

# Safety Instructions

## **Tank Side Monitor NRF81**

Ex db [ia Ga] IIC T6 Gb





# Tank Side Monitor NRF81

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<b>Associated documentation</b>	This document is an integral part of the following Operating Instructions: BA01465G/00										
<b>Supplementary documentation</b>	Explosion-protection brochure: CP00021Z/11 The Explosion-protection brochure is available: <ul style="list-style-type: none"> <li>■ In the download area of the Endress+Hauser website: <a href="http://www.endress.com">www.endress.com</a> -&gt; Downloads -&gt; Brochures and Catalogs -&gt; Text Search: CP00021Z</li> <li>■ On the CD for devices with CD-based documentation</li> </ul>										
<b>Manufacturer's certificates</b>	<b>Certificate of Conformity</b>  Certificate number: CML 21JPN11320X  Affixing the certificate number certifies conformity with the following standards (depending on the device version): <ul style="list-style-type: none"> <li>■ JNIO SH-TR-46-1 : 2020</li> <li>■ JNIO SH-TR-46-2 : 2018</li> <li>■ JNIO SH-TR-46-6 : 2015</li> </ul>										
<b>Manufacturer address</b>	Endress+Hauser SE+Co. KG Hauptstraße 1 79689 Maulburg, Germany Address of the manufacturing plant: See nameplate.										
<b>Extended order code</b>	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.  <b>Structure of the extended order code</b>  <table border="0" style="margin-left: 40px;"> <tr> <td style="text-align: center;">NRF81</td> <td style="text-align: center;">–</td> <td style="text-align: center;">*****</td> <td style="text-align: center;">+</td> <td style="text-align: center;">A*B*C*D*E*F*G*..</td> </tr> <tr> <td style="text-align: center;"><i>(Device type)</i></td> <td></td> <td style="text-align: center;"><i>(Basic specifications)</i></td> <td></td> <td style="text-align: center;"><i>(Optional specifications)</i></td> </tr> </table> <p>* = Placeholder At this position, an option (number or letter) selected from the specification is displayed instead of the placeholders.</p> <p><i>Basic specifications</i></p> <p>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.</p> <p><i>Optional specifications</i></p> <p>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).</p> <p>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.</p>	NRF81	–	*****	+	A*B*C*D*E*F*G*..	<i>(Device type)</i>		<i>(Basic specifications)</i>		<i>(Optional specifications)</i>
NRF81	–	*****	+	A*B*C*D*E*F*G*..							
<i>(Device type)</i>		<i>(Basic specifications)</i>		<i>(Optional specifications)</i>							

**Extended order code: Tank Side 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	JA	JPN Ex db [ia Ga] IIC T6 Gb

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. enclosure, sensor element, special varnishing, attached additional plates, ..)
  - Of isolated capacities (e.g. isolated metallic plates)
- Modifications to the device can affect the explosion protection and must be carried out by staff authorized to perform such work by Endress+Hauser.

#### Safety instructions: Special conditions

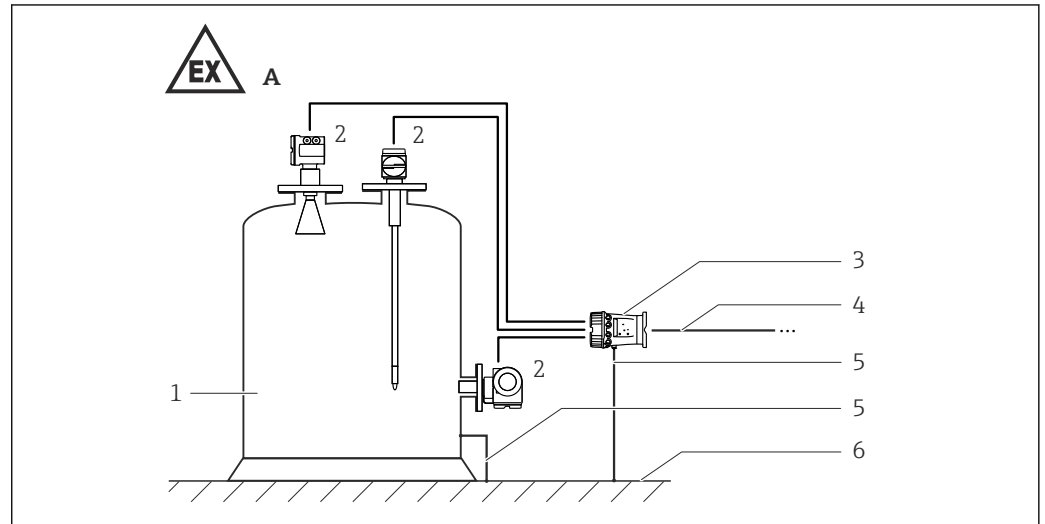
Permitted ambient temperature range at the electronics enclosure:

→  8, "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 enclosure or other metal parts or for adhesive plates:
  - Observe the danger of electrostatic charging and discharge.
  - Do not install in the vicinity of processes ( $\leq 0.5$  m) generating strong electrostatic charges.
- Flamepath joints are not for repair. Contact the manufacturer.
- Use heat resisting cables rated  $\geq 85$  °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.
- Ex d certified seals are required within 50 mm (2 in) on all used enclosure entries.

### Safety instructions: Installation



#### 1

- A Zone 1  
 1 Tank; Zone 0, Zone 1  
 2 Observe Safety Instructions of used devices!  
 3 Tank Side 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.
- In potentially explosive atmospheres:
  - Do not disconnect the electrical connection of the power supply circuit when energized.
  - Do not open the connection compartment cover.
- Only use certified cable entries suitable for the application. Observe national regulations and standards. Accordingly, the connection terminal does not include any ignition sources.
- When operating the transmitter enclosure at an ambient temperature under  $-20\text{ }^{\circ}\text{C}$ , use appropriate cables and cable entries permitted for this application.
- When connecting through a conduit entry approved for this purpose, mount the associated sealing unit directly at the enclosure.
- Seal unused entry glands with approved sealing 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.

#### Potential equalization

Integrate the device into the local potential equalization.

#### Overvoltage protection

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 = A1, B1, C1, E1, H1
  - Basic specification, Position 7, 8 = A1, A2, B1, B2, C2, X0
  - Basic specification, Position 9, 10 = 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 = AA

Permitted ambient temperature range T <sub>a</sub> (ambient)
-40 to +60 °C

Basic specification, Position 11, 12 = BA

 For configurations other than listed: use configuration 1.

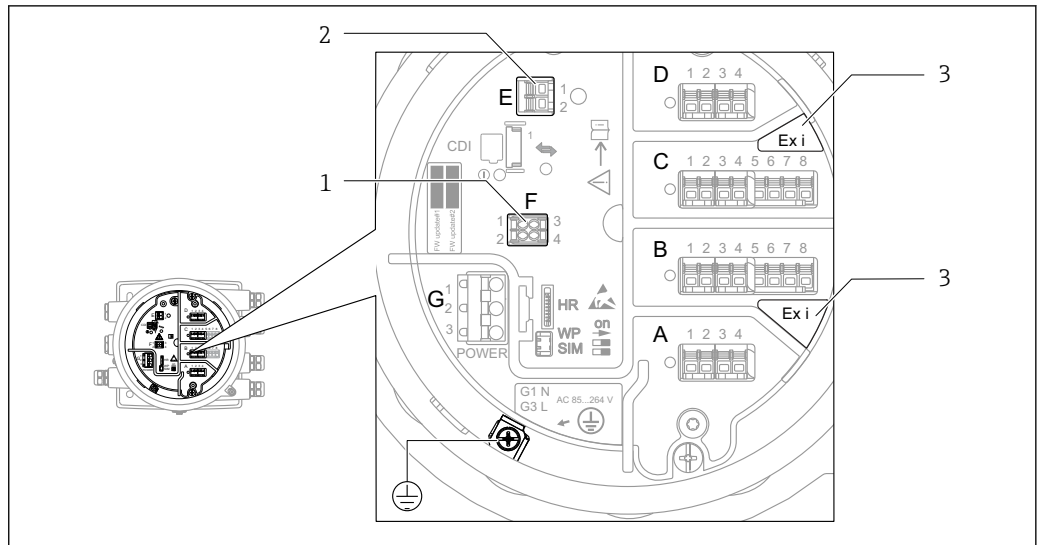
Configuration of electronics:

	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 <sub>a</sub> (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



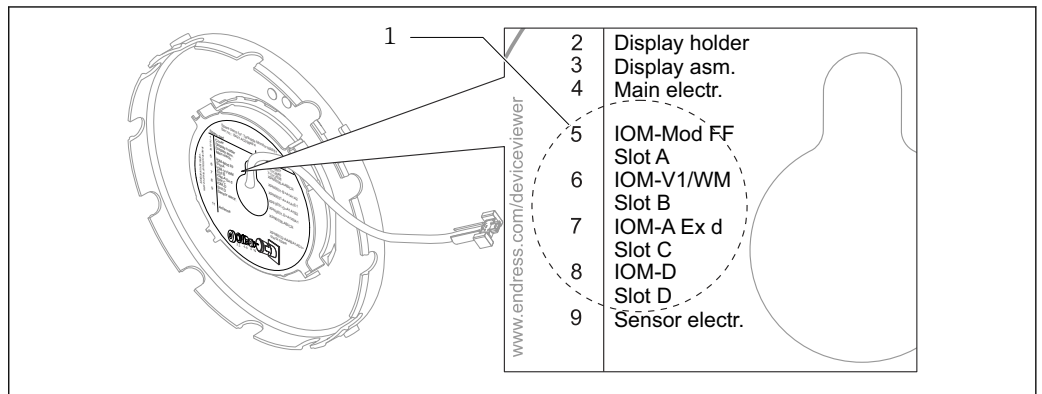
A0035243

2

- 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:



A0035244

3

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

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]	$U_o = 29 \text{ V}$ $I_o = 110 \text{ mA}$ $P_o = 700 \text{ mW}$ $C_o = 65 \text{ nF}$ $L_o = 2.9 \text{ mH}$	$U_o = 3.9 \text{ V}$ $I_o = 500 \text{ mA}$ $P_o = 230 \text{ mW}$ $C_o = 99 \mu\text{F}$ $L_o = 140 \mu\text{H}$
non-Ex (functional)	$U_N = 24 \text{ V}_{DC}$ $P_N \leq 426 \text{ mW}$	$U_N = 3.3 \text{ V}_{DC}$ $P_N = 41 \text{ mW}$

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)	$U_N = 12 \text{ V}_{DC}$ $P_N \leq 12 \text{ mW}$ $U_M = 250 \text{ V}$	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)	$U_N = 24 V_{DC}$ $P_N \leq 414 mW$ $U_M = 250 V$	$U_N = 4 V_{DC}$ $P_N \leq 120 mW$ $U_M = 250 V$

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

Terminal	Slot B or slot C	
Operation mode: <ul style="list-style-type: none"> <li>■ 4 to 20 mA output or HART slave + 4 to 20 mA output or</li> <li>■ 4 to 20 mA input or HART master + 4 to 20 mA input or</li> <li>■ HART master</li> </ul>	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): $U_N = 24 V_{DC}$ $P_N \leq 600 mW$	Terminals 2-3 (Active): $U_N = 24 V_{DC}$ $P_N \leq 540 mW$
	Terminals 5-8 (RTD): $I_N = 400 \mu A_{DC}$ $P_N \leq 160 \mu W$	Terminals 1-2 (Passive): $U_N = 29 V_{DC}$ $P_N \leq 653 mW$

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

Terminal	Slot B or slot C	
Operation mode: <ul style="list-style-type: none"> <li>■ 4 to 20 mA output or HART slave + 4 to 20 mA output or</li> <li>■ 4 to 20 mA input or HART master + 4 to 20 mA input or</li> <li>■ HART master</li> </ul>	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): $U_N = 24 V_{DC}$ $P_N \leq 540 \text{ mW}$ $U_M = 250 \text{ V}$
	Terminals 5-8 (RTD): $I_N = 400 \mu A_{DC}$ $P_N \leq 160 \mu W$ $U_M = 250 \text{ V}$	Terminals 1-2 (Passive): $U_N = 29 V_{DC}$ $P_N \leq 653 \text{ mW}$ $U_M = 250 \text{ V}$

TRC[31], type "Digital"; optional

Terminal	Slot A through slot D	
Operation mode: <ul style="list-style-type: none"> <li>■ disabled</li> <li>■ passive output</li> <li>■ passive input</li> <li>■ active input</li> </ul>	Installed in slot A: 1: A1-1   3: A2-1 2: A1-2   4: A2-2	
	Installed in slot B: 1: B1-1   3: B2-1 2: B1-2   4: B2-2	
	Installed in slot C: 1: C1-1   3: C2-1 2: C1-2   4: C2-2	
	Installed in slot D: 1: D1-1   3: D2-1 2: D1-2   4: D2-2	
Designation	Relay / Digital Input/Output 1	Relay / Digital Input/Output 2
non-Ex (functional)	Relay: $U_N = 250 V_{AC/DC}$ $I_N \leq 2 \text{ A}$	Relay: $U_N = 250 V_{AC/DC}$ $I_N \leq 2 \text{ A}$
	Digital Input: $U_N = 5 \text{ to } 230 V_{AC/DC}$ $U_M = 250 \text{ V}$	Digital Input: $U_N = 5 \text{ to } 230 V_{AC/DC}$ $U_M = 250 \text{ V}$

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