CERTIFICATE OF CONFORMITY



- 1. HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT PER US REQUIREMENTS
- 2. Certificate No:
- 3. Equipment: (Type Reference and Name)
- 4. Name of Listing Company:
- 5. Address of Listing Company:

FM16US0006X

Tank Gauge Radar Micropilot NMR8x

Endress+Hauser SE+Co KG

Hauptstrasse 1 Postfach 1261 Maulburg D79689 Germany

6. The examination and test results are recorded in confidential report number:

3057382 dated July 11th 2016

7. FM Approvals LLC, certifies that the equipment described has been found to comply with the following Approval standards and other documents:

FM Class 3600:2018, FM Class 3610:2018, FM Class 3611:2018, FM Class 3615:2018, FM Class 3810:2018, ANSI/UL 60079-0:2020, ANSI/UL 60079-1:2015, ANSI/ISA 60079-11:2014, ANSI/ISA 60079-26:2017, ANSI/UL 121201:2019, ANSI/UL 122701:2017, ANSI/NEMA 250:2008, ANSI/IEC 60529:2004, ANSI/ISA 61010-1:2012 (82.02.01), ANSI/UL 61010-1:2012

- 8. If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to specific conditions of use specified in the schedule to this certificate.
- 9. This certificate relates to the design, examination and testing of the products specified herein. The FM Approvals surveillance audit program has further determined that the manufacturing processes and quality control procedures in place are satisfactory to manufacture the product as examined, tested and Approved.

Certificate issued by:

1 arguerali

J/E. Marquedant VP, Manager - Electrical Systems 19 October 2020 Date

To verify the availability of the Approved product, please refer to www.approvalguide.com

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FM Approvals LLC. 1151 Boston-Providence Turnpike, Norwood, MA 02062 USA T: +1 (1) 781 762 4300 F: +1 (1) 781 762 9375 E-mail: <u>information@fmapprovals.com</u> <u>www.fmapprovals.com</u>

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10. Equipment Ratings:

Explosionproof for Class I, Division 1, Groups B, C, D with Intrinsically Safe Antenna for Class I, Division 1, Groups A, B, C, D; also providing Intrinsically Safe Connections to Class I, II, III, Division 1, Groups A, B, C, D, E, F, G or Nonincendive Field Wiring Connections to Class I, II, III, Division 2, Groups A, B, C, D, E, F, G; Flameproof for Class I, Zone 1, Group IIC with Intrinsically Safe Antenna for Class I, Zone 0, Group IIC; also providing Intrinsically Safe Connections to Class I, Zone 0, Group IIC; also and Outdoor Type 4X, Type 6P, IP66 & IP68.

11. The marking of the equipment shall include:

NMR81, NMR84

XP CL I DIV 1 GP BCD T*

IS CL I DIV 1 GP ABCD

AIS CL I,II,III DIV 1 GP ABCDEFG

ANI CL I,II,III DIV 2 GP ABCDEFG

CL I Zn 0/1 AEx ia/db IIC T* Ga/Gb

CL I Zn 1 AEx db [ia Ga] IIC T* Gb

 $Ta = -40^{\circ}C$ to $+60^{\circ}C$

IP66/IP68, Type 4X/6P, Single Seal, Dual Seal Without Annunciation

Entity and NIFW Parameters - refer to drawing XA01436G

T* - refer to drawing XA01436G.

12. Description of Equipment:

General - The Tank Gauge Radar Micropilot NMR8x is used for the contactless, continuous measurement of liquids in hazardous areas with gas atmosphere. Two different types of transmitters are available, the NMR81 and NMR84, each with a different transmitter, antenna and working frequencies for different applications. Short microwave impulses 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 Tank Gauge Radar Micropilot NMR8x is comprised of certified Tank Gauge Platform Enclosures (FM16US0136U) and certified Tank Gauge Platform Electronic Modules (FM16US0007U). The following enclosures and electronic modules may be used:

Enclosure TRC[01-10-11] ALU C-Band Enclosure TRC[01-20-11] ALU E- Band Enclosure TRC[02-10-12] SS C-Band Enclosure TRC[02-20-12] SS E- Band

Module TRC[00] FP Front Plane Board Module TRC[01] PS_HV Power Supply, High Voltage Module TRC[02] PS_LV_AC Power Supply, Low Voltage, AC

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Module TRC[03] PS_LV_DC Power Supply, Low Voltage, DC Module TRC[10] MB Main Board, Module TRC[20] IOM_A IO Module Analog Module TRC[21] IOM_A IO Module Analog Module TRC[31] IOM_D IO Module Digital Module TRC[32] IOM_Mod_ FF IO Module Modbus/FF Module TRC[33] IOM_V1_WM550 IO Module V1/WM550

Construction - The Tank Gauge Radar Mircropilot NMR8x Series comprises a single compartment explosionproof/flameproof enclosure with a thread-on window cover —housing the display module, electronics assembly, radar module— along with a feedthrough and a process connector with antenna. NMR81 and NMR84 have a unique radar box, feedthrough, connection cable and antenna while they share the same enclosure, display and electronics assembly. The enclosure for NMR81 and NMR84 can be Aluminum or Stainless Steel, with 7 integral M20 sized field wiring entries. Integral threaded inserts allow for optional field wiring entry options including M25, ½ NPT or ¾ NPT.

Ratings - The Tank Gauge Radar NMR8x operates at 85-264 Vac (28.8 Volt-Amperes), 52-75Vac (21.6 Volt-Amperes) and 19-64Vdc (13.4 Watts). The transmitters are rated for use in an ambient temperature range of -40°C to +60°C. The transmitter probes are rated for use in a process temperature range of -40°C to +200°C. For further information regarding the Temperature Class and Ambient Temperature Ranges, refer to the temperature and configuration tables.

Temperature Class	Maximum ambient temperature / °C	Maximum allowed ambient temperature at maximum process temperature / °C	Maximum process temperature / °C
Configuration 1			
T6	55	51	85
T5	55	46	100
T4	55	50	135
T3, T2, T1	55	47	200
Configuration 2			
T6	60	51	85
T5	60	46	100
T4	60	58	135
T3, T2, T1	60	54	200
Configuration 3	F 11/1		M ALV
Т6	58	51	85
T5	58	46	100
T4	58	54	135
T3, T2, T1	58	51 200	
Configuration 4			
T6	60	51	85
T5	60	46	100
T4	60	56	135
T3, T2, T1	60	53	200

NMR81 (E-Band Radar with Aluminum enclosure):

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Configuration 5			
T6	55	51	85
T5	55	46	100
T4	55	52	135
T3, T2, T1	55	49	200

NMR81 (E-Band Radar with Stainless Steel enclosure

Temperature Class	Maximum ambient temperature / °C	Maximum allowed ambient temperature at maximum process temperature / °C	Maximum process temperature / °C
Configuration 1			
T6	43	40	85
T5	43	37	100
T4	43	37	135
T3, T2, T1	43	32	200
Configuration 2			
Т6	55	46	85
T5	55	38	100
T4	55	52	135
T3, T2, T1	55	46	200
Configuration 3	E 11/1		
T6 50 45		45	85
T5	50	38	100
T4	50	45	135
T3, T2, T1	50	40 20	
Configuration 4			
T6	53	46	85
T5	53	38	100
T4	53	46	135
T3, T2, T1	53	43	200
Configuration 5	100 D. 10	-	
T6	45	44	85
T5	45	38	100
T4	45	40	135
T3, T2, T1 45 36		200	

NMR84 (C-Band Radar with Aluminum enclosure):

Temperature Class	Maximum ambient temperature / °C	Maximum allowed ambient temperature at maximum process temperature / °C	Maximum process temperature / °C
Configuration 1			
T6	55	52	85
T5	55	52	100
T4	55	49	135

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T3 T2 T1	55	49	150
Configuration 2		10	100
T6	60	60	85
T5	60	59	100
T4	60	56	135
T3, T2, T1	60	56	150
Configuration 3	F IVI		
T6	58	55	85
T5	58	55	100
T4	58	53	135
T3, T2, T1	58	53	150
Configuration 4			
T6	60	57	85
T5	60	57	100
T4	60	54	135
T3, T2, T1	60	54	150
Configuration 5	100 D		
T6	55	55	85
T5	55	54	100
T4	55	51	135
T3, T2, T1	55	51	150

NMR84 (C-Band Radar with Stainless Steel enclosure):

Temperature Class	Maximum ambient temperature / °C Maximum allowed ambient temperature at maximum proce temperature / °C		Maximum process temperature / °C
Configuration 1			
T6	43	39	85
T5	43	39	100
T4	43	36	135
T3, T2, T1	43	36	150
Configuration 2			1.1.0
T6	55	55	85
T5	55	54	100
T 4	55	51	135
T3, T2, T1	55	51	150
Configuration 3			
T6	50	47	85
T5	50	47	100
T4	50	44	135
T3, T2, T1	50	44	150
Configuration 4			
T6	53	50	85

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T5	53	50	100	
T4	53	46	135	
T3, T2, T1	53	46	150	
Configuration 5	per pa de	10		
T6	45	43	85	
T5	45	43	100	
T4	45	39	135	
T3, T2, T1	45	39	150	

	Co	onfiguration of E	lectronics		UIU.
	1	2	3	4	5
	(worst case)	(best case)			
Enclosure (Alu)	Х	Х	Х	Х	Х
Slot A - IOM_D	Х		Х	Х	Х
Slot B - IOM_D	Х				
Slot B - IOM_A(Ex ia)	¥		Х		Х
Slot C - IOM_A(Ex ia)	Х				
Slot D - IOM_D	Х	10 IN			Х
PS_LV_DC	Х	Х	Х	X	X
MB	Х	Х	Х	Х	Х
ExLi	Х	Х	Х	Х	X

Tank Gauge Radar Micropilot NMR81-aabcddeeffgghiijjkkklll + (options)

aa	Approval:
	FC - FM XP-AIS CI. I, Div. 1 Gr. A-D, AEx db [ia], T6
	FE - FM XP-AIS CI. I, Div. 1 Gr. A-D, AEx db [ia], T4
b	Terminal Type:
	1 - Spring Terminals
	2 - Screw Terminals
	9 - Special version, TSP (not relevant for safety)
С	Power Supply:
	B - 85-264VAC, LCD + operation
-	D - 52-75VAC, LCD + operation
	E - 19-64VDC, LCD + operation operation
	Y - Special Version (not relevant for safety)
dd	Primary Output:
	A1 - Modbus – RS485
	B1 - V1
	C1 - WM550
	E1 - 4-20mA HART Exd
	H1 - 4-20mA HART Ex i
	Y9 - Special Version (not relevant for safety)
ee	Secondary I/O Analog:
	A1 - Ex d – 1 x 4-20mA HART; 1 x RTD Input
	A2 - Ex d – 2 x 4-20mA HART; 2 x RTD Input
	B1 - Ex i – 1 x 4-20mA HART; 1 x RTD Input
	B2 - Ex i – 2 x 4-20mA HART; 2 x RTD Input
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	C2 - Ex i – 1 x 4-20mA HART; 2 x RTD Input + 1 x Ex d 4-20mA HART
	X0 - Prepared for I/O Analog RTD input
	Y9 - Special Version (not relevant for safety)
ff	Secondary I/O Digital Ex d:
	A1 - 2 x relay + 2 x module discrete
	A2 - 4x relay + 4x module discrete
	A3 - 6x relay + 6x module discrete
	R1 - Modushus RS485
	B^{2} - Modusbus RS485 + 2 x relay + 2 x module discrete
	B2 - Modusbus $RS485 \pm 4$ x relay ± 4 x module discrete
	$C_2 = V_1 + 2x$ relax + 2x discrete module
	$C_2 = \sqrt{1 + 2x}$ relay + 2x discrete module
	$C_{3} = \sqrt{1 + 4x}$ relay + 4x discrete module
	E1 - W000
	$E_2 = W550 + 2 \times relay + 2 \times module discrete$
	E3 - W550 + 4 x relay + 4 x module discrete
	XU - Prepared for I/O digital Ex d
	Y9 - Special Version (not relevant for safety)
gg	Housing:
	AC - Transmitter Housing Aluminum coated process 316/316L
	BC - Transmitter + Process 316/316L
	Y9 - Transmitter Housing 316/316L special coating for e.g. marine applications
h	Electrical Connection:
and the second se	A - Thread M20
	B - Thread M25
	E - Thread NPT1/2"
	F - Thread NPT3/4"
	Y - Special Version (not relevant for safety)
ii	Antenna:
	AB - 50mm/2"
	AC - 80mm/3"
	AD - 100mm/4"
	YY - Special Version (not relevant for safety)
ii	Process Sealing:
,,	A1 - HNBR – -30150°C / -22302°F
	B1 - FKM GLT40200°C / -40392°F
	B2 - FFKM20200°C / -4392°F
	B3 - FKM, -10,160°C/-14,340°F
	YY - Special Version (not relevant for safety)
kkk	Process Connection
	Any 3 characters combinations (not relevant for safety)
///	Accuracy Weight + Measure Approval:
	Any 3 characters combinations (not relevant for safety)
(ontions)	Any 5 characters combinations (not relevant for safety)
(0)	Options. not relevant for safety

Tank Gauge Radar Micropilot NMR84-aabcddeeffgghiijjkkklll + (options)

aa	Approval:
	FC - FM XP-AIS CI. I, Div. 1 Gr. A-D, AEx db [ia], T6
b	Terminal Type:

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	1 - Spring Terminals
	2 - Scrow Terminals
	2 - Sciew Terminals 0 Special version, TSP (not relevant for safety)
	9 - Special version, TSP (not relevant for salety)
С	Power Supply:
	B - 85-264VAC, LCD + operation
	D - 52-75VAC, LCD + operation
	E - 19-64VDC, LCD + operation
	Y - Special Version (not relevant for safety)
dd	Primary Output:
	A1 - Modbus – RS485
	B1 - V1
	C1 - WM550
	E1 - 4-20mA HART Exd
	H1 - 4-20mA HART Ex i
	Y9 - Special Version (not relevant for safety)
00	Secondary I/O Analog:
	$\Delta 1 = Exd = 1 x 4-20 \text{m} \Delta H \Delta \text{RT}$: 1 x RTD logut
	$A_2 = Exd = 2 x 4 - 20mA HAPT \cdot 2 x PTD Input$
	$P_{1} = E_{1} + 2 + 2 + 2 + 2 + 2 + 1 + 1 + 1 + 1 + 2 + 1 + 1$
	$B_1 = E_X I - T_X 4 - 20 mA HART, T_X KTD input$
	DZ = EXI - ZX 4-20 mA RARI, ZX RID input
	C2 - EXT-TX 4-20MA HART; 2 X RTD INPUT + TX EX 0 4-20MA HART
	X0 - Prepared for I/O Analog RTD input
	Y9 - Special Version (not relevant for safety)
tt	Secondary I/O Digital Ex d:
	A1 - 2 x relay + 2 x module discrete
	A2 - 4 x relay + 4 x module discrete
	A3 - 6 x relay + 6 x module discrete
	B1 - Modusbus RS485
	B2 - Modusbus RS485 + 2 x relay + 2 x module discrete
	B3 - Modusbus RS485 + 4 x relay + 4 x module discrete
	C1 - V1
	C2 - V1 + 2x relay + 2x discrete module
	C3 - V1 + 4x relay + 4x discrete module
	E1 - W550
	E2 - W550 + 2 x relay + 2 x module discrete
	E3 - W550 + 4 x relay + 4 x module discrete
	X0 - Prepared for I/O digital Ex d
	Y9 - Special Version (not relevant for safety)
aa	Housing:
55	AC - Transmitter Housing Aluminum coated process 316/316L
	BC - Transmitter + Process 316/316L
	Y9 - Transmitter Housing 316/316L special coating for e.g. marine applications
h	Electrical Connection:
	A - Thread M20
	B - Thread M25
	E - Thread NPT1/2"
	F = Thread NPT3/A"
	V - Special Version (not relevant for safety)
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	BD - Planar 100mm/4"	
	BF - Planar 150mm/6"	
	BG - Planar 200mm/8"	
	BH - Planar 250mm/10"	
	BJ - Planar 300mm/12"	
	YY - Special Version (not relevant for safety)	
jj	Process Sealing:	
	A1 - HNBR – -30150°C / -22302°F	
	B1 - FKM GLT – -40150°C / -40392°F	
	B2 - FFKM, -20150°C/-4392°F	
	YY - Special Version (not relevant for safety)	
kkk	Process Connection:	
	Any 3 characters combinations (not relevant for safety)	
	Accuracy, Weight + Measure Approval:	
	Any 3 characters combinations (not relevant for safety)	
(options)	Options: not relevant for safety	

13. Specific Conditions of Use:

- 1. For Ambient and Process Temperature Range refer to drawing XA01436G-x.
- 2. Flamepath joints are not for repair. Contact the manufacturer.
- 3. Use heat resisting cables rated \ge 85°C for Ta > 50°C.
- 4. Precautions shall be taken to minimize the risk from electrostatic discharge of non-metallic labels, varnishes/coatings on the stainless steel 316L, and isolated metal tags applied to the enclosure.
- 5. To maintain the ingress protection ratings (IP66/68), teflon tape or pipe dope is required for blanking plugs.
- 6. Explosionproof certified seals are required within 450 mm (18") for Group B, C, D and within 50mm (2") for Group IIC on all used housing entries.
- 7. This is boundary wall equipment: The XP ratings are applicable to the transmitter portion and the IS ratings are applicable to the radar antenna portion

14. Test and Assessment Procedure and Conditions:

This Certificate has been issued in accordance with FM Approvals US Certification Requirements.

15. Schedule Drawings

A copy of the technical documentation has been kept by FM Approvals.

16. Certificate History

Details of the supplements to this certificate are described below:

Date	Description
11 th July 2016	Original Issue.

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	Cumplement 4
	Supprement 1:
	Report Reference: PR450190 dated 2 nd July 2018.
	Description of the Change:
	1) Qualification of a new, alternate process seal option and associated documentation
2 nd July 2018	update.
	2) Change in company name from "Endress+Hauser GmbH+Co KG" to
	"Endress+Hauser SE+Co KG".
	3) Updated the year on FM Class 3600, FM Class 3615 and FM Class 3810 standard
	to 2018 due to nontechnical in the latest edition of these standards.
	Supplement 2:
	Report Reference: PR450370 dated 1 st February 2019.
2 C	Description of the Change:
	1) Updated model code.
	a) Add T6 model code option aa = "FC" to NMR81
1 st February 2019	b) Add alternative process sealing option ii = "B3" to NMR81
	c) Add alternative process sealing option ii = "B2" to NMR84
	2) Corrected errors in model codes
	3) Introduce Stainless Steel enclosure
	4) Introduce Dual Seal
	Supplement 3:
	Report Reference: PR458124 dated 19th October 2020
	Description of the Change:
	1) ANSI/UL 60079-0 updated to Edition 7, 2020
	2) FM3611 updated to latest edition (2018)
	3) ANSI/LII 121201:2019 added to standards assessment list
19th October 2020	 4) Model code amendments due to Tank Gauge Platform electronic module
	updates and enclosure updates to add special coating for marine applications
	5) Specific Condition of Use 4) revised due to updated enclosure option
	6) Modifications to inner antenna construction
	7) XP and IS marking (Section 11) have been separated due to the difference in
	allowed Gas Groups and Specific Condition of Use 7) added to certificate to
	account for the undated marking

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