

 **PRAS21**

Angle sensor for indoor applications



- **Protection class IP60**
- **Measurement range 0°... 360°**
- **Overall height 6 mm**
- **Contactless with external position magnet, wear-free**
- 
- 

### Product versions



**Analog output**



## PRAS21 - Magnetic Angle Sensor Version with Analog output

### Specifications

|                                |                                                                            | Order options |                                |
|--------------------------------|----------------------------------------------------------------------------|---------------|--------------------------------|
| Measurement range              | 0 ... 15° to 0 ... 360° (in 15° increments)                                | <b>1</b>      | 15 / 30 / 45 / ... / 345 / 360 |
| Output                         | Voltage 0.5 ... 4.5 V, ratiometric                                         | <b>2</b>      | U6                             |
| Signal characteristics         | Signal increasing CW, clockwise<br>Signal increasing CCW, counterclockwise | <b>3</b>      | CW<br>CCW                      |
| 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                                           |               |                                |
| Housing material               | Epoxy glass fibre, thermoplastic                                           |               |                                |
| Mounting                       | Screws M3                                                                  |               |                                |
| Protection class               | IP60                                                                       |               |                                |
| Connection                     | Single wire ETFE 3 x 0.5 mm <sup>2</sup> , length 300 mm                   | <b>4</b>      | A300                           |
| 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                         |               |                                |
| Temperature range              | -40 ... +85°C                                                              |               |                                |
| Weight                         | 5 g approx. (without cable)                                                |               |                                |
| EMC                            | DIN EN 61326-1:2013                                                        |               |                                |

### Order code

PRAS21    –    **1**    –    **2**    –    **3**    –    **4**

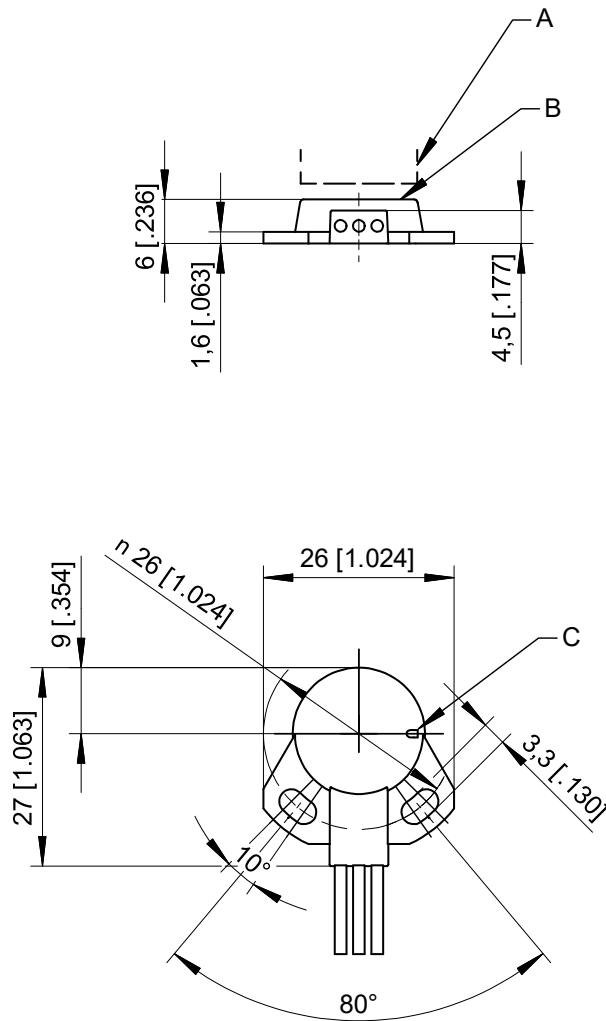
**Order example:** PRAS21 – 360 – U6 – CW – A300

### Accessories:

**Position magnets (see from page 4)**

**Magnetic shield (see page 11)**

## Dimensions



- A – Position magnet
- B – Measuring area
- C – Marking

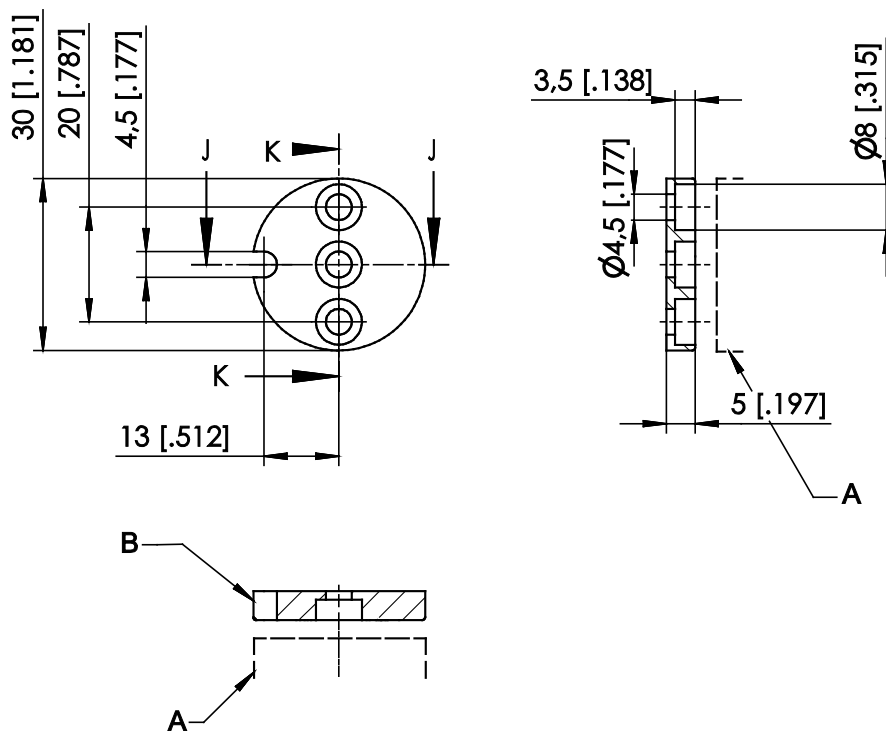
Dimensions in mm [inch]. Weight without cable approx. 5 g.

Dimensions informative only.

For guaranteed dimensions consult factory.

## Position magnets

### PRMAG20



A – Sensor  
B – Marking

| Order code     | Weight       | Material                   | Moment of inertia     |
|----------------|--------------|----------------------------|-----------------------|
| <b>PRMAG20</b> | approx. 12 g | zinc coated steel, plastic | 1.3 kgmm <sup>2</sup> |

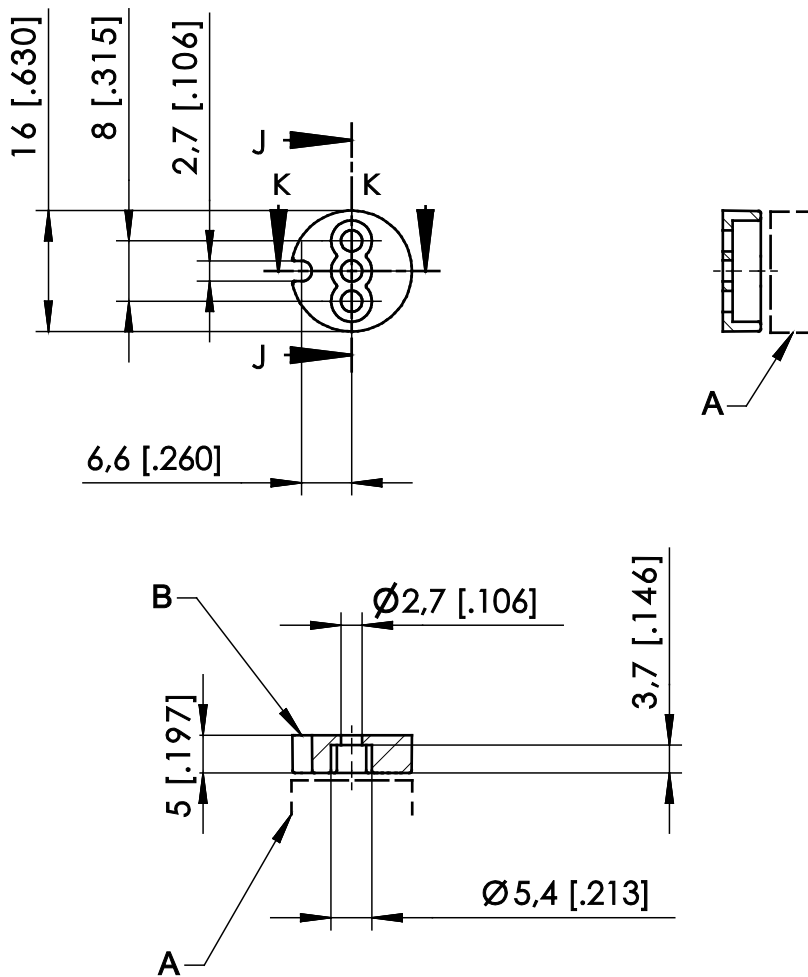
A misalignment of the position magnet has an effect on the linearity.

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 <sup>2</sup> |

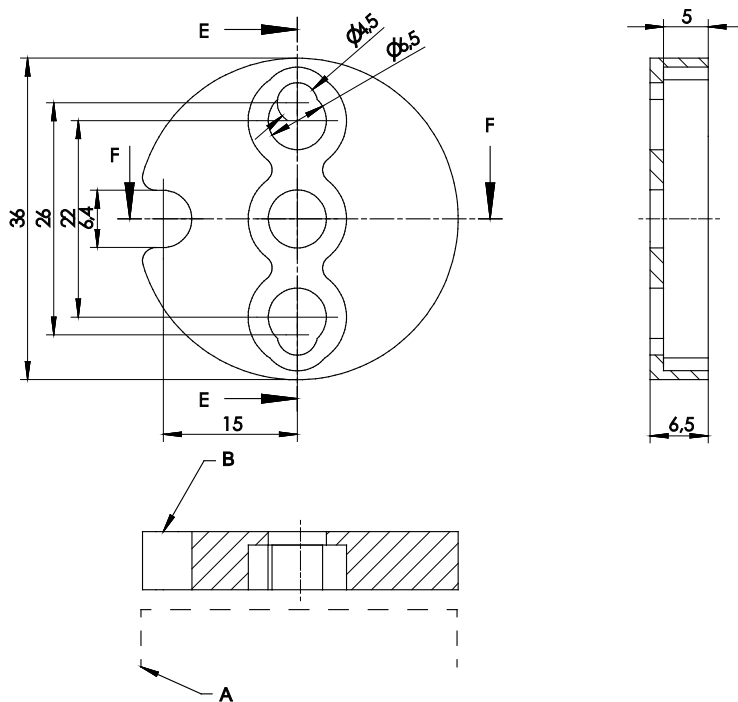
A misalignment of the position magnet has an effect on the linearity.

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 <sup>2</sup> |

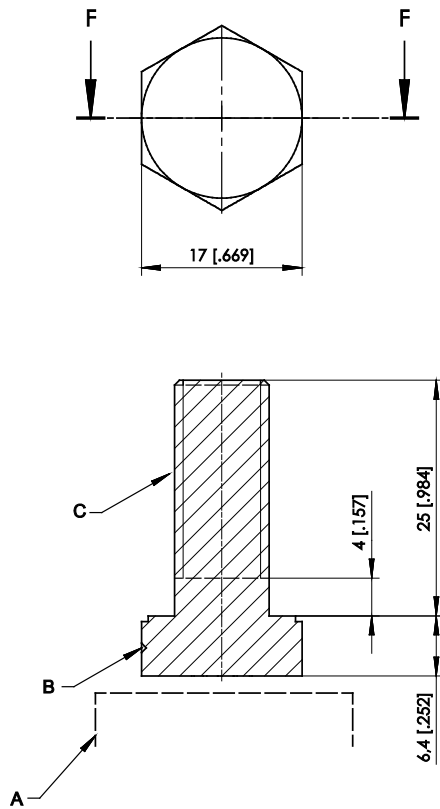
A misalignment of the position magnet has an effect on the linearity.

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     |
|------------------|--------------|--------------------|-----------------------|
| <b>PRMAG-M10</b> | approx. 30 g | stainless steel A2 | 1.3 kgmm <sup>2</sup> |

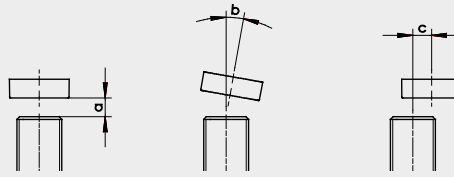
A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch].

Dimensions informative only.

For guaranteed dimensions please consult factory.

## Measuring error by misalignment of the position magnet



Air gap (a)  
Parallelism (b)  
Lateral offset (c)

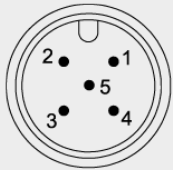
| Sensor | Position magnet | Air gap [mm] | Parallelism [°] | Error by lateral offset [°] |        |      |      |      |      |
|--------|-----------------|--------------|-----------------|-----------------------------|--------|------|------|------|------|
|        |                 |              |                 | 0.2 mm                      | 0.5 mm | 1 mm | 2 mm | 3 mm | 4 mm |
| PRAS21 | PRMAG20         | 0 ... 7      | 0 ... 5         | 0.1                         | 0.3    | 0.7  | 2    | 4.6  | –    |
|        | PRMAG21         | 0 ... 2      | 0 ... 5         | 0.15                        | 0.3    | 0.9  | 3.6  | 9.6  | –    |
|        | PRMAG22         | 0 ... 10     | 0 ... 5         | 0                           | 0      | 0.7  | 1.5  | 3.8  | 7    |
|        | PRMAG-M10       | 0 ... 3      | 0 ... 5         | 0.1                         | 0.1    | 0.5  | 2    | 7    | –    |

## Output specification

### Analog output

|                                                                                                                                             |                         |                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>U6</b><br>Voltage output<br>10 ... 90 % ratiometric<br> | Excitation voltage      | 5 V DC ±10 %                                                                                                        |
|                                                                                                                                             | Excitation current      | typical 8 mA<br>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 <sup>-6</sup> / °C f.s. (typical for 90° ... 360°)<br>±100 x 10 <sup>-6</sup> / °C f.s. (typical for <90°) |
|                                                                                                                                             | Protection              | Reverse polarity, short circuit                                                                                     |
|                                                                                                                                             | Operating temperature   | -40 ... +85 °C                                                                                                      |
|                                                                                                                                             | EMC                     | DIN EN 61326-1:2013                                                                                                 |

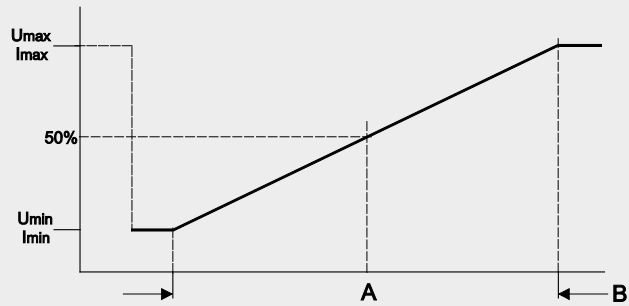
### Analog output, 1 channel (connector and cable output)

| Signal wiring                                                                                                                                      | Output signals  | Connector pin no. | Cable color |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------|-------------|
| <b>Connector M12, 5 pin</b><br><br>View to the sensor connector | Excitation +    | 1                 | brown       |
|                                                                                                                                                    | Signal          | 2                 | white       |
|                                                                                                                                                    | GND             | 3                 | blue        |
|                                                                                                                                                    | Do not connect! | 4                 | black       |
|                                                                                                                                                    | Do not connect! | 5                 | grey        |

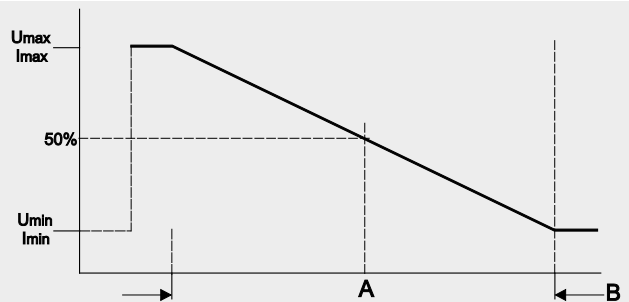
3-wire current 4...20 mA interface: GND has to be connected!

## Characteristics for magnetic angle sensors

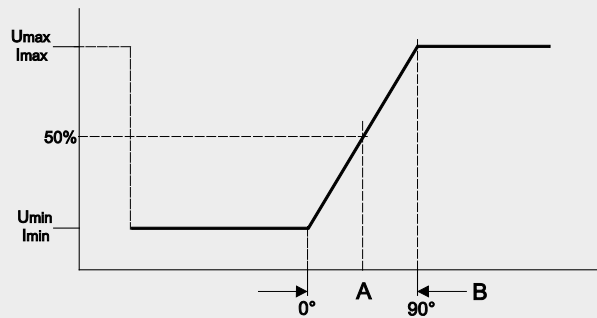
### Output signal CW (clockwise increasing)



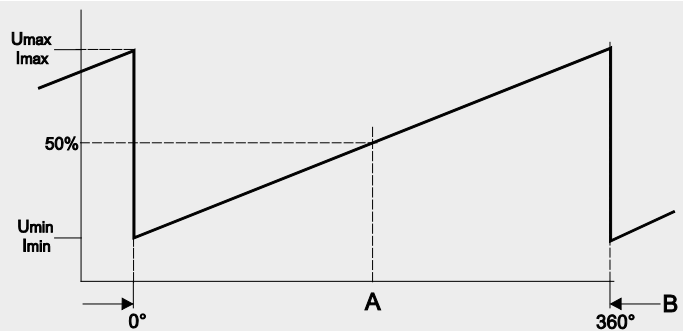
### Output signal CCW (counterclockwise increasing)



### 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**

