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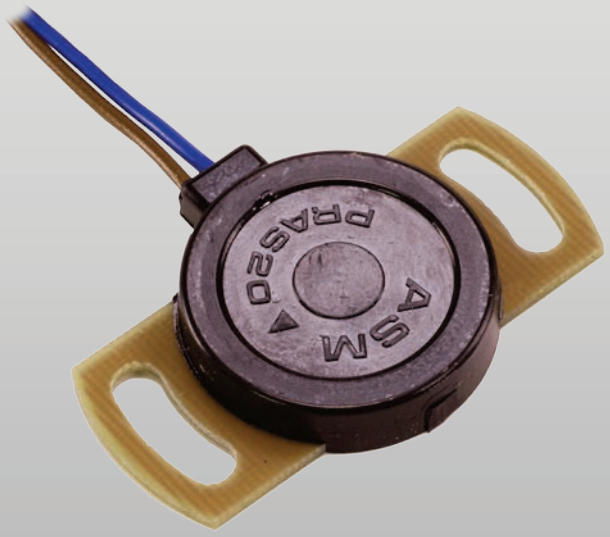
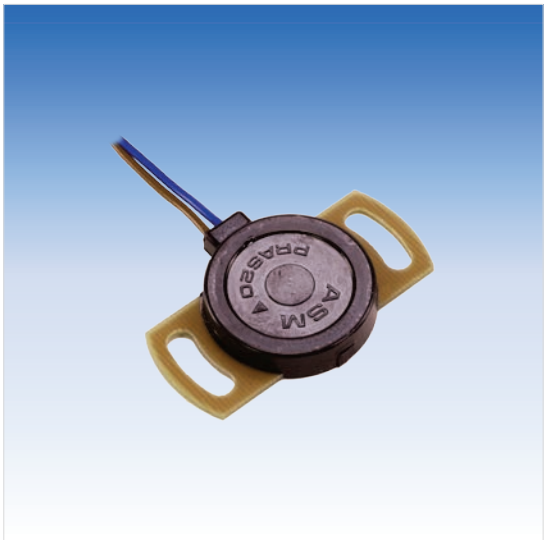
Magnetic Angle Sensors

PRAS20
Magnetic Angle Sensor

Datasheet

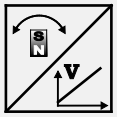


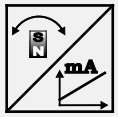
Analog output



Sensor features

- **Measurement range 0 ... 360°**
- **Protection class IP60**
- **Analog output**
- **Compact, low profile housing**
- **Non-contact with external position magnet, no wear**
- **Housing: Epoxy glass fibre, thermoplastic**





Specifications

Output	Voltage 0.5 ... 10 V Voltage 0.5 ... 4.5 V, ratiometric Current 4 ... 20 mA, 3 wire
Measurement range	0 ... 15° to 0 ... 360° (in 15° increments)
Resolution	0.03% (60 ... 360°); 0.1% (15 ... 45°)
Repeatability	±0.03% (60 ... 360°); ±0.1% (15 ... 45°)
Linearity	±0.5% f.s. (typical)
Rated distance sensor / magnet	Depending on the position magnet
Protection class	IP60
Housing material	Epoxy glass fibre, thermoplastic
Mounting	Screws M4
Connection	Single wire ETFE 3 x 0.5 mm^2
Temperature range	-40 ... +85°C
Shock	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
Vibration	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
Weight	8 g approx. (without cable)
EMC	DIN EN 61326-1:2013

Order code

PRAS20	–	1	–	2	–	3	–	4

1 Measurement range (0 ... 15° to 0 ... 360°, in 15° increments)

15 / 30 / 45 / ... / 345 / 360

2 Output

U2B	= Voltage 0.5 ... 10 V (excitation voltage 11.5 ... 27 V DC)
U6	= Voltage 0.5 ... 4.5 V ratiometric (excitation voltage 5 V DC)
I1B	= Current 4 ... 20 mA, 3 wire (excitation voltage 10 ... 27 V DC)

3 Signal characteristics

CW	= Signal increasing CW, clockwise
CCW	= Signal increasing CCW, counterclockwise

4 Connection

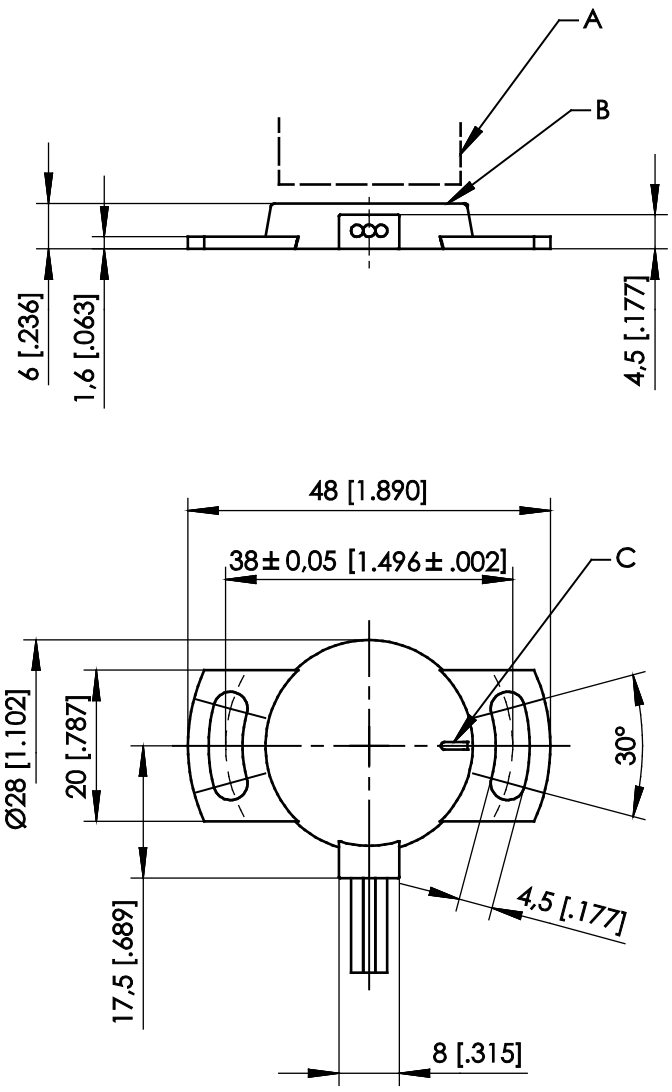
A300	= Single wire ETFE 3 x 0.5 mm^2, length 300 mm

Order example

PRAS20 – 360 – U6 – CW – A300

Accessories:
Position magnets (see from page 7)
Magnetic shield (see page 14)

Dimensions

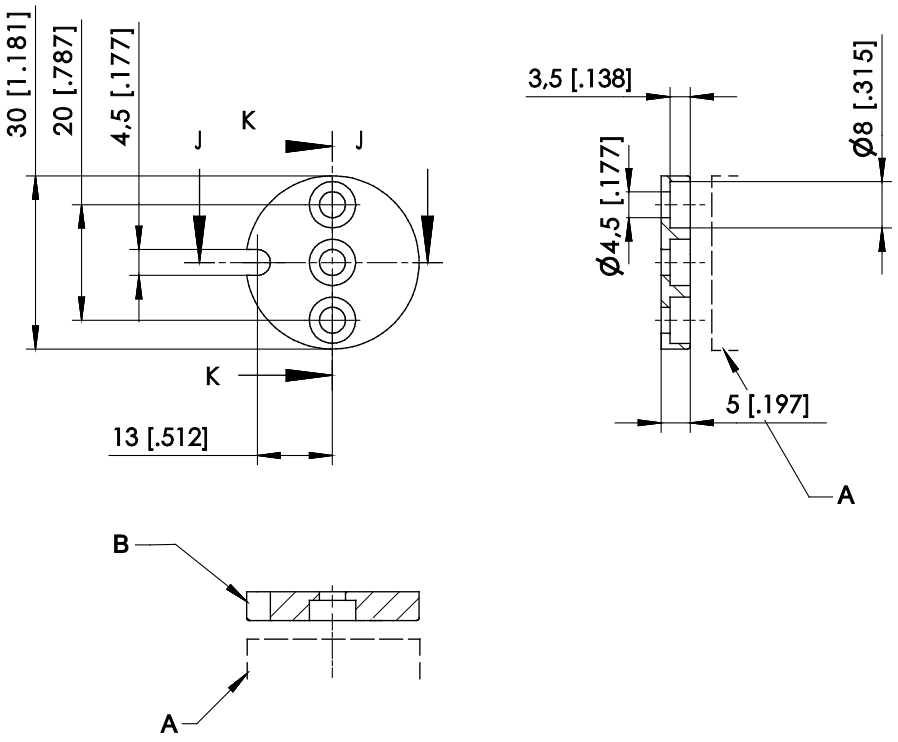


A – Position magnet
B – Measuring area
C – Marking

Dimensions in mm [inch]. Weight without cable approx. 8 g.
Dimensions for information only.
For guaranteed dimensions consult factory.

Position magnets

PRMAG20



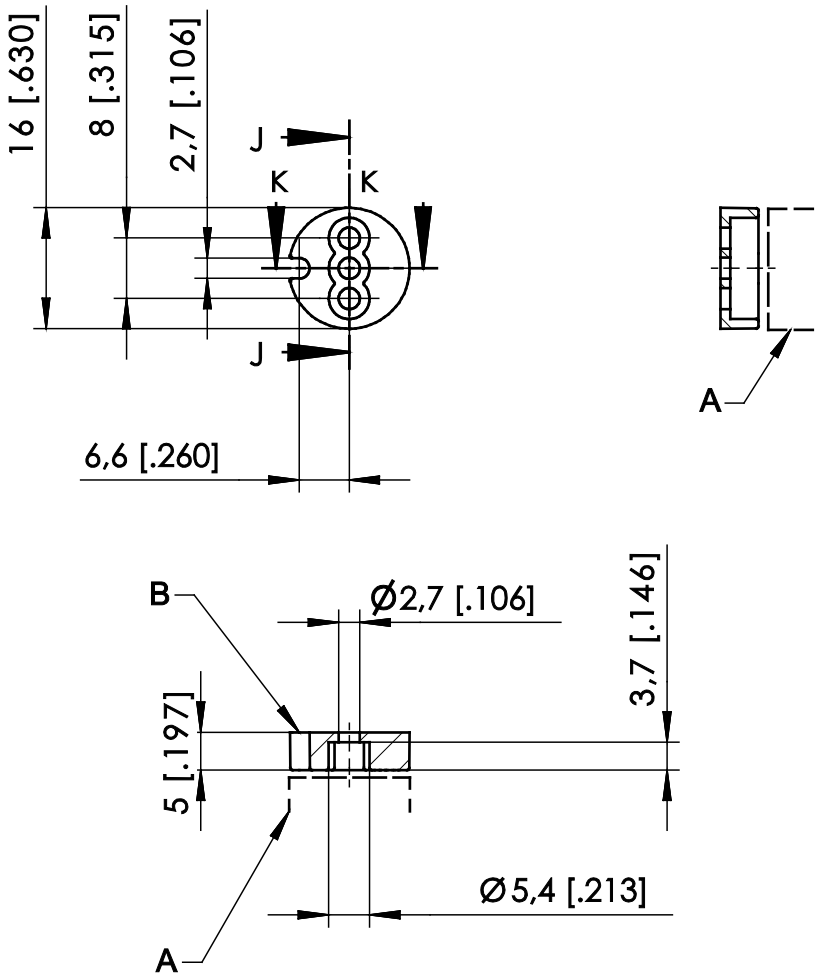
A – Sensor
B – Marking

Order code	Weight	Material	Moment of inertia
PRMAG20	approx. 12 g	zinc coated steel, plastic	1.3 kgmm^2

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions please consult factory.

PRMAG21



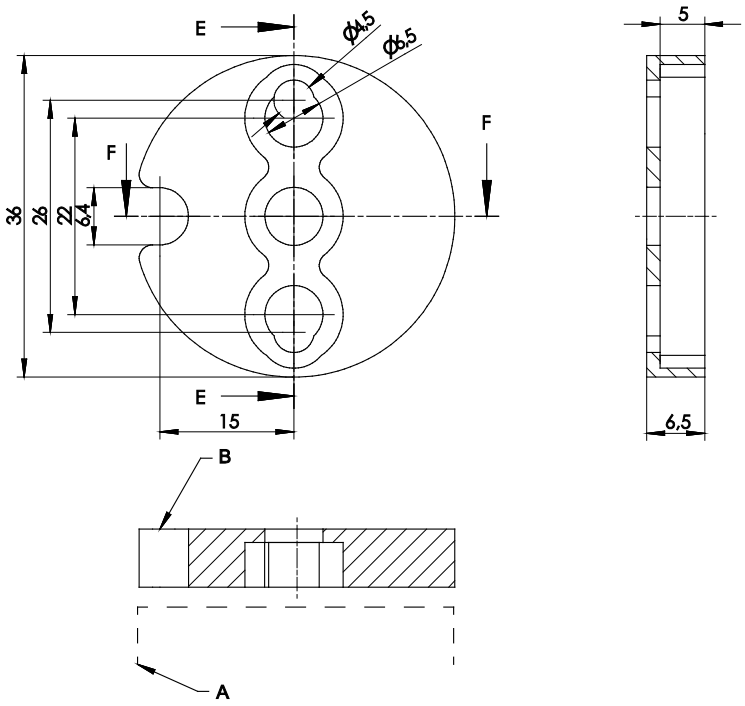
A – Sensor
B – Marking

Order code	Weight	Material	Moment of inertia
PRMAG21	approx. 3 g	zinc coated steel; plastic	0.1 kgmm^2

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch]
Dimensions informative only.
For guaranteed dimensions please consult factory.

PRMAG22



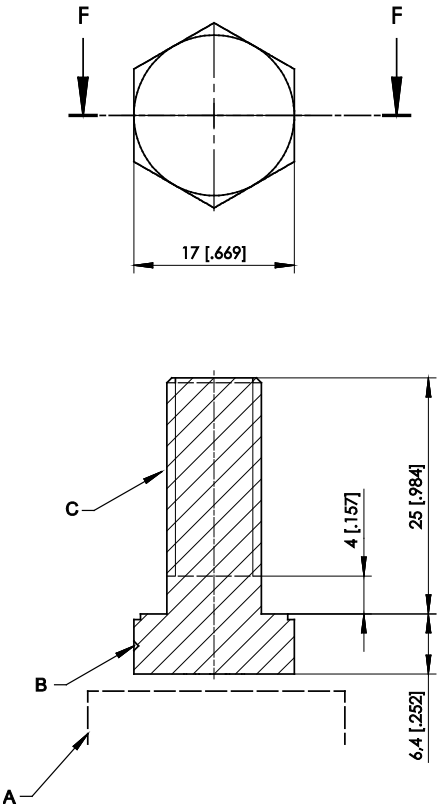
A – Sensor
B – Marking

Order code	Weight	Material	Moment of inertia
PRMAG22	approx. 19 g	zinc coated steel, plastic	3 kgmm^2

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch].
Dimensions informative only
For guaranteed dimensions please consult factory.

PRMAG-M10



A – Sensor
B – Marking
C – Thread M10

Order code	Weight	Material	Moment of inertia
PRMAG-M10	approx. 30 g	stainless steel A2	1.3 kgmm2

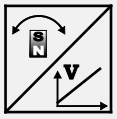
A misalignment of the position magnet has an effect on the linearity.

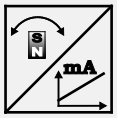
Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions please consult factory.

Output specification

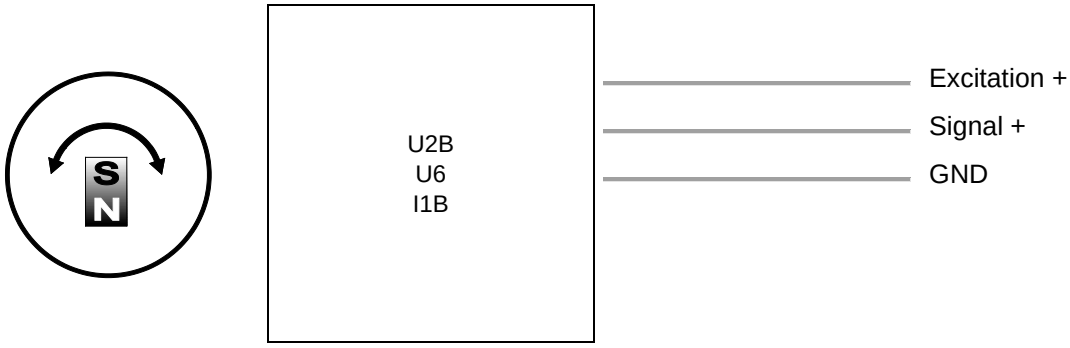
Analog output

U2B Voltage output 0.5 ... 10 V 	Excitation voltage	11.5 … 27 V DC
	Excitation current	typical 12 mA max. 16 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

I1B Current output 4 … 20 mA, 3 wires 	Excitation voltage	10 … 27 V DC
	Excitation current	typical 32 mA max. 36 mA
	Load R_L	250 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

Signal diagram PRAS20

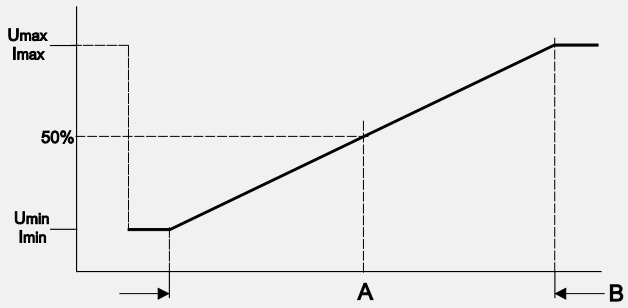


Signal wiring PRAS20/PRAS20R/PRAS21

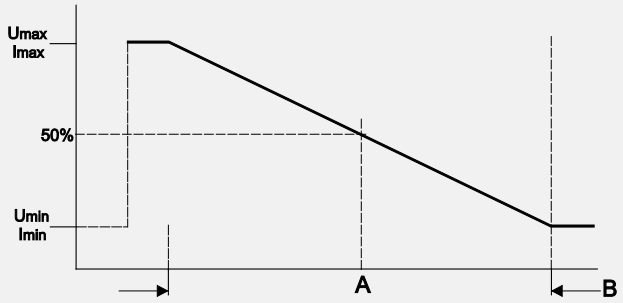
Signal	Cable color
Excitation +	brown
Signal	white
GND	blue

Characteristics for magnetic angle sensors

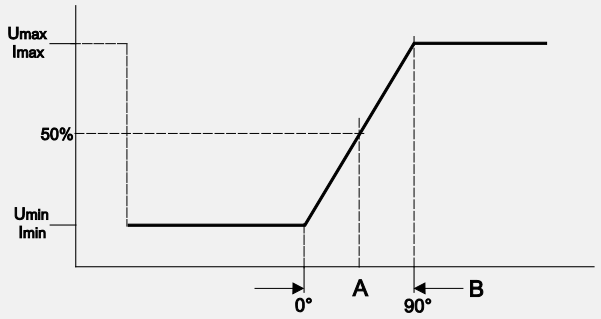
Output signal CW
(clockwise increasing)



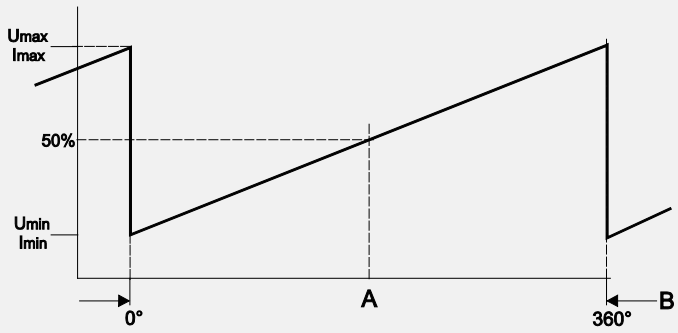
Output signal CCW
(counterclockwise increasing)



Example angular range 90°



Example angular range 360°



A – Marking
B – Measurement range [°]

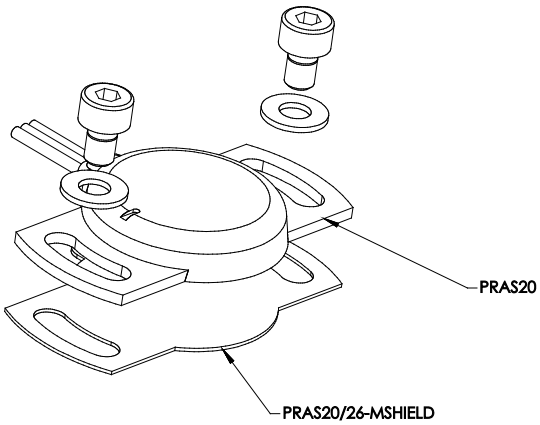
Accessories

PRAS20 / PRAS20R Magnetic shield

An optional shield plate is available for the angle sensors PRAS20 and PRAS20R. It can reduce the effect of residual magnetizing in case the sensor has to be mounted on a ferromagnetic material.

Order code magnetic shield:

PRAS20/26-MSHIELD



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Magnetic Angle Sensors

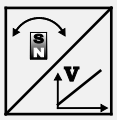
PRAS20R
Magnetic Angle Sensor

Datasheet

Analog output, redundant

Sensor features

- **Measurement range 0 ... 360°**
- **Protection class IP60**
- **Analog output, redundant**
- **Compact, low profile housing**
- **Non-contact with external position magnet, no wear**
- **Redundant second channel**



Specifications

Output	Voltage 0.5 ... 4.5 V, ratiometric
Measurement range	0 ... 15° to 0 ... 360° (in 15° increments)
Resolution	0.03% (60 ... 360°); 0.1% (15 ... 45°)
Repeatability	±0.03% (60 ... 360°); ±0.1% (15 ... 45°)
Linearity	±0.5% f.s. (typical)
Rated distance sensor / magnet	Depending on the position magnet
Protection class	IP60
Housing material	Epoxy glass fibre, thermoplastic
Mounting	Screws M4
Connection	Single wire ETFE 6 x 0.5 mm^2
Temperature range	-40 ... +85°C
Shock	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
Vibration	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
Weight	8 g approx. (without cable)
EMC	DIN EN 61326-1:2013

Order code

PRAS20R – **1** – **2** – **3** – **4**

1 Measurement range (0 ... 15° to 0 ... 360°, in 15° increments)

15 / 30 / 45 / ... / 345 / 360

2 Output

U6 = Voltage 0.5 ... 4.5 V ratiometric (excitation voltage 5 V DC)

3 Signal characteristics

CW/CCW = Signal 1 increasing clockwise, signal 2 increasing counterclockwise
CW/CW = Signal 1 and signal 2 increasing clockwise
CCW/CCW = Signal 1 and signal 2 increasing counterclockwise

4 Connection

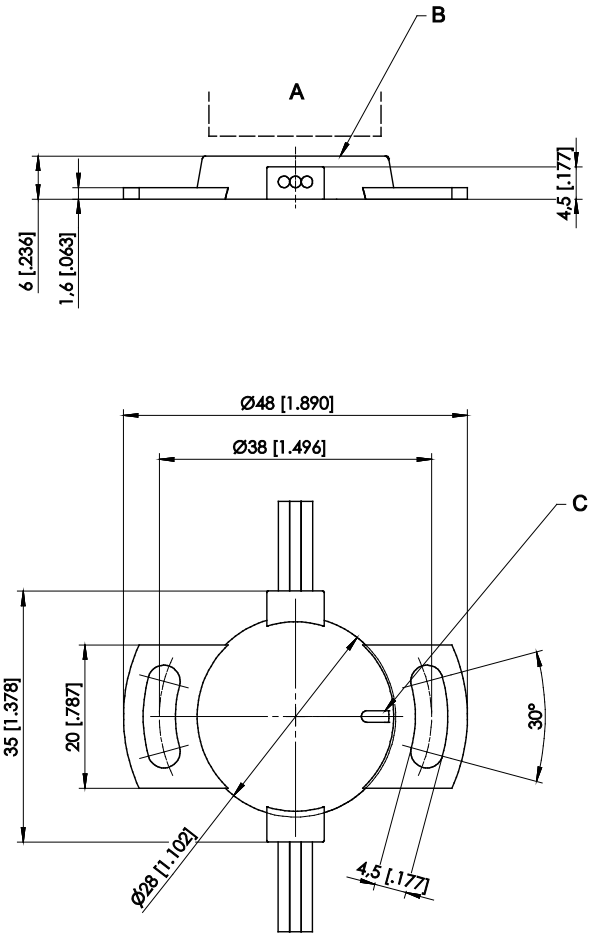
A300 = Single wire ETFE 6 x 0.5 mm^2, length 300 mm

Order example

PRAS20R – 360 – U6 – CW/CCW – A300

Accessories:
Position magnets (see from page 7)
Magnetic shield (see page 13)

Dimensions

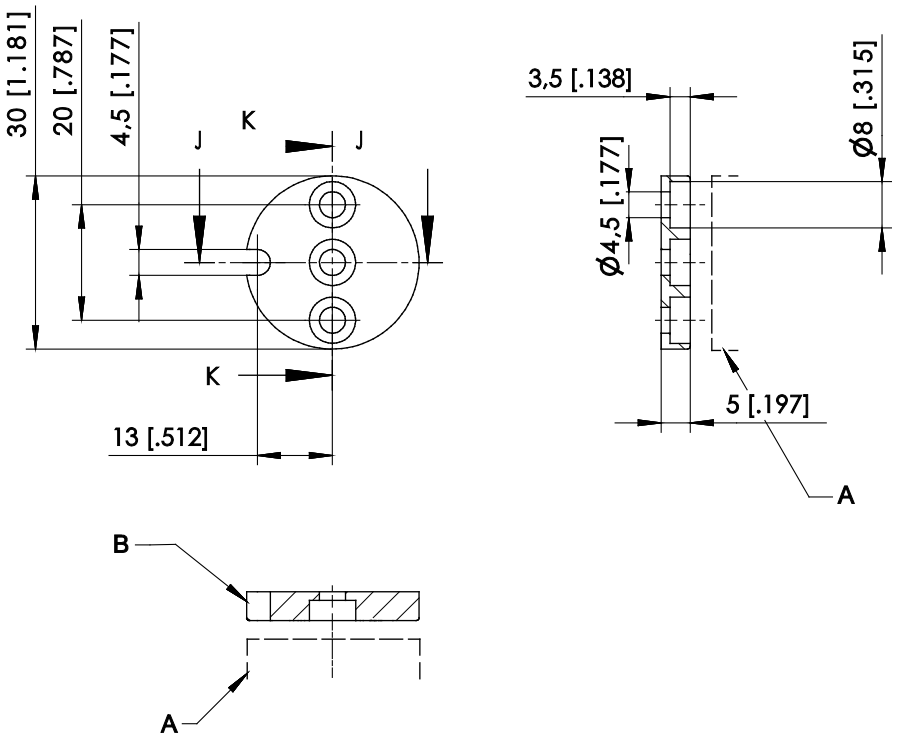


A – Position magnet
B – Measuring area
C – Marking

Dimensions in mm [inch]. Weight without cable approx. 8 g.
Dimensions informative only.
For guaranteed dimensions consult factory.

Position magnets

PRMAG20



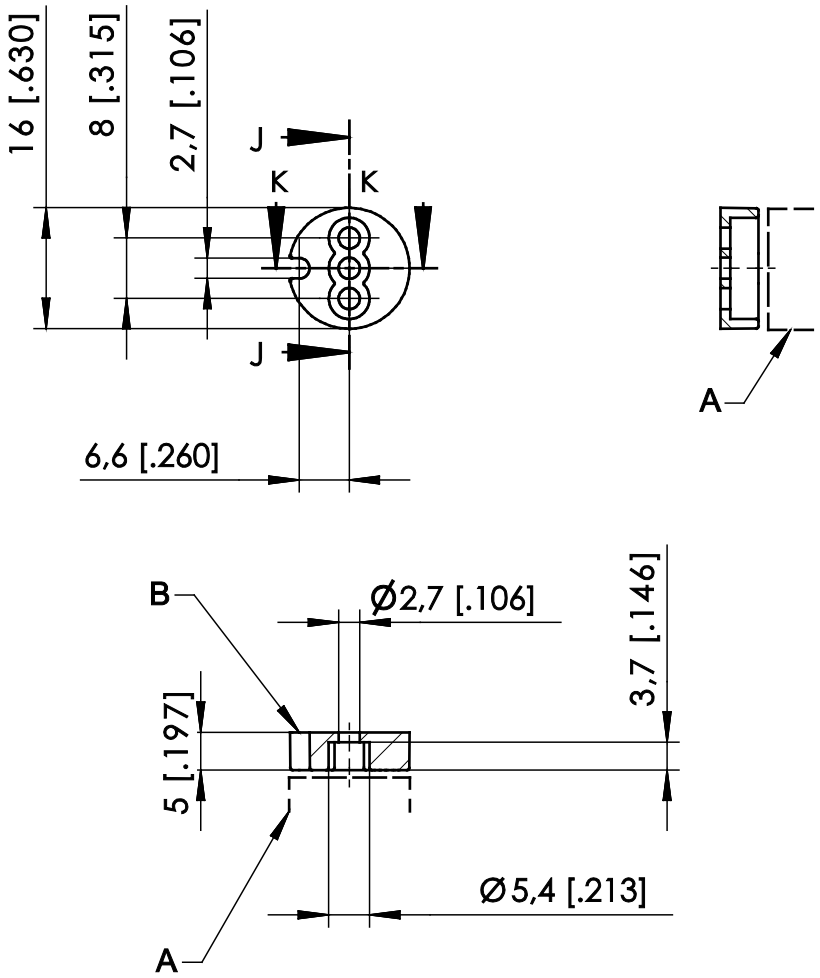
A – Sensor
B – Marking

Order code	Weight	Material	Moment of inertia
PRMAG20	approx. 12 g	zinc coated steel, plastic	1.3 kgmm^2

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions please consult factory.

PRMAG21



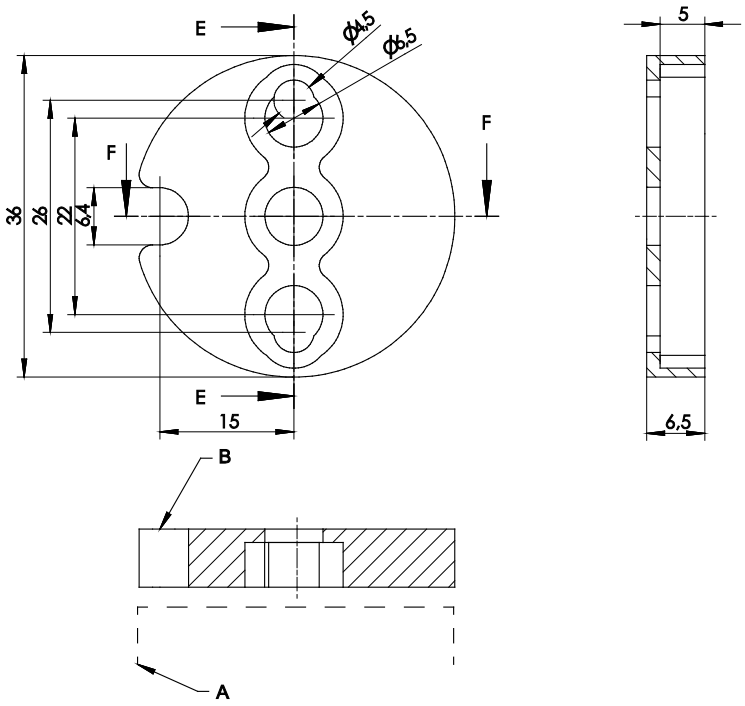
A – Sensor
B – Marking

Order code	Weight	Material	Moment of inertia
PRMAG21	approx. 3 g	zinc coated steel; plastic	0.1 kgmm^2

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch]
Dimensions informative only.
For guaranteed dimensions please consult factory.

PRMAG22



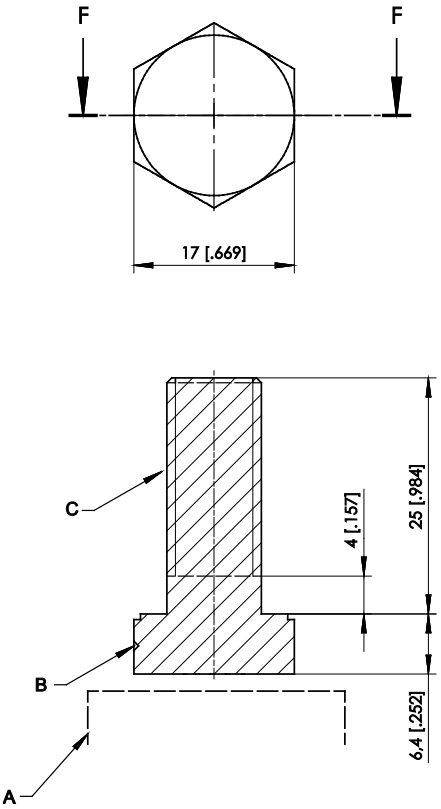
A – Sensor
B – Marking

Order code	Weight	Material	Moment of inertia
PRMAG22	approx. 19 g	zinc coated steel, plastic	3 kgmm^2

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch].
Dimensions informative only
For guaranteed dimensions please consult factory.

PRMAG-M10



A – Sensor
B – Marking
C – Thread M10

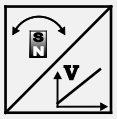
Order code	Weight	Material	Moment of inertia
PRMAG-M10	approx. 30 g	stainless steel A2	1.3 kgmm2

A misalignment of the position magnet has an effect on the linearity.

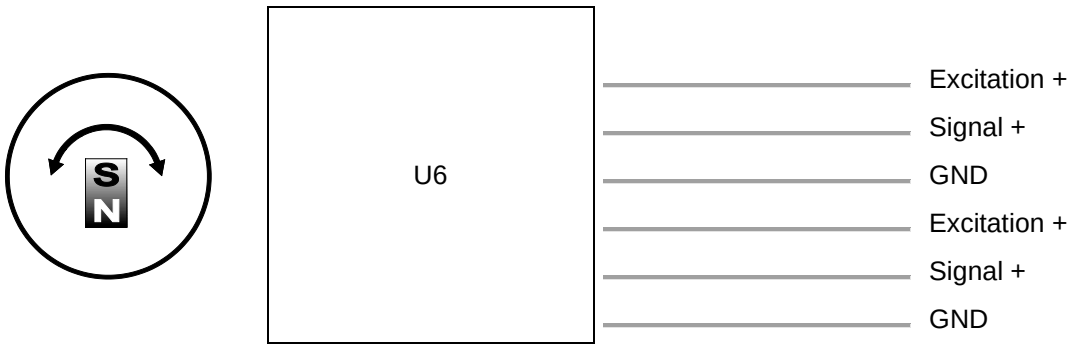
Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions please consult factory.

Output specification

Analog output

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

Signal diagram PRAS20R

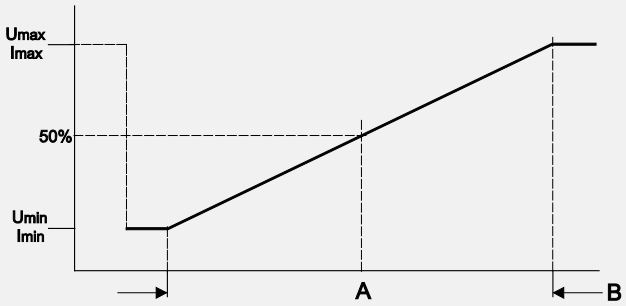


Signal wiring PRAS20/PRAS20R/PRAS21

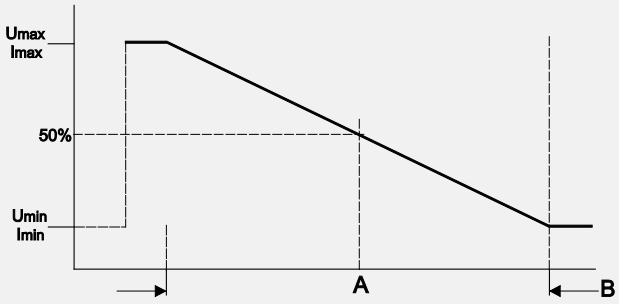
Signal	Cable color
Excitation +	brown
Signal	white
GND	blue

Characteristics for magnetic angle sensors

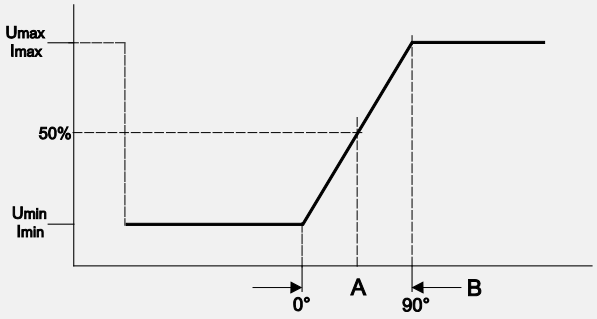
Output signal CW
(clockwise increasing)



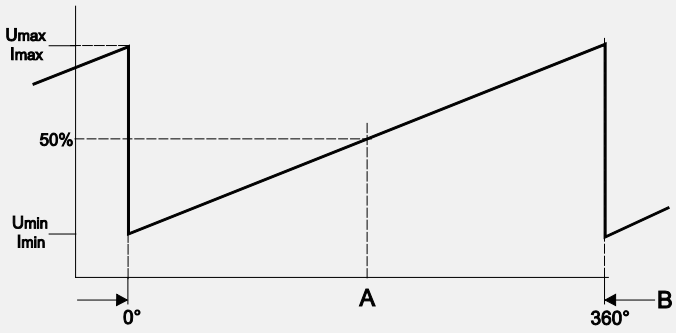
Output signal CCW
(counterclockwise increasing)



Example angular range 90°



Example angular range 360°



A – Marking
B – Measurement range [°]

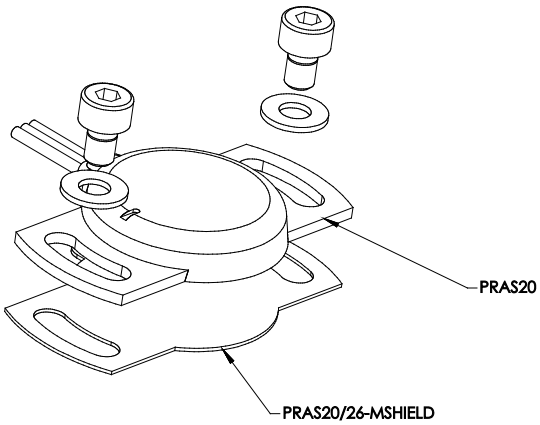
Accessories

PRAS20 / PRAS20R Magnetic shield

An optional shield plate is available for the angle sensors PRAS20 and PRAS20R. It can reduce the effect of residual magnetizing in case the sensor has to be mounted on a ferromagnetic material.

Order code magnetic shield:

PRAS20/26-MSHIELD



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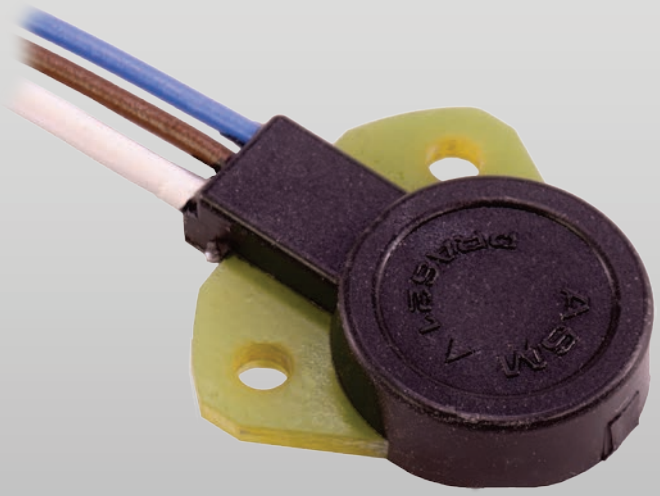
Magnetic Angle Sensors

PRAS21
Magnetic Angle Sensor

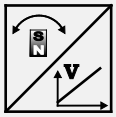
Datasheet



Analog output

Sensor features

- **Measurement range 0 ... 360°**
- **Protection class IP60**
- **Analog output**
- **Compact, low profile housing**
- **Non-contact with external position magnet, no wear**
- **Housing: Epoxy glass fibre, thermoplastic**



Specifications

Output	Voltage 0.5 ... 4.5 V, ratiometric
Measurement range	0 ... 15° to 0 ... 360° (in 15° increments)
Resolution	0.03% (60 ... 360°); 0.1% (15 ... 45°)
Repeatability	±0.03% (60 ... 360°); ±0.1% (15 ... 45°)
Linearity	±0.5% f.s. (typical)
Rated distance sensor / magnet	Depending on the position magnet
Protection class	IP60
Housing material	Epoxy glass fibre, thermoplastic
Mounting	Screws M3
Connection	Single wire ETFE 3 x 0.5 mm^2
Temperature range	-40 ... +85°C
Shock	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
Vibration	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
Weight	5 g approx. (without cable)
EMC	DIN EN 61326-1:2013

Order code

PRAS21 – [1] – [2] – [3] – [4]

1 Measurement range (0 ... 15° to 0 ... 360°, in 15° increments)

15 / 30 / 45 / ... / 345 / 360

2 Output

U6 = Voltage 0.5 ... 4.5 V ratiometric (excitation voltage 5 V DC)

3 Signal characteristics

CW = Signal increasing CW, clockwise
CCW = Signal increasing CCW, counterclockwise

4 Connection

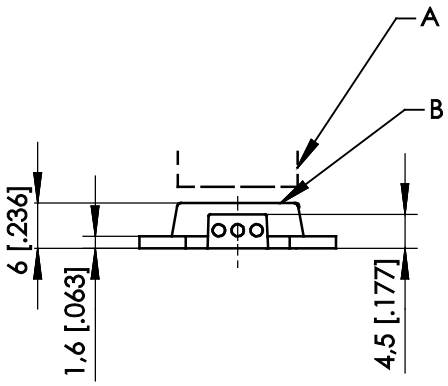
A300 = Single wire ETFE 3 x 0.5 mm^2. length 300 mm

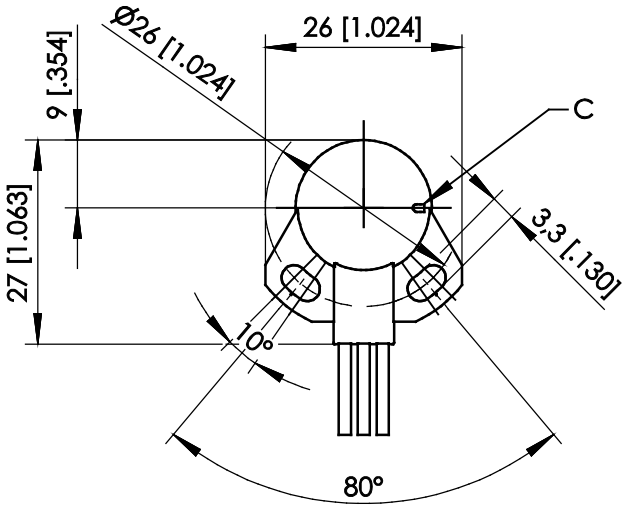
Order example

PRAS21 – 360 – U6 – CW – A300

Accessories:
Position magnets (see from page 7)
Magnetic shield (see page 13)

Dimensions



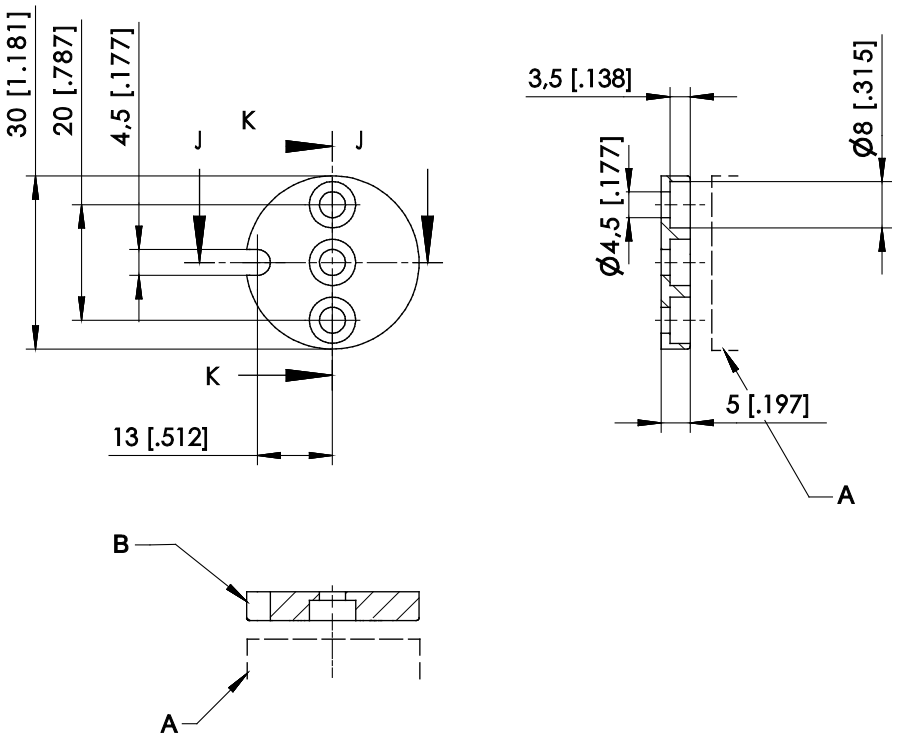


A – Position magnet
B – Measuring area
C – Marking

Dimensions in mm [inch]. Weight without cable approx. 5 g.
Dimensions informative only.
For guaranteed dimensions consult factory.

Position magnets

PRMAG20



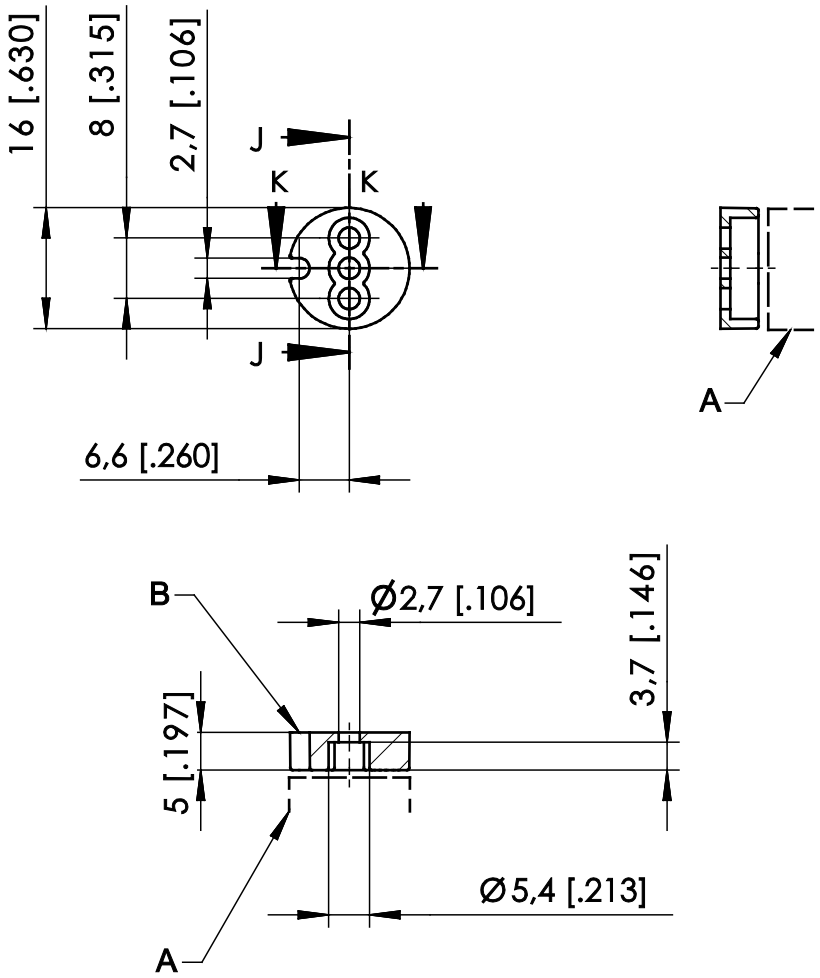
A – Sensor
B – Marking

Order code	Weight	Material	Moment of inertia
PRMAG20	approx. 12 g	zinc coated steel, plastic	1.3 kgmm^2

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions please consult factory.

PRMAG21



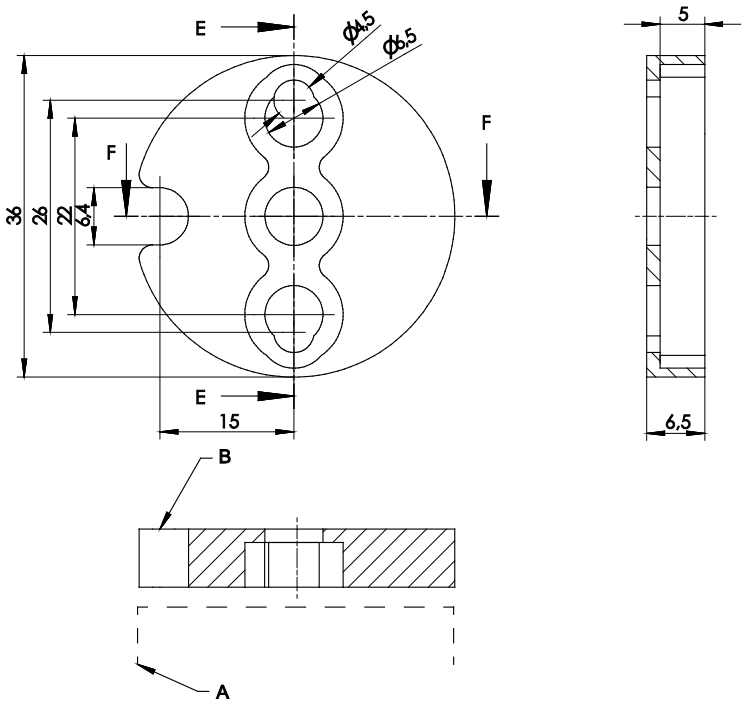
A – Sensor
B – Marking

Order code	Weight	Material	Moment of inertia
PRMAG21	approx. 3 g	zinc coated steel; plastic	0.1 kgmm^2

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch]
Dimensions informative only.
For guaranteed dimensions please consult factory.

PRMAG22



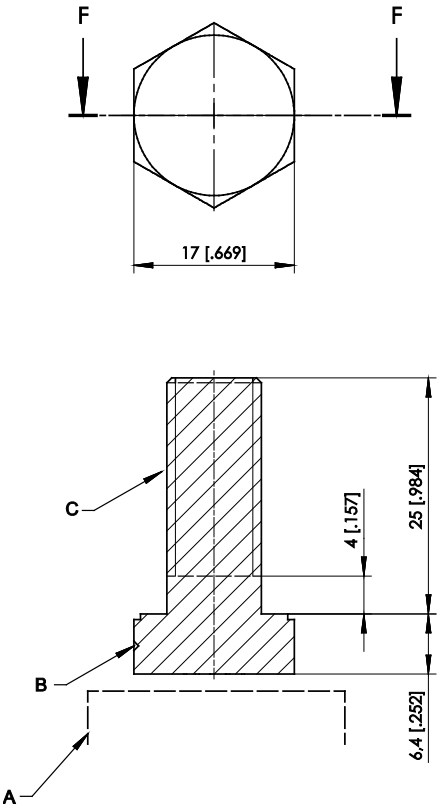
A – Sensor
B – Marking

Order code	Weight	Material	Moment of inertia
PRMAG22	approx. 19 g	zinc coated steel, plastic	3 kgmm^2

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch].
Dimensions informative only
For guaranteed dimensions please consult factory.

PRMAG-M10



A – Sensor
B – Marking
C – Thread M10

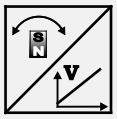
Order code	Weight	Material	Moment of inertia
PRMAG-M10	approx. 30 g	stainless steel A2	1.3 kgmm2

A misalignment of the position magnet has an effect on the linearity.

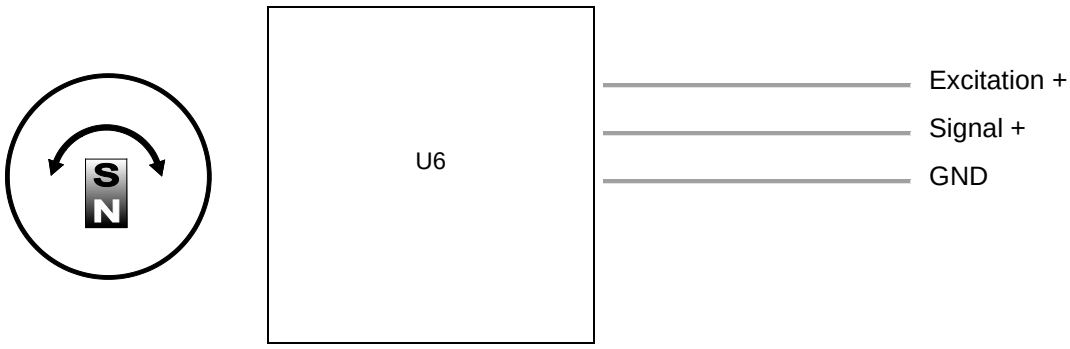
Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions please consult factory.

Output specification

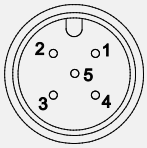
Analog output

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

Signal diagram



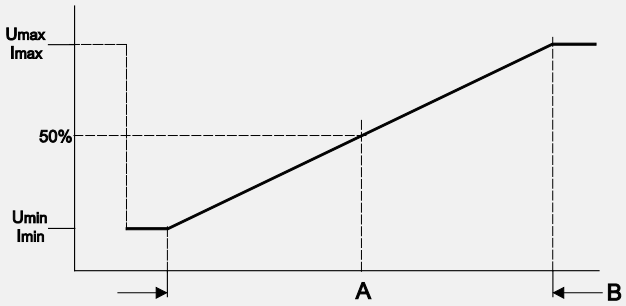
Signal wiring
(connector and cable output)

Signal	Connector pin no.	Cable color	View to the sensor connector
Excitation +	1	brown	
Signal	2	white	
GND	3	blue	
Do not connect!	4	black	
Do not connect!	5	grey	

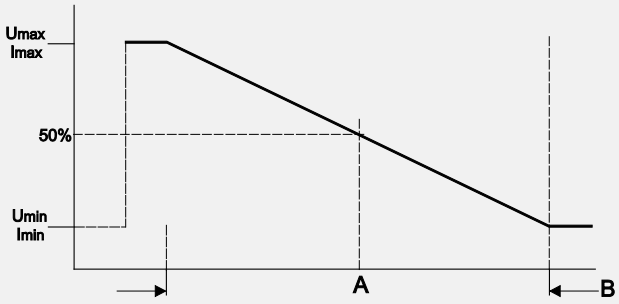
3-wire current 4...20 mA interface: GND has to be connected!

Characteristics for magnetic angle sensors

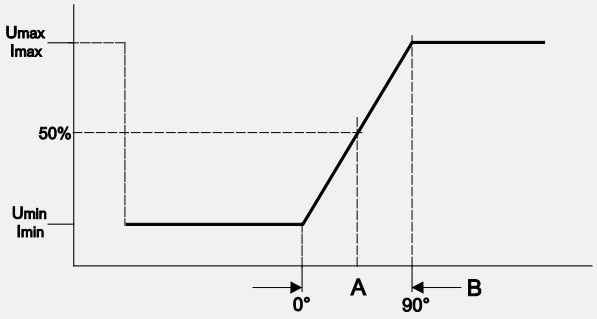
Output signal CW
(clockwise increasing)



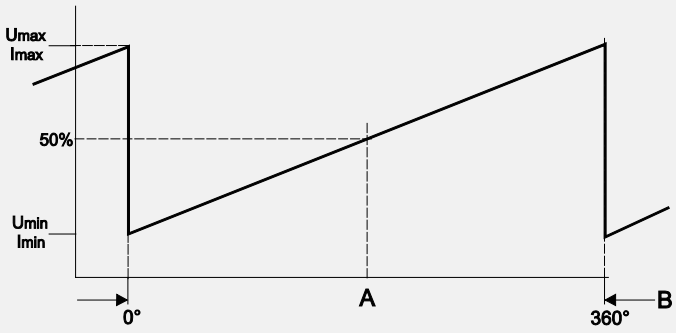
Output signal CCW
(counterclockwise increasing)



Example angular range 90°



Example angular range 360°



A – Marking
B – Measurement range [°]

Accessories

PRAS21 Magnetic Shield

An optional shield plate is available for the angle sensor PRAS21. It can reduce the effect of residual magnetizing in case the sensor has to be mounted on a ferromagnetic material.

Order code magnetic shield:

PRAS21-MSHIELD