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

Certificate No.:	**IECEx IBE 16.0035X**	Issue No: 3	Certificate history:
			Issue No. 3 (2019-07-24)
Status:	**Current**		Issue No. 2 (2018-09-12)
		Page 1 of 6	Issue No. 1 (2018-03-02)
Date of Issue:	**2019-07-24**		Issue No. 0 (2017-01-02)

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

Equipment: **Microwave unit Micropilot type series**
Optional accessory: **FMR6x-... .**

Type of Protection: **Ex db, Ex ec, Ex ia, Ex ta/tb**

Marking:

Ex ia IIC T6...T1 Ga/Gb

Ex ia/db [ia Ga] IIC T6...T1 Ga/Gb, Ex ia/ic [ia Ga] IIC T6...T1 Ga/Gb/Gc

Ex ia/ec [ia Ga] IIC T6...T1 Ga/Gb/Gc, Ex ec IIC T6...T1 Gc

Ex ic IIC T6...T1 Gc

Ex ia III C T85 °C Da/Db, Ex ta/tb III C T85 °C Da/Db, Ex ta [ia Da] IIIC T_{500} 125 °C Da

Approved for issue on behalf of the IECEx
Certification Body:

Position:

Signature:
(for printed version)

Date:

Dipl.-Ing. Kai Willamowski

Deputy Head of the Certifikation Body

24.07.19

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.

Certificate issued by:

IBExU Institut für Sicherheitstechnik GmbH
Certification Body
Fuchsmühlenweg 7
09599 Freiberg
Germany

IBExU

IECEx Certificate
of Conformity

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

Additional Manufacturing location(s):

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 : 2017
Edition:7.0
Explosive atmospheres - Part 0: Equipment - 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 60079-26 : 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"

IEC 60079-7 : 2015
Edition:5.0
Explosive atmospheres – Part 7: Equipment protection by increased safety "e"

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/IBE/ExTR16.0019/00   DE/IBE/ExTR16.0019/01   DE/IBE/ExTR16.0019/02
DE/IBE/ExTR16.0019/03

Quality Assessment Report:

DE/TUN/QAR06.0003/07

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

The microwave units Micropilot, type series FMR60-... , FMR62-... . and FMR67-... . are used for the contactless, 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 (Group II) which require equipment of EPLs Ga, Ga/Gb, Ga/Gb/Gc, Gc or for use in explosion hazardous areas with dust atmosphere (Group III) which require equipment 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 time delay between emission and reception of the microwave radiation 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 or with a surge protector module TRC[38] (OVP10) resp. TRC[39] (OVP20) with screwed terminals. Herewith, the data in the certificates 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 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 FMR6x-... .

SPECIFIC CONDITIONS OF USE: YES as shown below:

- Permitted ambient temperature range at the electronics housing

  is -40 °C ≤ Ta ≤ +80 °C. Observe the information in the temperature tables.

- 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 housing or other metal parts:

  - Observe the danger of electrostatic charging and discharge.

  - Do not rub surfaces with a dry cloth.

- Avoid electrostatic charging of the sensor (e.g. do not rub dry and install outside the filling flow).

- If in the explosion marking no surface temperature under dust input (T_{500} 125 ° C Da), dust layers above 5 mm are to be removed.

Device type FMR67 and Basic specification, Position 11-13 (Process Connection) = XxA

- In Zone 0: avoid sparks caused by impact and friction

- Changing the position of the alignment device must be impossible:

  - After the alignment of the antenna via the pivot bracket

  - After tightening of the clamping flange

  - After setting the clamping ring (torque 10-11 Nm)

- Degree of protection IP67 must be fulfilled.

Device type FMR67 and Basic specification, Position 14 (Air Purge Connection) = 1, 2

- If equipment with Ga/Gb or Da/Db (Pos. 14 = 3, 4 excluded) is required: In the closed state the minimum degree of protection of the installation must be IP67.

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

- Addition of Korean (K*) approval's features.
- New coating used.

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Additional information:

Annex:

Annex CoC_3.pdf

Variants:

Type key	
Micropilot FMRxx, type series FMRxx-aabcdeffgghhh*+#	
xx	Probe type 60, 62 or 67
aa	**Approval code**
IA	IEC Ex ia IIC T6...T1 Ga
KA	IEC/KC Ex ia IIC T6...T1 Ga
IB	IEC Ex ia IIC T6...T1 Ga/Gb
KB	IEC/KC Ex ia IIC T6...T1 Ga/Gb
IC	IEC Ex ia/db [ia Ga] IIC T6...T1 Ga/Gb
KC	IEC/KC Ex ia/db [ia Ga] IIC T6...T1 Ga/Gb
ID	IEC Ex ia/ic [ia Ga] IIC T6...T1 Ga/Gb/Gc[1)]
IE	IEC Ex ta IIIC T_{500} 125 °C Da
KE	IEC/KC Ex ta IIIC T_{500} 125 °C Da
IF	IEC Ex ta/tb IIIC T85 °C Da/Db[2)]
KF	IEC/KC Ex ta/tb IIIC T85 °C Da/Db[2)]
IG	IEC Ex ec IIC T6...T1 Gc[2)]
IH	IEC Ex ic IIC T6...T1 Gc[2)]
IL	IEC Ex ia/ec [ia Ga] IIC T6...T1 Ga/Gb/Gc[1)]
I2	IEC Ex ia IIC T6...T1 Ga/Gb IEC Ex ia IIIC T85 °C Da/Db
I3	IEC Ex ia/db [ia Ga] IIC T6...T1 Ga/Gb[2)] IEC Ex ta/tb IIIC T85 °C Da/Db[2)]
I4	IEC Ex ia IIC T6...T1 Ga/Gb IEC Ex ia/db [ia Ga] IIC T6...T1 Ga/Gb[2)]
b	**Power Supply, Output**
A	2-wire; 4-20 mA HART
B	2-wire; 4-20 mA HART, switch output
C	2-wire; 4-20 mA HART, 4-20 mA
Y	Special version, not relevant for safety, e.g. adjustment
c	**Display, Operation**
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 remote display FHX50 + NPT1/2" thread, custom connection
d	**Housing**
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…
e	**Electrical Connection [cable glands]**
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.

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M		Plug 7 /8", IP66/68 Type 4X/6P Encl.
Y		Special version, not relevant for safety, e.g. adjustment
ff		**Antenna**
		Type specified in form, sizes, materials
gg		**Seal**
		If available for specified type, materials, sizes, ... ; any single letter or number or combination
hhh		**Process Connection**
		triple combinations of numbers or characters representing ANSI DIN JIS flange, threads, hygienic or other standardized process connections
*****		**Air Purge Connection**
		if available
#		**Options**
		Options not mandatory (multiple selection possible)

notes   [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	Marking
IE[1]	x	M or N	Ex ta [ia Da] IIIC T_{500} 125 °C Da
KE[1]	x	M or N	KC Ex ta [ia Da] IIIC T_{500} 125 °C Da
IF[1]	x	M or N	Ex ta/tb [ia Da] IIIC T85 °C Da/Db
KF[1]	x	M or N	KC Ex ta/tb [ia Da] IIIC T85 °C Da/Db
IG[1]	B, C[2]	M or N	Ex ec [ia Ga] IIC T6...T1 Gc
IH	B, C[3]	L, M or N	Ex ic [ia Ga] IIC T6...T1 Gc
I3[1]	x	M or N	Ex ia/db [ia Ga] IIC T6...T1 Ga/Gb Ex ta/tb [ia Da] IIIC T85 °C Da/Db

[1] Approval code not in combination with Display, Operation = L (not with connection M12)

[2] Special product only with Ex e certified entry. Not in combination with Power supply, Output = A

[3] The marking does not change when Power supply, Output = A

Electrical data

I/O Interface

Approval code	Power Supply, Output			Type of Protection	Electrical data/ maximum values	
	Code	Mode (functional)	Module Trans-mission Code (TRC)		Supply/output (terminals 1 and 2)	Supply/output (terminals 3 and 4)
IA, KA, IB, KB, I2	A	4-20 mA HART (IO210_3)	31	Ex ia IIC	U_i = 30 V I_i = 300 mA P_i = 1 W L_i = 0 µH C_i = 12 nF	non-existent
IG				Ex ec IIC	U_N = 35 VDC[2)] I_N = 4 to 20 mA $P_N \leq$ 847 mW	
IH				Ex ic IIC	U_i = 35 V I_i = N/A P_i = N/A L_i = 0 µH C_i = 12 nF	
I4[1)]	A	4-20 mA HART (IO211/3)[3)]	02	Ex ia IIC	U_i = 30 V I_i = 300 mA P_i = 1 W L_i = 0 µH C_i = 5 nF	not-used
ID				Ex ia/ic [ia Ga] IIC	U_i = 35 V I_i = N/A P_i = N/A L_i = 0 µH C_i = 5 nF	
IC, KC, I3, I4[1)]	A	4-20 mA HART (IO212/3)[3)]	03	Ex ia/db [ia Ga] IIC	U_N = 35 V DC[2)] U_m = 250 V I_N = 4 to 20 mA I_{max} = 22 mA P_N = 0.7 W only for IE, KE: I_{Fault} = 54 mA	not-used
IF, KF, I3				Ex ta/tb IIIC		
IG				Ex ec IIC		
IL				Ex ia/ec [ia Ga] IIC		
IE, KE				Ex ta IIIC		

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Electrical data

I/O Interface

Approval code	Power Supply, Output			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, KA, IB, KB, I2, I4[1]	B	4-20 mA HART+switch (IO211/3)	02	Ex ia IIC Ex ia IIIC	$U_i = 30$ V $I_i = 300$ mA $P_i = 1$ W $L_i = 0$ µH $C_i = 5$ nF	$U_i = 30$ V $I_i = 300$ mA $P_i = 1$ W $L_i = 0$ µH $C_i = 6$ nF
ID, IH				Ex ia/ic [ia Ga] IIC Ex ic IIC	$U_i = 35$ V $I_i = $ N/A $P_i = $ N/A $L_i = 0$ µH $C_i = 5$ nF	$U_i = 35$ V $I_i = $ N/A $P_i = 1$ W $L_i = 0$ µH $C_i = 6$ nF
IC, KC, I3, I4[1]	B	4-20 mA HART+switch (IO212/3)	03	Ex ia/db [ia Ga] IIC	$U_N = 35$ V DC[2] $U_m = 250$ V $I_N = 4$ to 20 mA $I_{max} = 22$ mA $P_N = 0.7$ W only for IE, KE: $I_{Fault} = 54$ mA	$U_N = 35$ V DC[2] $U_m = 250$ V $P_N = 0.7$ W only for IE, KE: $Ri_{FAULT} = 380.3$ Ω
IF, KF, I3				Ex ta/tb IIIC		
IG				Ex ec IIC		
IL				Ex ia/ec [ia Ga] IIC		
IE, KE				Ex ta IIIC		
IA, KA, IB, KB, I2, I4[1]	C	4-20 mA HART+ 4-20 mA (IO214_2)	24	Ex ia IIC Ex ia IIIC	$U_i = 30$ V $I_i = 300$ mA $P_i = 1$ W $L_i = 0$ µH $C_i = 30$ nF	$U_i = 30$ V $I_i = 300$ mA $P_i = 1$ W $L_i = 0$ µH $C_i = 30$ nF
ID, IH				Ex ia/ic [ia Ga] IIC Ex ic IIC	$U_i = 30$ V $I_i = $ N/A $P_i = $ N/A $L_i = 0$ µH $C_i = 30$ nF	$U_i = 30$ V $I_i = $ N/A $P_i = $ N/A $L_i = 0$ µH $C_i = 30$ nF
IC, KC, I3, I4[1]	C	4-20 mA HART+ 4-20 mA (IO215_2)	25	Ex ia/db [ia Ga] IIC	$U_N = 30$ V DC[2] $U_m = 250$ V $I_N = 4$ to 20 mA $I_{max} = 22$ mA $P_N = 0.7$ W only for IE, KE: $I_{Fault} = 54$ mA	$U_N = 30$ V DC[2] $U_m = 250$ V $I_N = 4$ to 20 mA $I_{max} = 22$ mA $P_N = 0.7$ W only for IE, KE: $I_{Fault} = 54$ mA
IF, KF, I3				Ex ta/tb IIIC		
IG				Ex ec IIC		
IL				Ex ia/ec [ia Ga] IIC		
IE, KE				Ex ta IIIC		

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Notes:
[1] Multiple marking; type of protection selected for first installation must be indicated and shall not be changed
[2] Specifies maximum value, which includes 10% tolerance in mains voltage
[3] For application /certificates which need modules with galvanic separation and use of 4-20 mA HART in 1-channel mode (switch terminals closed)

The power supply and signal output circuits of the I/O interfaces (Power supply / Output) with the order code A, B 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 circuits of the I/O interface (Power supply / Output) with the order code C combined with I/O module TRC[24] and TRC[25] 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[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 Mainboard TRC[41] (MB 30)
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 FMR6x-... .

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

U_o = 7.3 V
I_o = 60 mA
P_o = 110 mW
L_i, C_i = negligible

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

L_o (mH)	5.0	2.0	1.0	0.5	0.2	0.1	0.05	0.02	0.01	0.005	0.002	0.001
C_o (µF)*	0.73	1.2	1.6	2.0	2.6	3.2	4.0	5.5	7.3	10.0	12.7	12.7
C_o (µF)#	-	0.49	0.90	1.4	-	2.0	-	-	-	-	-	-

* Values acc. PTB Ispark program
# Values acc. IEC/EN 60079-25, Annex C

If the interface is used in type of protection Intrinsic Safety Ex ic IIC the following maximum values are valid:
U_o = U_i = 7.3 V

If the interface is used in type of protection for increased safety devices Ex ec or for devices with dust explosion protection by enclosure Ex tb, the following maximum value is valid:
U_N = 6.5 V

Interface of the display of the Mainboard TRC[41] (MB 30)

The type of protection for the interface of the display depends on the "Approval Code" of the microwave units Micropilot type series FMR6x-... .
If the interface is used in type of protection Intrinsic Safety Ex ia IIC/IIIC, Ex ia/ic [ia Ga] IIC, Ex ia/ec [ia Ga] IIC or Ex ta/tb IIIC the following maximum values are valid:

U_o/U_i = 7.3 V
I_o = 83 mA

P_o = 538 mW
I_{opeak} = 1.65 A

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