

 PRAS5

Angle sensor for heavy duty applications



- Measurement range 0°... 360°
- Protection class IP67/IP69, IP68 optional
- Hermetically sealed stainless steel housing
- Longitudinal water barrier; potted electronics
- Measurement with 10 mm shaft or contactless

### Product versions



Analog output



Analog output, redundant



PRAS5 - Magnetic Angle Sensor  
Version with analog output

Specifications

		Order options
<b>Mechanical connection</b>	Shaft 10 mm Contactless with external position magnet	<b>1</b> V K
<b>Measurement range</b>	0 ... 15° to 0 ... 360° (in 15° increments)	<b>2</b> 15 / 30 / 45 / ... / 345 / 360
<b>Output</b>	Voltage 0.5 ... 10 V Voltage 0.5 ... 4.5 V ratiometric Voltage 0.5 ... 4.5 V Current 4 ... 20 mA, 3 wire	<b>3</b> U2 / U2B U6 U8 I1 / I1B
<b>Signal characteristics</b>	Signal increasing CW, clockwise Signal increasing CCW, counterclockwise	<b>4</b> CW CCW
<b>Resolution</b>	0.03% (60 ... 360°); 0.1% (15 ... 45°)	
<b>Repeatability</b>	±0.03% (60 ... 360°); ±0.1% (15 ... 45°)	
<b>Linearity</b>	±0.3% f.s. (typical)	
<b>Connection</b>	5-pin connector M12 axial (compatible with 4-pin connector) 5-pin connector M12 radial (compatible with 4-pin connector) Cable, standard length 2 m Deutsch connector, not shielded	<b>5</b> M12A5  M12R5  KAB2M
<b>Housing material</b>	Stainless steel EN 1.4404 (AISI 316L)	<b>6</b> VA
<b>Mounting</b>	Screws M8	
<b>Protection class</b>	IP67/IP69, IP68 optional	
<b>Life cycle of bearings (shaft version)</b>	100 x 10 <sup>6</sup> revolutions (<1500 r.p.m.)	
<b>Revolutions per minute (mechanical)</b>	10,000 r.p.m.	
<b>Allowable shaft load</b>	120 N radial / 120 N axial	
<b>Shock</b>	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks	
<b>Vibration</b>	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles	
<b>Temperature range</b>	-40 ... +85°C	
<b>Weight</b>	390 g approx., 890 g approx. with shaft (without cable)	
<b>EMC</b>	DIN EN 61326-1:2013	

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**Order code**

PRAS5 – **1** – **2** – **3** – **4** – **5** – **6**

**Order example:** PRAS5 – V – 360 – I1 – CW – M12A5 – VA

**Accessories:**

**Connector cable (see page 24)**

**Position magnets (see from page 12)**



PRAS5 - Magnetic Angle Sensor  
Version with analog output, redundant

Specifications

		Order options
<b>Mechanical connection</b>	Shaft 10 mm Contactless with external position magnet	<b>1</b> V K
<b>Measurement range</b>	0 ... 15° to 0 ... 360° (in 15° increments)	<b>2</b> 15 / 30 / 45 / ... / 345 / 360
<b>Output</b>	Voltage 0.5 ... 10 V, redundant Voltage 0.5 ... 4.5 V ratiometric, redundant Voltage 0.5 ... 4.5 V, redundant Current 4... 20 mA, 3 wire, redundant	<b>3</b> U2R U6R U8R I1R
<b>Signal characteristics</b>	Signal 1 increasing clockwise, signal 2 increasing counterclockwise Signal 1 and signal 2 increasing clockwise* Signal 1 and signal 2 increasing counterclockwise*  * not available with output I1R	<b>4</b> CW/CCW  CW/CW CCW/CCW
<b>Resolution</b>	0.03% (60 ... 360°); 0.1% (15 ... 45°)	
<b>Repeatability</b>	±0.03% (60 ... 360°); ±0.1% (15 ... 45°)	
<b>Linearity</b>	±0.3% f.s. (typical)	
<b>Connection</b>	8-pin connector M12 axial 8-pin connector M12 radial Cable, standard length 2 m Deutsch connector, not shielded	<b>5</b> M12A8 M12R8 KAB2M
<b>Housing material</b>	Stainless steel EN 1.4404 (AISI 316L)	<b>6</b> VA
<b>Mounting</b>	Screws M8	
<b>Protection class</b>	IP67/IP69, IP68 optional	
<b>Life cycle of bearings (shaft version)</b>	100 x 10 <sup>6</sup> revolutions (<1500 r.p.m.)	
<b>Revolutions per minute (mechanical)</b>	10,000 r.p.m.	
<b>Allowable shaft load</b>	120 N radial / 120 N axial	
<b>Shock</b>	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks	
<b>Vibration</b>	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles	
<b>Temperature range</b>	-40 ... +85°C	
<b>Weight</b>	390 g approx., 890 g approx. with shaft (without cable)	
<b>EMC</b>	DIN EN 61326-1:2013	

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**Order code**

PRAS5 – **1** – **2** – **3** – **4** – **5** – **6**

**Order example:** PRAS5 – V – 360 – U2R – CW/CCW – M12R8 – VA

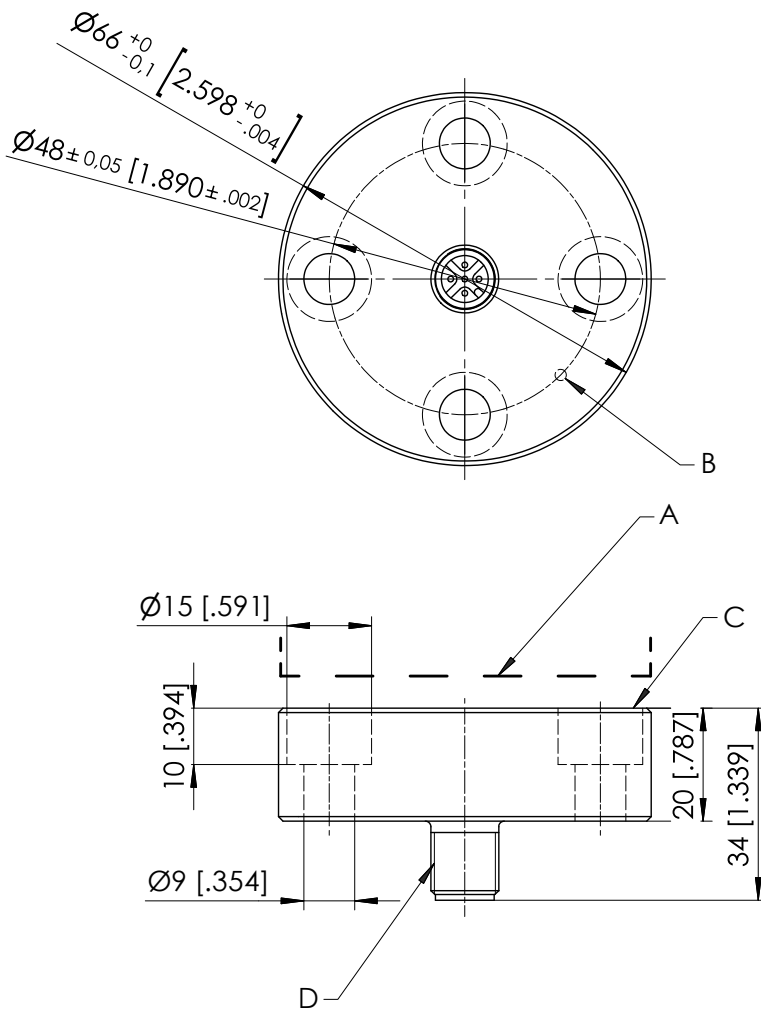
**Accessories:**

**Connector cable (see page 25)**

**Position magnets (see from page 12)**

## Dimensions

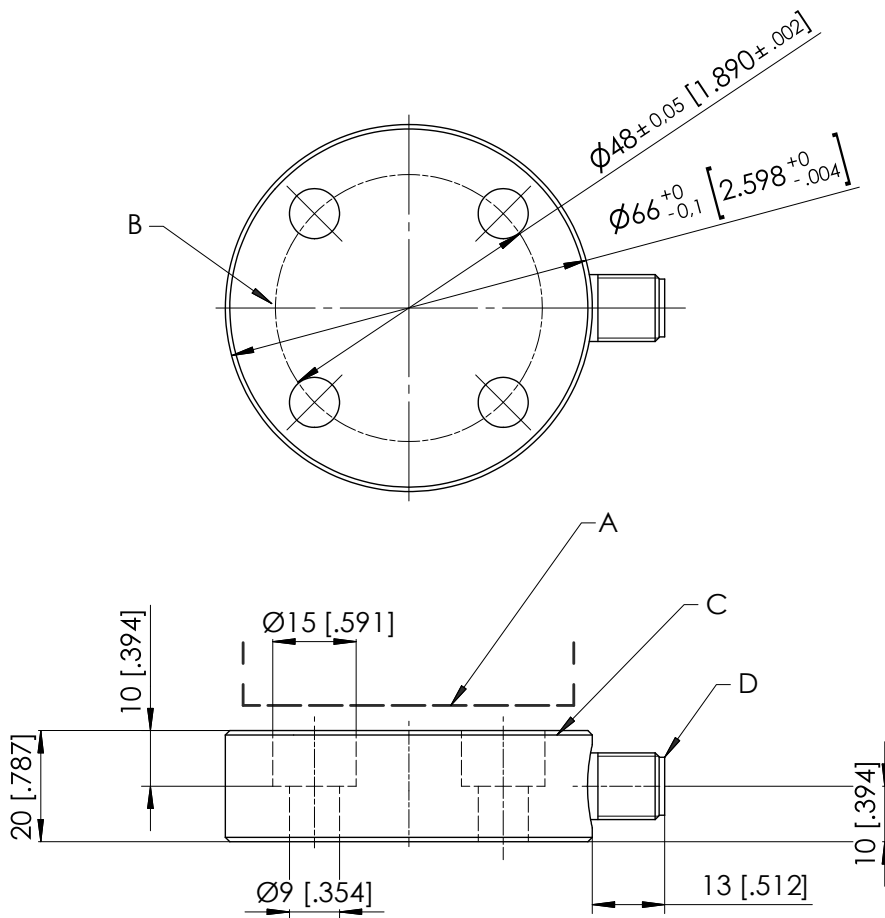
Contactless, connector M12, axial



- A – Position magnet
- B – Marking
- C – Measuring area
- D – Connector M12

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

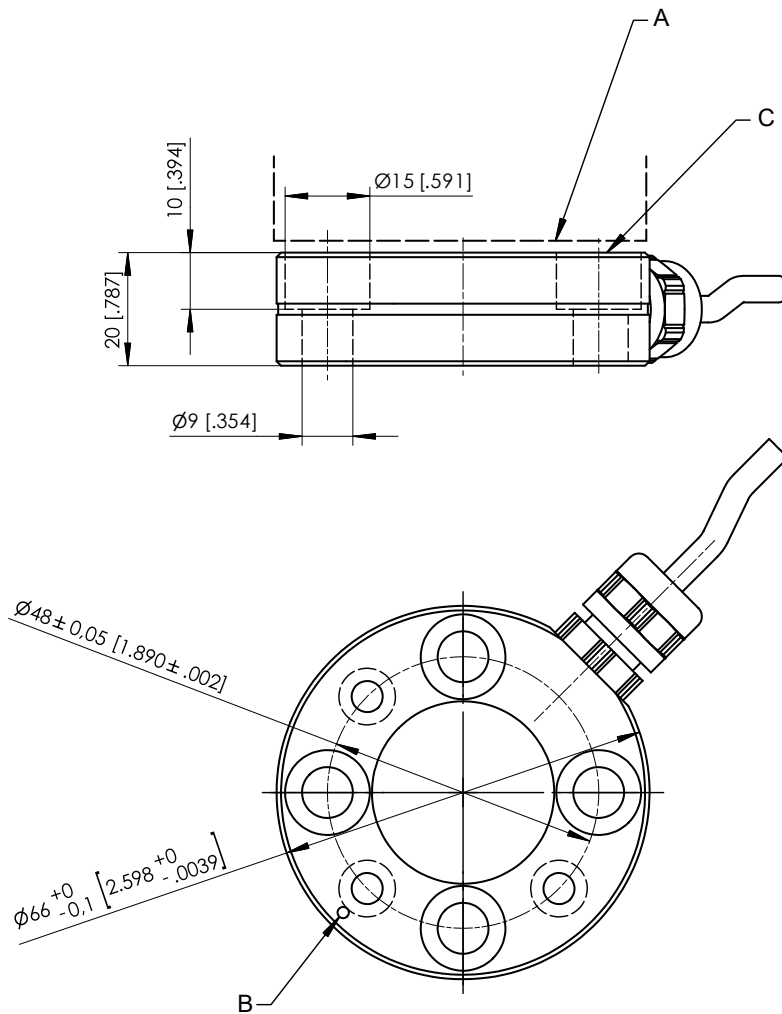
Contactless, connector M12, radial



- A – Position magnet
- B – Marking
- C – Measuring area
- D – Connector M12

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

Cable version, contactless

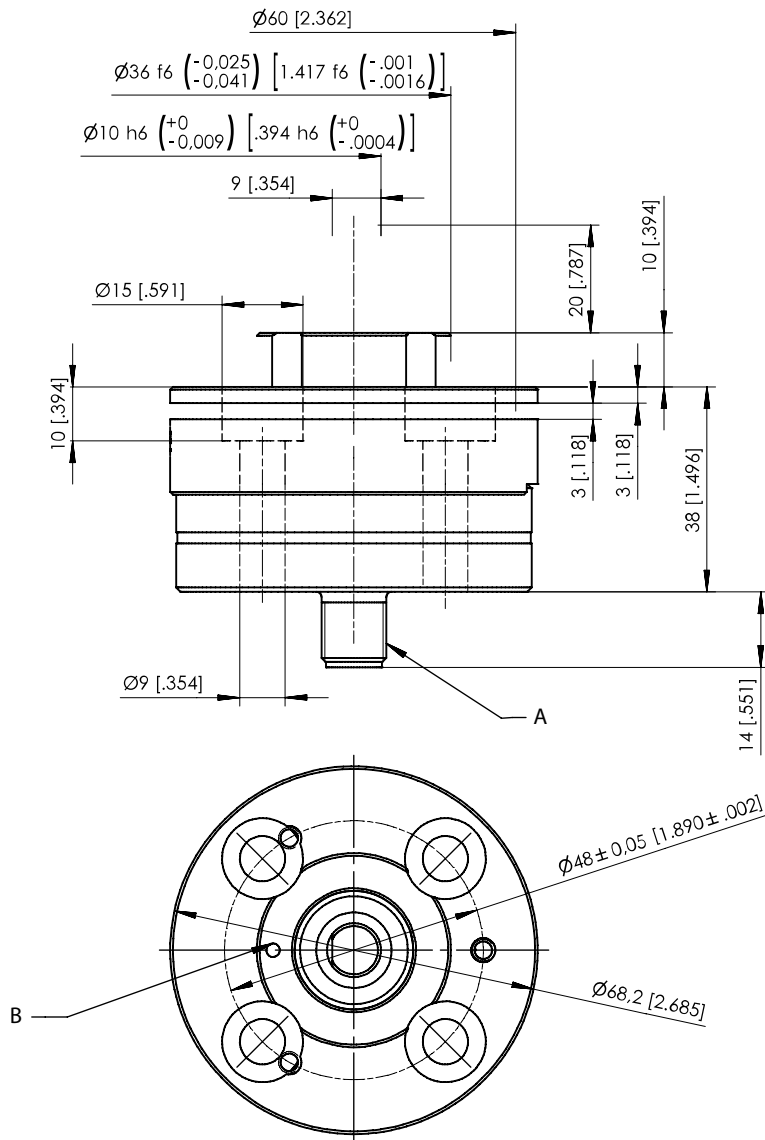


- A – Position magnet
- B – Marking
- C – Measurement area

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



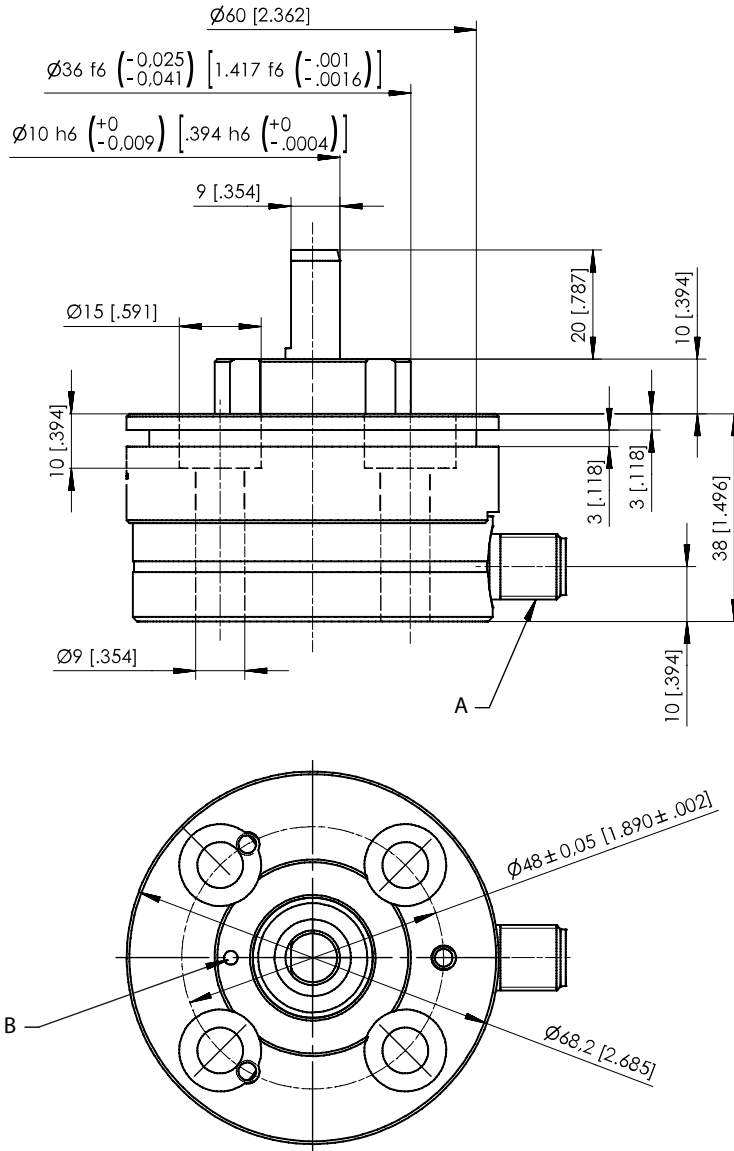
With shaft, connector M12, axial



A – Connector M12  
B – Marking

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

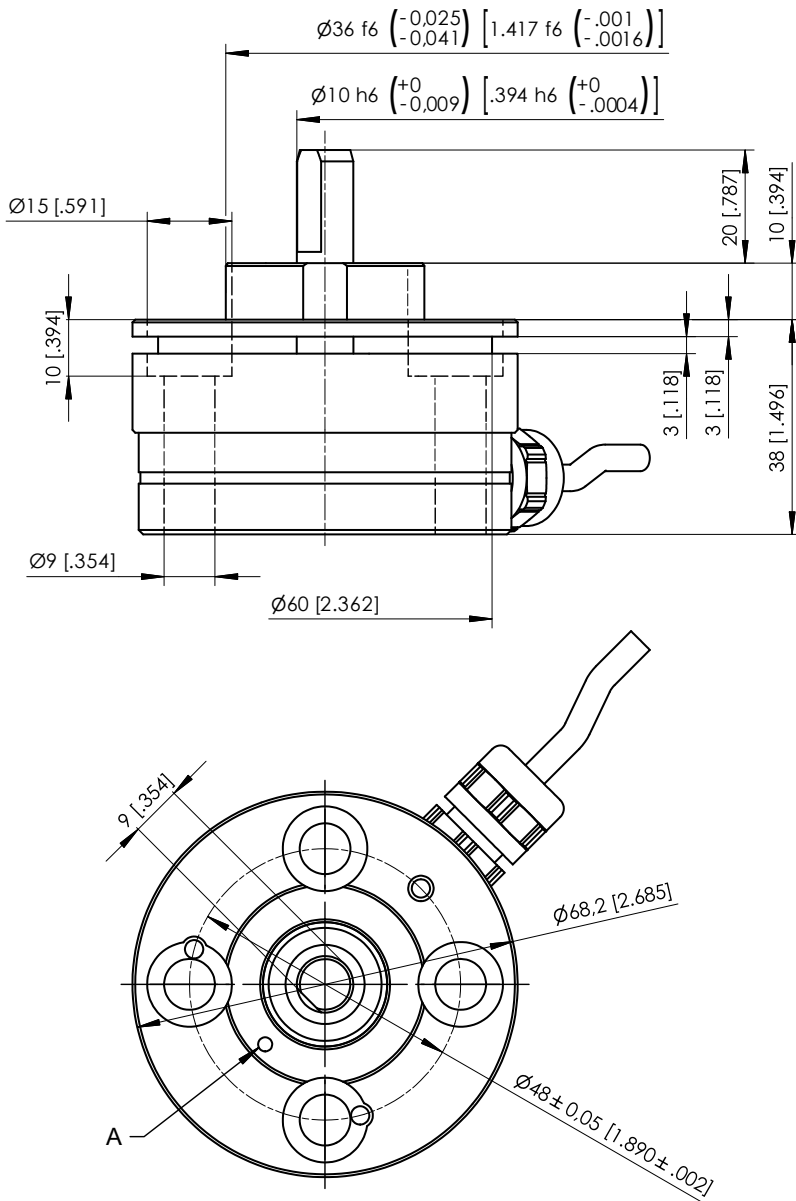
**With shaft, connector M12, radial**



A – Connector M12  
B – Marking

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

Cable version, with shaft

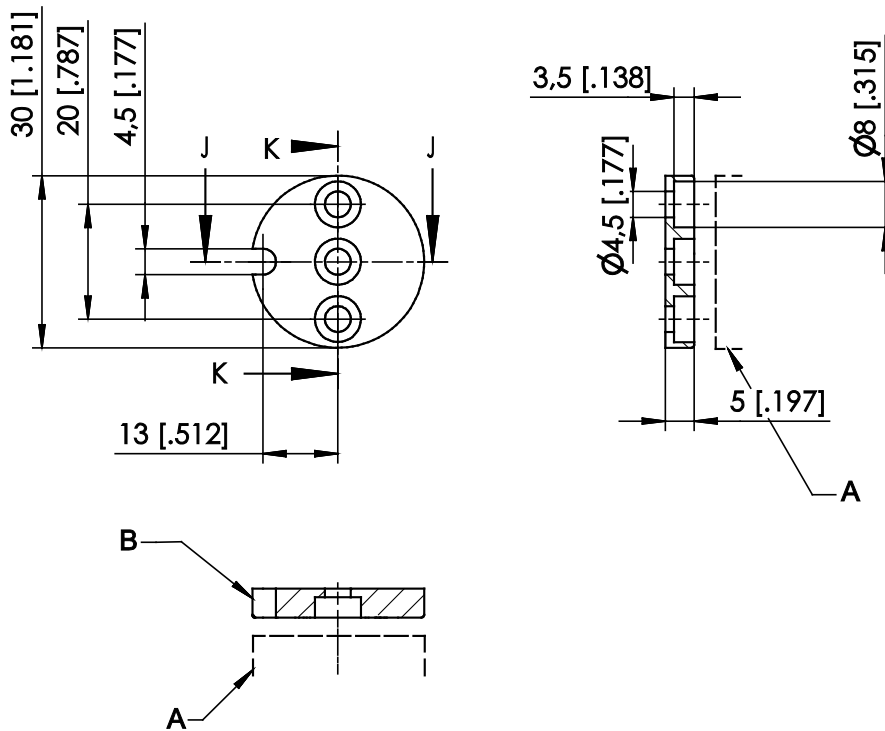


A – Marking

Dimensions in mm [inch].  
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 <sup>2</sup>

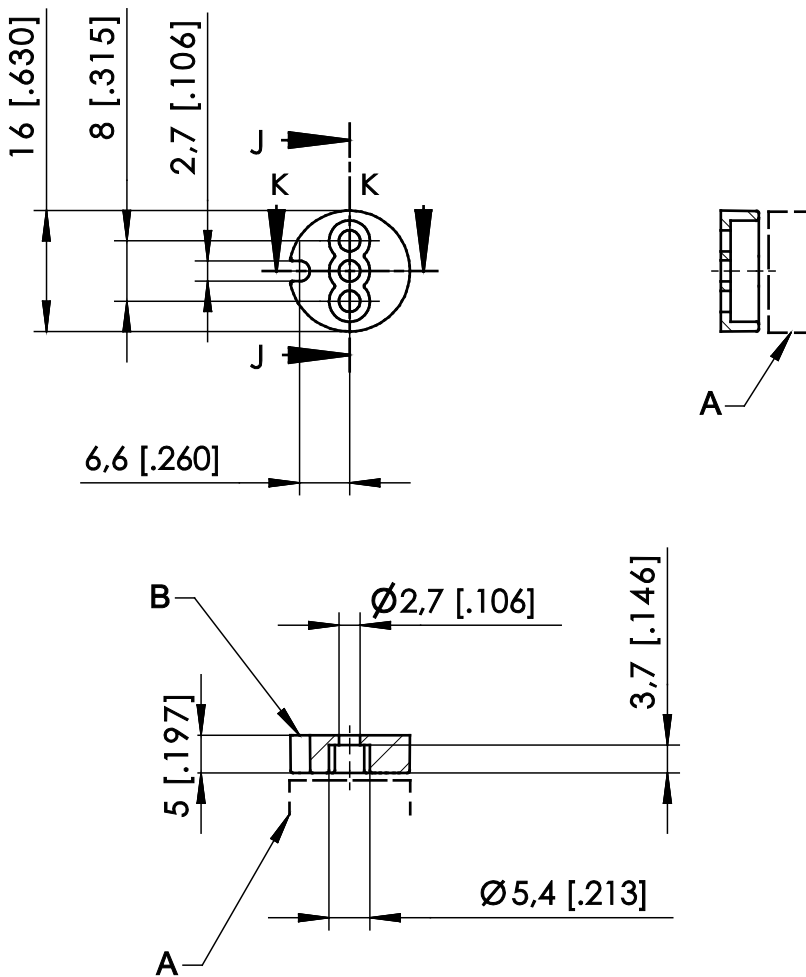
A misalignment of the position magnet has an effect on the linearity.

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>

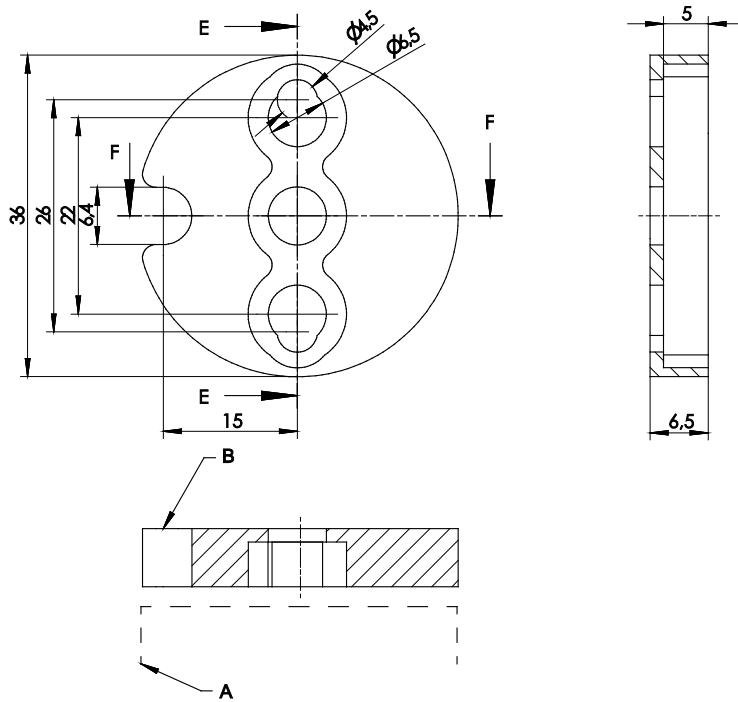
A misalignment of the position magnet has an effect on the linearity.

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>

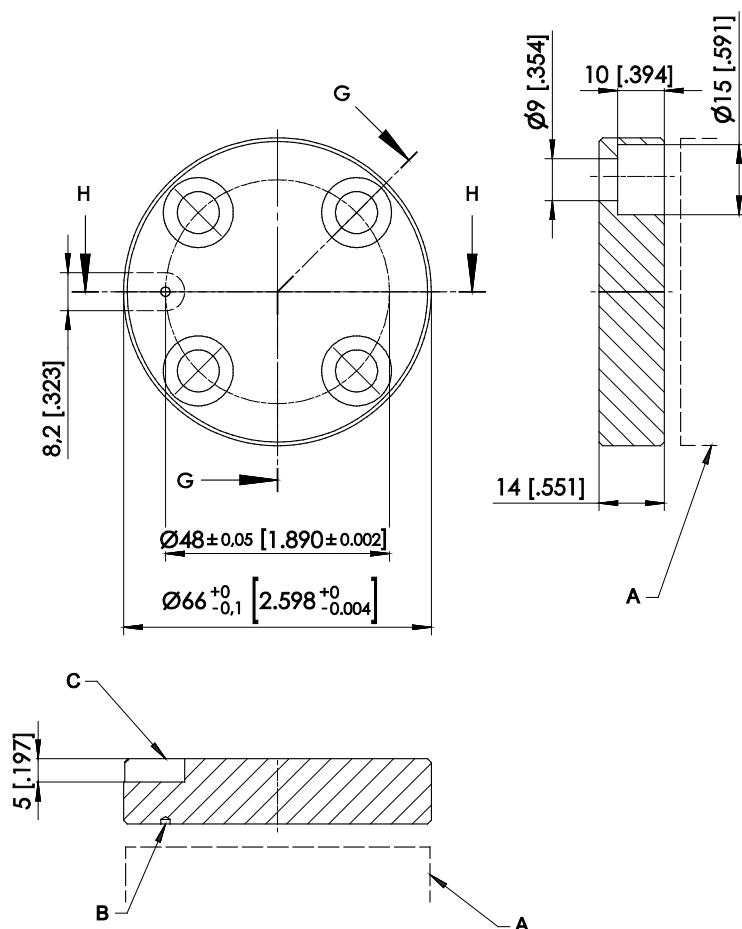
A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch].

Dimensions informative only

For guaranteed dimensions please consult factory.

PRMAG5-Z / PRMAG5-Z-VA



A – Sensor  
B – Marking  
C – Notch

Order code	Weight	Material	Moment of inertia
PRMAG5-Z	approx. 110 g	AlMgSi1	59,9 kgmm <sup>2</sup>
PRMAG5-Z-VA	approx. 275 g	stainless steel EN 1.4404 (AISI 316L)	149,9 kgmm <sup>2</sup>

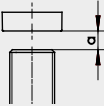
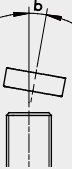
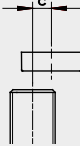
A misalignment of the position magnet has an effect on the linearity.

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) Axial misalignment (c)					
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	
PRAS5	PRMAG20	0 ... 5.5	0 ... 5	0.15	0.4	0.8	2.2	5	–	
PRDS5	PRMAG21	0 ... 3	0 ... 5	0.2	0.4	1	3.8	10	–	
	PRMAG22	0 ... 8.5	0 ... 5	0.1	0.4	1	2.2	4.5	8	
	PRMAG5-Z-(VA)	0 ... 7.5	0 ... 5	0.1	0.2	0.6	1.5	4.5	8.5	





## Output specification


### Analog output


<b>U2</b> Voltage output 0.5 ... 10 V 	Excitation voltage	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)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical for 90° ... 360°) $\pm 100 \times 10^{-6}$ / °C f.s. (typical for <90°)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

<b>U2B</b> 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)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical for 90° ... 360°) $\pm 100 \times 10^{-6}$ / °C f.s. (typical for <90°)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

<b>U6</b> 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 <sup>-6</sup> / °C f.s. (typical for 90° ... 360°) ±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

<b>U8</b> Voltage output 0.5 ... 4.5 V 	Excitation voltage	11 ... 36 V DC
	Excitation current	typical 10 mA max. 20 mA
	Output voltage	0.5 ... 4.5 V DC
	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°) ±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

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

<b>I1B</b> 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 $\Omega$ max.
	Output current	4 ... 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical for 90° ... 360°) $\pm 100 \times 10^{-6}$ / °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 output)**

Signal wiring	Output signals	Connector pin no.	Cable color
<b>Connector M12, 5 pin</b>  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!


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**Analog output (cable output, seawater resistant submarine cable)**


Signal wiring	Output signals	Cable color
	Excitation +	white
	Signal	green
	GND	brown
	Do not connect!	grey
	Do not connect!	-


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

### Analog output, redundant

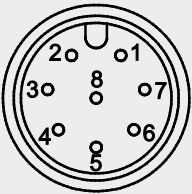
<b>U2R</b> Voltage output 0.5 ... 10 V 	Excitation voltage	18 ... 36 V DC
	Excitation current	typical 10 mA max. 15 mA per channel
	Output voltage	0.5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz Standard
	Stability (temperature)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical for 90° ... 360°) $\pm 100 \times 10^{-6}$ / °C f.s. (typical for <90°)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

<b>U6R</b> Voltage output 10 ... 90 % ratiometric 	Excitation voltage	5 V DC $\pm 10$ %
	Excitation current	typical 8 mA max. 12 mA per channel
	Output voltage	10 ... 90 % of the excitation voltage
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical for 90° ... 360°) $\pm 100 \times 10^{-6}$ / °C f.s. (typical for <90°)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	EN 61326-1:2013

<b>U8R</b> Voltage output 0.5 ... 4.5 V 	Excitation voltage	11 ... 36 V DC
	Excitation current	typical 10 mA max. 20 mA per channel
	Output voltage	0.5 ... 4,5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical for 90° ... 360°) $\pm 100 \times 10^{-6}$ / °C f.s. (typical for <90°)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

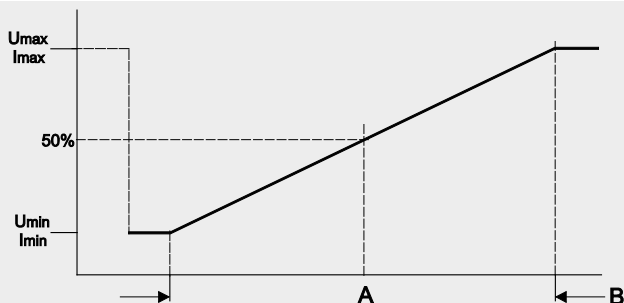
<b>I1R</b> Current output 4 ... 20 mA, 3 wires 	Excitation voltage	18 ... 36 V DC
	Excitation current	typical 30 mA max. 35 mA per channel
	Load R <sub>L</sub>	500 Ω max.
	Output current	4 ... 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical for 90° ... 360°) $\pm 100 \times 10^{-6}$ / °C f.s. (typical for <90°)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

**Analog output, 2 channels, redundant (connector and cable output)**

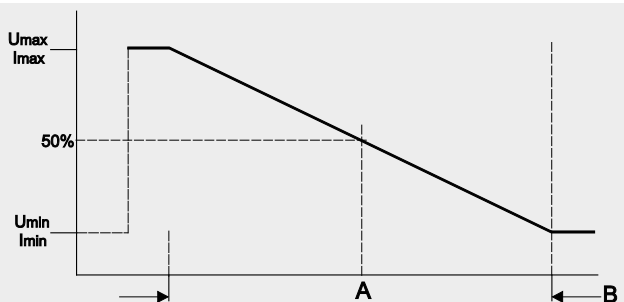
Signal wiring	Channel	Output signals	Connector pin no.	Cable color
<b>Connector M12, 8 pin</b>  View to the sensor connector	1	Excitation +	1	white
		Signal	2	brown
		GND	3	green
		Do not connect!	4	yellow
	2	Excitation +	5	grey
		Signal	6	pink
		GND	7	blue
		Do not connect!	8	red

## Characteristics for magnetic angle sensors

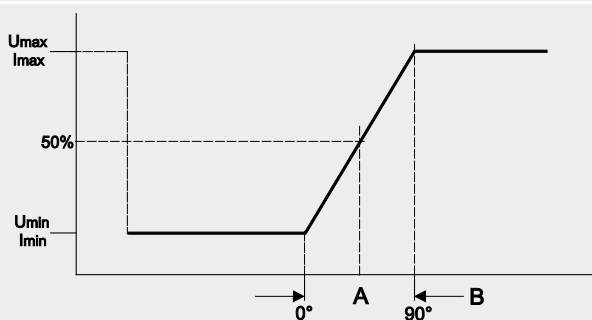
### Output signal CW (clockwise increasing)



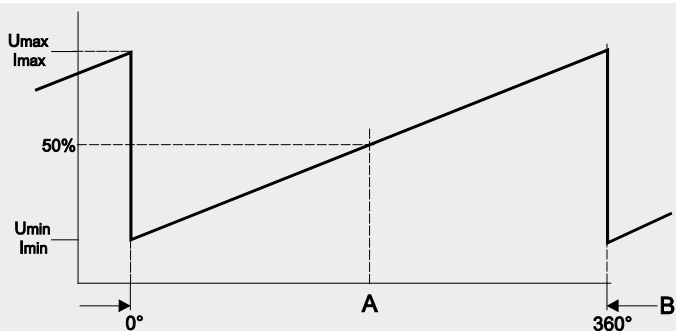
### Output signal CCW (counterclockwise increasing)



### Example angular range 90°



### Example angular range 360°



A – Marking

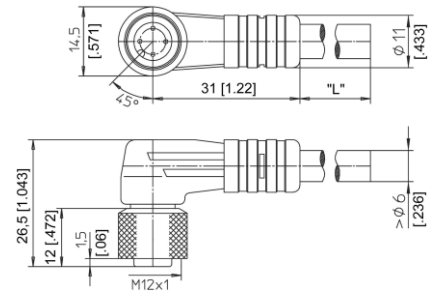
B – Measurement range [°]

## Accessories

### Connector cable M12, 4 pin (angular coupling)

shielded connector  
Suitable for 5-pin  
sensor connectors

The 4-core screened cable is supplied with a mating 4-pin 90° M12 connector at one end and 4 wires at the other end. Available lengths are 2 m, 5 m and 10 m.  
Wire: cross sectional area 0.34 mm<sup>2</sup>  
Cable diameter: 5.6 ±0.2 mm



#### Order code

**KAB - xM - M12/4F/W - LITZE**

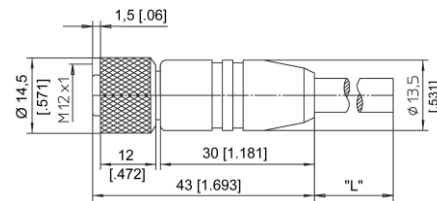
IP69: **KAB - xM - M12/4F/W/69K - LITZE**

xM = length in m

### Connector cable M12, 4 pin (straight coupling)

shielded connector  
Suitable for 5-pin  
sensor connectors

The 4-core screened cable is supplied with a mating 4-pin M12 connector at one end and 4 wires at the other end. Available lengths are 2 m, 5 m and 10 m.  
Wire: cross sectional area 0.34 mm<sup>2</sup>  
Cable diameter: 5.6 ±0.2 mm



#### Order code

**KAB - xM - M12/4F/G - LITZE**

IP69: **KAB - xM - M12/4F/G/69K - LITZE**

xM = length in m

Signal wiring M12, 4 pin	Plug connection / cable color			
	1	2	3	4
	brown	white	blue	black

#### Applicable for cable carriers

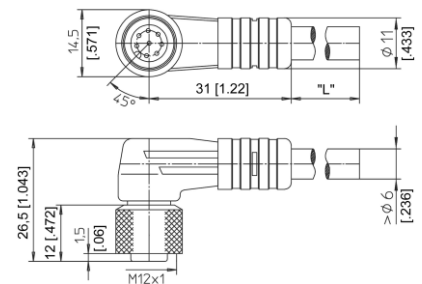
Maximum movement speed	3 m/s
Maximum acceleration	5 m/s <sup>2</sup>
Minimum bending radius	10 x cable diameter



### Connector cable M12, 8 pin (angular coupling)

shielded connector

The 8-lead shielded cable is supplied with a mating 8-pin 90° M12 connector at one end and 8 wires at the other end. Available lengths are 2 m, 5 m and 10 m.  
Wire: cross sectional area 0.25 mm<sup>2</sup>  
Cable diameter: 6.3 ±0.2 mm



#### Order code

**KAB - xM - M12/8F/W - LITZE**

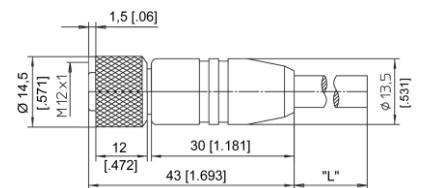
IP69: **KAB - xM - M12/8F/W/69K - LITZE**

xM = length in m

### Connector cable M12, 8 pin (straight coupling)

shielded connector

The 8-lead shielded cable is supplied with a mating 8-pin M12 connector at one end and 8 wires at the other end. Available lengths are 2 m, 5 m and 10 m.  
Wire: cross sectional area 0.25 mm<sup>2</sup>  
Cable diameter: 6.3 ±0.2 mm



#### Order code

**KAB - xM - M12/8F/G - LITZE**

IP69: **KAB - xM - M12/8F/G/69K - LITZE**

xM = length in m

Signal wiring M12, 8 pin	Plug connection / cable color							
	1	2	3	4	5	6	7	8
	white	brown	green	yellow	grey	pink	blue	red

#### Applicable for cable carriers

Maximum movement speed	3 m/s
Maximum acceleration	5 m/s <sup>2</sup>
Minimum bending radius	10 x cable diameter