



Instruction Manual PAx9



Issue

Information on issue	
Document ID	NAN-KD-0030-en
Issue	V01.02
Date	April 2021

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1 General information

Use for intended purpose

- The product may only be used for the applications specified in this document and in the technical documentation. Transportation with due care and attention, correct storage and installation as well as careful use and maintenance during operation of the product must be ensured to guarantee trouble-free and safe operation.
- The product must be used at all times in agreement with the technical specifications. In particular, compliance with the ambient conditions recommended in the technical documentation must be ensured.

Installation, assembly, repair and maintenance work

- Observe the relevant national regulations and observe the applicable standards and directives for special applications.
- Installation, assembly, repair and maintenance work must be carried out exactly according to the installation and maintenance instructions applicable to the individual products in order to guarantee their functional reliability and avoid installation errors and damage.
- Installation, assembly, repair and maintenance work must only be performed by qualified and authorised technical personnel in accordance with the relevant documentation, especially the safety and warning information contained therein.
- Make sure that no excess parts (screws, tools, etc) are left behind in or on products after performing installation, assembly, repair or maintenance work. Non-compliance with this requirement may cause malfunctions and/or damage to the products or the system.
- Make sure a function test is carried out on completion of installation, assembly, repair and maintenance work to ensure trouble-free operation of the products.

Suitable tools and equipment

Only suitable tools and equipment, especially materials provided by NORIS, are to be used for installation, assembly, repair and maintenance work. Damaged products or components are to be replaced only by genuine NORIS components or parts. NORIS shall accept no liability whatsoever for any damage incurred as the result of using unauthorised spare parts. This will invalidate the warranty. Keep the operating instructions in a place that is accessible to all users at any time.

Modification of products

NORIS shall accept no liability whatsoever if unauthorised modifications have been made to the products. This will also invalidate the warranty. Therefore, consult our technical staff before undertaking any modifications.

Shipping, appropriate storage and packaging

Products that are sent in for repair must be appropriately packaged to prevent damage (from impacts, moisture, static charge, etc). Make sure that products and all spare parts are stored correctly. Refer to the corresponding technical information for further information.

Disclaimer

We review the contents of our technical documentation at regular intervals to ensure it agrees with our products. Nevertheless, variations cannot be completely ruled out. NORIS therefore cannot guarantee complete agreement of the documentation contents with the hardware and software. Changes and corrections will be included in subsequent issues of the technical documentation.

2 General information on this instruction manual

2.1 Scope of validity

This instruction manual applies to the sensors listed below:

Sensor type	Product revision
PAX9	- - -

Important information on the use of this instruction manual and supplementary information

In addition to the information in this instruction manual, refer also to the information in the customer drawing for installation, commissioning and operation.

2.2 Subject of the instruction manual

The subject of this instruction manual is the installation, commissioning, operation and maintenance of pressure transmitters series PAX9. Furthermore, this instruction manual also contains important troubleshooting information.

2.3 Use of safety and warning notes



Warning about the type and source of immediate danger that leads to death or serious injuries when disregarding the given precautions.



Warning about the type and source of danger that may possibly lead to death or serious injuries when disregarding the given precautions.



Warning about the type and source of danger that may lead to minor injuries when disregarding the given precautions.



Warning about the type and source of danger that may lead to material damages when disregarding the given precautions.

2.4 Scope of delivery

Pressure transmitters type series PAX9 are delivered with a flat gasket. Ensure that this flat gasket is part of your delivery.

2.5 Accessories and spare parts

Available accessories

There are no additional accessories available for pressure transmitters type series PAX9.

Available spare parts

There are no additional spare parts available for pressure transmitters type series PAX9.

3 Product description

3.1 Safety notes

NOTICE

Select the appropriate pressure transmitter with regard to scale range, performance, medium-contacting parts and specific measurement conditions prior to installing and starting the instrument

Otherwise the transmitter can be damaged.



CAUTION

Observe the relevant national regulations and observe the applicable standards and directives for special applications (e.g. with dangerous media such as acetylene, flammable gases or liquids and toxic gases or liquids and with refrigeration plants or compressors).

If you do not observe the appropriate regulations, serious injuries and/or damage can occur!



CAUTION

Open pressure connections only after the system is without pressure!

Please make sure that the pressure transmitter is only used within the overload threshold limit all the time!

Observe the ambient and working conditions outlined in „Technical data“.

Observe the technical data for the use of the pressure transmitter in connection with aggressive / corrosive media and for the avoidance of mechanical hazards. Open circuit before removing connector / cover.

Ensure that the pressure transmitter is only operated in accordance with the provisions i.e. as described in the following instructions.

Do not interfere with or change the pressure transmitter in any other way than described in these operating instructions.

Remove the pressure transmitter from service and mark it to prevent it from being used again accidentally, if it becomes damaged or unsafe for operation.

Otherwise serious injuries may occur and the transmitter can be damaged.



CAUTION

Take precautions with regard to remaining media in removed pressure transmitter.

Remaining media in the pressure port may be hazardous or toxic!

3.2 Scope of application

Series PAX9 pressure transmitters are mainly used in: Shipbuilding industry, transport technology, machinery and equipment. They measure the pressure of liquid or gaseous media.

NOTICE

Caution: An unsuitable pressure medium may damage or even destroy the pressure sensor!

Therefore, please check whether the pressure medium is suitable for the medium-contacting parts of the pressure sensor before installation and use. For further information please read the technical data.

3.3 Measuring principle

The pressure prevailing within the application is transformed into a standardised electrical signal through the deflection of the diaphragm, which acts on the sensor element with the power supply fed to the transmitter. This electric signal changes in proportion to the pressure and can be evaluated correspondingly.

3.4 Type code

Type code structure						
PA	G	9	-81	-11	I2 A	Example: PAG9-81-11I2A
Reference						
Construction type 9						
Connection thread						
Measuring range						
Signal output						
Electrical connection						

Type code PAx9-... (standard and preferred types)									
Reference	A	Absolute pressure							
	G	Relative pressure							✱
Construction type	9								
Connection thread		81	G 1/4 B						✱
		90	1/4 - 18 NPT						
		21	M14x1.5						
Measuring range		See measuring range table							
Signal output				I2	4 – 20 mA				✱
				U1	0 – 10 V				
Electrical connection						A	Elbow connector as per DIN 175301-803 Form A		
					E	Circular connector M12x1			
					X	Cable outlet, length 2 m			
PA	9	-	-			Example: PAG9-81-11I2A			

Preferred types

Features marked with a ✱ symbol at the end of the line are preferred features. If you select a preferred feature for each placeholder, the device is specified as preferred type. Preferred types are available quickly from stock. Other types will be delivered according to scheduled appointments.

4 Technical data

Electrical connection	
Supply voltage	8 ... 30 VDC @ output signal 4 ... 20 mA; 14 ... 30 VDC @ output signal 0 ... 10 VDC
Current limitation	Power supply by energy-limited electrical circuit in accordance with 9.3 of UL/EN/IEC 61010-1 or LPS in accordance with UL/EN/IEC 60950-1 or Class 2 in accordance with UL1310/UL1585 (NEC or CEC) (the power supply must also be suitable for operation at an altitude above 2000 m, if used in these heights)
Reverse voltage protection	UB against 0 V
Short-circuit protection	S+ against 0 V (only U1 version)
Electrical connection	Angular connector Form A EN175301-803, circular connector Euro M12 x 1, cable outlet 2 m length
Pressure connection	G¼ B, ¼ - 18 NPT, M14 x 1.5
Signal acquisition	
Standard measuring range	See measuring range table
Special measuring range	See measuring range table
Electrical output	
Output signal and maximum permissible load	4 ... 20 mA, 2-wire, $RA \leq (UB - 8 \text{ V}) / 0.02 \text{ A}$; 0 ... 10 VDC, 3-wire, $RA > 10 \text{ k}\Omega$;
Accuracy	$\leq \pm 1 \%$ of the range (including non-linearity, hysteresis, zero point and final value deviation (IEC 6198-2)); calibrated in vertical mounting position with process connection facing downward
Non-linearity	$\leq \pm 0.5 \%$ of range
Non-repeatability	$\leq 0.1 \%$ of range
Long-term drift	$\leq \pm 0.1 \%$ of range (under reference conditions)
Transient response	Transient recovery time $< 4 \text{ ms}$; turn on-time $< 15 \text{ ms}$

Environmental influences	
Operating temperature	Permissible measured medium temperature: -30 ... +100 °C Permissible ambient temperature: -30 ... +100 °C (for type -X cable outlet 0 ... +80°C)
Storage temperature	-30 ... +100 °C (for type -X cable outlet -20 ... +80 °C)
Vibration resistance	IEC 60068-2-6: 10 g (resonance)
Shock resistance	IEC 60068-2-27: 500 g (mechanical)
Protection class	IP 65: Elbow connector Form A EN 175301-803; IP 67: Circular connector Euro M 12 x 1, cable outlet 2 m length
Mechanical properties	
Material	Parts in contact with measured medium: < 10 bar CrNi steel 316L; > 10 bar CrNi steel 316L and 13-8 PH, housing CrNi steel 316L (check the pressure medium for suitability for medium-contacting parts)
Weight	Approx. 80 g
Other	
Approvals	DNV
CE Conformity	Pressure Equipment Directive 97/23/EC; EMC Directive 2004/108/EC EN 61326 Emission (Group 1, Class B) and interference immunity (industrial environment)

Preferred types

Features marked with a * symbol at the end of the line are preferred features. If you select a preferred feature for each placeholder, the device is specified as preferred type. Preferred types are available quickly from stock. Other types will be delivered according to scheduled appointments.

Measuring range PAX9					
		Code	Measuring range [bar]	Overload [bar]	
Standard	Absolute or relative	01	1 bar	2 bar	
		02	1.6 bar	3.2 bar	
		03	2.5 bar	5 bar	✱
		04	4 bar	8 bar	✱
		05	6 bar	12 bar	✱
		06	10 bar	20 bar	✱
		07	16 bar	32 bar	
		08	25 bar	50 bar	
	Relative	09	40 bar	80 bar	✱
		10	60 bar	120 bar	
		11	100 bar	200 bar	
		12	160 bar	320 bar	
		13	250 bar	500 bar	
		14	400 bar	800 bar	
		15	600 bar	1200 bar	
Special	Relative	20	2 bar	4 bar	
		21	3 bar	6 bar	
		22	-1...4 bar	10 bar	
		23	5 bar	10 bar	
		24	7 bar	14 bar	
		25	8 bar	16 bar	
		26	15 bar	30 bar	
		27	20 bar	40 bar	
		28	30 bar	60 bar	
		29	50 bar	100 bar	
		30	150 bar	300 bar	
		31	180 bar	360 bar	
32	300 bar	600 bar			

5 Installation and commissioning

5.1 Tools and equipment



Have the following tools and equipment ready for commissioning:

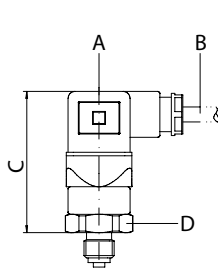
- Open-ended spanner (spanner width 27)
- Screwdriver

NOTICE

Make sure that the tools and equipment are in perfect working order.

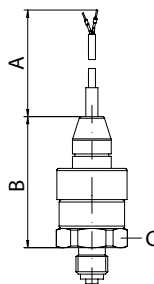
Otherwise the pressure transmitter can be damaged.

5.2 Dimensions



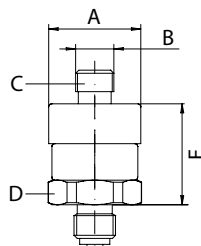
Angular connector form A

- A) Angular connector as per DIN 175301-803
B) $\varnothing 6...8$ mm
C) Length 61.5 mm
D) WAF 27 mm



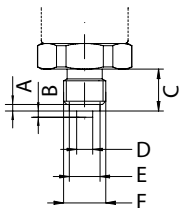
Cable terminal

- A) Length 2 m
B) Length 54.5 mm
C) WAF 27 mm



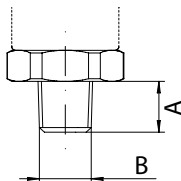
Circular connector M12 x 1

- A) $\varnothing 29$ mm
B) M12x1
C) 4-pin circular connector
D) WAF 27 mm
E) Length 33 mm



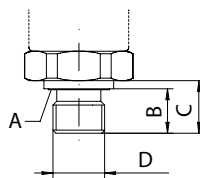
Process connection G1/4B

- A) Length 2 mm
- B) Length 2 mm
- C) Length 13 mm
- D) Ø 5 mm
- E) Ø 9.5 mm
- F) G 1/4 B



Process connection 1/4-18 NPT

- A) Length 13 mm
- B) 1/4 - 18 NPT



Process connection M14x1.5

- A) Nitrile rubber seal
- B) Length 12 mm
- C) Length 14 mm
- D) M14x1.5

5.3 Installation

Install the transmitter in your application in compliance with the following notes:

- During mounting, make sure that the sealing faces at the instrument and the measuring point are clean and undamaged.
- Only ever screw in, or unscrew, the transmitter via the spanner flats and to the prescribed torque using an appropriate tool. The correct torque (maximum 50 Nm) depends on the dimensions of the process connection and the gasket used (form/material). **NOTICE! When screwing in or unscrewing the pressure transmitter, do not use the housing as contact surface. This may damage the transmitter.**
- **NOTICE! When screwing in, do not cross the threads. This may damage the transmitter.**

5.4 Sealing

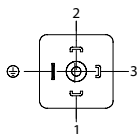
Correct sealing of the process connections with parallel threads at the sealing face must be made using suitable flat gaskets or sealing rings or proper sealings. The sealing of tapered threads (e.g. NPT threads) is made by providing the thread with additional sealing material such as, for example, PTFE tape (EN 837-2).

5.5 Electrical connection

Note the following instructions and connection variants (see Section "Connection variants [► 16]" and "Connection of the angular connector [► 17]") for electrical connection:

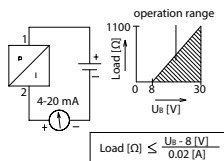
- The instrument must be grounded via the process connection.
- The power supply for the pressure transmitter must be made via an energy-limited electrical circuit in accordance with section 9.3 of UL/EN/IEC 61010-1, or an LPS per UL/EN/IEC 60950-1, or class 2 in accordance with UL1310/ UL1585 (NEC or CEC). The voltage supply must be suitable for operation above 2,000 m should the pressure transmitter be used at this altitude.
- Select a cable diameter that matches the cable gland of the plug. Make sure that the cable gland of the mounted plug has a tight fit and that the seals are present and undamaged. Tighten the threaded connection and check that the seal is correctly seated, in order to ensure the ingress protection.
- For cable outlets, make sure that no moisture enters at the cable end.

5.5.1 Connection variants

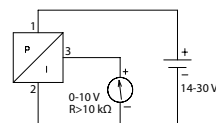


Electrical connection, angular connector form A

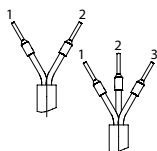
- 1) $+U_B$
- 2) $-U_B$ (0V)
- 3) S+ (only U1 version)



Wiring diagram, angular connector form A, 2-wire technology

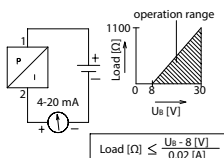


Wiring diagram, angular connector form A, 3-wire technology

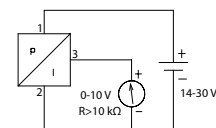


Electrical connection, cable outlet

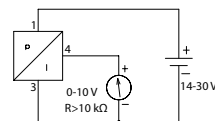
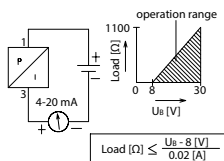
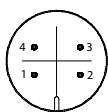
- 1) Brown = $+U_B$
- 2) Blue = $-U_B$ (0V)
- 3) Black = S+



Wiring diagram, cable outlet, 2-wire technology



Wiring diagram, cable outlet, 3-wire technology



Electrical connection, circular connector M12x1

- 1) +U_B
- 2) Not connected
- 3) -U_B (0V)
- 4) S+ (U1-Version)

Wiring diagram, circular connector M12x1, 2-wire technology

Wiring diagram, circular connector M12x1, 3-wire technology

5.5.2 Connection of the angular connector

Follow the instructions to connect the cable to the angular connector:

- A. Loosen the screw (see next Fig., Pos.1).
- B. Loosen the cable gland (see next Fig., Pos.2).
- C. Pull the angular connector away from the instrument (see next Fig., Pos.5 and 6)

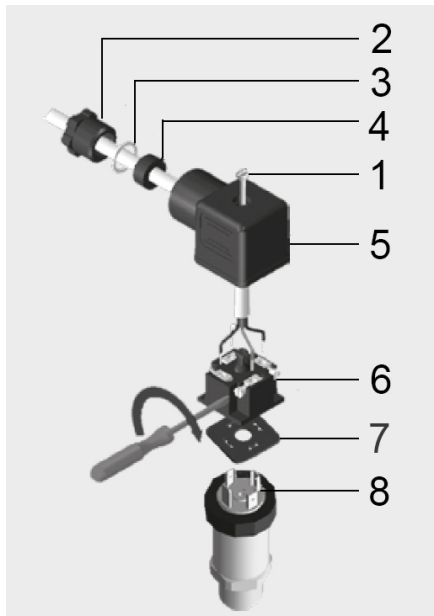
NOTICE

Improper mounting

The seal of the angle housing will be damaged. Do not try to push the terminal block (see next Fig., Pos.6) out using the screw hole (see next Fig., Pos.1) or the cable gland (see next Fig., Pos.2).

- D. Lever the terminal block (see next Fig., Pos.6) out of the angle housing (see next Fig., Pos.5).
- E. Slide the cable through the cable gland (see next Fig., Pos.2), the ring (see next Fig., Pos.3), the sealing (see next Fig., Pos.4) and the angle housing (see next Fig., Pos.5).
- F. Connect the cable ends to the terminal blocks (see next Fig., Pos.6) in accordance with the connection diagram. (see Section "Connection variants" ▶ 16").
- G. Press the angle housing (see next Fig., Pos.5) onto the terminal block (see next Fig., Pos.6).
- H. Make sure that the seals are not damaged and that the cable gland and seals are assembled correctly in order to ensure ingress protection.
- I. Tighten the cable gland (see next Fig., Pos.2) around the cable.
- J. Place the flat gasket (see next Fig., Pos.7) over the transmitter's connection pins.
- K. Push the angular connector (see next Fig., Pos.5 and 6) onto the instrument.

L. Tighten the screw (see next Fig., Pos.1).



1: PAX9 with angular connector_explored view

Explanation to the previous illustration

1. Screw
2. Cable gland
3. Ring
4. Sealing
5. Angle housing
6. Terminal block
7. flat gasket
8. Connector pins

6 Maintenance

Maintenance	<p>This transmitter is maintenance-free. Repairs must only be carried out by the manufacturer. However, note the following instructions for cleaning, if the transmitter is damaged and you have to remove it or before you send it back to the manufacturer.</p>
Cleaning	<ul style="list-style-type: none">▪ Before cleaning, correctly disconnect the pressure transmitter from the supply voltage and the pressure supply.▪ Clean the instrument with a moist cloth. CAUTION! Do not touch the measuring material, if used with media that may harm people. Otherwise serious injuries can be the result.▪ Wash or clean the dismantled instrument before returning it, in order to protect persons and the environment from exposure to residual media. CAUTION! Residual media in dismantled devices could harm people and environment.▪ Take sufficient precautionary measures.▪ NOTICE! Do not use any pointed or hard objects for cleaning, as they may damage the diaphragm of the process connection.

7 De-installation and disposal

De-installation of sensors

NOTICE

For removing the transmitter, note the instructions and safety notes in the Section "Maintenance [► 19]". In case of claim, also note the instructions for return delivery in the Section "General information [► 4]".

Disposal of defective sensors

Electric devices must not be disposed together with normal waste. Dispose the transmitters in accordance with local requirements for electronic equipment. Note that you have to clean the transmitter, if it was used in applications with harmful media before (see Section "Maintenance [► 19]"). In this case all activities should also comply with the local requirements of poisonous and dangerous substances.

8 Troubleshooting

In the event of any faults, first check whether the pressure transmitter is mounted correctly, mechanically and electrically.

Fault	Cause of failure	Remedy
No output signal	Cable break	Renew the broken cable
Deviating zero point signal	Overpressure limit exceeded	Replace instrument
	Too high/low working temperature	Observe the permissible temperatures
Constant output signal upon change in pressure	Mechanical overload caused by overpressure	Replace instrument
Signal span varies	EMC interference sources in the environment; for example, frequency converter	Shield instrument; cable shield; remove source of interference
Signal span varies/inaccurate	Too high/low working temperature	Observe the permissible temperatures
Signal span drops/is too small	Mechanical overload caused by overpressure	Replace instrument



CAUTION

If faults cannot be eliminated by means of the measures listed above, shut down the pressure transmitter immediately, and ensure that pressure and/or signal are no longer present, and secure the instrument from being put back into operation inadvertently.

In this case, contact the manufacturer.

9 Service

Do you have any questions or do you require help with the installation, commissioning or maintenance? Contact our Service representatives:

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