Safety Instructions

Proservo
NMS80, NMS81, NMS83

INMETRO: Ex db [ia Ga] IIC T6/T1 Ga/Gb

INMETRO

Safety instructions for electrical apparatus for Explosion-hazardous Areas

Endress+Hauser
People for Process Automation

Table of contents

Associated documentation

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

- NMS80: BA01456G/00
- NMS81: BA01459G/00
- NMS83: BA01462G/00

Supplementary documentation

Explosion-protection brochure: CP00021Z/11

The Explosion-protection brochure is available:

- In the download area of the Endress+Hauser website: www.endress.com → Download → Advanced → Documentation Code: CP00021Z
- On the CD for devices with CD-based documentation

Manufacturer's certificates

Type-examination certificate

Certificate number: TÜV 17.1694X

Affixing the certificate number certifies conformity with the following standards (depending on the device version).

- ABNT NBR IEC 60079-0:2013
- ABNT NBR IEC 60079-1:2016
- ABNT NBR IEC 60079-11:2013
- ABNT NBR IEC 60079-26:2014
- Portaria INMETRO No. 179 de 18/05/2010

Other standards

Among other things, the following standards shall be observed for proper installation:

- IEC/EN 60079-14: 2013: "Explosive atmospheres - Part 14: Electrical installations design, selection and erection"
- EN 1127-1: 2011: "Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology"

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*..
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 of the Proservo

Device type: NMS8x

Basic specifications

Position		Selected option		Description
1, 2	Approval	NMS8x	MC	INMETRO Ex d[ia] IIC T6 Ga/Gb
5, 6	Primary Output	NMS8x	A1	Modbus RS485
			B1	V1
			E1	4-20mA HART Ex d
			H1	4-20mA HART Ex i
7, 8	Secondary I/O Analogue	NMS8x	A1	Ex d, 1x 4-20 mA HART, 1x RTD input
			A2	Ex d, 2x 4-20 mA HART, 2x RTD input
			B1	Ex i, 1x 4-20 mA HART, 1x RTD input
			B2	Ex i, 2x 4-20 mA HART, 2x RTD input
			C2	1x Ex i 4-20 mA HART, 2x RTD input + 1x Ex d 4-20 mA HART
			X0	Prepared for I/O analogue, RTD input
9, 10	Secondary I/O Digital Ex d	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
			X0	Prepared for I/O digital, Ex d
13	Process Pressure	NMS80	1	0... 0.2bar/20kPa/2.9psi
			2	0... 6bar/600kPa/87psi
		NMS81	1	0... 0.2bar/20kPa/2.9psi
			2	0... 6bar/600kPa/87psi
			3	0... 25bar/2.5MPa/362psi
		NMS83	2	0... 6bar/600kPa/87psi
17, 18, 19	Displacer material: Type	NMS80 NMS81	1AA	316L; 30mm Cylindrical
			1AC	316L; 50mm Cylindrical
			1BE	316L; 70mm Conical
			1BJ	316L; 110mm Conical
			2AA	PTFE; 30mm Cylindrical
			2AC	PTFE; 50mm Cylindrical
			3AC	Alloy-C; 50mm Cylindrical
		NMS83	4AC	316L polished; 50mm Cylindrical
			4AE	316L polished; 70mm Conical
20, 21	Process Sealing	NMS8x	A1	HNBR -30...150 °C/-22...302 °F
			B1	FKM GLT, -40...200 °C/-40...392 °F
			B2	FFKM, -20...200 °C/-4...392 °F
			C1	CR Chloroprene -30 ... +80 °C/-22...176 °F
			D1	PTFE (wire drum FKM) -100...150 °C/-148...302 °F
			E1	VMQ Silicone -40...200 °C/-40...392 °F

Optional specifications

ID		Selected option		Description
Px	Accessory Enclosed	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 process temperature and 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

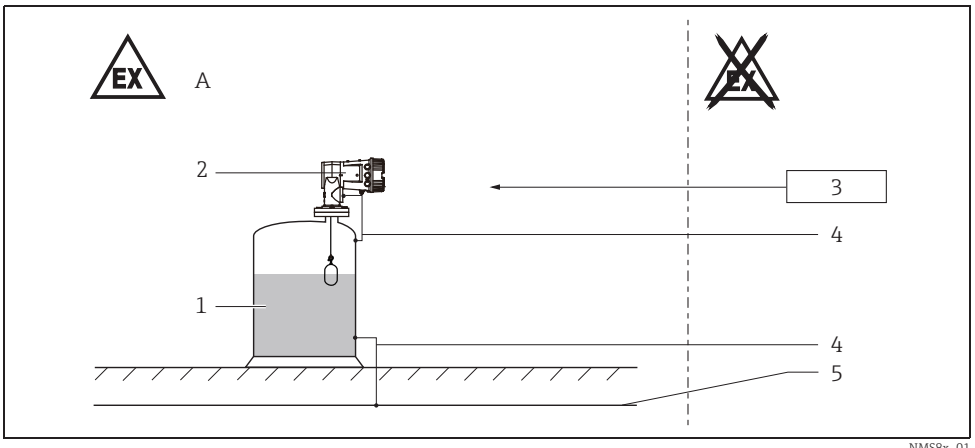
Permitted ambient temperature range at the electronics housing: $-40\ °C \leq T_a \leq +60$, +70 or +80 °C. Observe the information in the temperature table on page 9.

- 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 - INMETRO

- Flamepath joints are not for repair. Contact the manufacturer.
- Use heat resisting cables rated ≥ 85 °C for Ta > 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") on all used housing entries.

Safety installation: Special installation



1

A *Zone 1*
1 *Tank; Zone 0, Zone 1*
2 *Connection and electronics compartment 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 ≥ +xx °C; in accordance with the range of service temperature taking into account additional influences of the process conditions (Ta,min), (Ta,max +30 K). (→ 🖹 9, "Ambient temperature").
- 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 housing at an ambient temperature under −20 °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 housing.
- 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.
- 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.

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)

Potential equalization

Integrate the device into the local potential equalization.

Overvoltage protection

Overvoltage protection against atmospheric over voltages.

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

Position	Terminal
Power supply	G
HART interface	E
external Display	F

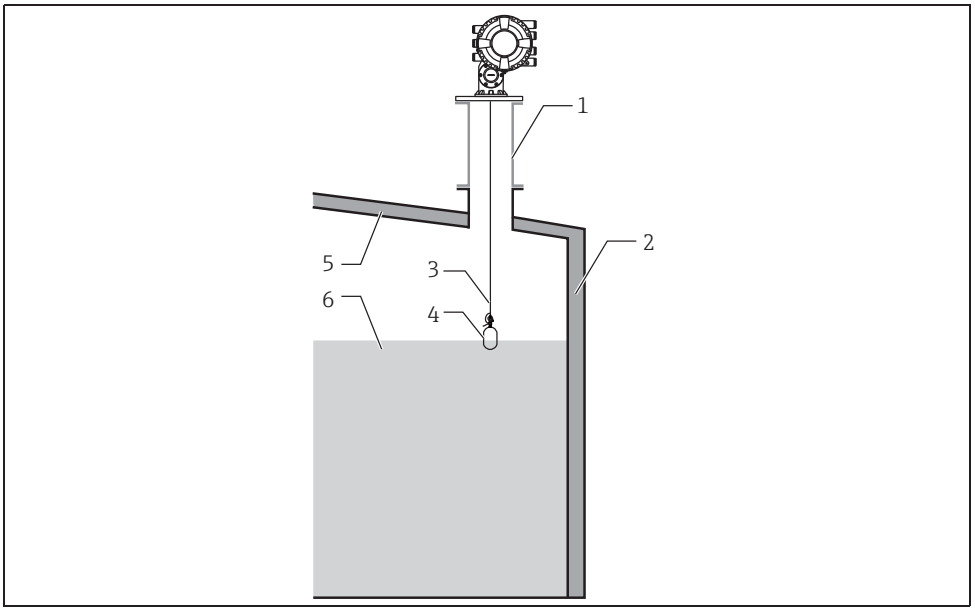
- Device configuration:
  - Basic specification, Position 5, 6 (Primary output) = A1, B1, E1, H1
  - Basic specification, Position 7, 8 (Secondary I/O Analogue) = A1, A2, B1, B2, C2, X0
  - Basic specification, Position 9, 10 (Secondary I/O Digital Ex d) = B1
- All other configurations must be protected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

Ambient temperature

Temperature class	Ambient temperature	Process temperature (Temperature of displacer)
T1	-40°C ≤Ta ≤+80°C	-253°C ≤Tpro ≤+450°C
T2		-253°C ≤Tpro ≤+300°C
T3		-253°C ≤Tpro ≤+200°C
T4		-253°C ≤Tpro ≤+135°C
T5	-40°C ≤Ta ≤+70°C	-253°C ≤Tpro ≤+100°C
T6	-40°C ≤Ta ≤+60°C	-253°C ≤Tpro ≤+85°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.



2

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

The temperature of the flange and the internal temperature of the drum compartment: -40°C ≤ Ta ≤ +60°C, +70°C or +80°C (see 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 group	Displacer weight		
	252 g (Standard)	270 g (Standard: Maximum)	300 g (Weight and Measure)
IIA	50.5 m	47.1 m	42.4 m
IIB	50.5 m	47.1 m	42.4 m
IIC	24.2 m	22.6 m	20.3 m

EN 13463-1:2009 clause 6.4.2.2.2 requirement of single impact energy limits for category 1G:

Gas group	Impact energy limit (E)
IIA	125 Nm
IIB	125 Nm
IIC	60 Nm

Calculation formula: Hmax = E / (Wd * 9.81)

CAUTION 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.

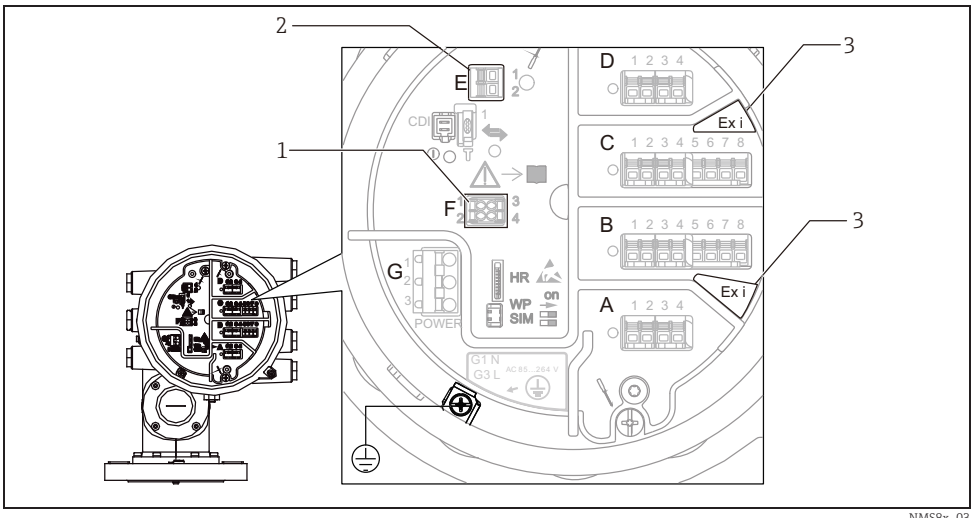
Safety installation: Zone 0

- In the event of potentially explosive vapor/air mixtures, only operate the device under atmospheric conditions.
  - Temperature: 20 to +60 °C
  - Pressure: 80 to 110 kPa (0.8 to 1.1 bar)
  - Air with normal oxygen content, usually 21% (V/V)
- If no potentially explosive mixtures are present, or if additional protective measures have been taken, the device may also be operated under non-atmospheric conditions in accordance with the manufacturer's specifications.

Connection data

Basic specification, Position 1, 2 (Approval) = MC

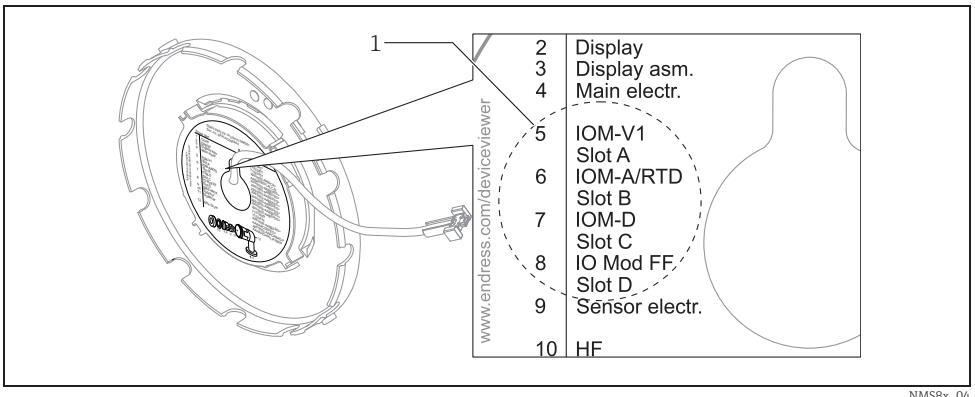
Connection compartment Ex d



3

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:



4

1 Area device configuration

- For detailed information, see Operating Instructions.
- For assignment of the terminals, see designation of front plane.

TRC [01], type power supply

Terminal	G	CDI
	G1: L G2: not connected G3: N	plug connected
Designation	**Power / Mains**	**Local LCD, CDI (internal)**
non-Ex	U_N = 85...264 V AC, 50/60 Hz P_N = 28.8 VA	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	U_N = 24 V DC $P_N \leq$ 426 mW	U_N = 3.3 V DC P_N = 41 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	U_N = 12 V DC $P_N \leq$ 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	U_N = 24 V DC $P_N \leq$ 414 mW U_M = 250 V	Currently not supported

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

Terminal	**Slot B or slot C**	
Operation mode: ▪ 4...20 mA output or HART slave + 4...20 mA output or ▪ 4...20 mA input or ▪ HART master + 4...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): Ui = 29 V Ii = 106 mA Pi = 760 mW C_i = 11 nF Li = 0
non-Ex	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 µA DC $P_N \leq$ 160 µW	Terminals 1-2 (Passive): U_N = 29 V DC $P_N \leq$ 653 mW

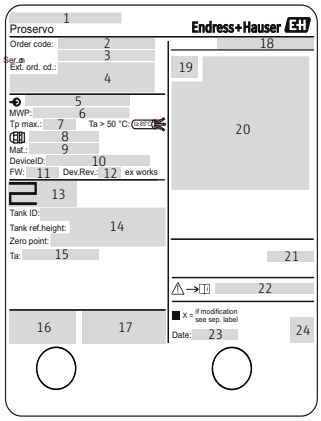
TRC [21], type "Analog module" (Ex d); 4-20 mA HART; optional

Terminal	**Slot B or slot C**	
Operation mode: ▪ 4...20 mA output or HART slave + 4...20 mA output or ▪ 4...20 mA input or ▪ HART master + 4...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	Terminals 4-5 (24 V): not used	Terminals 2-3 (Active): U_N = 24 V DC $P_N \leq$ 540 mW U_M = 250 V
	Terminals 5-8 (RTD): I_N = 400 µA DC $P_N \leq$ 160 µW U_M = 250 V	Terminals 1-2 (Passive): U_N = 29 V DC $P_N \leq$ 653 mW U_M = 250 V

TRC [31], type Digital; optional

Designation	**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	Relay: U_N = 250 V AC/DC $I_N \leq 2$ A	Relay: U_N = 250 V AC/DC $I_N \leq 2$ A
	Digital Input: U_N = 5...230 V AC/DC U_M = 250 V	Digital Input: U_N = 5...230 V AC/DC U_M = 250 V

Attachment: Nameplate view



Pos	Position	VGR	Code	Text	Ex-relevant
1	Manufacturer address	-	MC	Made in Japan, 406-0846 Yamanashi	yes
2	Order code	-	MC	NMS80- 27 digits, mandatory	yes
				NMS81- 27 digits; mandatory	yes
				NMS83- 27 digits; mandatory	yes
3	Serial number	-	-	mandatory	yes
4	Extended order code	-	-	optional, digits not limited	no
5	Supply voltage	030	B	85-264VAC; LCD + operation	yes
			D	24-62VAC/DC; LCD + operation	yes
6	Maximum process pressure	080	1	0.2bar/20kPa/2.9psi	yes
			2	6bar/600kPa/87psi	yes
			3	25bar/2.5MPa/362psi	yes
7	Maximum process temperature	-	-	depends on liquid temperature in the tank	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 in contact with process	-	-	depends on liquid type	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...+60°C	yes
16	CE mark / C-tick mark	-	-		no
17	Additional information of the device version	-	-	marks, not relevant for Ex: e.g. C-Tick, SIL, 3A, ...	no
18	Ingress protection	-	-	IP68 / 66	yes
19	Certificate symbol	010	MC	Segurança INMETRO OCP 0004	yes
20	Data concerning Ex approvals	010	MC	INMETRO TÜV 17.1694 X	yes
				Ex db [ia Ga]IIC T6...T1 Ga/Gb	
			MC	WARNINGS	yes
				– do not open when an explosive atmosphere is present	
				– potential electrostatic charging hazard – see instructions	
				– Ta and T-code reqs. Per XA01495G	
21	General certificate of approval	010	all	e.g. Overspill protection; optional	no
22	Associated Safety Instruction (XA)	010	MC	XA01705G-. (actual rev.)	yes
23	Manufacturing date	010	all	YYYYY-MM	yes

NMS8x_05

www.addresses.endress.com

Endress+Hauser

People for Process Automation