrinsically safe circuits, with the following maximum values: $U_i = 30\text{ V}$ $I_i = 300\text{ mA}$ $P_i = 1\text{ W}$ $L_i = 0\text{ }\mu\text{H}$ $C_i = 30\text{ nF}$
ID, IH				Ex ia/ic [ia Ga] IIC Ex ic IIC	for connection to intrinsically safe circuits, with the following maximum values: $U_i = 30\text{ V}$	for connection to intrinsically safe circuits, with the following maximum values:



					$I_i = \text{N/A}$ (current controlled circuit) $P_i = \text{N/A}$ $L_i = 0 \mu\text{H}$ $C_i = 30 \text{ nF}$	$U_i = 30 \text{ V}$ $I_i = \text{N/A}$ (current controlled circuit) $P_i = \text{N/A}$ $L_i = 0 \mu\text{H}$ $C_i = 30 \text{ nF}$
IK				Ex ia IIIC	Refer to Ex ia IIC, not exceeding max value <sup>5)</sup>	Refer to Ex ia IIC, not exceeding max value <sup>5)</sup>
IC, IE <sup>6)</sup> , IF, I3, I4 <sup>1)</sup>	C	4..20mA HART+ 4..20mA (IO215)	05, 25	Ex ia/db [ia Ga] IIC	$U_N = 10.4 \dots 30 \text{ V dc}^{2)}$ $U_m = 250 \text{ V}$ $I_N = 4 \dots 20 \text{ mA}$ $I_{\text{max}} = 22 \text{ mA}$ $P_N = 0.7 \text{ W}$	$U_N = 10.4 \dots 30 \text{ V dc}^{2)}$ $U_m = 250 \text{ V}$ $I_N = 4 \dots 20 \text{ mA}$ $I_{\text{max}} = 22 \text{ mA}$ $P_N = 0.7 \text{ W}$
IG				Ex ta IIIC		
IL				Ex ta/tb IIIC		
IE				Ex nA IIC	$U_N = 10.4 \dots 30 \text{ V dc}^{2)}$ $I_N = 4 \dots 20 \text{ mA}$ $I_{\text{max}} = 22 \text{ mA}$ $P_N = 0.7 \text{ W}$	$U_N = 10.4 \dots 30 \text{ V dc}^{2)}$ $I_N = 4 \dots 20 \text{ mA}$ $I_{\text{max}} = 22 \text{ mA}$ $P_N = 0.7 \text{ W}$
				Ex ia/nA [ia Ga] IIC	$U_N = 10.4 \dots 30 \text{ V dc}^{2)}$ $U_m = 250 \text{ V}$ $I_N = 4 \dots 20 \text{ mA}$ $I_{\text{max}} = 22 \text{ mA}$ $P_N = 0.7 \text{ W}$	$U_N = 10.4 \dots 30 \text{ V dc}^{2)}$ $U_m = 250 \text{ V}$ $I_N = 4 \dots 20 \text{ mA}$ $I_{\text{max}} = 22 \text{ mA}$ $P_N = 0.7 \text{ W}$
				Ex ta IIIC	Refer to Ex tb, <sup>8)</sup> $I_{\text{FAULT}} = 54 \text{ mA}$	Refer to Ex tb, <sup>8)</sup> $I_{\text{FAULT}} = 54 \text{ mA}$
IA, IB, I2, I4 <sup>1)</sup>	E,G	Fieldbus + switch (IO220)	26, 28	Ex ia IIC	FISCO field device or for connection to an intrinsically safe circuit, with the following maximum values: $U_i = 30 \text{ V}$ $I_i = 300 \text{ mA}$ $P_i = 1.2 \text{ W}$ $L_i = 10 \mu\text{H}$ $C_i = 5 \text{ nF}$	passive: for connection to intrinsically safe circuits, with the following maximum values: $U_i = 30 \text{ V}$ $I_i = 300 \text{ mA}$ $P_i = 1.0 \text{ W}$ $L_i = 0 \mu\text{H}$ $C_i = 3 \text{ nF}$ $C_i = 5.28 \text{ nF}$ (to ground)  $U_o = \text{negligible low}$ $I_o = \text{negligible low}$ $P_o = \text{negligible low}$
ID, IH				Ex ia IIIC		
				Ex ia/ic [ia Ga] IIC	FISCO field device or for connection to an energy limited circuit, with the following maximum values $U_i = 32 \text{ V}$ $I_i = 300 \text{ mA}$ $I_i = \text{N/A}$ (current controlled circuit) $P_i = \text{N/A}$ $L_i = 10 \mu\text{H}$ $C_i = 5 \text{ nF}$	passive: for connection to an intrinsically safe circuit, with the following maximum values: $U_i = 35 \text{ V}$ $I_i = 300 \text{ mA}$ $P_i = 0.7/0.85/1.0 \text{ W}$ $L_i = 0 \mu\text{H}$ $C_i = 3 \text{ nF}$ $C_i = 5.28 \text{ nF}^{9)}$  $U_o = \text{negligible low}$ $I_o = \text{negligible low}$ $P_o = \text{negligible low}$
IK				Ex ia IIIC	Refer to Ex ia IIC, not exceeding max value <sup>5)</sup>	Refer to Ex ia IIC, not exceeding max value



							5)
IC, IE <sup>6)</sup> , IF, I3, I4 <sup>1)</sup>	E, G	Fieldbus + switch (IO221)	27, 29	Ex ia/db [ia Ga] IIC	U <sub>N</sub> = 9 ... 32 V dc <sup>2)</sup> U <sub>m</sub> = 250 V ac P <sub>N</sub> ≤ 880 mW Fieldbus	U <sub>N</sub> = 10.4 ... 35 V dc <sup>2)</sup> U <sub>m</sub> = 250 V ac P <sub>N</sub> = 0.7/0.85/1.0 W <sup>3)</sup>	
				Ex ta IIIC			
				Ex ta/tb IIIC			
				IG	Ex nA IIC	U <sub>N</sub> = 9 ... 32 V dc <sup>2)</sup> U <sub>m</sub> = 250 V ac P <sub>N</sub> ≤ 880 mW	U <sub>N</sub> = 10.4 ... 35 V dc <sup>2)</sup> U <sub>m</sub> = 250 V ac P <sub>N</sub> = 0.7/0.85/1.0 W <sup>3)</sup>
IL	Ex ia/nA [ia Ga] IIC	U = 9 ... 32 V dc <sup>2)</sup> U <sub>m</sub> = 250 V ac P <sub>N</sub> ≤ 880 mW Fieldbus	U <sub>N</sub> = 10.4 ... 35 V dc <sup>2)</sup> U <sub>m</sub> = 250 V ac P <sub>N</sub> = 0.7/0.85/1.0 W <sup>3)</sup>				
IE			Ex ta IIIC	U <sub>N</sub> = 9 ... 20 V dc, <sup>8)</sup> U <sub>m</sub> = 250 V AC P <sub>N</sub> = 880mW	Refer to Ex tb, <sup>8)</sup> R <sub>IFault</sub> = 380,3 Ohms		
IC, IE <sup>6)</sup> , IF, IG, IL, I3	L	4-wire DC + 4..20mA HART (IO410)	08	Ex ia/db [ia Ga] IIC	U <sub>N</sub> = 10.4 ... 48 V dc <sup>2)</sup> U <sub>m</sub> = 250 V I <sub>N</sub> = 112 mA I <sub>max</sub> = 300 mA P <sub>N</sub> = 1328 mW	aktiv: U <sub>N</sub> = 22 V dc <sup>2)</sup> U <sub>m</sub> = 250 V I <sub>max</sub> = 22 mA	
				Ex ta IIIC			
				Ex ta/tb IIIC			
				Ex nA IIC			
				Ex ia/nA [ia Ga] IIC			
IC, IE <sup>6)</sup> , IF, IG, IL, I3	K	4-wire AC + 4..20mA HART (IO411)	09	Ex ia/db [ia Ga] IIC	U <sub>N</sub> = 90 ... 253 V ac <sup>2)</sup> 50/60 Hz; U <sub>m</sub> = 250 V I <sub>N</sub> = 25 mA I <sub>max</sub> = 160 mA P <sub>N</sub> = 1540 mW	aktiv: U <sub>N</sub> = 22 V dc <sup>2)</sup> U <sub>m</sub> = 250 V I <sub>max</sub> = 22 mA	
				Ex ta IIIC ,			
				Ex ta/tb IIIC			
				Ex nA IIC			
				Ex ia/nA [ia Ga] IIC			

Note:

- 1) Multiple marking; type of protection selected for first installation must be indicated and may not be changed.
- 2) Specifies maximum value, which includes 10% safety margin for typical power line variations.
- 3) Different P<sub>i</sub> values are applicable resulting in different maximum surface temperatures, refer to thermal data.
- 4) N/A
- 5) U<sub>i</sub> = 30 V; I<sub>i</sub> ≤ 250 mA; P<sub>i</sub> ≤ 600 mW@85 ° C in case of missing protection by an enclosure of at least IP5x
- 6) Approval code IE:  
Based on the "one-fault-conditions" as required by IEC/EN 60079-31 Ed. 2 or later. If used as replacement for devices certified on preceding issues IEC/EN60079-31 ed.1 the values stated in former issue for Ex d [ia] IIC still apply for Ex ta.
- 7) For application where galvanic separation is preferred.
- 8) The values of the respective position apply, provided that the values do not exceed the stated P<sub>i</sub> or P<sub>nom</sub> + 10% for an extended period; Which can be prevented by
  - using a power source with power limitation,
  - reducing the maximum voltage at the terminals of the device employing this module (either by using a suitable power supply, a limiting resistor or both. The resistor may be a load/communication resistor or a relay); the resistor to be installed outside of the device,
  - monitoring the current and cut-off the supply in case 22 mA are exceeded (this applies to 4... 20 mA circuits only)



The power supply and signal output circuits of the I/O interfaces (Power supply / Output) with the order code B, C, E, G, K, L and A combined with I/O module TRC[02] and TRC[03] are safely galvanically isolated up to a peak voltage of 375 V from the intrinsically safe interface circuits and the other circuits and are separated up to a voltage of 500 VAC from ground potential.

The power supply and signal output circuit of the I/O interface (Power supply/Output) with the order code A combined with TRC[21, 31] is electrically connected to the intrinsically safe interface circuit and isolated from ground potential up to a voltage of 500 VAC.

**Service Interface (CDI) of the Main boards Type MB 10 [TRC11/14] or Type MB20 [TRC12/15] or Type MB30 [TRC41]**

The type of protection of the service interface, which is intended for connection to the Endress + Hauser service interface FXA291 or any other interface is dependent on the "Approval Code" of the level gauges Micropilot type series FMR/OFMR5x-... .

If the interface is used in type of protection Intrinsic Safety Ex ia IIC/IIIC, the following maximum values are valid:

<b>MB10/20:</b> $U_o = 7.3 \text{ V}$ $I_o = 100 \text{ mA}$ $P_o = 160 \text{ mW}$ $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$	<b>MB30:</b> $U_o = 7.3 \text{ V}$ $I_o = 60 \text{ mA}$ $P_o = 110 \text{ mW}$ $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$
--	--

The permissible external common inductance and capacitance values are listed in the table below:

For interconnection Service Interface of ProToF-devices (e.g. Commubox FXA291)														
For Group IIC	$L_o$ [ $\mu\text{H}$ ]	1	2	5	10	20	50	100	150	200	500	1000	2000	5000
ISPARK PTB	$C_o$	$\leq 12,7$	$\leq 12,7$	$\leq 10,0$	$\leq 7,30$	$\leq 5,50$	$\leq 4,00$	3,20	-	$\leq 2,60$	$\leq 2,00$	$\leq 1,60$	$\leq 1,20$	$\leq 0,73$
EN 60079-25	$C_o$ [ $\mu\text{F}$ ]	-	-	-	-	-	-	-	2,0	-	1,40	0,90	0,49	-

(Taken from EU Type Examination Certificate KEMA 09 ATEX 0062 U, Issue 5 (Addendum 960009604-B) and Certificate of Conformity IECEx KEM 09.0030 U, Issue No. 4 (Addendum 960009604-B))

or

for connection to an intrinsically safe circuit  
maximum value:

$$U_i = 7.3 \text{ V}$$

The rules for the interconnection of intrinsically safe circuits shall be observed.

If the interface is used in type of protection Intrinsic Safety Ex ic IIC the following maximum values are valid:

$$U_o = 7.3 \text{ V};$$

$$U_i = 7.3 \text{ V}$$

The rules for the interconnection of intrinsically safe circuits shall be observed.

If the interface is used in type of protection for non sparking devices „Ex nA“ or for devices with dust explosion protection by enclosure „Ex ta“, the following maximum value is valid:

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Postfach 33 45, 38023 Braunschweig, Germany  
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$U_N = 6.5 \text{ V}$

**Interface of the display of the Mainboards Type MB 10 [TRC11/14] or Type MB20 [TRC12/15] or Type MB30 [TRC41]**

The type of protection for the interface of the display depends on the "Approval Code" of the microwave units Micropilot type series FMR/OFMR5x-... .

If the interface is used in type of protection Intrinsic Safety Ex ia IIC/IIIC, the following maximum values are valid:

<b>MB10/20:</b> $U_o = 7.3 \text{ V}$ $I_o = 327 \text{ mA}$ $P_o = 800 \text{ mW}$ $I_{\text{opeak}} = 1.65 \text{ A}$ $U_i = 7.3 \text{ V}$  $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$	<b>MB30:</b> $U_o = 7.3 \text{ V}$ $I_o = 90 \text{ mA}$ $P_o = 540 \text{ mW}$ $I_{\text{opeak}} = 1.65 \text{ A}$ $U_i = 7.3 \text{ V}$  $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$
The rules for the interconnection of intrinsically safe circuits shall be observed.	

If the interface is used in type of protection Intrinsic Safety Ex ic [ia] IIC, the following maximum values are valid:

<b>MB10/20:</b> $U_o = 7.3 \text{ V}$ $I_o = 327 \text{ mA}$ $P_o = 800 \text{ mW}$ $I_{\text{opeak}} = 1.65 \text{ A}$ $U_i = 7.3 \text{ V}$  $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$	<b>MB30:</b> $U_o = 7.3 \text{ V}$ $I_o = 90 \text{ mA}$ $P_o = 540 \text{ mW}$ $I_{\text{opeak}} = 1.65 \text{ A}$ $U_i = 7.3 \text{ V}$  $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$
The rules for the interconnection of intrinsically safe circuits shall be observed.	

If the interface is used in type of protection for devices of dust explosion protection by enclosure „Ex ta [ia] IIIC“ or in application for non-sparking devices „Ex nA [ia] IIC“, the following maximum values are valid:

<b>MB10/20:</b> $U_o = 7.3 \text{ V}$ $I_o = 327 \text{ mA}$ $P_o = 800 \text{ mW}$ $I_{\text{opeak}} = 1.65 \text{ A}$ $U_i = 7.3 \text{ V}$  $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$	<b>MB30:</b> $U_o = 7.3 \text{ V}$ $I_o = 90 \text{ mA}$ $P_o = 540 \text{ mW}$ $I_{\text{opeak}} = 1.65 \text{ A}$ $U_i = 7.3 \text{ V}$  $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$
The rules for the interconnection of intrinsically safe circuits shall be observed.	



Special conditions for safe use

- 1) **Electrostatic charging of plastic surfaces resp. isolated metal parts (TAGs) of the microwave units Micropilot type series FMR/OFMR5x-...**
- a. The microwave units Micropilot type series FMR/OFMR5x-... in the version with a plastic enclosure (enclosure-code GT19) contain plastic surfaces that may be electrostatically charged. During operation of the mentioned microwave units Micropilot type series FMR/OFMR5x-... in explosion hazardous areas with gas or dust atmosphere the risk of electrostatic charging of these enclosure parts, caused by friction, cleaning, maintenance and operation in fluid flows, is to be considered. They shall not be operated near processes which are strongly charge generating (warning label).
  - b. The microwave units Micropilot type series FMR/OFMR50-aabcdeBMgghh \* + # ... in all types of housing contain plastic surfaces that may be electrostatically charged. During operation of the mentioned level gauges Micropilot in explosion hazardous areas with gas atmosphere the risk of electrostatic charging of these enclosure parts, caused by friction and cleaning is to be considered (warning label).
  - c. The microwave units Micropilot type series FMR/OFMR50/56-aabcB/CeBNgghh\*+ #... and FMR/OFMR50/56-aabcB/CeBRgghh\*+ #... in the version with a stainless-steel enclosure (enclosure-code GT18) or aluminum enclosure (enclosure-code GT20) include plastic surfaces which may be electrostatically charged. They are suitable for operating in potentially explosive atmospheres with dust atmosphere or in areas with gas atmosphere group IIA, even in the presence of strong charge generating processes, if any conductive parts are connected electrically to the equipotential bonding.
  - d. The microwave units Micropilot type series FMR/OFMR51/54/57-... in the version with a stainless-steel enclosure (enclosure-code) GT18 or aluminum enclosure (enclosure-code GT20) and the flexible sealing contain plastic surfaces that may be electrostatically charged. They are suitable to be operated in all explosion hazardous areas with gas atmosphere or dust atmosphere, even in the presence of strong charge generating processes, if any conductive parts are connected electrically to the equipotential bonding.
  - e. The microwave units Micropilot type series FMR/OFMR53-... in the version with a stainless-steel enclosure (enclosure-code GT18) or aluminum enclosure (enclosure-code GT20) and non-conductive rod, tube, screw in adapter and cladding and microwave units Micropilot types FMR/OFMR52-... in the version with stainless steel enclosure (enclosure-code GT18) or aluminum enclosure (enclosure-code GT20) contain plastic surfaces that may be electrostatically charged. They are suitable to be operated in explosion hazardous areas with dust atmosphere, even in the presence of strong charge generating processes, if any conductive parts are connected electrically to the equipotential bonding.
  - f. The microwave units Micropilot type series FMR/OFMR53-... in all enclosure versions and non-conductive rod, tube and screw in adapter and cladding contain plastic surfaces that may be electrostatically charged. If they are operated in explosion hazardous areas with gas atmosphere, the danger of electrostatic charging of these enclosure parts, caused by friction and cleaning is to be considered (warning label).
  - g. The microwave units Micropilot type series FMR/OFMR54-... in all enclosure versions with enameled horn antenna and in the version with planar antenna contain enclosure parts that may be electrostatically charged. During operation of the mentioned microwave units Micropilot type series FMR/OFMR54-... in explosion hazardous areas with gas atmosphere the danger of electrostatic charging of these enclosure parts, caused by friction and cleaning is to be considered (warning label).
  - h. The horn antenna coverage includes plastic surfaces that may be electrostatically charged. It is suitable to operate in explosion hazardous areas with dust atmosphere or in potentially explosive areas with gas atmosphere group IIA and IIB as an accessory to the microwave unit

Micropilot type series FMR/OFMR5x-..., even in the presence of strong charge-generating processes, if all conductive parts of the microwave unit Micropilot types FMR/OFMR5x-... are connected electrically to the equipotential bonding.

- i. The microwave units Micropilot type series FMR/OFMR5x-... in the version with a plastic enclosure (enclosure-code GT19) contain metal surfaces (TAGs) that may be charged. During operation of the mentioned microwave units Micropilot type series FMR/OFMR5x-... in explosion hazardous areas with gas atmosphere the danger of charging of these enclosure parts, caused by friction and cleaning is to be considered. They shall not be operated near processes which are strongly charge generating (warning label).
- 2) **Isolated installation**  
If the conductive enclosure / antenna parts of the microwave units Micropilot type series FMR/OFMR5x-... in an application as a EPL Ga- or Ga/Gb-equipment cannot be connected to the local equipotential bonding (isolated installation), these conductive parts have to be electrostatically connected to the equipotential bonding (resistance  $\leq 1 \text{ M}\Omega$ ).
- 3) **Impact and friction sparks**  
In the application as EPL Ga-1 equipment the microwave units Micropilot type series FMR/OFMR5x-... in the versions in which the material aluminum is used, shall be installed in such a way that sparking as a result of impact or friction between aluminum and steel (with the exception of stainless steel if the presence of rust particles can be excluded) is excluded.
- 4) **Over voltage protection**  
The surge modules OVP10 (TRC16/38) or OVP20 (TRC17/39) to be used as an option meet the requirements of EN 60079-14, section 12.3. In applying these modules the power supply and signal output circuits of the I/O interface (Power supply/Output) are considered as isolated from earth, although the used 600 VAC gas discharge tubes (connected to the potential equalization) may trigger at 420 VAC due to their tolerances.  
For operation of the overvoltage protection modules OVP type OVP10 resp. OVP20 in the enclosures of the microwave units Micropilot type series FMR/OFMR5x ... the details of the temperature tables in the respective safety instructions XA ... of the microwave units Micropilot FMR/OFMR5x-... are to be considered.
- 5) **Chemical resistance**  
For applications in areas with gas atmosphere requiring equipment of EPL Ga or EPL Ga/Gb all parts of the microwave units Micropilot type series FMR/OFMR5x-... in contact with the media may be used only in such media against which the wetted parts are sufficiently resistant.
- 6) **Scavenge junction**  
If the microwave units Micropilot type series FMR/OFMR5x-... with scavenge junction are used in explosion hazardous areas with gas atmosphere, requiring EPL Ga/Gb-equipment, the installation shall have an enclosure protection on min. IP 67 according to EN 60529 in the closed state. After removing the scavenge junction the opening has to be locked with a suitable plug, so that the degree of protection IP 67 is maintained.
- 7) **Alignment unit**  
The microwave units Micropilot type series FMR/OFMR5x-... in the version with alignment unit are to be installed in a way that after the alignment of the antenna via the pivot bracket and after the tightening of the clamping flange or the setting of the clamping ring by the hexagon-nut (torque 65-85 Nm) an adjustment of the position of the alignment unit is no longer possible and the degree of protection IP 67 is fulfilled.
- 8) **Antenna extension**  
The microwave units Micropilot type series FMR/OFMR5x-... in the version with antenna extension are to be installed in such a way that contact between the sensor and the tank wall with consideration of the built-in parts of the tank and the flow conditions inside the tank can be excluded with sufficient certainty.
- 9) **Microwave units Micropilot type series FMR/OFMR5x-... with approval code ID und IL**  
The microwave units Micropilot type series FMR/OFMR5x-... with approval code ID and IL are

qualified for installation in the partition wall, which separates the explosion hazardous areas for equipment of EPL Ga and Gc, since by construction measures within the enclosure of the microwave units guarantee the necessary separation between the zones. For the process fitting, a degree of protection of at least IP 67 according to EN/IEC 60529 is to be fulfilled. In the area of the process connection outside of the equipment it is to guarantee by suitable measures that the explosion hazardous area complies with Zone 2, e.g. by natural ventilation.

**10) Remote Display FHX 50**

The regulations for installation in the safety instructions XA01053F-x or XA001055F-x of the Remote Display FHX50 (IECEx DEK12.0046X) and in the safety instructions XA ... to the respective microwave units Micropilot type series FMR/OFMR5x-... are to be considered.

In applications where a surge protector according to IEC/EN60079-14 section 12.3 is necessary for the safe operation of the microwave units Micropilot FMR/OFMR5x-..., for normal operating a risk assessment with respect to overvoltage influence is necessary using the remote displays FHX50 with the microwave unit Micropilot type series FMR/OFMR5x-... . For short-term service and control activities it is allowed to operate the remote displays FHX50 with the level transmitters Micropilot type series FMR/OFMR5x-... .

When operate the Remote Display FHX50 with microwave units Micropilot type series FMR/OFMR5x-... with the plastic enclosure enclosure-code GT19 the temperature tables in the safety instructions XA ... of the microwave units Micropilot FMR/OFMR5x-... types are to be considered.

By using the microwave units Micropilot type series FMR/OFMR5x-aabN...., the requirements acc. IEC/EN60079-14 sec. 9.4 for Conduit Systems – wiring- and the statements of the adequate safety advice XA... must be considered. In addition, national or other standards should be followed for conduit systems.

**11) CDI / Interface Service / CDI**

For normal operation of the microwave units Micropilot type series FMR/OFMR5x-..., in applications where a surge protector according to IEC/EN 60079-14 section 12.3 is required, the service interface / CDI interface shall be operated with further apparatus, installed outside the microwave units, only after a risk assessment has been carried out. For short-term service and control activities the operation of additional equipment, installed outside the microwave units, at the service interface / CDI interface is allowed.

**12) Microwave units Micropilot type series FMR/OFMR5x-I4bcdeffgghh\*+##...**

When the microwave units Micropilot type series FMR/OFMR5x-I4bcdeffgghh\*+##... (marking Ex [ia] IIC T6...T1 Ga/Gb and Ex ia/db [ia Ga] IIC T6 Ga/Gb) are put into service for the first time, the user has to select the mode of the first use on the label (see the relevant safety instructions XA ...). In the application Ex ia/db [ia Ga] IIC T6 Ga/Gb certified associated accessories (e.g. cable and cable glands and seals) are to be used for the enclosure, that meet the requirements of type of protection Flameproof Enclosure "d".

**13) Microwave units Micropilot type series FMR/OFMR5x-... with enclosure enclosure-code B (GT18) und C (GT20)**

If the enclosures of the microwave units Micropilot type series FMR/OFMR5x-... with enclosure-codes B (GT18) and C (GT20) are used in microwave units Micropilot type series FMR/OFMR5x-... with approval codes IC, IE, IF, IG, IL, IK, I2, I3 and I4, separately certified accessories, such as cable glands and seals are to be used, appropriate for the applied type of protection.

**14) Microwave units Micropilot type series FMR/OFMR5x-... with enclosure enclosure-code B (GT18) und C (GT20)**

If the enclosures of the microwave units Micropilot type series FMR/OFMR5x-... with enclosure-codes B (GT18) and C (GT20) are used in microwave units Micropilot type series FMR/OFMR5x-... with approval codes IE, the measures listed in the safety instructions for the power limitation of the 4 ... 20 mA circuit(s) or the „Switch Output (PPS)“ must be observed.



Applicant: Endress+Hauser SE+Co. KG,  
Hauptstrasse 1, 79689 Maulburg, Germany  
Electrical Apparatus: Microwave unit Micropilot type series FMR/OFMR5x-...

Manufacturing locations

1.	Endress+Hauser SE+Co. KG Hauptstraße 1 79689 Maulburg Germany
3.	Endress+Hauser (Suzhou) Automation Instrumentation Co. Ltd. China – Singapore Industrial Park (SIP) Su-Hong-Zhong-Lu, No. 491 Jiangsu Province, 215021 Suzhou P.R. China
4.	Endress+Hauser (India) Automation Instrumentation Pvt. Ltd. M-192, Waluj MIDC, Aurangabad – 431 136 Maharashtra State India
5.	Endress+Hauser (USA) Automation Instrumentation Inc. 2340 Endress Place Greenwood, Indiana 46143 USA
6.	Endress+Hauser Yamanashi Co. Ltd. 862-1, Sakaigawa-cho, Fuefuki-shi 406 0846 Yamanashi Japan
7.	Endress+Hauser (Brasil) Instrumentacao e Automacao Ltda. Avenida Antonio Sesti, 600, Itatiba/SP Brasil