POSIROT® / PRAS

Analog Magnetic Angle Sensors

Instruction Manual Explosion-proof Sensors

Please read carefully before installation and operation!
Save these instructions for future reference.

Contents

Safety instructions	3
Intended use	4
Non intended use	4
Description	5
Marking	5
Mounting	5
Placement and alignment of the position magnet	5
Reference position	6
Electrical connection	7
Potential equalization	8
Connecting the sensor	8
Mechanical information	11
Torque for the mounting screws	11
Removal	11
Maintenance and service	12
Maintenance interval	12
Outline drawings	13
Specification of the outputs	23
Accessories	25
Position magnets	25
Mounting plates	28
Declaration of conformity	30

Safety instructions

Do not use POSIROT® position sensors in safety critical applications where malfunction or total failure of the sensor may cause danger for man or machine.

For safety related applications additional mechanisms (devices) are necessary to maintain safety and to avoid damage.

Disregard of this advice releases the manufacturer from product liability.

The sensor must be operated only within values specified in the catalog or datasheet.

Connection to power supply must be performed in accordance with safety instructions for electrical facilities and performed only by qualified personnel.

The qualified personnel must have knowledge about the type of ex-protection, regulation and ordinance of operating equipment in ex-proof areas.

Check that the protection class of the sensor is suitable for the operation conditions.

Do not connect or disconnect the sensor under tension!

Disregard of this advice can lead to malfunctions, damage to property or personal injury and releases the manufacturer from product liability.

Intended use

The angle sensor was intended for angle position measurement via rotation of the position magnet or rotation of the shaft, when used in the properly rated ambient explosive atmospheric and technical conditions for which the sensor is designated.

Unintended use

The unintended use is when the application has an explosive gas atmosphere or higher explosive dust atmosphere that requires a higher rated device.

Description

The angle sensors PRAS of the POSIROT® product family perform touchless or shaft based angle measurement. A position magnet rotates in front of the sensing area of the sensor head. The angular position is converted into a standardized high resolution voltage or current output. Measuring ranges 15° to 360° having rising or falling characteristic are available.

Marking Sensors

PRAS2EX-M12A	Ⓔx II 3D Ex tc IIIC T80°C Dc X
PRAS2EX-M12R	Ⓔx II 3D Ex tc IIIC T80°C Dc X
PRAS3EX-M12A	Ⓔx II 3D Ex tc IIIC T80°C Dc X
PRAS3EX-M12R	Ⓔx II 3D Ex tc IIIC T80°C Dc X
PRAS5EX-K-M12A	Ⓔx II 3D Ex tc IIIC T80°C Dc X
PRAS5EX-K-M12R	Ⓔx II 3D Ex tc IIIC T80°C Dc X
PRAS5EX-V-M12A	Ⓔx II 3D Ex tc IIIC T80°C Dc X
PRAS5EX-V-M12R	Ⓔx II 3D Ex tc IIIC T80°C Dc X

II	= Equipment group II
3	= Hazard Category 3
D	= applicable in Zone 22; D = dust
tc	= Protection by enclosure: dust, zone 22
IIIC	= conductive dust
T80°C	= The maximum allowed housing temperature is 80 °C
X	= Tested with low impact energy 4 J

Ambient temperature: -20 °C to +40 °C

Mounting

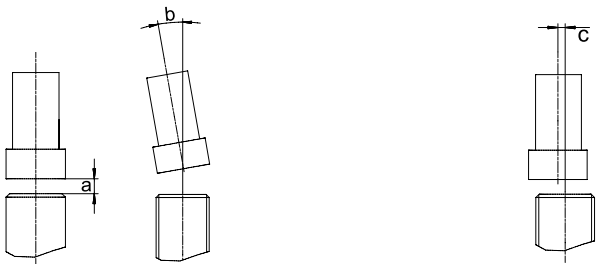
Placement and alignment of the position magnet

CAUTION

For non-contact sensor models air gap and alignment of sensor and position magnet has to be observed. The linearity will degrade in case of misalignment. Also external magnetic fields and magnetized materials nearby can effect the measuring result.

Measuring error by misalignment of the position magnet

Sensor	Position magnet	Air gap [mm]	Parallelism [°]	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

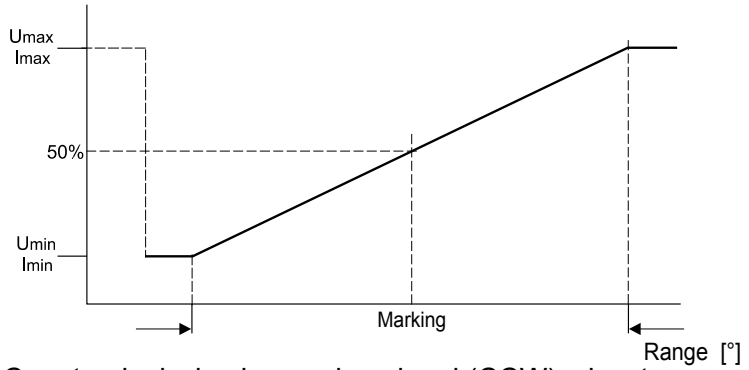


Mounting

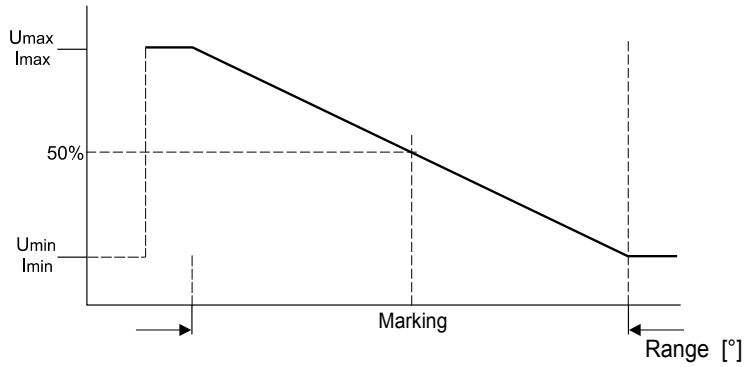
Reference position

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.

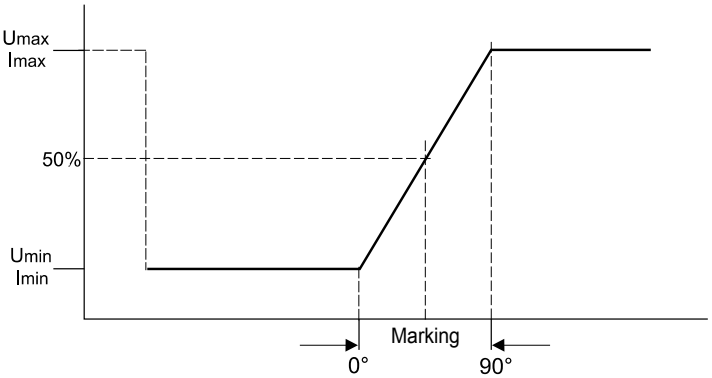
Clockwise increasing signal (CW), view to measuring area/shaft



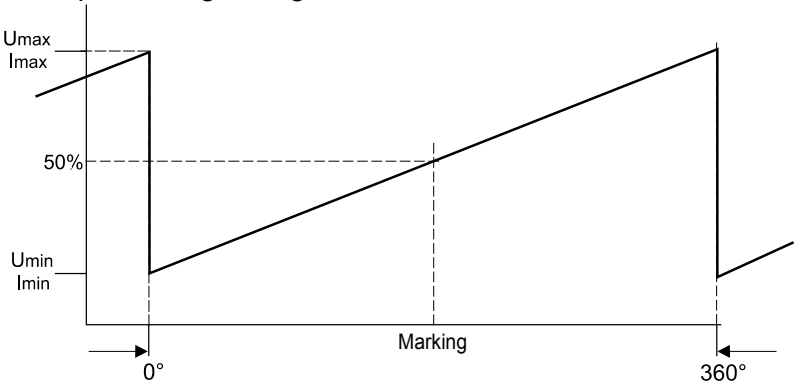
Counterclockwise increasing signal (CCW), view to measuring area/shaft



Example for angle range 90°



Example for angle range 360°



Mounting

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

Elektrical connection

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

Excitation voltage, excitation current

Wiring of the connector or the connecting cable, excitation voltage and excitation current see chapter “Specification of the outputs“ at the end of this manual.

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

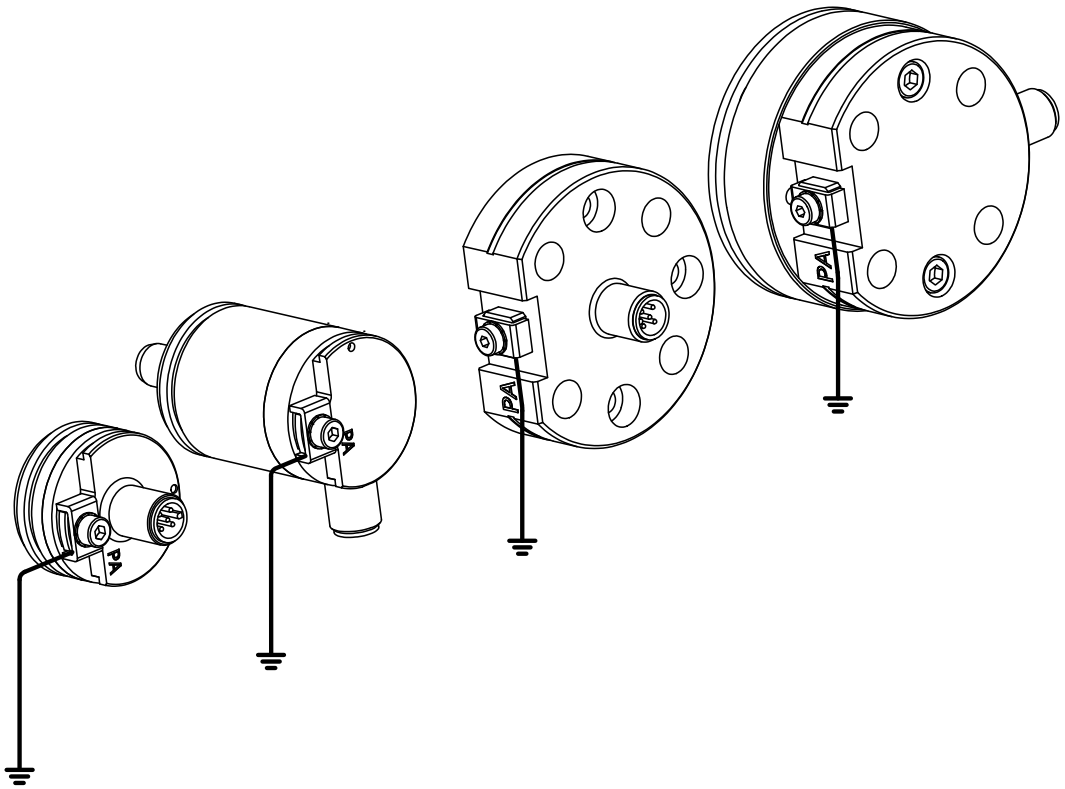
Caution:

- Assembled accessory cables may have different wire colors! Take notice of the accessory pages of the catalog.
- Sensors with connector output have the given IP protection class only with the correct plugged mating connector!
- Follow the signal wiring table!

Mounting

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

Connecting the sensor

- Connecting and disconnecting of the M12 connector / socket only if excitation voltage is OFF.

Mounting

- Only approved M12 connector / socket can be used, which can removed only with special tools, e.g. z.B. EVC 04A or EVC 05A of ifm/Essen
- Cables must be fixed firmly and protected against damage.
- Protect cables against UV radiation.
- Do not turn the M12 connector insert.
- A separate cord grip is recommended.
- Installation according to DIN EN 60079-14.

Mechanical information

- Do not mount the sensor in dust condition.
- Avoid dust deposit.
- Do not expose the sensor to shocks, the housings have been tested with low impact energy (DIN EN 61241-0).

PRAS2EX-M12A	Impact energy 4J
PRAS2EX-M12R	Impact energy 4J
PRAS3EX-M12A	Impact energy 4J
PRAS3EX-M12R	Impact energy 4J
PRAS5EX-K-M12A	Impact energy 4J
PRAS5EX-K-M12R	Impact energy 4J
PRAS5EX-V-M12A	Impact energy 4J
PRAS5EX-V-M12R	Impact energy 4J

- Do not expose the sensor to shocks or any kind of impacts.
- Tightening torque – see following table.

Torque of the fixing screws

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

General information

- Secure mounting screws against loosening, use threadlocker if necessary.
- Mount sensor with corrosion-resistant screws.
- Mount sensor on a flat and smooth metallic surface .
- Provide protection devices to avoid damage or blocking of sensor and magnet by strange parts falling into the working area.
- Dust concentrations between sensor and magnet are not allowed – remove any dust deposit – appropriate maintenance intervals must be scheduled.

Mechanical information for PRAS2EX and PRAS5EX-K

- Contact between sensor and magnet is not allowed.
- The max. number of revolutions is 1000 1/min (1000 RPM)

Mechanical information for PRAS3EX and PRAS5EX-V

- The max. number of revolutions is 1000 1/min (1000 RPM)
- Mount the sensor mechanical strainless.
- Use shaft couplings resp. torque arms (e.g. flexible ones) to avoid misalignment errors.
- Use electrically conductive shafts/torque arms..
- Sensor housing and senor shaft must be connected to the same potential equilizer.

Removal

- **Remove sensor only in de-energized condition.**
- **Removal of the sensor under non-explosible conditions only.**

Maintenance and service

- Any modification or repair of the sensor is not allowed.
- In case of any fault or error put the sensor out of service and contact ASM.

Maintenance interval

Within maintenance activities, those parts of the sensor which are associated with the risk of ignition must be checked mainly (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.

The following maintenance activities are recommended:

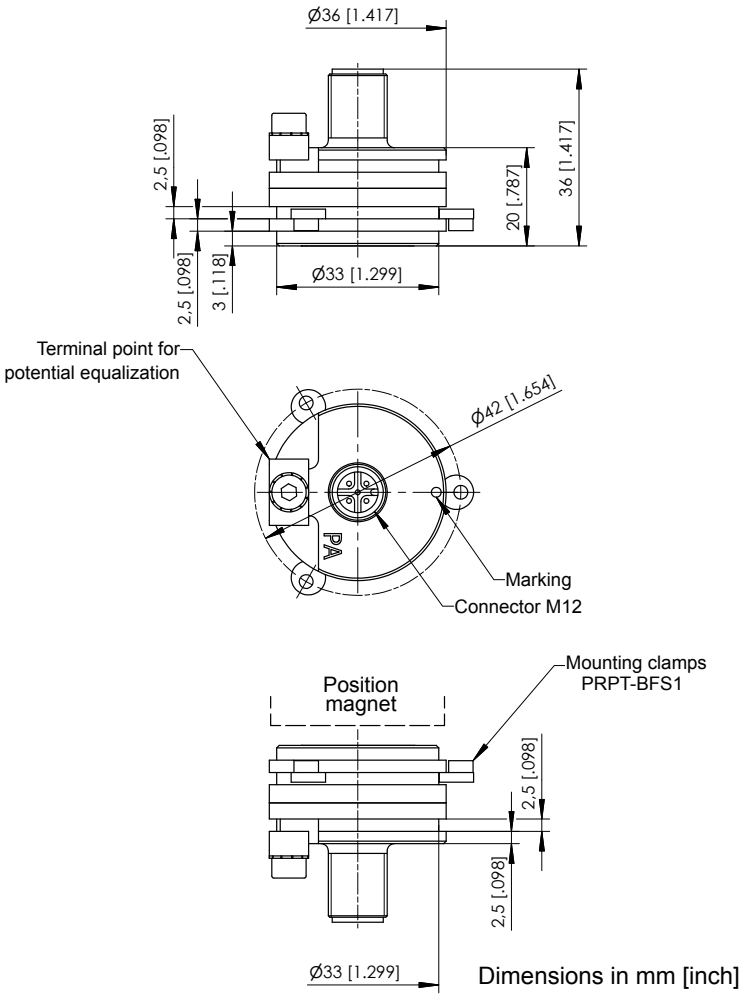
CAUTION	Check for dust deposit	Integrity of housing, connector, cable	Mounting elements	Visual check of shaft sealing
PRAS2EX	X	X	X	
PRAS3EX	X	X	X	X
PRAS5EX-K	X	X	X	
PRAS5EX-V	X	X	X	X
Activity	Dust deposit: Remove dust	Damaged parts: Put sensor out of service and replace damaged parts resp. send sensor to ASM for repair	Loose mounting parts: Screw tight mounting parts with recommended torque, if applicable use bolt adhesive	Damaged shaft sealing: Put sensor out of service and send it to ASM for repair

DANGER

Maintenance work must not be made under combustible conditions.

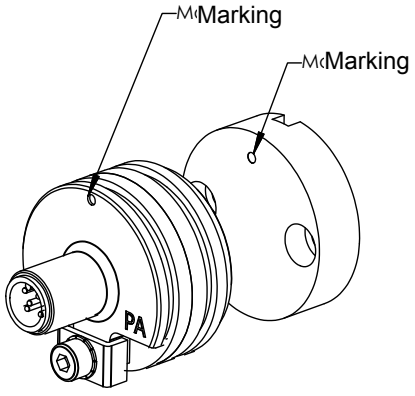
Outline drawing PRAS2EX

Connector version
M12 axial



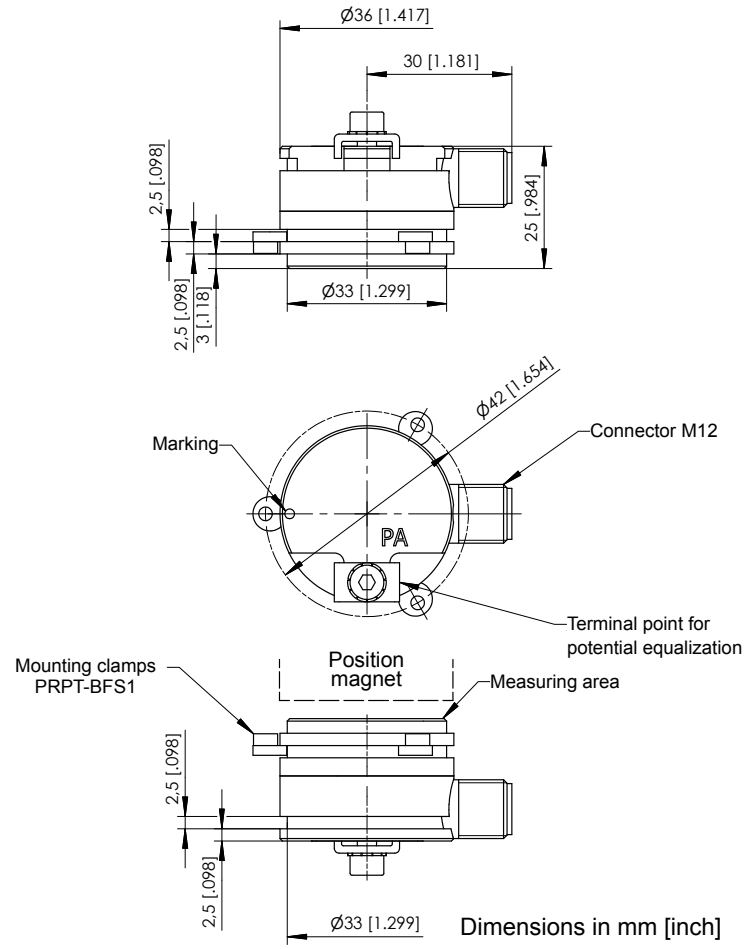
Weight without cable 110 g approx.
Dimensions informative only.
For guaranteed dimensions consult factory.

Reference position



Magnets:
e.g. PRMAG2-VA
PRMAG2Z-VA
PRMAG5Z VA

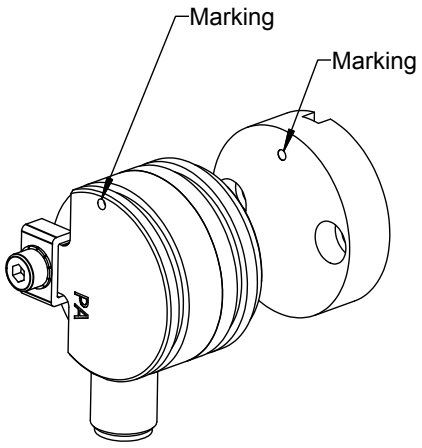
Outline drawing
PRAS2EX
Connector version
M12 radial



Dimensions in mm [inch]

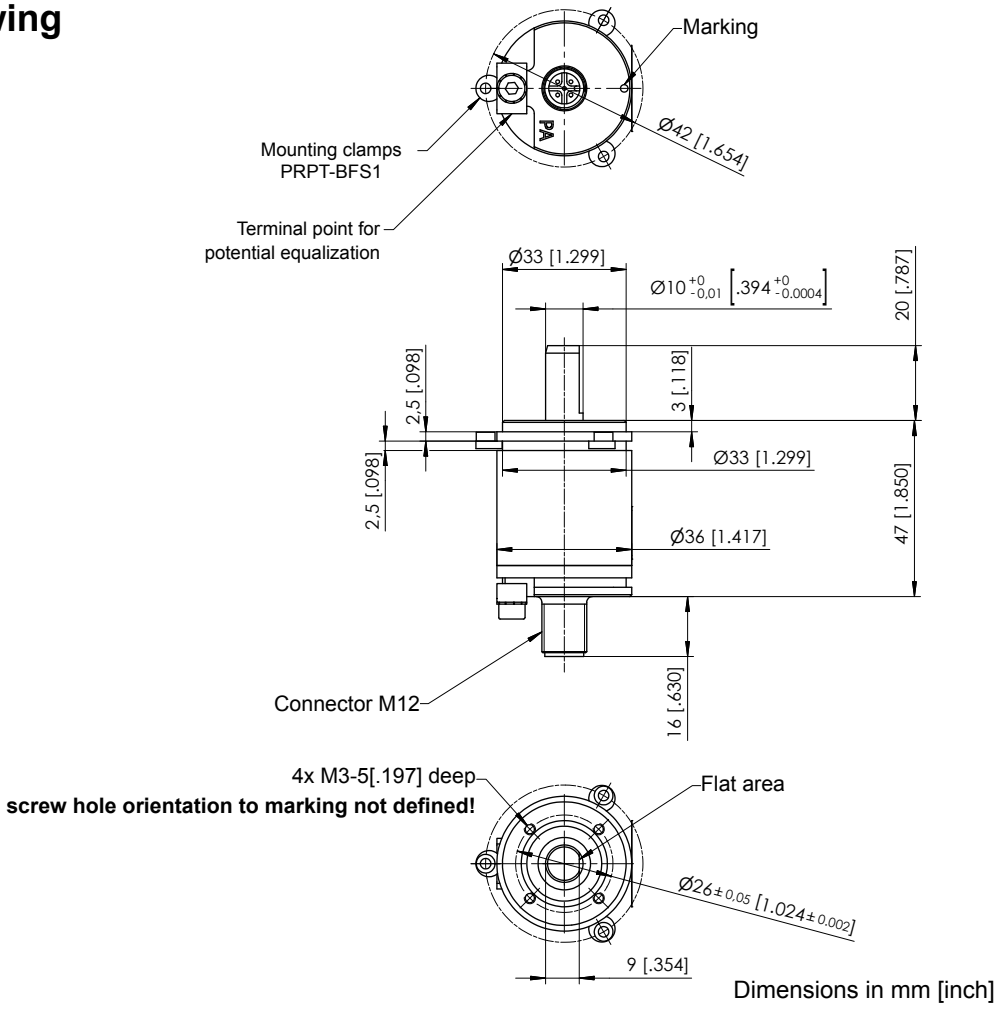
Weight without cable 140 g approx.
Dimensions informative only.
For guaranteed dimensions consult factory.

Reference position



Magnets:
e.g. PRMAG2-VA
PRMAG2Z-VA
PRMAG5Z VA

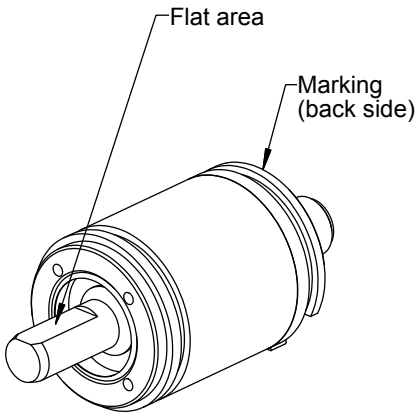
Outline drawing
PRAS3EX
M12 axial
Solid shaft



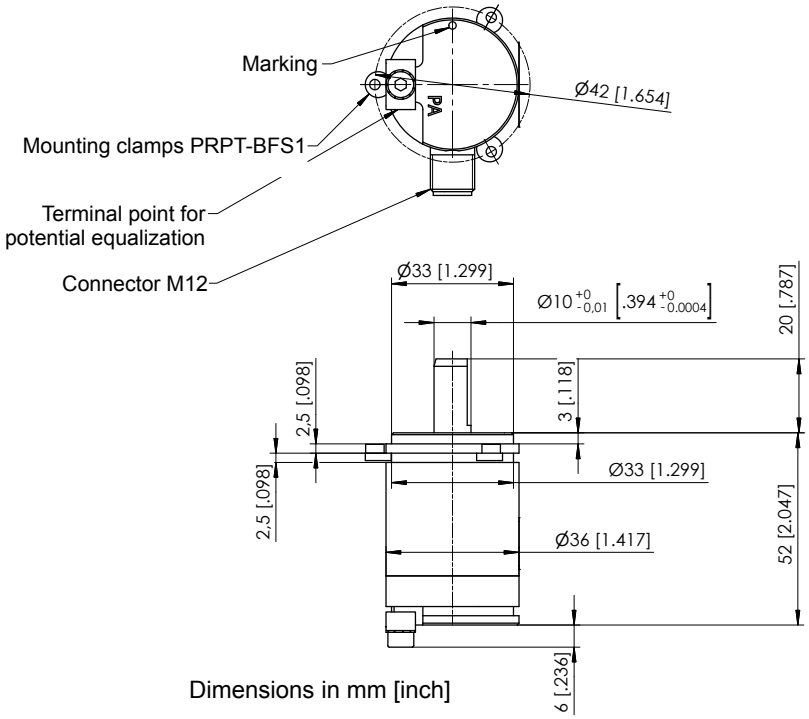
Dimensions in mm [inch]

Weight without cable 290 g approx.
Dimensions informative only.
For guaranteed dimensions consult factory.

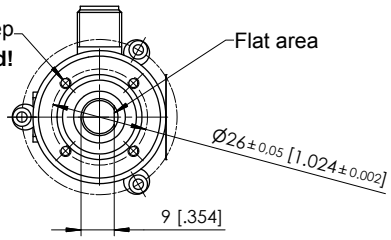
Reference position



Outline drawing
PRAS3EX
M12 radial
Solid shaft



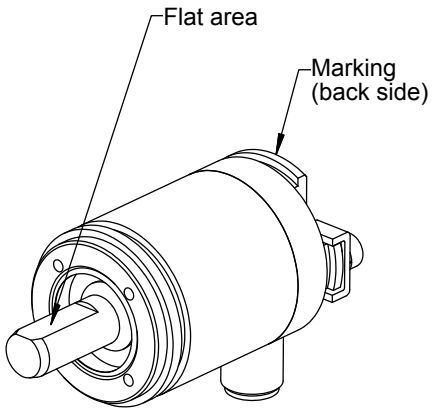
Dimensions in mm [inch]



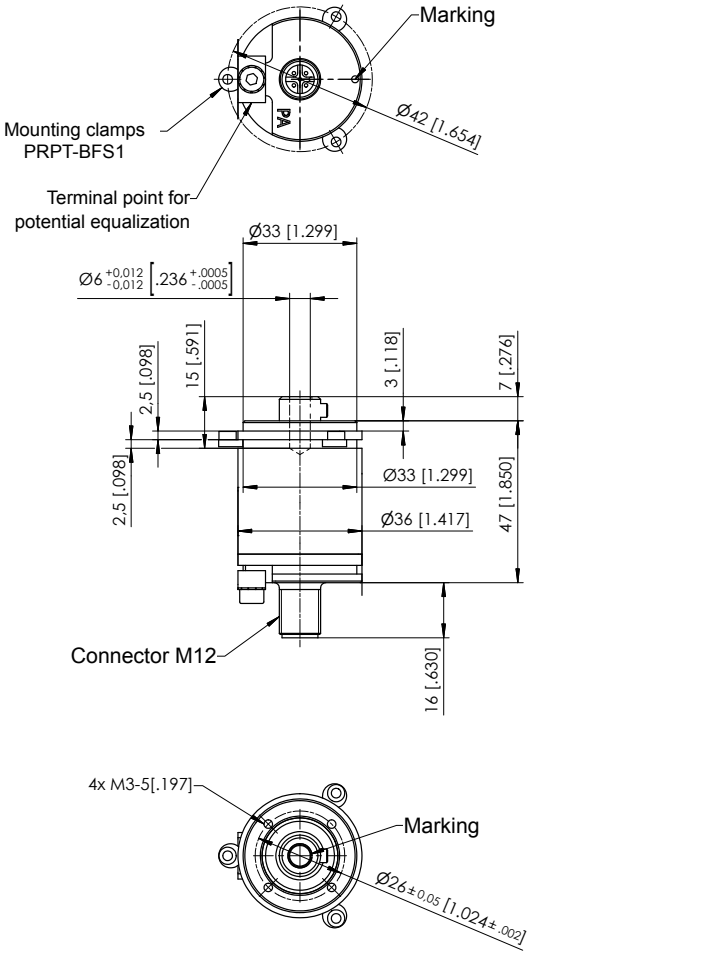
screw hole orientation to marking not defined!

Weight without cable 320 g approx.
Dimensions informative only.
For guaranteed dimensions consult factory.

Reference position



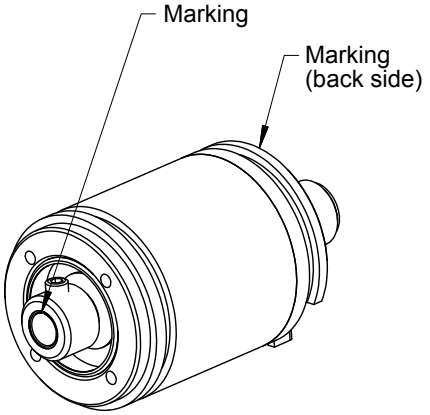
Outline drawing
PRAS3EX
M12 axial
Hollow shaft



Dimensions in mm [inch]

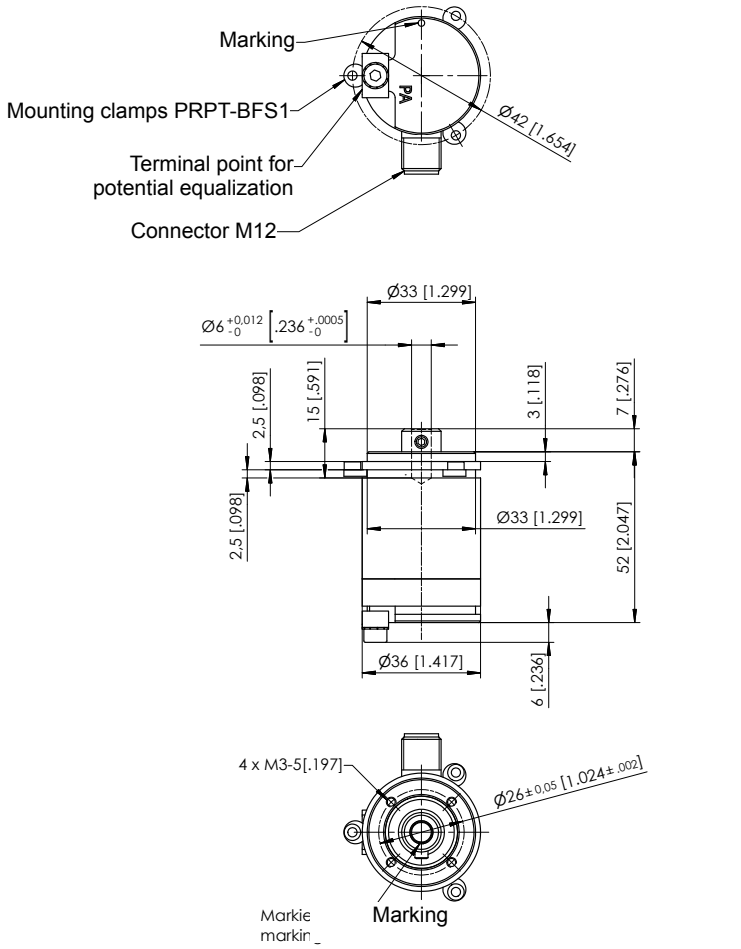
Weight without cable 290 g approx.
Dimensions informative only.
For guaranteed dimensions consult factory.

Reference position



Outline drawing PRAS3EX

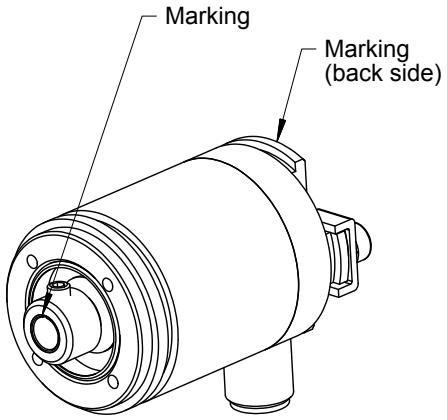
M12 radial
Hollow shaft



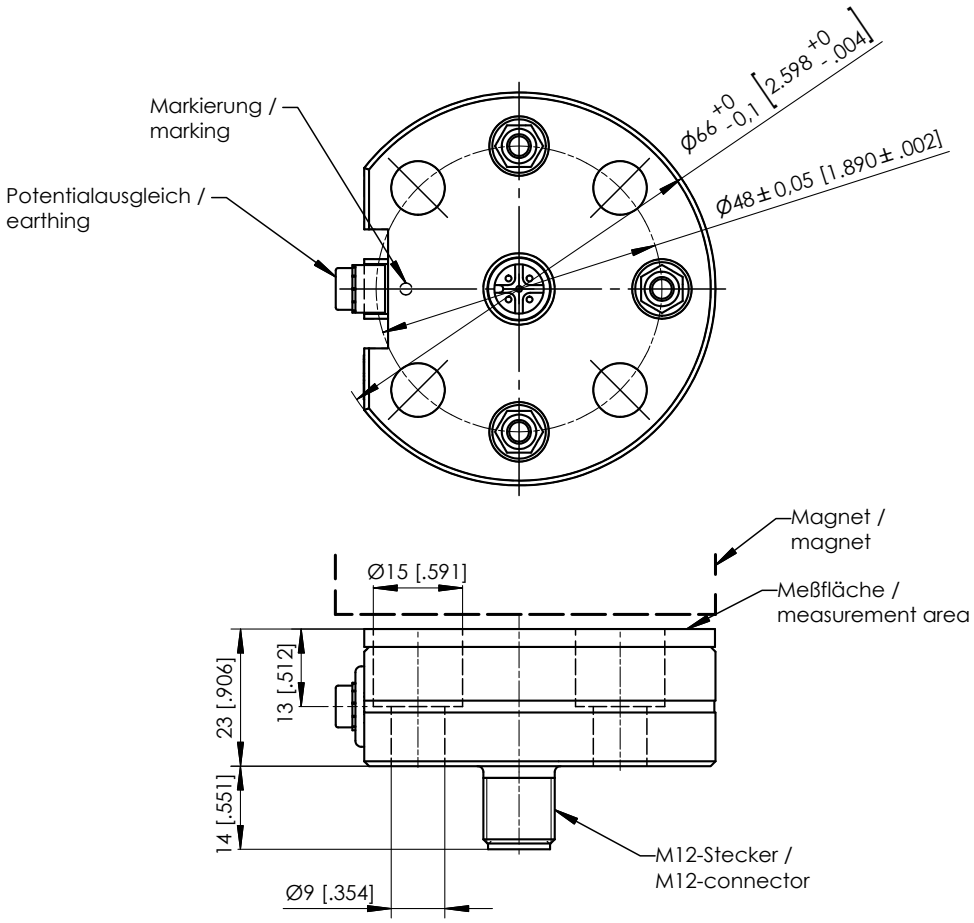
Dimensions in mm [inch]

Weight without cable 320 g approx.
Dimensions informative only.
For guaranteed dimensions consult factory.

Reference position

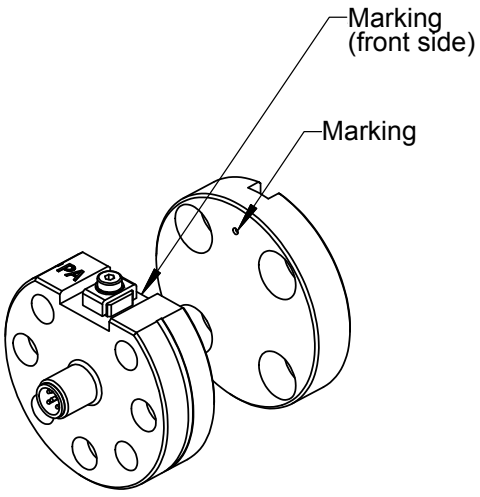


Outline drawing
PRAS5EX-K
M12 axial



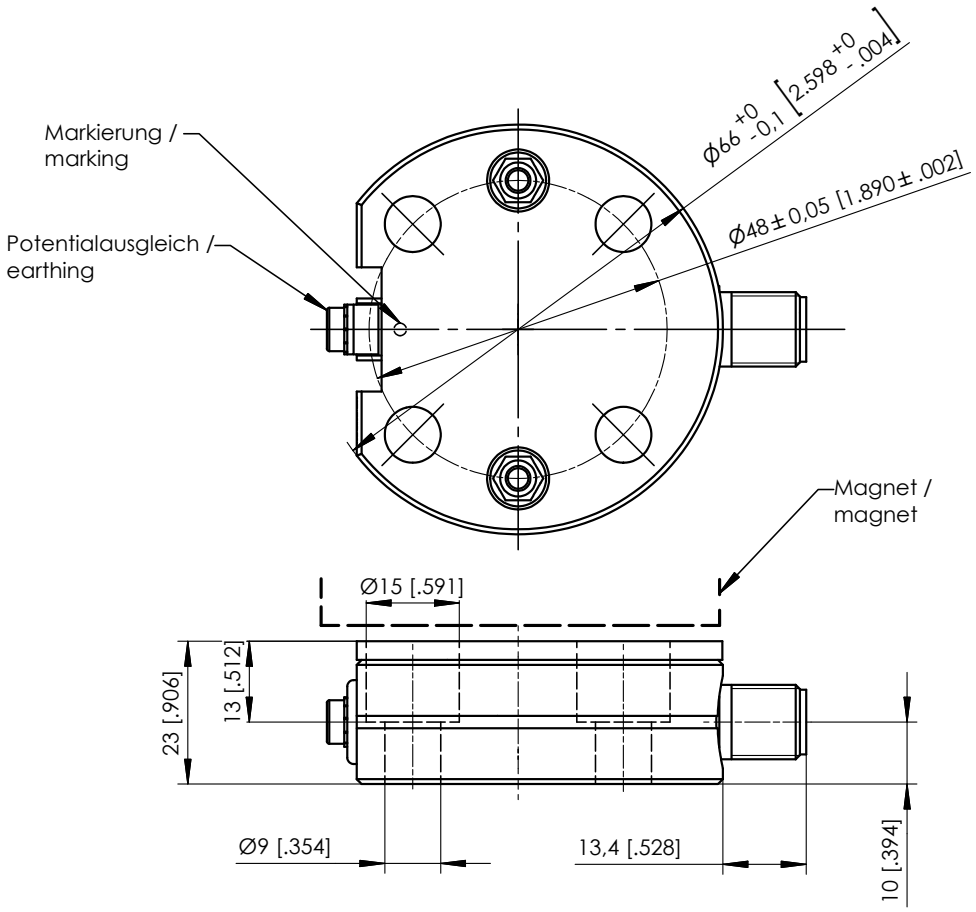
Weight 380 g approx.
Dimensions informative only.
For guaranteed dimensions consult factory.

Reference position



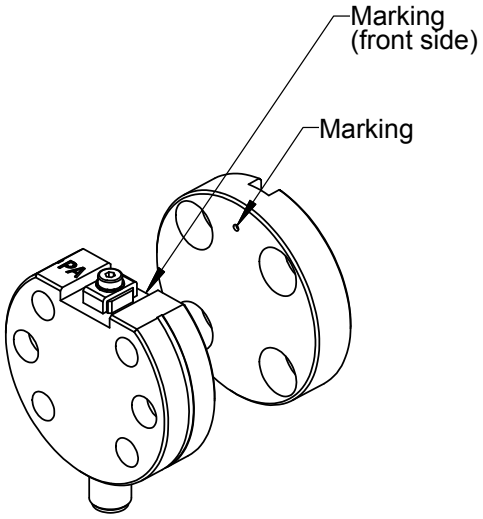
Magnets:
e.g. PRMAG2-VA
PRMAG2Z-VA
PRMAG5Z VA

Outline drawing
PRAS5EX-K
M12 radial



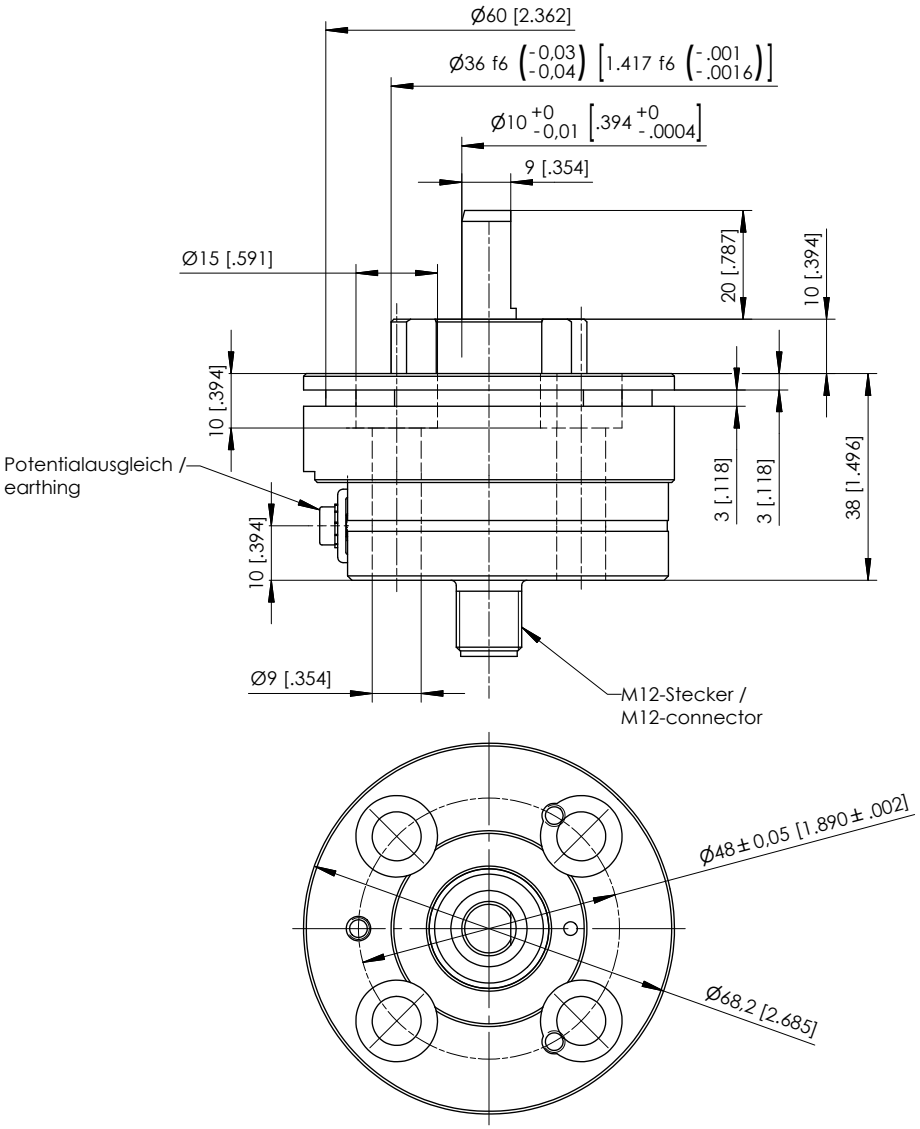
Weight without cable 400 g approx.
Dimensions informative only.
For guaranteed dimensions consult factory.

Reference position



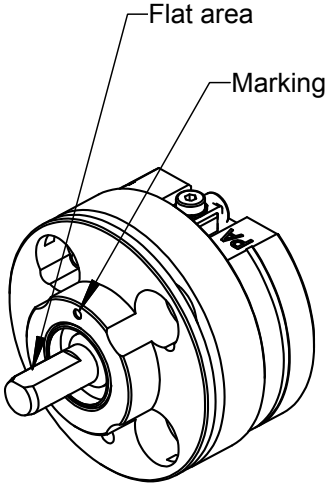
Magnets:
e.g. PRMAG2-VA
PRMAG2Z-VA
PRMAG5Z VA

Outline drawing
PRAS5EX-V
M12 axial

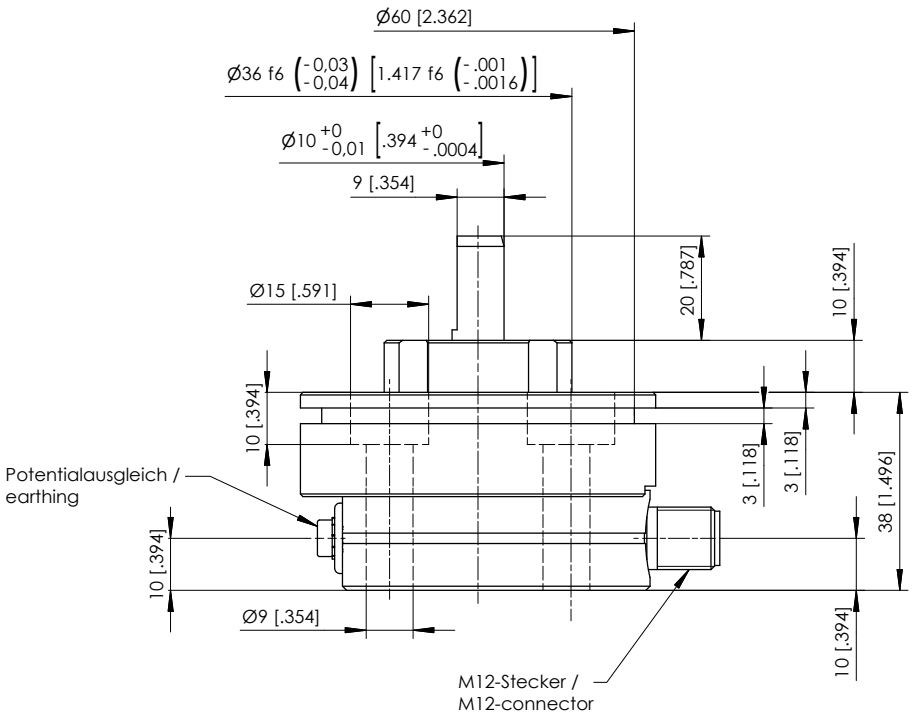


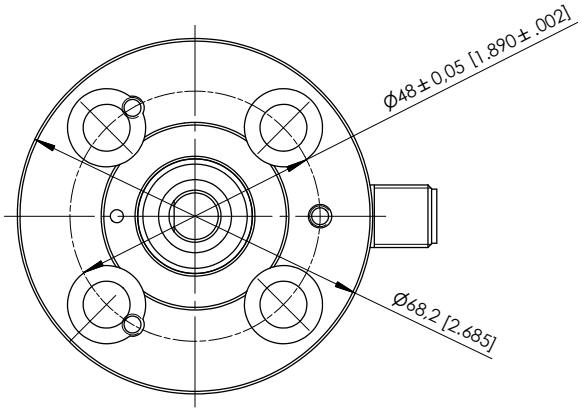
Weight without cable 860 g approx.
Dimensions informative only.
For guaranteed dimensions consult factory.

Reference position



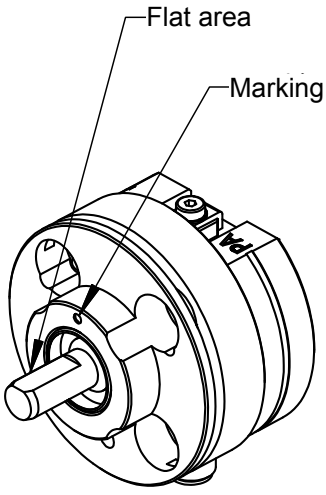
Outline drawing
PRAS5EX-V
M12 radial

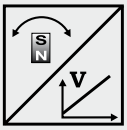


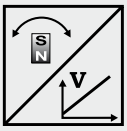


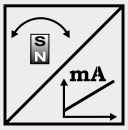
Weight without cable 890 g approx.
Dimensions informative only.
For guaranteed dimensions consult factory.

Reference position

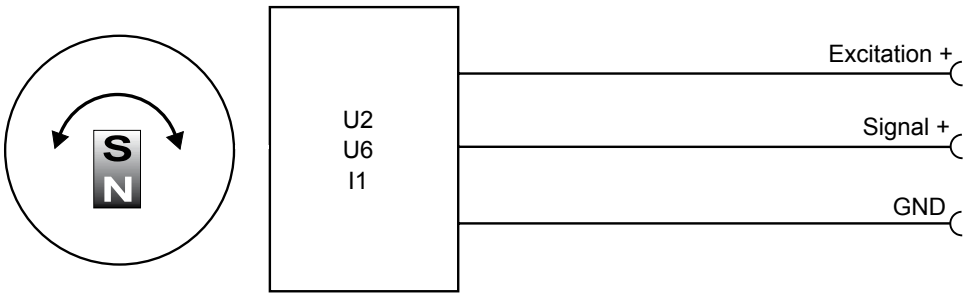


U2 Voltage Output 0.5 ... 10 V 	Excitation voltage	24 V DC (18 ... 36 V DC)
	Excitation current	40 mA max.
	Output voltage	0.5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typ.) for 90°...360° ±100 x 10^{-6} / °C f.s. (typ.) for <90°
	Protection	Reverse polarity, short circuit

U6 Voltage Output 0.5 ... 4.5 V ratiometric 	Excitation voltage	+ 5V DC ±10 %
	Excitation current	40 mA max.
	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. (typ.) for 90°...360° ±100 x 10^{-6} / °C f.s. (typ.) for <90°
	Protection	Reverse polarity, short circuit

I1 Current Output 4 ... 20 mA 	Excitation voltage	24 V DC (18 ... 36 V DC)
	Excitation current	60 mA max.
	Load resistor	500 Ω max.
	Output current	4 ... 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typ.) for 90°...360° ±100 x 10^{-6} / °C f.s. (typ.) for <90°
	Protection	Reverse polarity, short circuit

Output signals

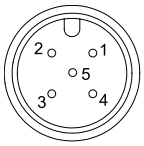


Signal Wiring	Output signals	M12A4/5, M12R4/5 pin no.	Cable output IEC60947-5-2
	Excitation +	1	Brown
	Signal	2	White
	GND	3	Blue
	Not used!	4	Black
	Not used!	5	

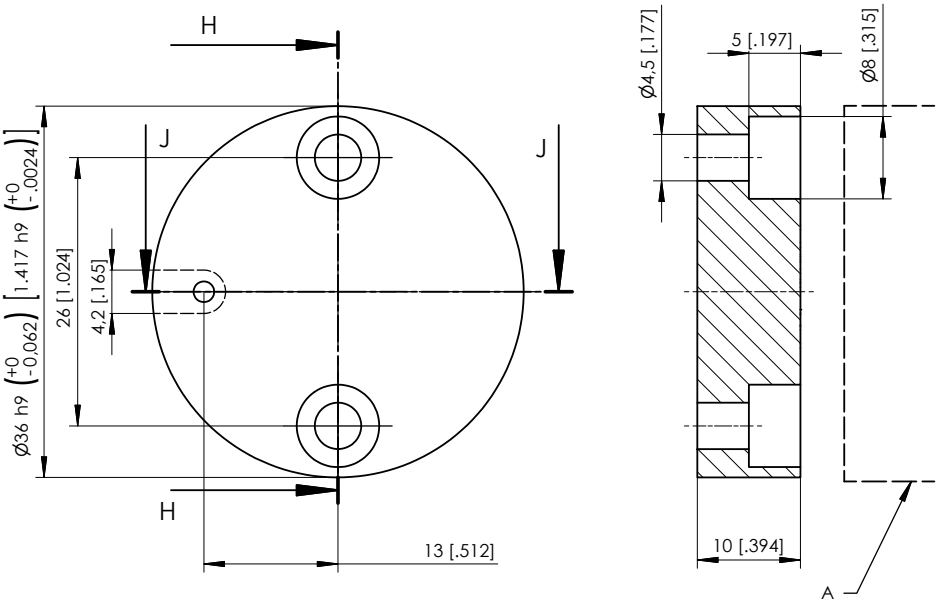
Connect not used terminals with GND

Connection

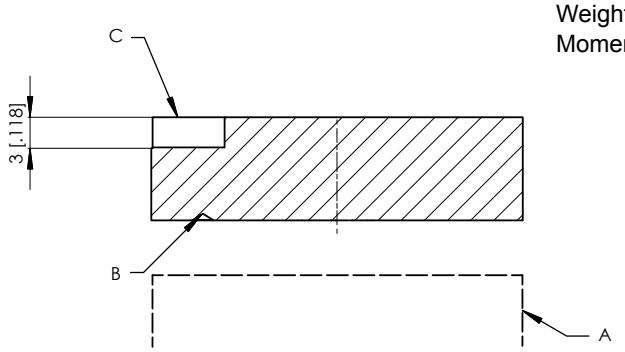
View to sensor connector



Position magnet PRMAG2Z-VA



Weight 30 g approx.
Moment of inertia 4.5 kgmm²

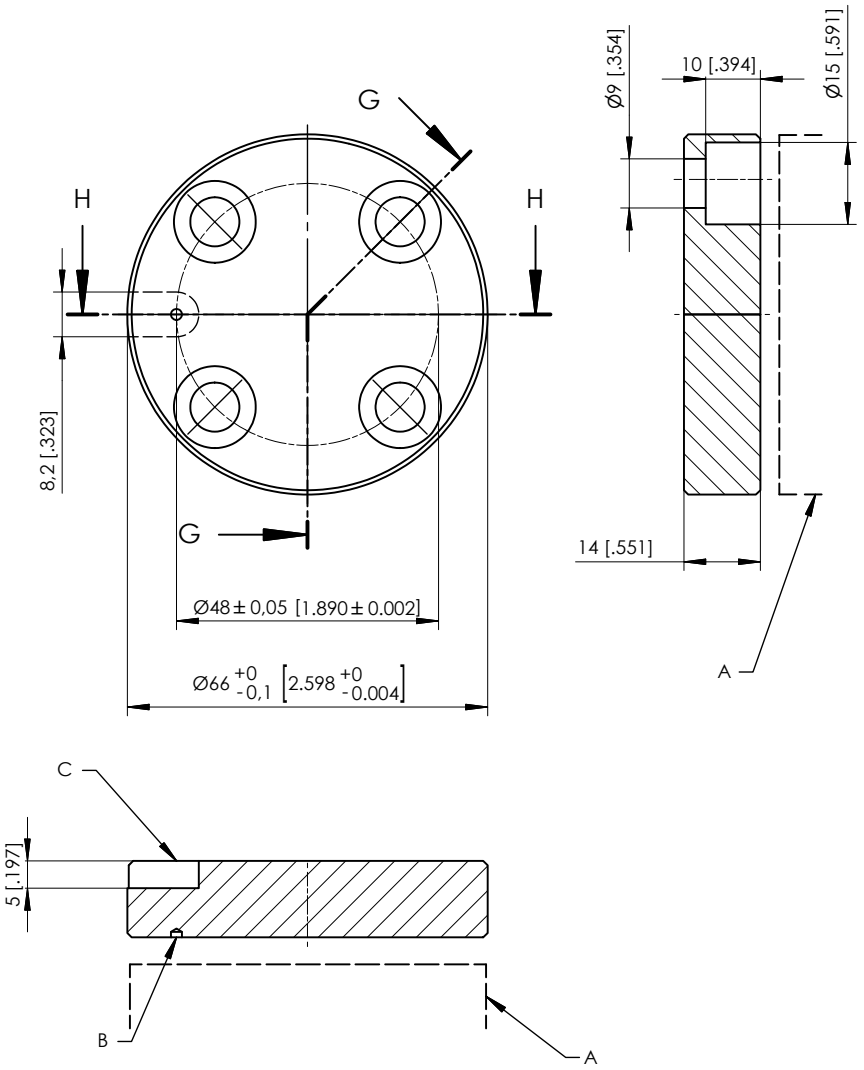


A - Sensor
B - Marking
C - Nut

Dimensions in mm [inch]

Dimensions informative only.
For guaranteed dimensions consult factory.

Position magnet PRMAG5Z-VA



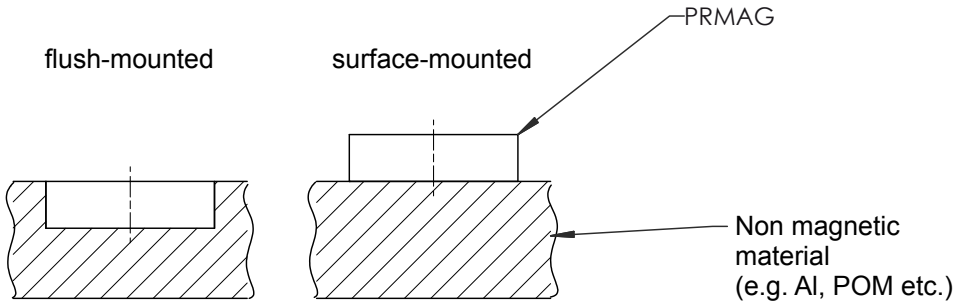
A - Sensor
B - Marking
C - Nut

Dimensions in mm [inch]

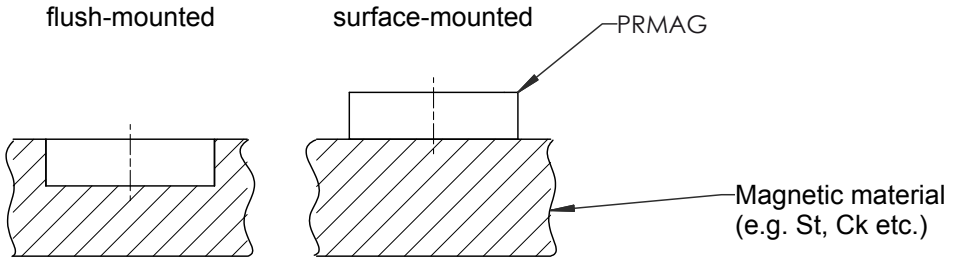
Dimensions informative only.
For guaranteed dimensions consult factory.

	Magnet	Mounting method	Material	Torque [Nm]
Mounting of the magnets	PRMAG2-VA	Schrauben M4	A2	2.0
	PRMAG2Z-VA	Schrauben M4	A2	2.0
	PRMAG5Z-VA	Schrauben M8	A2	20
	Anti-rotation element	–	A2 or non-magnetic	–

Assembly of the position magnets

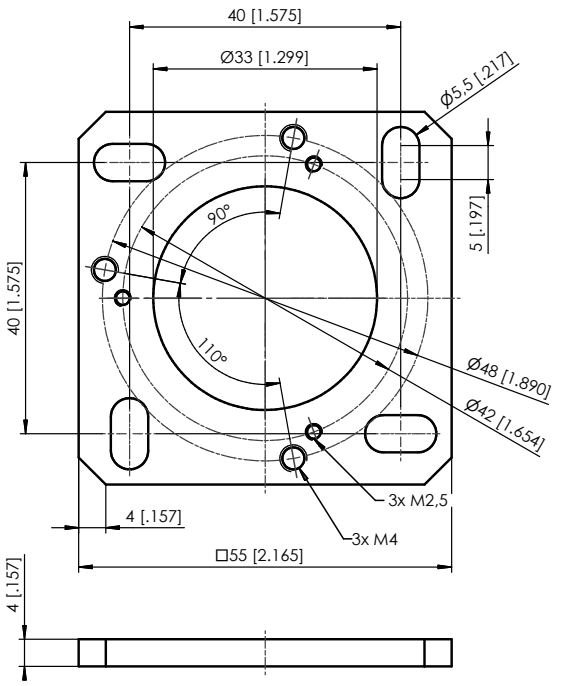


✓	✓	PRMAG2-VA
✓	✓	PRMAG2Z-VA
✓	✓	PRMAG5Z-VA



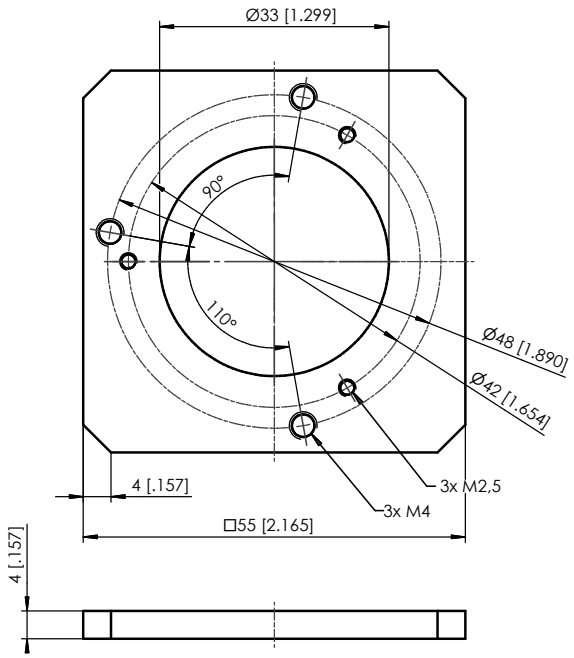
✓	✓	PRMAG2-VA
✓	✓	PRMAG2Z-VA
✓	✓	PRMAG5Z-VA

Mounting plate PRPT-BPL1



In combination with the mounting clamps PRPT-BFS1 (3 x M2.5) or in combination with the mounting bracket PRPT-BFS2 (3 x M4).

Mounting plate PRPT-BPL2 (welding assembly)

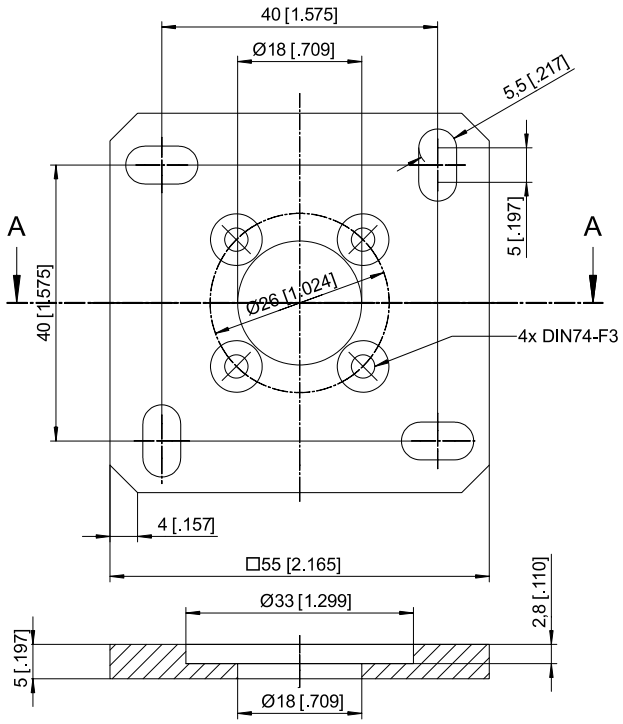


In combination with the mounting clamps PRPT-BFS1 (3 x M2.5) or in combination with the mounting bracket PRPT-BFS2 (3 x M4).

Dimensions in mm [inch]

Dimensions informative only.
For guaranteed dimensions consult factory.

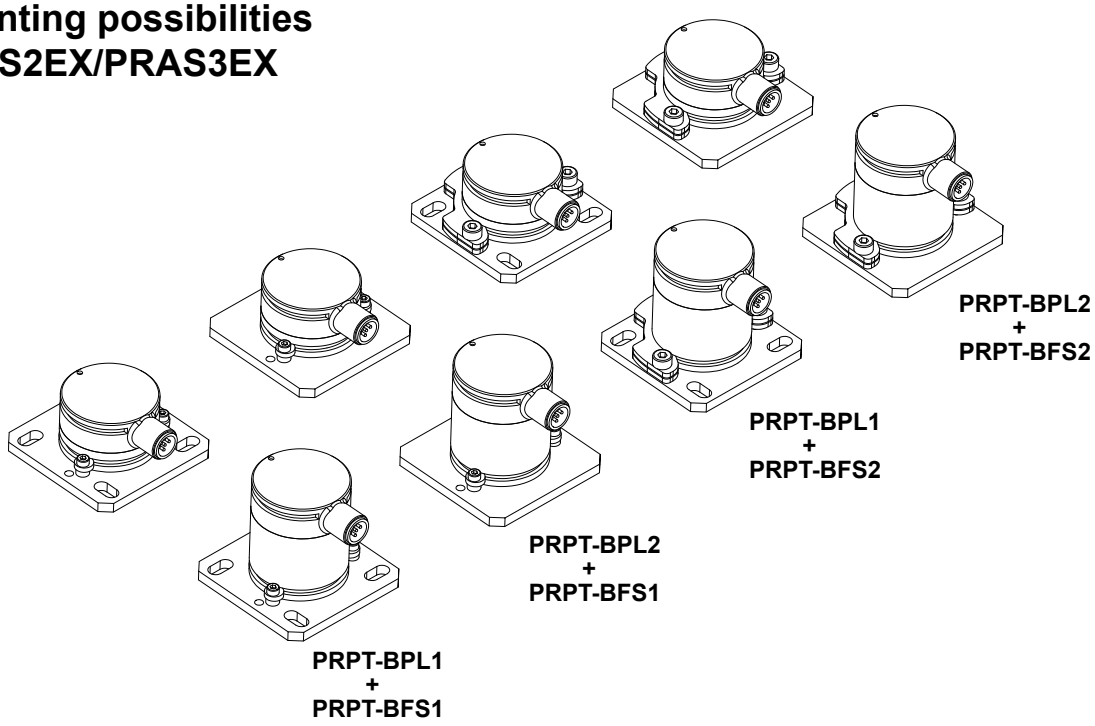
Mounting plate PRPT-BPL3



Dimensions in mm [inch]

Dimensions informative only.
For guaranteed dimensions consult factory.

Mounting possibilities PRAS2EX/PRAS3EX



EU Declaration of conformity

We

ASM GmbH
Am Bleichbach 18 - 24
85452 Moosinning
Germany

declare under our sole responsibility that the product

Name: **Angle sensor**

Type: **PRAS2EX, PRAS3EX, PRAS5EX-K, PRAS5EX-V**

to which this declaration relates is in conformity with the following standards or other normative documents:

Directives: 2014/30/EU (EMC)
94/9EG (ATEX 100a) (up to 19.04.2016)
2014/34/EU (from 20.04.2016)

Standards: DIN EN 61326-1:2013 (EMC)
DIN EN 60079-0 (June 2014)
DIN EN 60079-31 (December 2014)

Moosinning, 22nd February 2016

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