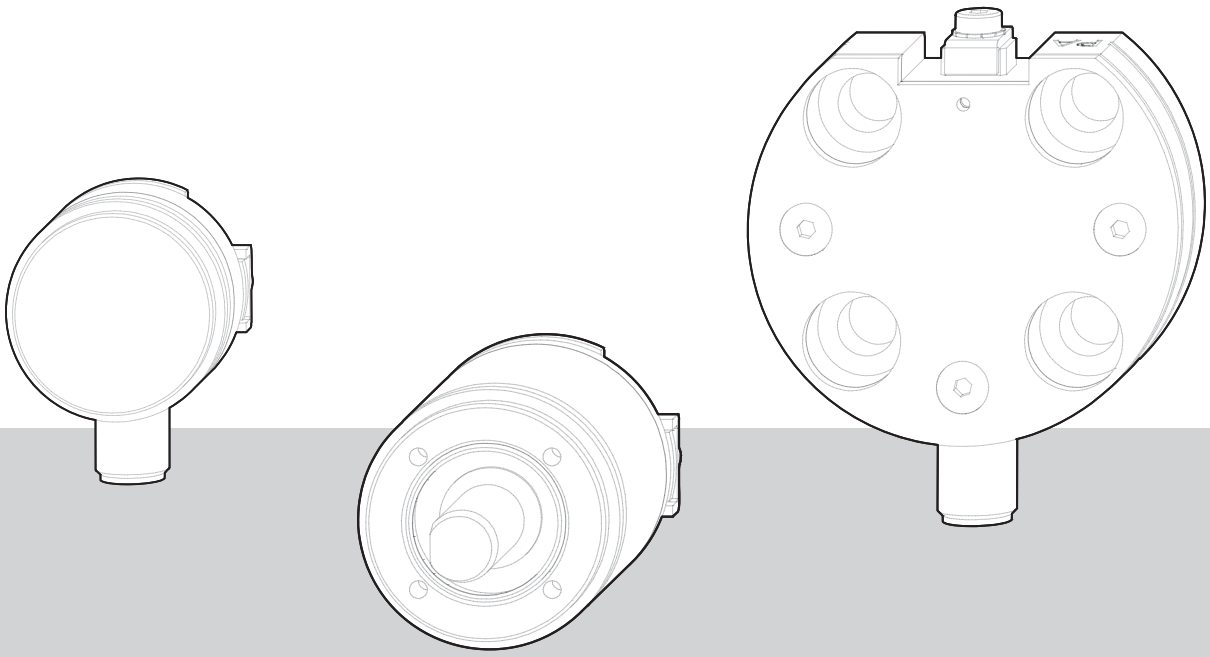
ASM®
perfect in sensors.

posirot®

PRAS2EX, PRAS3EX, PRAS5EX

Magnetic angle sensors, dust-ex proof

Installation and operation manual **EN**



Please read carefully before installation and operation!

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Germany

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1 Safety instructions

1.1 Signal words and symbols



WARNING, Risk of Injury:
Indicates a potentially hazardous situation, which, if not avoided, can result in serious injury or property damage.

⚠ DANGER
WARNING, Risk of Personal Injury or Death:
Indicates a situation that can result in serious personal injury or death if not properly avoided.

⚠ WARNING
WARNING, Risk of Personal Injury or Death:
Indicates a situation that can result in moderate personal injury or death if not properly avoided.

⚠ CAUTION
WARNING, Risk of Personal Injury:
Indicates a situation that can result in minor personal injury if not properly avoided.

NOTICE
WARNING, Risk of Property Damage:
Indicates a situation that can result in minor to major property damage if not properly avoided.

Product liability

- Disregarding the following instructions may result in malfunction, damage to property and personal injury and releases the manufacturer from product liability.

Safety regulations

- National safety regulations must be observed!

1.2 General safety instructions

⚠ DANGER

Danger of explosion! Danger of injury to persons or damage to the property

- Mounting or servicing of the sensor only by qualified personnel who must have knowledge about the type of ex-protection, regulation and ordinance of operating equipment in ex-proof areas.

Explosion risk due to use in non-conforming environment

- The sensor must only be used in the specified environment.
- Special notes concerning the electrical installation of dust-ex proof sensors must be observed.

⚠ WARNING

Danger of injury to the operator or damage to the property

- Connection to power supply must be performed in accordance with safety instructions for electrical facilities and performed only by qualified personnel.
- Any alteration, reconstruction or extension of the sensor is not allowed!
- The sensor must be operated only within values specified in the datasheet.
- The danger of personal injury and danger of property damage due to a malfunction of the sensor in machines or systems must be excluded by additional safety measures.

- In safety-relevant applications, additional facilities must be provided for maintaining safety and preventing damage.
- Check whether the protection class of the sensor is suitable for the application.

1.3 Dust-ex proof marking

The Dust-ex proof marking according to the guideline 2014/34/EU is lasered on the sensor housing.

These are:

PRAS2EX, PRAS5EX-K:

 II 3D
Ex tc IIIC T80°C Dc X

PRAS3EX, PRAS5EX-V:

 II 3D
Ex tc IIIC T80°C Dc X
max. 1000rpm

This means:

II	=	Equipment-group II: Equipment **not** intended for use in underground parts of mines, as well as their overground plants, which are endangered by firedamp or/and combustible dusts
3	=	Equipment category 3: Normal level of safety – application in dust explosion hazardous areas. Equipment in this category is intended for use in areas in which explosive atmospheres – in the case of this sensor caused by dispersed dust – are unlikely to occur, or, if they do occur, are likely to do so only infrequently and for a short period only. Equipment in this category ensures the requisite level of protection during normal operation.
D	=	Air/dust mixture
EX	=	This symbol indicates that the electrical equipment complies with one or more types of protection
Tc	=	Ignition protection class: protection by enclosure IP65
IIIC	=	Group for conductive dust
T80°C	=	Maximum surface temperature of the angle sensor
Dc	=	Equipment Protection Level (EPL): EPL „Dc“ complies with the categorie 3D
X	=	Resists an impact with reduced impact energy of 4J, without X the sensor resists an impact of 7J impact energy
max. 1000rpm	=	Max. revolutions of 1000 1/min resp. max. 1000rpm are admissible. A higher number of revolutions can cause the surface temperature to exceed 80°C.

1.4 Intended use

The angle sensor is intended for angle position measurement via rotation of the position magnet or rotation of the shaft. For determining measuring range, environmental compatibility and connection data of the sensor, please note the data sheet. Use the sensor as intended by operating within its specified technical data and ambient conditions. The environmental conditions are specified in the dust-ex proof category of the sensor.

The installation and operating instructions supplied with the unit must be observed and all maintenance and service work must be carried out. The data sheet of the respective sensor is part of this instruction manual. If not yet available, it may be requested by stating the respective model number.

The sensor must not be used in applications with an explosive gas atmosphere or higher explosive dust atmosphere that requires a higher rated device.

Do not use the sensor in the following environmental conditions:

- abrasive dust e.g. dust including metal or metaloxid, stone dust, glass dust, ceramic dust
- corrosive and aggressive media e.g. atmospheres containing chloride.

2 Transport and storage

⚠ DANGER

Loss of explosion protection in case of shipment damages

- Damaged sensors may no longer meet the specified EX rating and must not be mounted and operated in explosion-risk areas.

Observe storage and transport temperatures according to the operating temperature (see data sheet)

Max. rel. humidity 60%, condensation must be excluded

The device must be secured against slipping and tipping during transport.

Shipment damage

Check sensor immediately for shipment damage. In case of any damage or equipment not operating appropriately, please contact your supplier.

Shipment content

- Sensor
- Installation and operation manual

3 Installation and initial operation

3.1 Mechanical installation

⚠ DANGER

Danger of explosion due to the overheating of the sensor

- Avoid dust deposits.
- Do not exceed the maximum number of revolutions of 1000 1/min (1000 RPM).

Danger of explosion due to the static charge of the sensor

- Do not mount the sensor in the dust particle stream.

Danger of explosion due to the spark flashover in case of insufficient equipotential bonding

- Use electrically conductive shafts/torque arms.
- Sensor housing and sensor shaft must be connected to the same equalization system.

Fixing of the sensor

- Secure mounting screws against loosening, use thread locker if necessary.
- Mount sensor with corrosion-resistant screws.
- Mount sensor on a flat metallic surface.
- Provide protection devices to avoid damage or blocking of sensor and magnet by foreign objects falling into the working area.

Mechanical information for PRAS2EX and PRAS5EX-K

- Contact between sensor and magnet is not allowed.

Mechanical information for PRAS3EX and PRAS5EX-V

- The max. number of revolutions is 1000 1/min (1000 RPM)
- Ensure the sensor is mounted and aligned correctly.
- Use shaft couplings resp. torque arms (e.g. flexible ones) to avoid misalignment errors.

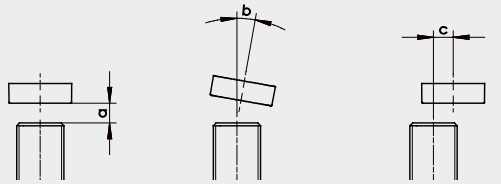
Torque of the fixing screws

Mounting method	Torque [Nm]
M2,5 screws for mounting brackets (PRAS2, PRAS3)	0.8
M3 screws for mounting flange (PRAS3)	1.2
M8 screws (PRAS5)	<20

Placement and alignment of the position magnet

When mounting the position magnets, consider that a large air gap, lack of parallelism and lateral misalignment to the sensor can cause measuring errors. Also, external magnetic fields and magnetized materials nearby can affect the measuring result.

Measuring error by misalignment of the position magnet



Air gap (a)
Parallelism (b)
Axial misalignment (c)

Sensor	Position magnet	Air gap [mm]	Paral-lelism [°]	Error by axial misalignment [°]					
				0.2 mm	0.5 mm	1 mm	2 mm	3 mm	4 mm
PRAS2EX	**PRMAG2-VA**	0 ... 5	5	0.1	0.3	0.8	1.8	6.5	-
	PRMAG2Z-VA	0 ... 9	5	0.1	0.2	0.6	1.5	4.5	8.5
	PRMAG5Z-VA	0 ... 8	5	0.1	0.2	0.6	1.5	4.5	8.5
PRAS5EX	**PRMAG2-VA**	0 ... 4.5	5	0.1	0.3	0.8	1.8	6.5	-
	PRMAG2Z-VA	0 ... 5.5	5	0.1	0.2	0.6	1.5	4.5	8.5
	PRMAG5Z-VA	0 ... 7.5	5	0.1	0.2	0.6	1.5	4.5	8.5

3.2 Electrical installation

⚠ DANGER

Explosion risk!

- Mounting / removal of the sensor under non-explosible conditions only.

NOTICE

Damage or destruction of the sensor due to excessive operating voltage or mounting error

- The applied operating voltage must not exceed the value specified in the data sheet.
- Operate the sensor only within the limits specified in the data sheet.
- Connection to the power supply only by qualified personnel and in accordance with the applicable safety regulations for electrical equipment.
- Do not connect or disconnect the sensor under tension!

Corrosion in the sensor due to moisture penetration

- Use the sensor only according to protection class.
- Avoid crossing the dew point.
- Cable outputs must be installed in such a way that no moisture can get into the cable.
- The protection class of sensors with connector output is valid only if the electrical plug is connected!

Damage of the sensor cable due to mechanical stress

- Use only M12 sockets approved in compliance with ATEX which allow deinstallation only with tools, eg. EVC 04A or EVC 05A of ifm/Essen.
- Do not twist the M12 connector insert.
- It is important that the knurled nut on the connector is tightened to the correct torque, according to the manufacturer's instruction. Use a torque wrench, if needed.
- Cable must be properly secured and protected against damage.
- Cable must be protected from UV-radiation!
- Installation according to DIN EN 60079-14.
- Do not strain the connection cable.
- A separate strain relief is recommended.

Connector Pin assignment

According to the definitions of the output types contained in the appendix. Observe different color code for pre-assembled accessory cables. See catalog information for accessories.

Connect the cable screen - if present - to the local potential equalizer.

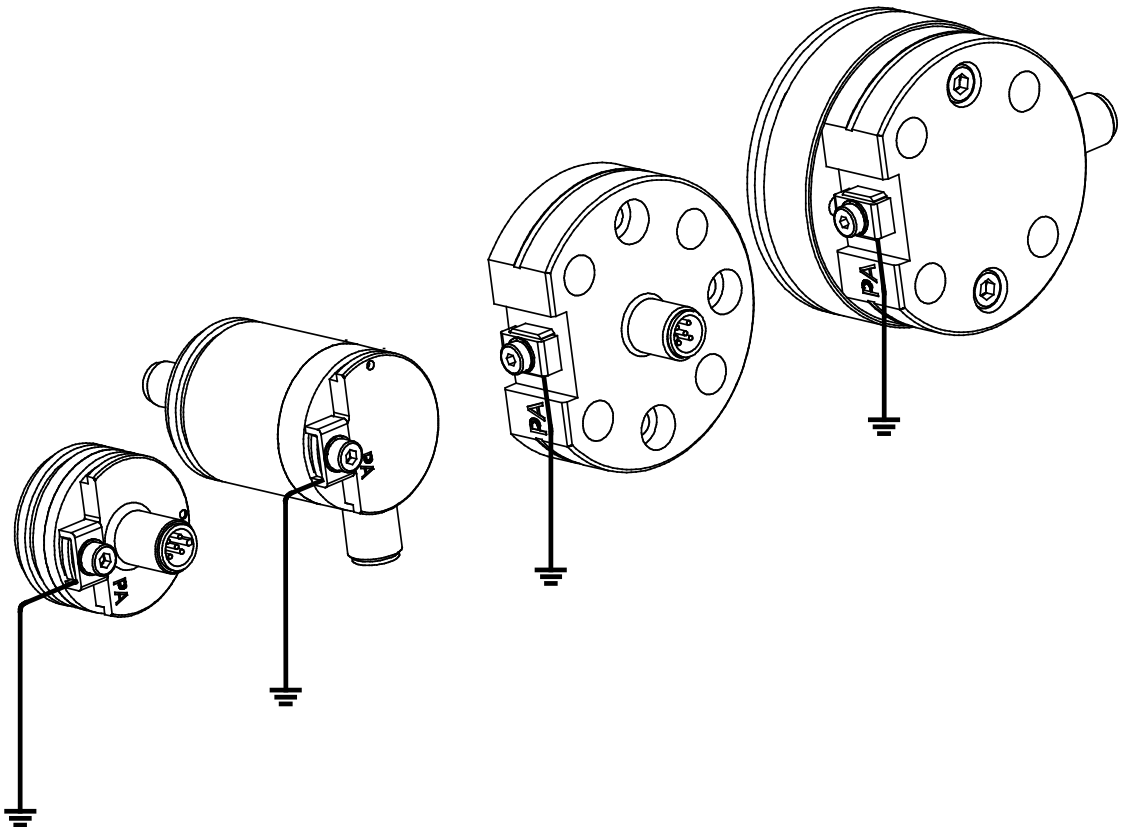
Follow the signal wiring table!

Supply voltage

See specification in the data sheet of the sensor. The maximum operating voltage must not be exceeded.

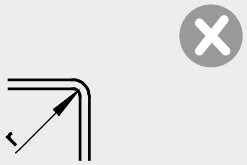
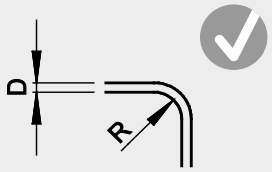
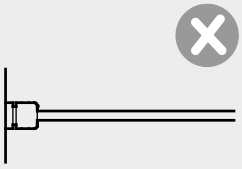
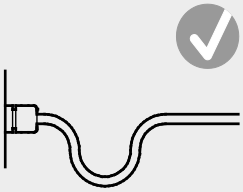
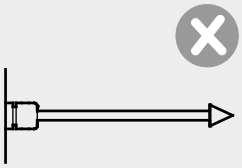
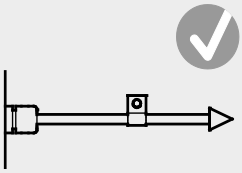
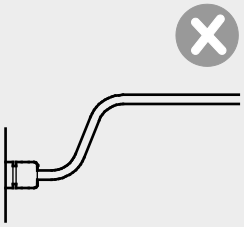
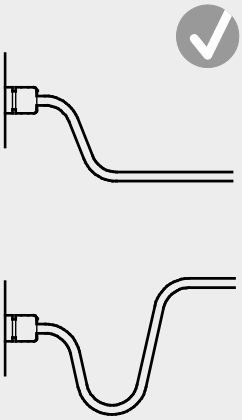
Potential equalization

The local potential equalization has to be realized with a wire cross section of 4 mm² minimum.



PRAS2EX **PRAS3EX** **PRAS5EX-K** **PRAS5EX-V**

Installation of the sensor supply cable

	incorrect	correct
Admissible bending radius of the cable must be observed: R ~ 5 x D R ~ 10 x D (underwater cable)		
Length compensation for the cable must be observed		
A separate cord grip for cable strain relief is recommended		
Observe cable routing in case of splashing water, water condensation and humidity		

Electromagnetic Compatibility (EMC)

Electromagnetic compatibility of posirot® dust-ex proof magnetic angle sensors is influenced by the sensor wiring.

NOTICE

Possible malfunction of the sensor when used in systems with highly interference-prone components such as frequency inverters

Recommended wiring:

- Use single shielded sensor cable with twisted pair conductors for power supply and signal output.
- Connect the cable shield to ground on one side of the control cabinet. Connect the shield connection over a large area using cable clamps before or at the cable entry into the control cabinet. When preassembled cables are delivered, the screen is not connected to the housing on the sensor side.
- Do not install sensor cables close to power conductors such as motor or contactor control cables (use separate cable ducts for signal and power cables).
- Install the cables in metal cable ducts which are connected to the same earth bonding as the dust-ex proof sensors.

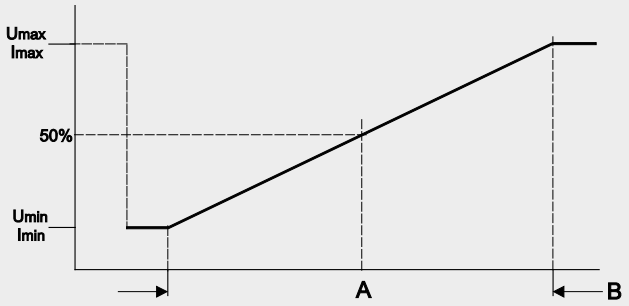
3.3 Operating temperature

posirot® PRAS2EX	-20 … +40°C
posirot® PRAS3EX	-20 … +40°C
posirot® PRAS5EX	-20 … +40°C

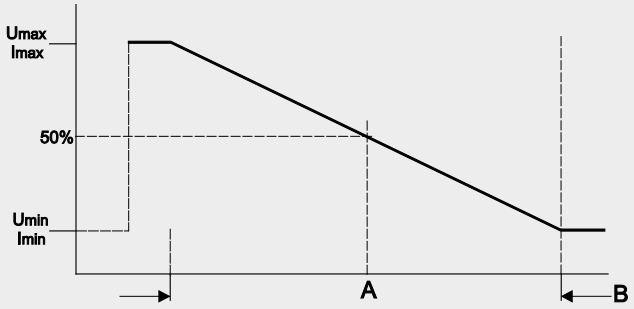
3.4 Characteristics for magnetic angle sensors

For ease of mounting there are reference markings at housing, position magnet and near the shaft. If both markings match output will be on the 50% of full scale.

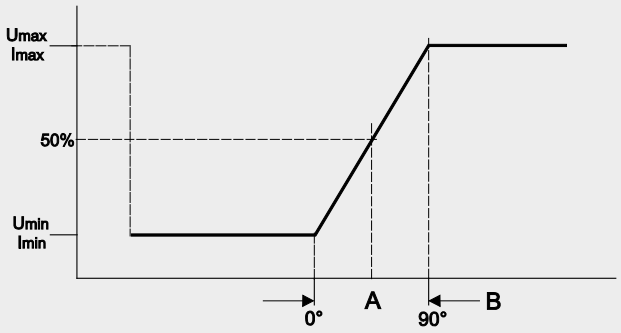
Output signal
(CW increasing*)



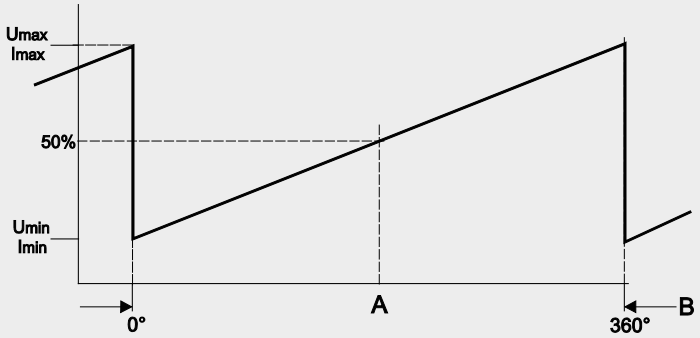
Output signal
(CCW increasing*)



Example angular range 90°

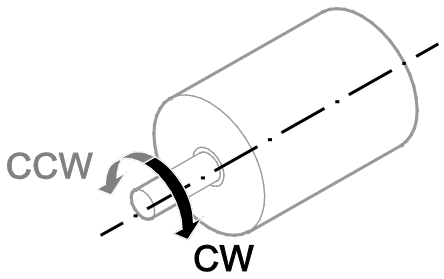


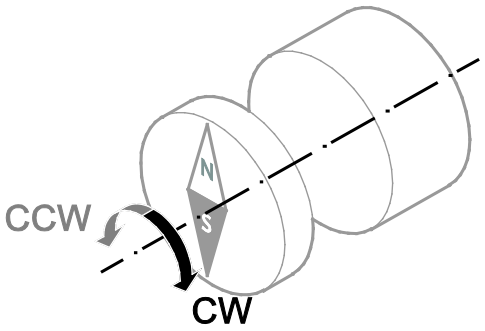
Example angular range 360°



A – Marking
B – Measurement range [°]

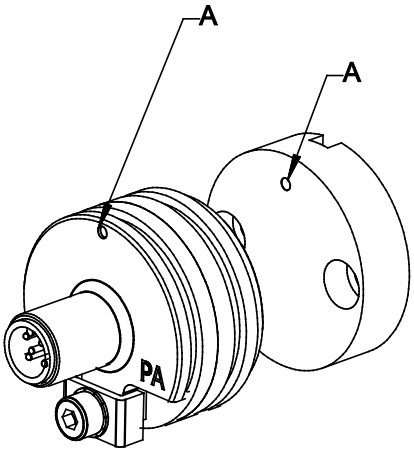
*: Rotation direction of the sensor axis / of the position magnet with a view to the sensor





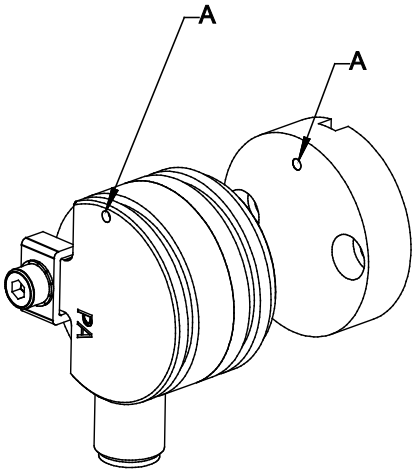
Output	Value range	50% value of output signal
U2	0.5 ... 10 V	5.25 V
U6	0.5 ... 4.5 V	2.5 V
I1	4 ... 20 mA	12 mA

Reference position PRAS2EX



Connector M12 axial

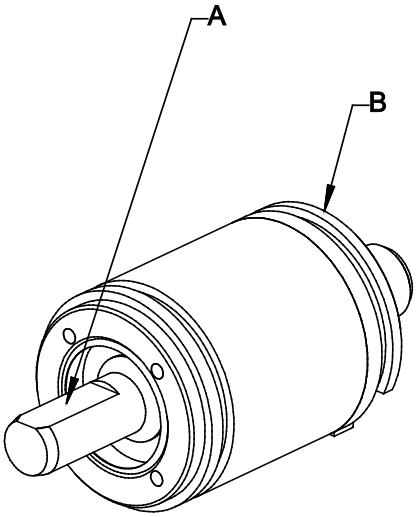
A – Marking
Magnets:
PRMAG2-VA
PRMAG2Z-VA
PRMAG5Z VA



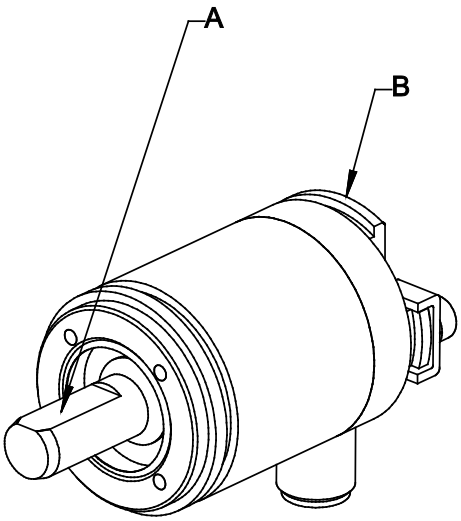
Connector M12 radial

A – Marking
Magnets:
PRMAG2-VA
PRMAG2Z-VA
PRMAG5Z VA

Reference position PRAS3EX, solid shaft



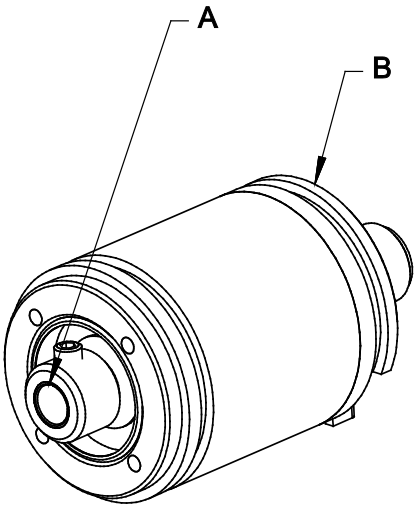
Connector M12 axial



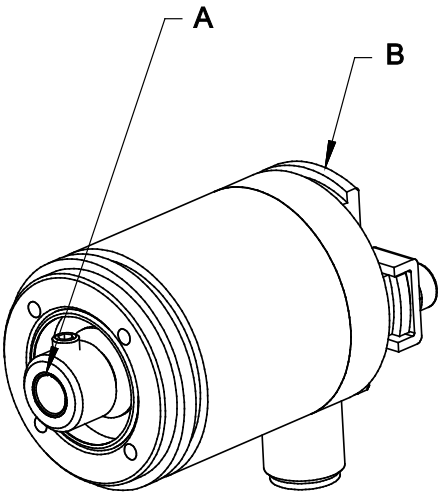
Connector M12 radial

A – Marking
B – Marking (back side)

Reference position PRAS3EX with hollow shaft



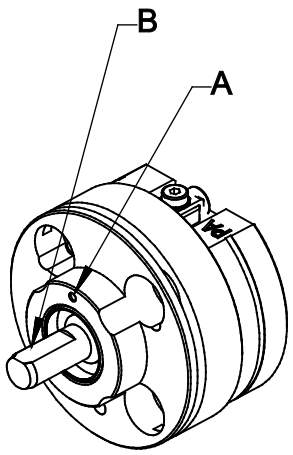
Connector M12 axial



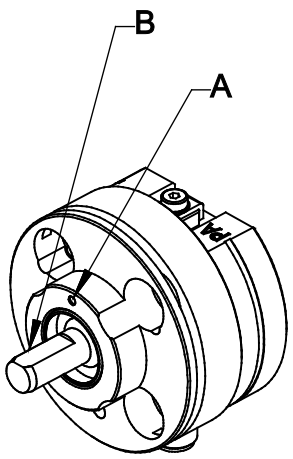
Connector M12 radial

A – Marking
B – Marking (back side)

Reference position PRAS5EX-V



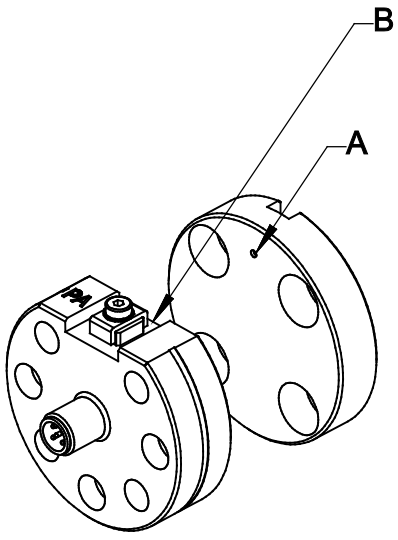
Connector M12 axial



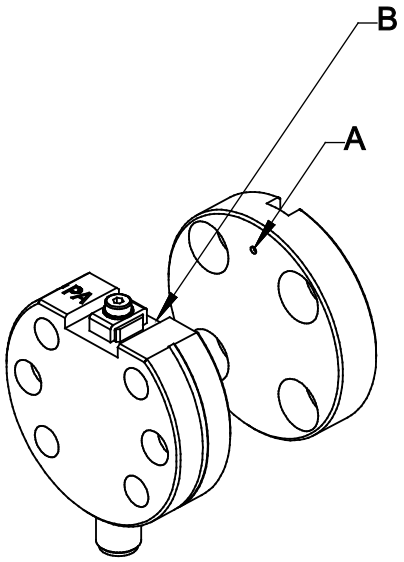
Connector M12 radial

A – Marking
B – Flat area

Reference position PRAS5EX-K



Connector M12 axial



Connector M12 radial

A – Marking
B – Marking (front side)

4 Maintenance and disposal

4.1 Maintenance and service

⚠ DANGER **Explosion risk!**

- Maintenance may only be performed when no explosive atmospheric conditions are present.

Maintenance interval

- Within maintenance activities, especially those parts of the sensor which are associated with the risk of ignition must be checked (e.g. the integrity of connectors, cables, seals etc.). Maintenance intervals are application specific and must be determined by the customer depending on the operating conditions.
- Dust concentrations between sensor and magnet are not allowed – remove any dust deposit – appropriate maintenance intervals must be scheduled.

The following maintenance steps are recommended:

	Check for dust deposit	Integrity of housing, cables connectors	Mounting elements	Visual check of shaft sealing
PRAS2EX	x	x	x	
PRAS3EX	x	x	x	x
PRAS5EX-K	x	x	x	
PRAS5EX-V	x	x	x	x
Actions	Dust deposit: Remove dust	Damaged parts: remove sensor from service and send it to ASM for repair	Loose mounting parts: Screw tight mounting parts with recommended torque, if applicable use bolt adhesive	Damaged shaft sealing: remove sensor from service and send it to ASM for repair

4.2 Deinstallation (dust-ex proof standard-compliant)

⚠ DANGER **Danger of explosion due to incorrect deinstallation**

- Remove sensor only in de-energized condition.
- Removal of the sensor must only be undertaken in non-explosive conditions.

Calibration

The recommended calibration interval is 1 year.

Test protocol and traceable calibration certificate (ISO9001 / ISO10012) is available on request.

4.3 Disposal

Disposal according to applicable government regulations.

5 Output specification

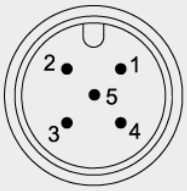
Analog output

U2 Voltage output 0.5 ... 10 V 	Excitation voltage	24 V DC (18 … 36 V DC)
	Excitation current	typical 10 mA max. 15 mA
	Output voltage	0.5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical for 90° … 360°) ±100 x 10^{-6} / °C f.s. (typical for <90°)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

U6 Voltage output 10 … 90 % ratiometric 	Excitation voltage	5 V DC ±10 %
	Excitation current	typical 8 mA max. 12 mA
	Output voltage	10 … 90 % of the excitation voltage
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical for 90° … 360°) ±100 x 10^{-6} / °C f.s. (typical for <90°)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

I1 Current output 4 … 20 mA, 3 wires 	Excitation voltage	24 V DC (18 … 36 V DC)
	Excitation current	typical 30 mA max. 35 mA
	Load R_L	500 Ω max.
	Output current	4 … 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical for 90° … 360°) ±100 x 10^{-6} / °C f.s. (typical for <90°)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

1 channel M12, 5 pin (connector output)

Signal wiring **Connector M12, 5 pin**	**Output signals**	**Connector pin no.**
 View to the sensor connector	Excitation +	1
	Signal	2
	GND	3
	Do not connect!	4
	Do not connect!	5

3-wire current 4...20 mA interface: GND has to be connected!

6 EU Declaration of Conformity

We:

ASM Automation Sensorik Messtechnik GmbH
Am Bleichbach 18-24
85452 Moosinning
Germany

declare under our sole responsibility that the product

Name: **posirot® Magnetic angle sensor, dust-ex proof**

Type:

- **PRAS2EX II 3D Ex tc IIIC T80°C Dc X**
- **PRAS3EX II 3D Ex tc IIIC T80°C Dc X**
- **PRAS5EX-K II 3D Ex tc IIIC T80°C Dc X**
- **PRAS5EX-V II 3D Ex tc IIIC T80°C Dc X**

to which this declaration relates is in conformity with the following EU harmonization standards and other normative documents

Directives:	2014/30/EU	(EMC)
	2011/65/EU, 2015/863/EU	(RoHS-3)
	2014/34/EU	

Standards:
EN 61326-1:2013
EN 60079-0 (September 2019)
EN 60079-31 (December 2014)

Moosinning, April 6, 2021



Dr.-Ing. Gunnar Kamp
Head of Mechanical Engineering



Peter Wirth
Head of Electronic Developmen

perfect in sensors.

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