XA01532G-C/00/EN/03.20
71497827
2020-08-03

Safety Instructions
Tankside Monitor NRF81

CA: XP / I / 1 / BCD / T6
I / 1 / Ex db [ia Ga] IIC / T6 Gb; Entity
AIS / I, II, III / 1 / ABCDEFG; Entity
ANI / I / 2 / ABCD; NIFW
US: XP / I / 1 / BCD / T6
I / 1 / AEx db [ia Ga] IIC / T6 Gb; Entity
AIS / I, II, III / 1 / ABCDEFG; Entity
ANI / I / 2 / ABCD; NIFW

FM C US APPROVED

Document: XA01532G-C
Safety instructions for electrical apparatus for explosion-hazardous areas → 3

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Attachment: Nameplate view → 15

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Tankside Monitor NRF81

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Associated documentation

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

BA01465G/00

Manufacturer's certificates

FM C/US certificate

Certificate number:

- FM16US0137X
- FM16CA0078X

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

NRF81	–	**********	+	A*B*C*D*E*F*G*..
(Device type)		*(Basic specifications)*		*(Optional specifications)*

* = 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: Tankside Monitor

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

NRF81

Basic specifications

Position 1, 2 (Approval)		
Selected option		**Description**
NRF81	FD	FM C/US XP-AIS Cl.I Div.1 Gr.B-D, AEx d[ia] IIC T6 detailed: FM16CA0078X: XP / I / 1 / BCD / T6 I / 1 / Ex db [ia Ga] IIC / T6 Gb; Entity AIS / I, II, III / 1 / ABCDEFG; Entity ANI / I / 2 / ABCD; NIFW FM16US0137X: XP / I / 1 / BCD / T6 I / 1 / AEx db [ia Ga] IIC / T6 Gb; Entity AIS / I, II, III / 1 / ABCDEFG; Entity ANI / I / 2 / ABCD; NIFW

Position 5, 6 (Primary Output)		
Selected option		**Description**
NRF81	A1	Modbus RS485
	B1	V1
	C1	WM550
	E1	4-20mA HART Ex d/XP, RTD input
	H1	4-20mA HART Ex i/IS, RTD input

Position 7, 8 (Secondary I/O Analogue)		
Selected option		**Description**
NRF81	A1	Ex d/XP, 1x 4-20 mA HART, 1x RTD input
	A2	Ex d/XP, 2x 4-20 mA HART, 2x RTD input
	B1	Ex i/IS, 1x 4-20 mA HART, 1x RTD input
	B2	Ex i/IS, 2x 4-20 mA HART, 2x RTD input
	C2	1x Ex i/IS 4-20 mA HART, 2x RTD input + 1x Ex d/XP 4-20 mA HART
	X0	Not selected

Position 9, 10 (Secondary I/O Digital Ex d/XP)		
Selected option		**Description**
NRF81	A1	2x relay + 2x module discrete
	A2	4x relay + 4x module discrete
	A3	6x relay + 6x module discrete
	B1	Modbus RS485
	B2	Modbus RS485 + 2x relay + 2x module discrete
	B3	Modbus RS485 + 4x relay + 4x module discrete
	C1	V1
	C2	V1 + 2x relay + 2x module discrete
	C3	V1 + 4x relay + 4x module discrete
	E1	WM550
	E2	WM550 + 2x relay + 2x module discrete
	E3	WM550 + 4x relay + 4x module discrete
	X0	Not selected

Position 11, 12 (Housing)		
Selected option		**Description**
NRF81	AA	Transmitter Alu, coated
	BA	Transmitter 316/316L

Optional specifications

No options specific to hazardous locations are available.

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.
- Avoid electrostatic charging:
  - Of plastic surfaces (e.g. housing, 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

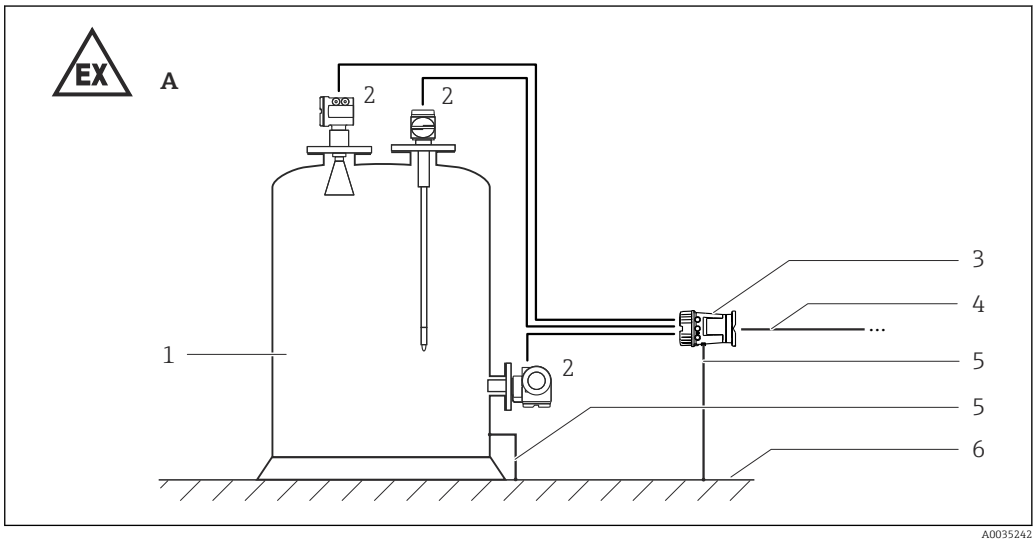
Permitted ambient temperature range at the electronics housing:
→ 🖹 9, "Temperature tables".

- To avoid electrostatic charging: Do not rub surfaces with a dry cloth.
- In the event of additional or alternative special varnishing on the housing or other metal parts or for adhesive plates:
  - Observe the danger of electrostatic charging and discharge.
  - Do not install in the vicinity of processes (≤0.5 m) generating strong electrostatic charges.

Special conditions of use - CA/US

- Flamepath joints are not for repair. Contact the manufacturer.
- Use heat resisting cables rated ≥ 85 °C for T_a > 50 °C.
- Precautions shall be taken to minimize the risk from electrostatic discharge of non-metallic labels and isolated metal tags applied to the enclosure.
- To maintain the ingress protection ratings (IP66/68), teflon tape or pipe dope is required for blanking plugs.
- Explosionproof certified seals are required within 450 mm (18 in) for Group B, C, D and within 50 mm (2 in) for Group IIC on all used housing entries.

Safety instructions: Installation



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A Division 1, Zone 1 or Division 2
1 Tank; Division 1, Zone 0, Zone 1
2 Observe Safety Instructions of used devices!
3 Tankside Monitor
4 to inventory management system
5 Potential equalization line
6 Potential equalization

Install the device to exclude any mechanical damage or friction during the application.

Explosionproof / Flameproof

Class I, Div. 1, Groups B, C, D, Class I, Zone 1, AEx d [ia] IIC/Ex d [ia] IIC

- Install per National Electrical Code (NFPA70) or Canadian Electrical Code, Part I (C22.1), as applicable.
- For the maximum supply voltage: See "Connection data" section.
- Control room equipment may not use or generate over 250 V_{rms}.
- Seal unused entries with approved plugs that correspond to the type of protection. The plastic transport sealing plug does not meet this requirement and must therefore be replaced during installation.
- Before operation:
  - Screw in the cover all the way.
  - Tighten the securing clamp on the cover.
- WARNINGS: Substitution of components may impair intrinsic safety.
- Do not open when explosive atmosphere is present.

Depending on approval be used, following issues to be considered:

Ex d (CA) / AEx d (US)	XP (CA/US)
IIC Certified seal required within 50 mm (2 in) on all used housing entries	Groups B, C, D; Certified seal required within 450 mm (18 in) on all used housing entries

Class I, Div. 2, Groups A-G

Device type NRF81, Basic specification, Position 1, 2 (Approval) = FD is not marked for use in Class I, Division 2; however, this device is suitable for this application when installed using the explosionproof instructions for Class I, Division 1.

Standard Wiring installation (only for NPT conduit entries)

- Install per National Electrical Code (NFPA70) or Canadian Electrical Code, Part I (C22.1), as applicable.
- Use wiring methods appropriate for the location.
- 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 hazardous locations.

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: $V_{max} \geq V_{oc}$, $C_a \geq C_i + C_{cable}$, $L_a \geq L_i + L_{cable}$.
- For transmitter parameters: See "Connection data" section.
- The transmitter provides a current controlled circuit; therefore, the parameter I_{max} is not required and needs not to be aligned with I_{sc} of the associated nonincendive field wiring apparatus or associated apparatus.
- 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.
- 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.

The NIFW wiring applies only for the "intrinsically safe outputs" of Main board and IOM_A:
- TRC[10] type "Main board"
- TRC[20] type "Analog module" (Ex i)

The additional marking for the application is as follows:
NRF81: ANI / I / 2 / A, B, C, D / T6; NIFW

Zone installation

Overvoltage protection against atmospheric overvoltages.

The following Terminal outputs / configurations need no separate external overvoltage protection measures:

Position	Terminal
Power supply	G
HART interface	E
External display	F

- Device configuration:
  - *Basic specification, Position 5, 6 (Primary output)* = A1, B1, C1, E1, H1
  - *Basic specification, Position 7, 8 (Secondary I/O Analogue)* = A1, A2, B1, B2, C2, X0
  - *Basic specification, Position 9, 10 (Secondary I/O Digital Ex d/XP)* = B1, C1, E1
- All other configurations must be protected by separate additional measures to comply national regulations and standards.
- Observe the safety instructions of the overvoltage protection.

Temperature tables

Basic specification, Position 11, 12 (Housing) = AA

Permitted ambient temperature range T_a (ambient)
−40 to +60 °C

Basic specification, Position 11, 12 (Housing) = BA

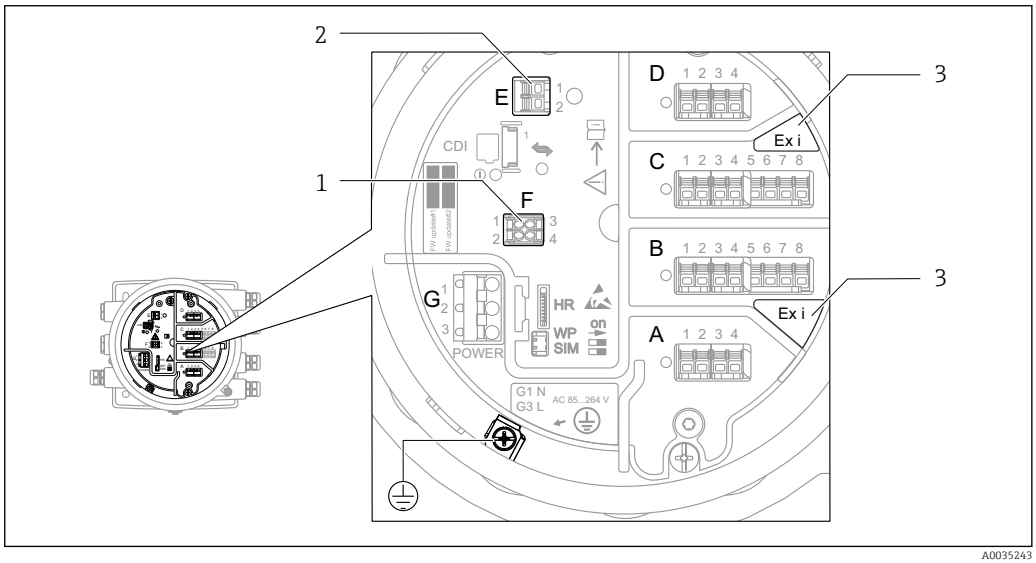
For configurations other than listed: use configuration 1.

Configuration of electronics:

	1 (worst case)	2 (best case)	3	4	5
Enclosure	X	X	X	X	X
Slot A - IOM_D	X		X	X	X
Slot B - IOM_A (Ex ia)	X		X		X
Slot C - IOM_A (Ex ia)	X				
Slot D - IOM_D	X				X
PS_HV	X	X	X	X	X
MB	X	X	X	X	X
Permitted ambient temperature range T_a (ambient)	−40 to +50 °C	−40 to +60 °C	−40 to +60 °C	−40 to +60 °C	−40 to +55 °C

Connection data

Connection compartment Ex d



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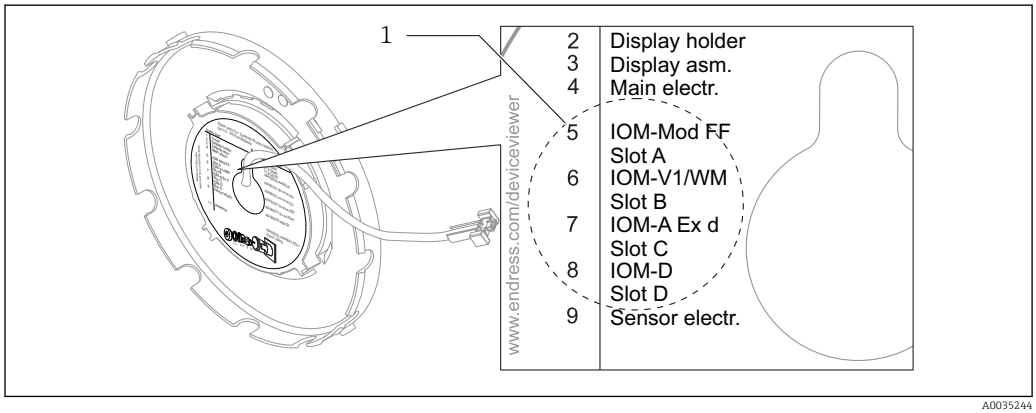
1 *Connection for external display Ex i*
2 *Connection for HART interface Ex i*
3 *only when "Analog Ex i" installed*

Detailed configuration information located at the display holder.

Example for lettering:



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1 Area device configuration

For detailed information see Operating Instructions.

Assignment of the terminals see designation of front plane.

TRC[01], type Power supply

Terminal	**G**		**CDI**
	AC voltage	G1: N G2: not connected G3: L	plug connected
	DC voltage	G1: L+ G2: not connected G3: L–	
Designation	**Power / Mains**		**Local LCD, CDI (internal)**
non-Ex (functional)	U_N = 85 to 264 V_{AC}, 50/60 Hz P_N = 28.8 VA or U_N = 52 to 75 V_{AC}, 50/60 Hz P_N = 21.6 VA U_N = 19 to 64 V_{DC} P_N = 13.4 W		U_N = 3.3 V_{DC} P_N = 41 mW

TRC[10], type Main board

Terminal	E	F
	E1: H+ E2: H-	F1: Vcc F2: A F3: B F4: gnd
Designation	**4-20 mA HART**	**Remote display**
Ex [ia]	U_o = 29 V I_o = 110 mA P_o = 700 mW C_o = 65 nF L_o = 2.9 mH	U_o = 3.9 V I_o = 500 mA P_o = 230 mW C_o = 99 µF L_o = 140 µH
non-Ex (functional)	U_N = 24 V_{DC} P_N ≤ 426 mW	U_N = 3.3 V_{DC} P_N = 41 mW
NIFW	V_{oc} = 24.5 V I_{sc} = 33 mA P_o = 498 mW C_a = 421 nF L_a = 73 mH	V_{oc} = 3.5 V I_{sc} = 30 mA P_o = 96 mW C_a = 999 µF L_a = 88 mH

TRC[32], type "Modbus" module; optional

Terminal	Slot A through slot D	
	1: S Cable shielding; capacitive connected to earth 2: 0V Common reference 3: B− Non-inverting signal line 4: A+ Inverting signal line	
Designation	**Modbus-Slave**	**FOUNDATION Fieldbus**
non-Ex (functional)	U_N = 12 V_{DC} P_N ≤ 12 mW U_M = 250 V	Currently not supported

TRC[33], type "V1" module; optional

Terminal	Slot A through slot D	
	1: S Cable shielding; capacitive connected to earth 2: not connected 3: B− Signal − 4: A+ Signal +	
Designation	**V1-Slave**	**WM550**
non-Ex (functional)	U_N = 24 V_{DC} P_N ≤ 414 mW U_M = 250 V	U_N = 4 V_{DC} P_N ≤ 120 mW U_M = 250 V

TRC[20], type "Analog module" (Ex i); 4-20 mA HART; optional

Terminal	**Slot B or slot C**	
Operation mode: ▪ 4 to 20 mA output or HART slave + 4 to 20 mA output or ▪ 4 to 20 mA input or HART master + 4 to 20 mA input or ▪ HART master	4-wire RTD connection: Terminal 5 through 8 3-wire RTD connection: Terminal 5, 6 and 8 2-wire RTD connection: Terminal 5 and 8	Terminal active use: 2: H- 3: H+
		Terminal passive use: 1: H- 2: H+
Designation	**24 V + RTD**	**4-20 mA HART**
Ex [ia]	Terminals 4-5 (24 V): U_o = 29 V I_o = 108 mA P_o = 776 mW C_o = 63 nF L_o = 3.0 mH	Terminals 2-3 (Active): U_o = 29 V I_o = 106 mA P_o = 760 mW C_o = 63 nF L_o = 3.1 mH
	Terminals 5-8 (RTD): U_o = 29 V I_o = 36 mA P_o = 263 mW C_o = 64 nF L_o = 26 mH	Terminals 1-2 (Passive): U_i = 29 V I_i = 106 mA P_i = 760 mW C_i = 11 nF L_i = 0
non-Ex (functional)	Terminals 4-5 (24 V): U_N = 24 V_{DC} P_N ≤ 600 mW	Terminals 2-3 (Active): U_N = 24 V_{DC} P_N ≤ 540 mW
	Terminals 5-8 (RTD): I_N = 400 μA_{DC} P_N ≤ 160 µW	Terminals 1-2 (Passive): U_N = 29 V_{DC} P_N ≤ 653 mW
NIFW	Terminals 4-5 (24 V): V_{oc} = 24 V I_{sc} = 90 mA P_o = 538 mW C_a = 449 nF L_a = 9.9 mH	Terminals 2-3 (Active): V_{oc} = 24 V I_{sc} = 28 mA P_o = 526 mW C_a = 449 nF L_a = 102 mH
	Terminals 5-8 (RTD): V_{oc} = 3.6 V I_{sc} = 5 mA P_o = 4 mW C_a = 999 µF L_a = 3.8 H	Terminals 1-2 (Passive): V_{max} = 29 V I_{max} [1)] = not available P_i = not available C_i = 11 nF L_i = 0

1) current controlled circuit

TRC[21], type "Analog module" (Ex d); 4-20 mA HART; optional

Terminal	**Slot B or slot C**	
Operation mode: ▪ 4 to 20 mA output or HART slave + 4 to 20 mA output or ▪ 4 to 20 mA input or HART master + 4 to 20 mA input or ▪ HART master	4-wire RTD connection: Terminal 5 through 8 3-wire RTD connection: Terminal 5, 6 and 8 2-wire RTD connection: Terminal 5 and 8	Terminal active use: 2: H- 3: H+
		Terminal passive use: 1: H- 2: H+
Designation	**24 V + RTD**	**4-20 mA HART**
non-Ex (functional)	Terminals 4-5 (24 V): not used	Terminals 2-3 (Active): U_N = 24 V_{DC} P_N ≤ 540 mW U_M = 250 V
	Terminals 5-8 (RTD): I_N = 400 μA_{DC} P_N ≤ 160 µW U_M = 250 V	Terminals 1-2 (Passive): U_N = 29 V_{DC} P_N ≤ 653 mW U_M = 250 V

TRC[31], type "Digital"; optional

Terminal	**Slot A through slot D**	
Operation mode: ▪ disabled ▪ passive output ▪ passive input ▪ active input	Installed in slot A:	
	1: A1-1 2: A1-2	3: A2-1 4: A2-2
	Installed in slot B:	
	1: B1-1 2: B1-2	3: B2-1 4: B2-2
	Installed in slot C:	
	1: C1-1 2: C1-2	3: C2-1 4: C2-2
	Installed in slot D:	
	1: D1-1 2: D1-2	3: D2-1 4: D2-2
Designation	**Relay / Digital Input/Output 1**	**Relay / Digital Input/Output 2**
non-Ex (functional)	Relay: U_N = 250 $V_{AC/DC}$ I_N ≤ 2 A	Relay: U_N = 250 $V_{AC/DC}$ I_N ≤ 2 A
	Digital Input: U_N = 5 to 230 $V_{AC/DC}$ U_M = 250 V	Digital Input: U_N = 5 to 230 $V_{AC/DC}$ U_M = 250 V

Tankside Monitor NRF81

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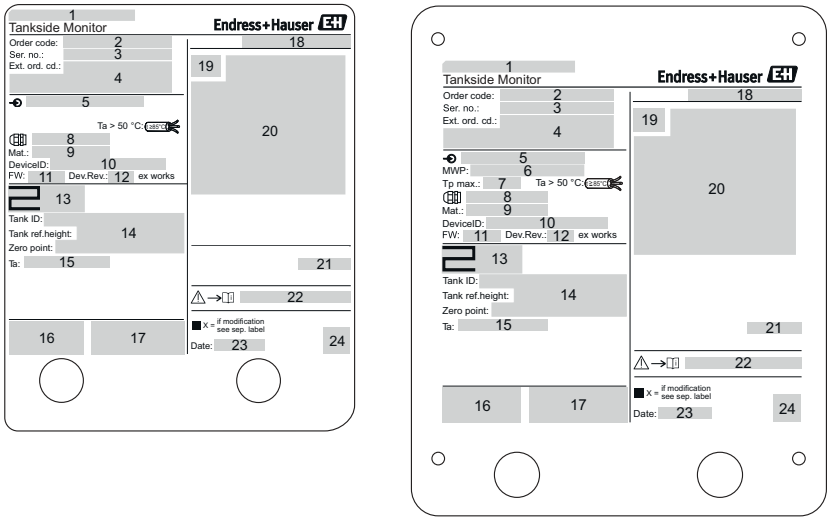
Attachment: Nameplate view



Pos	Position	VGR	Code	Text	Ex-relevant
1	Manufacturer address	-	-	Made in Germany, 79689 Maulburg	yes
2	Order code	-	FD	NRF80- 12 digits, mandatory NRF81- 16 digits, mandatory	yes
3	Serial number	-	-	mandatory	yes
4	Extended order code	-	-	optional, digits not limited	no
5	Supply voltage	030	B	85…264 V AC (50…60 Hz)	yes
			D	52...75 V AC (50...60 Hz)	yes
			E	19…64 V DC	yes
8	Thread cable entry	090	A	Thread M20	yes
			B	Thread M25	yes
			E	Thread NPT1/2	yes
			F	Thread NPT3/4	yes
9	Material	070	AA	Aluminium	yes
			BA	316/316L	yes
			Y9	316/316L special coating for e.g. marine applications	yes
10	Device ID	-	-		no
11	Firmware version	-	-		no
12	Device revision	-	-		no
13	PTB certification number	-	-		no
14	Customized parametrization data	-	-		no
15	Permissible ambient temperature	010	all	-40...+50°C, -40...+55°C or -40...+60°C depending on version	yes
16	CE mark / C-Tick mark	010	-		no
17	Additional information of the device version	-	-	Markings, not relevant for Ex: e.g. C-Tick, SIL, 3A, ...	no
18	Ingress protection	-	-	IP68 / 66, Type 4X / 6P Encl.	yes
19	Certificate symbol	010	FD	FM C US APPROVED	yes
20	Data concerning Ex approvals	010	FD	FM16US0137X CL I DIV 1 GP BCD T6 AIS CL I, II, III DIV 1 GP ABCDEFG ANI CL I DIV 2 GP ABCD CL I Zn 1 AEx db [ia Ga] IIC T6 Gb FM16CA0078X CL I DIV 1 GP BCD T6 AIS CL I, II, III DIV 1 GP ABCDEFG ANI CL I DIV 2 GP ABCD Ex db [ia Ga] IIC T6 Gb	yes
			FD	Enty and NIFW Parameters and Conduit seal reqs. per XA01532G	yes
21	General cerficate of approval	010	all	e.g. Overspill protection; optional	no
22	Associated Safety Instruction (XA)	010	FD	XA01532G-. (actual rev.)	yes
23	Manufacturing date	010	all	YYYY-MM	yes
24	QR code for E+H Operations App	-	-		no

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