

# Safety Instructions

## Proservo

### NMS80, NMS81, NMS83

CA: I / 1 / BCD T6...T1 AIS / I II III / 1 / ABCDEFG; Entity  
Ex db [ia Ga] IIC / T6...T1 Ga/Gb; Entity  
ANI / I II III / 2 / ABCDEFG; NIFW  
US: I / 1 / BCD / T6...T1 AIS I II III / 1 / ABCDEFG; Entity  
1 / 0/1 / AEx db [ia Ga] IIC T6...T1 Ga/Gb; Entity  
ANI / I II III / 2 / ABCDEFG; NIFW



Document: XA01496G-B

Safety instructions for electrical apparatuses used in explosion-hazardous areas → 3

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# Proservo

## NMS80, NMS81, NMS83

### Table of contents

Associated documentation .....	4
Manufacturer address .....	4
Extended order code .....	4
Safety instructions: General .....	7
Safety instructions: Special conditions .....	8
Safety instructions: Installation .....	9
Explosionproof / Flameproof .....	12

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

- BA01456G (NMS80)
- BA01459G (NMS81)
- BA01462G (NMS83)

**Manufacturer address** Endress+Hauser Yamanashi Co., Ltd.  
406-0846  
862-1 Mitsukunugi, Sakaigawa-cho, Fuefuki-shi, Yamanashi

**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

NMS8x	-	*****	+	A*B*C*D*E*F*G*..
<i>(Device type)</i>		<i>(Basic specifications)</i>		<i>(Optional specifications)</i>

\* = 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: Proservo**



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*

NMS80, NMS81, NMS83

*Basic specifications*

Position 1, 2 (Approval)		
Selected option		Description
NMS8x	FC	ATEX II 1/2G Ex d[ia Ga] IIC T6...T1 Ga/Gb FM C/US XP-AIS Cl.I Div.1 Gr.B-D, AEx d[ia] IIC T6...T1 Detailed: FM16CA0008X: I / 1 / BCD T6...T1 AIS / I II III / 1 / ABCDEFG; Entity I / 0 / 1 / Ex db [ia Ga] IIC / T6...T1 Ga / Gb; Entity ANI / I II III / 2 / ABCDEFG; FM16US0008X: I / 1 / BCD / T6...T1 AIS / I II III / 1 / ABCDEFG; Entity I / 0/1 / AEx db [ia Ga] IIC T6...T1 Ga/Gb; ANI / I II III / 2 / ABCDEFG;

Position 5, 6 (Primary Output)		
Selected option		Description
NMS8x	A1	Modbus RS485
	B1	V1
	C1	WM550
	E1	4 to 20 mA HART Ex d/XP
	H1	4 to 20 mA HART Ex i/IS

Position 7, 8 (Secondary I/O Analogue)		
Selected option		Description
NMS8x	A1	Ex d, 1x 4 to 20 mA HART, 1x RTD input
	A2	Ex d, 2x 4 to 20 mA HART, 2x RTD input
	B1	Ex i, 1x 4 to 20 mA HART, 1x RTD input
	B2	Ex i, 2x 4 to 20 mA HART, 2x RTD input
	C2	1x Ex i 4 to 20 mA HART, 2x RTD input + 1x Ex d 4 to 20 mA HART
	X0	Prepared for I/O analogue, RTD input

Position 9, 10 (Secondary I/O Digital Ex d/XP)		
Selected option		Description
NMS8x	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	Prepared for I/O digital, Ex d

Position 11, 12 (Housing)		
Selected option		Description
NMS80	AB	Transmitter+Process Alu coated
NMS81	AC	Transmitter Alu coated + Process 316/316L
	AD	Transmitter Alu coated + Process 316/316L internal FEP
	BC	Transmitter+Process 316/316L
	BD	Transmitter 316/316L + Process 316/316L internal FEP
NMS83	AC	Transmitter Alu coated + Process 316/316L
	BC	Transmitter+Process 316/316L

Position 13 (Process Pressure)		
Selected option		Description
NMS80	1	0 to 0.2 bar/20 kPa/2.9 psi
	2	0 to 6 bar/600 kPa/87 psi
NMS81	1	0 to 0.2 bar/20 kPa/2.9 psi
	2	0 to 6 bar/600 kPa/87 psi
	3	0 to 25 bar/2.5 MPa/362 psii
NMS83	2	0 to 6 bar/600 kPa/87 psi

Position 17, 18, 19 (Displacer material: Type)		
Selected option		Description
NMS80	1AA	316L; 30 mm (1.18 in) Cylindrical
NMS81	1AC	316L; 50 mm (1.97 in) Cylindrical
	1BE	316L; 70 mm (2.76 in) Conical
	1BJ	316L; 110 mm (4.33 in) Conical
	2AA	PTFE; 30 mm (1.18 in) Cylindrical
	2AC	PTFE; 50 mm (1.97 in) Cylindrical
	3AC	Alloy-C; 50 mm (1.97 in) Cylindrical
NMS83	4AC	316L polished; 50 mm (1.97 in) Cylindrical
	4AE	316L polished; 70 mm (2.76 in) Conical

Position 20, 21 (Process sealing)		
Selected option		Description
NMS8x	A1	HNBR -30 to 150 °C
	B1	FKM GLT, -40 to 200 °C
	C1	CR Chloroprene -25 to 100 °C
	D1	PTFE (wire drum FKM) -100 to 200 °C
	E1	VMQ Silicone -45 to 200 °C

#### Optional specifications

ID (Accessory Enclosed)		
Selected option		Description
NMS8x	PA	Weather protection cover
	RA	Relief valve, Rc3/8
	RB	Purge nozzle connection, Rc3/8
	RC	Pressure gauge, Rc3/8
	RD	Rc3/8 cleaning nozzle
	RG	Guide wire assembly

#### 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.
- Only use the device in media to which the wetted materials have sufficient durability.
- Avoid electrostatic charging:
  - Of plastic surfaces (e.g. housing, sensor element, special varnishing, attached additional plates, ..)
  - Of isolated capacities (e.g. isolated metallic plates)
- Refer to the temperature tables for the relationship between the permitted ambient temperature for the sensor and/or transmitter, depending on the range of application and the temperature class.
- 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:

$-40\text{ °C} (-40\text{ °F}) \leq T_a \leq +50\text{ (122)}, +55\text{ (131)}, \text{ or } +60\text{ °C} (140\text{ °F})$

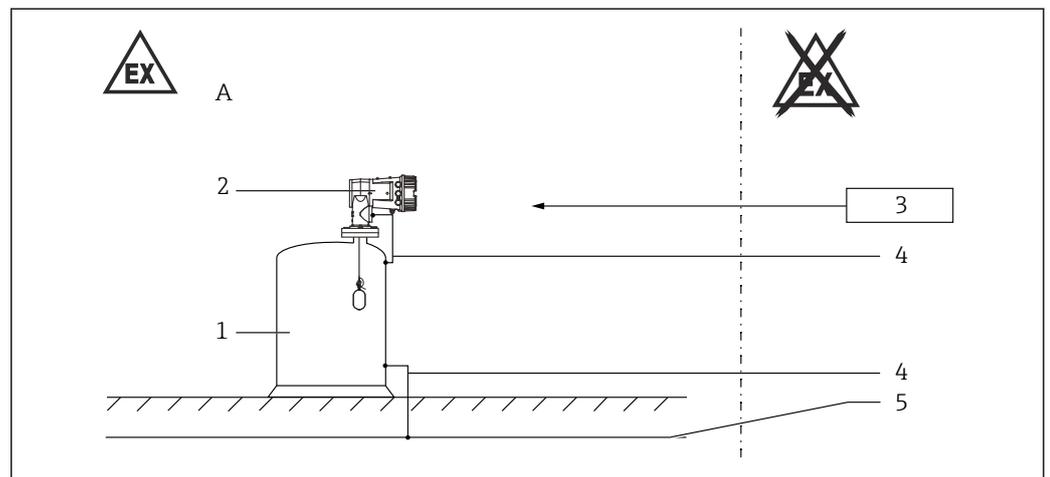
Observe the information in the temperature table on page xxxx

- Use supply wires suitable for 20 K above the ambient temperature.
- 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.

**Special conditions of use US/CA**

- Flamepath joints are not for repair. Contact the manufacturer.
- Use heat resisting cables rated  $\geq 85\text{ }^{\circ}\text{C}$  (185 °F) for  $T_a > 50\text{ }^{\circ}\text{C}$  (122 °F)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 (17.72 in) on all used housing entries.

**Safety instructions:  
Installation**



- A Division1, Zone 1, or Division2
- 1 Tank; Division1, Zone 0, or Zone 1
- 2 Connection and electronics compartment AEx d/Ex d
- 3 Power supply
- 4 Potential equalization line
- 5 Potential equalization

- Install the device to exclude any mechanical damage or friction during the application. Pay particular attention to flow conditions and tank fittings.
- Continuous service temperature of the connecting cable:  $-40$  to  $\geq +xx\text{ }^{\circ}\text{C}$  ( $-40$  to  $+xx\text{ }^{\circ}\text{F}$ ); in accordance with the range of service temperature taking into account additional influences of the process conditions ( $T_{a,min}$ ), ( $T_{a,max} +30\text{ K}$ ). (  $\rightarrow$  9, "Ambient temperature").
- The installation of the tank gauge NMS80/81/83 is to be made in such a way that no waving or rolling motion of the displacer can occur in operation causing a contact of the displacer with the tank wall. In case of the drum housing made of aluminum (NMS80), any impact or friction to the equipment has to be avoided in order to prevent an ignition hazard between the drum housing and internal parts.

*Ambient temperature*

Temperature class	Ambient temperature	Process temperature (Temperature of displacer)
T1	$-40\text{ }^{\circ}\text{C}$ ( $-40\text{ }^{\circ}\text{F}$ ) $\leq T_a \leq 60\text{ }^{\circ}\text{C}$ (140 °F) $-40\text{ }^{\circ}\text{C}$ ( $-40\text{ }^{\circ}\text{F}$ ) $\leq T_a \leq 55\text{ }^{\circ}\text{C}$ (131 °F) $-40\text{ }^{\circ}\text{C}$ ( $-40\text{ }^{\circ}\text{F}$ ) $\leq T_a \leq 50\text{ }^{\circ}\text{C}$ (122 °F) (See the tables below.)	$-253\text{ }^{\circ}\text{C}$ ( $-423.4\text{ }^{\circ}\text{F}$ ) $\leq T_{pro} \leq 450\text{ }^{\circ}\text{C}$ (842 °F)
T2		$-253\text{ }^{\circ}\text{C}$ ( $-423.4\text{ }^{\circ}\text{F}$ ) $\leq T_{pro} \leq 300\text{ }^{\circ}\text{C}$ (572 °F)
T3		$-253\text{ }^{\circ}\text{C}$ ( $-423.4\text{ }^{\circ}\text{F}$ ) $\leq T_{pro} \leq 200\text{ }^{\circ}\text{C}$ (392 °F)
T4		$-253\text{ }^{\circ}\text{C}$ ( $-423.4\text{ }^{\circ}\text{F}$ ) $\leq T_{pro} \leq 135\text{ }^{\circ}\text{C}$ (275 °F)
T5		$-253\text{ }^{\circ}\text{C}$ ( $-423.4\text{ }^{\circ}\text{F}$ ) $\leq T_{pro} \leq 100\text{ }^{\circ}\text{C}$ (212 °F)
T6		$-253\text{ }^{\circ}\text{C}$ ( $-423.4\text{ }^{\circ}\text{F}$ ) $\leq T_{pro} \leq 85\text{ }^{\circ}\text{C}$ (185 °F)

Table1: Basic specification, Position 11, 12 (Housing) = AB

Permitted ambient temperature range Ta (ambient)
-40 °C (-40 °F) ≤ Ta ≤ 60 °C (140 °F)

Table2: Basic specification, Position 11, 12 (Housing) = AC, AD Configuration of electronics:

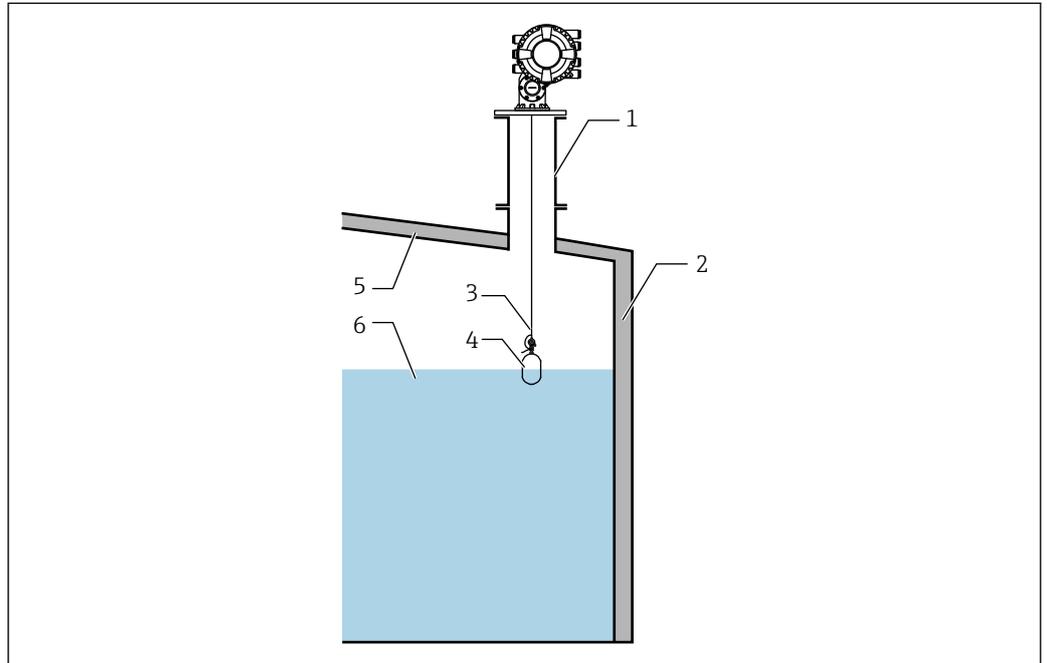
Configuration	Slot A / B / C / D				Permitted ambient temperature range Ta (ambient)
	IOM_V1/WM	IOM_Mod/FF	IOM_A [Ex i] / [Ex d]	IOM_D	
1			1	3	-40 °C ≤ Ta ≤ 55 °C
Combinations other than the list above					-40 °C ≤ Ta ≤ 60 °C

Table3: Basic specification, Position 11, 12 (Housing) = BC, BD Configuration of electronics:

Configuration	Slot A / B / C / D				Permitted ambient temperature range Ta (ambient)
	IOM_V1/WM	IOM_Mod/FF	IOM_A [Ex i] / [Ex d]	IOM_D	
1	1			3	-40 °C ≤ Ta ≤ 50 °C
2	1		1	2	
3	1		2	1	
4		1		3	
5			2	2	
6			1	3	
7	1		1	1	-40 °C ≤ Ta ≤ 55 °C
8	1			2	
9		1	2	1	
10		1	1	2	
11		1		2	
12			2	1	
13			1	2	
14		2		2	
15		1	1	1	
16		2	1	1	
17		2	2		
18	1	1		2	
19	2			2	
20	2		1	1	
21	1	1	2		
22	2		2		
23	1	1	1	1	
Combinations other than the list above					-40 °C ≤ Ta ≤ 60 °C

**Measure low or high temperature liquid**

- The process temperature shall not bring the enclosure of the electronics compartment beyond the specified ambient temperature range limits.
- When installing high or low temperature storage tank, heat or cold from the liquid, the vapor or tank wall should not be conducted to the NMS8x directly.
- Cover the tank with a thermal isolation material and/or install an ambient temperature adjustment pipe between NMS8x and nozzle of the tank.



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- 1 Ambient temperature adjust pipe (optional)
- 2 Terminal isolation material
- 3 Measuring wire
- 4 Displacer
- 5 Tank wall
- 6 High or low temperature liquid

**i** The temperature of the flange and the internal temperature of the drum compartment:  
 $-40\text{ °C } (-40\text{ °F}) \leq T_a \leq +50\text{ (122)}, +55\text{ (131)}, \text{ or } +60\text{ °C } (140\text{ °F})$  (see the table above.)

**Applicable maximum installation height**

Although IEC60079 series does not require contents of this section, the following is recommended to increase the safety when using this equipment. In the unlikely case that the displacer wire breaks and the displacer hits the tank bottom there is the possibility of an ignition if the potential energy stored in the displacer is greater than the minimum ignition energy. In order to avoid any ignition hazard the applicable maximum tank height (Hmax) which is depending on displacer weight (Wd) shall be as follows:

Ex/Vaopr group	Displacer weight		
	252 g (Standard)	270 g (Standard: Maximum)	300 g (Weight and Measure)
IIA (Grp. D)	50.5 m (165.68 ft)	47.1 m (154.52 ft)47.1 m	42.4 m (139.1 ft)
IIIB (Grp. C)	50.5 m (165.68 ft)	47.1 m (154.52 ft)47.1 m	42.4 m (139.1 ft)

Ex/Vaopr group	Displacer weight		
	252 g (Standard)	270 g (Standard: Maximum)	300 g (Weight and Measure)
IIB+H2 (Grp. B)	24.2 m (79.40 ft)	22.6 m (74.15 ft)	20.3 m (66.6 ft)
IIC (Grp. A)	24.2 m (79.40 ft)	22.6 m (74.15 ft)	20.3 m (66.6 ft)

**i** In case of a tank gauge installation above the maximum height (Hmax), when the tank is empty and explosive gas/vapor is present, the displacer must be lowered to the tank bottom to avoid any ignition hazard between the displacer and the tank bottom.

*Separation of Zone 0 and Zone1*

The partition wall between the drum compartment (Zone 0) and electronic compartment (Zone 1) meets requirement 4.2.5.3 i) of IEC 60079-26. Maximum working pressure of the drum compartment is below.

Device type	Maximum working pressure (MWP)
NMS80-*****1...	0.02 MPa (0.2 bar)
NMS80-*****2...	0.6 MPa (6 bar)
NMS81-*****1...	0.02 MPa (0.2 bar)
NMS81-*****2...	0.6 MPa (6 bar)
NMS81-*****3...	2.5 MPa (25 bar)
NMS83-*****2...	0.6 MPa (6 bar)

**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<sub>rms</sub>.
- 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.
- Antenna is intrinsically safe, AEx ia/Ex ia, and suitable for installation in Class I, Division 1 or Class I, Zone 0/1.
- 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 (C)	XP (US)
IIC Certified seal required within 50 mm (2") on all used housing entries	<ul style="list-style-type: none"> <li>■ Groups B, C, D; Certified seal required within 50 mm (2") on all used housing entries</li> <li>■ Boundary wall equipment: The XP and Ex db ratings are applicable to the transmitter portion. The IS and Ex ia ratings are applicable to the radar antenna portion.</li> </ul>	Groups B, C, D; Certified seal required within 450 mm (18") on all used housing entries

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