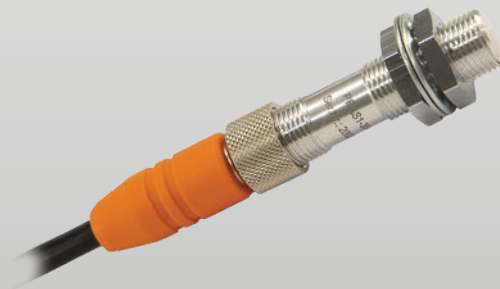


POSIROT[®]

Magnetic Angle Sensors

PRAS1
Magnetic Angle Sensor

Datasheet



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Am Bleichbach 18-24
85452 Moosinning
Germany

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ASM makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

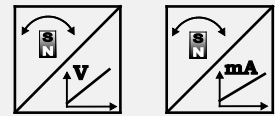
Analog output	4
Specifications	4
Order code	5
Dimensions	6
Position magnets	7
Output specification	11
Analog output	11
Characteristics for magnetic angle sensors	13
Accessories	14
Connector cable M12, 4 pin	14
Connector cable M12, 8 pin	15

Analog output



Sensor features

- Measurement range 0 ... 360°
- Protection class IP67/IP69
- Analog output
- Magnetic measurement principle
- Non-contact with external position magnet, no wear
- Housing: Stainless steel



Specifications

Output	Voltage 0.5 ... 10 V Voltage 0.5 ... 4.5 V 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	±0.3% f.s. (typical)
Rated distance sensor / magnet	Depending on the position magnet
Protection class	IP67/IP69 (with IP67/IP69 connector cable)
Housing material	Stainless steel
Mounting	M12 x 1
Connection	5-pin connector M12 (compatible to 4-pin connector)
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	35 g approx.
EMC	DIN EN 61326-1:2013

Order code

PRAS1 - 1 - 2 - 3 - 4

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

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

2 Output

- U2** = Voltage 0.5 ... 10 V (excitation voltage 18 ... 36 V DC)
- U6** = Voltage 0.5 ... 4.5 V ratiometric (excitation voltage 5 V DC)
- U8** = Voltage 0.5 ... 4.5 V (excitation voltage 11 ... 36 V DC)
- I1** = Current 4 ... 20 mA, 3 wire (excitation voltage 18 ... 36 V DC)

3 Signal characteristics

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

4 Connection

- M12A5** = 5-pin connector M12 (compatible to 4-pin connector)

Order example

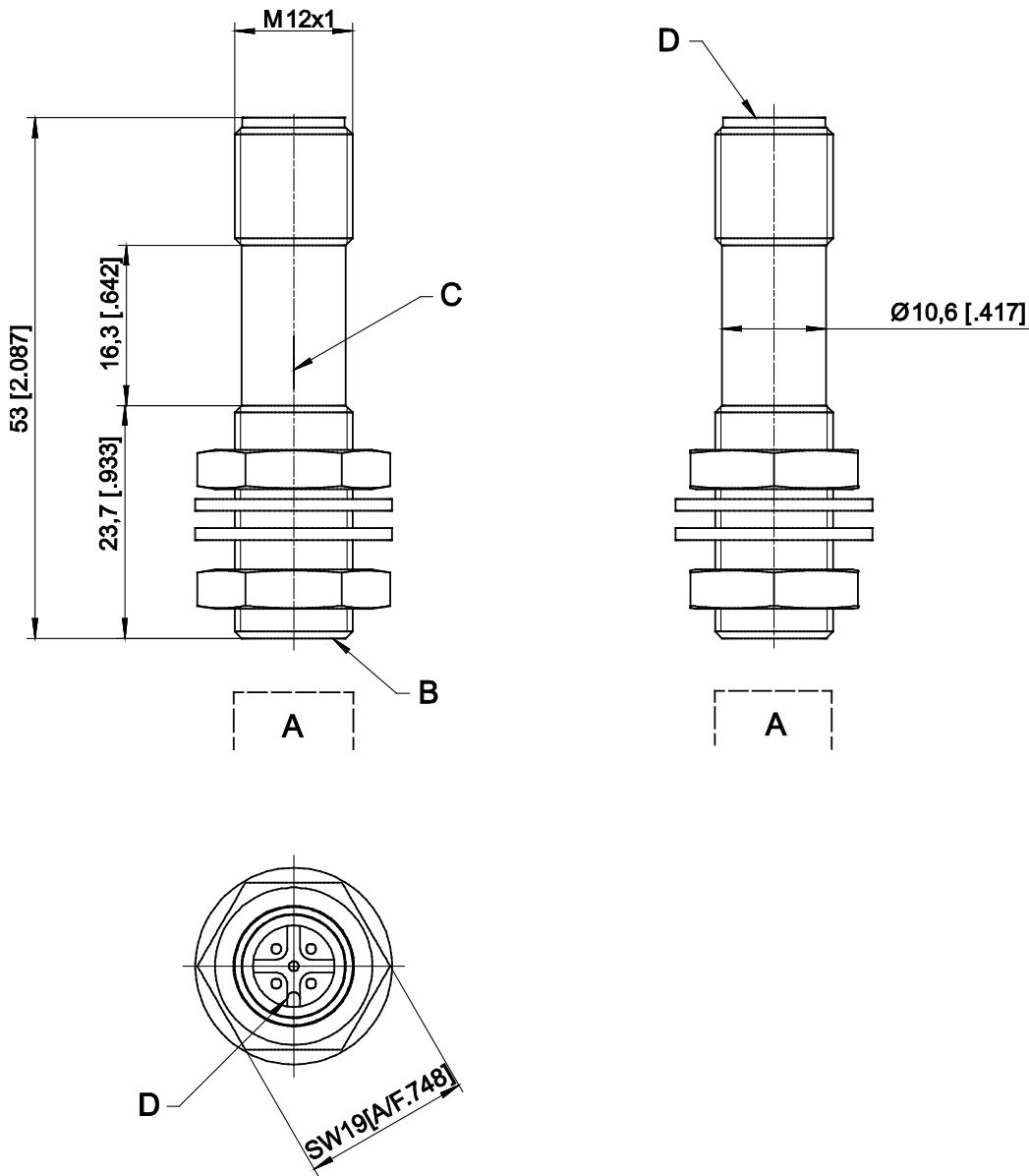
PRAS1 - 360 - I1 - CW - M12A5

Accessories:

Connector cable (see page 14)

Position magnets (see from page 7)

Dimensions

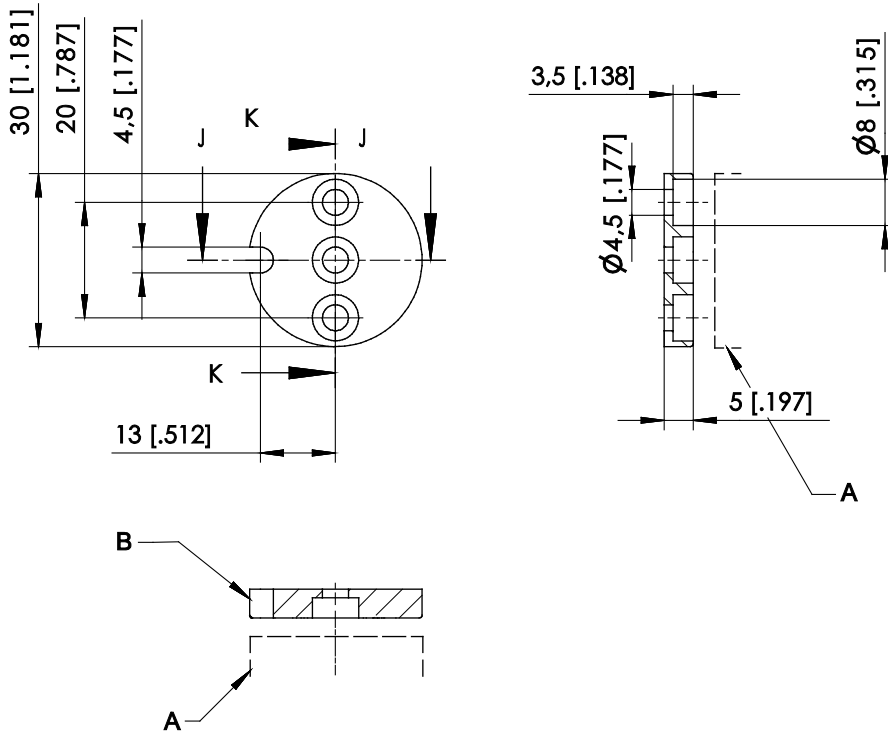


- A – Position magnet
- B – Measuring area
- C – Marking
- D – Connector M12

Dimensions in mm [inch]. Weight approx. 35 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

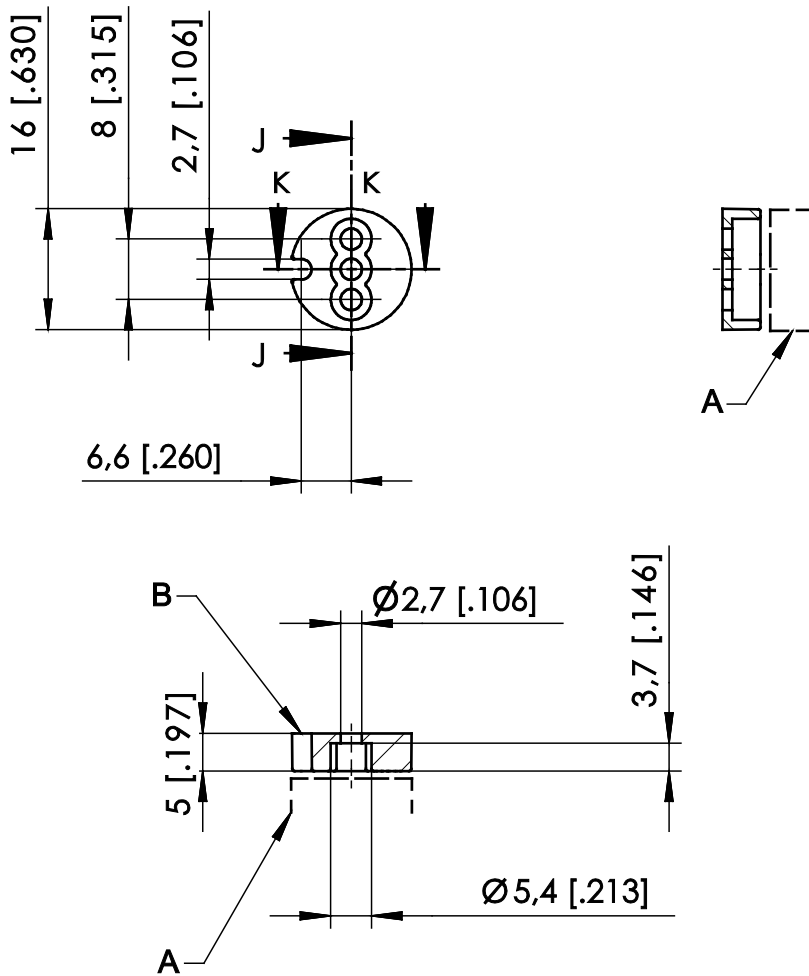
A misalignment of the position magnet has an effect on the linearity.

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

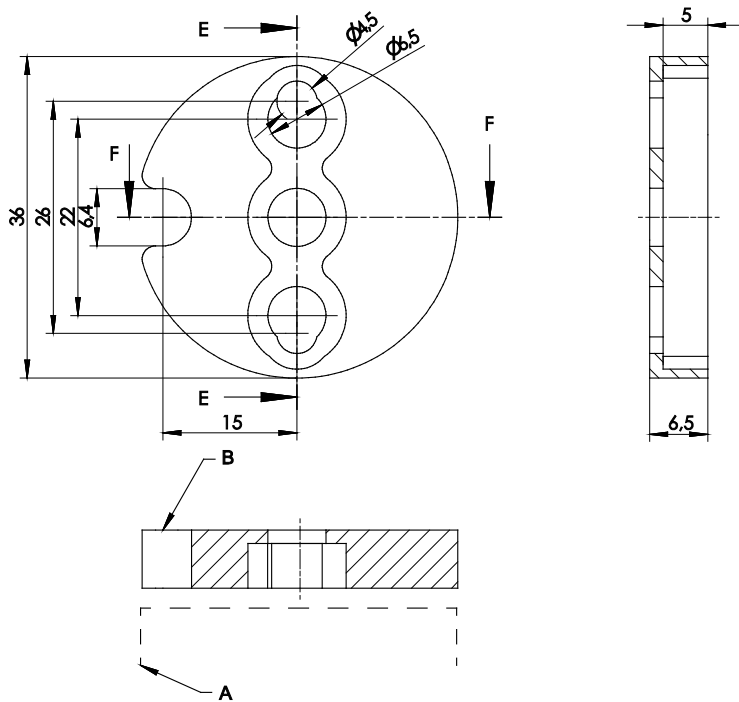
A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch]

Dimensions informative only.

For guaranteed dimensions please consult factory.

PRMAG22



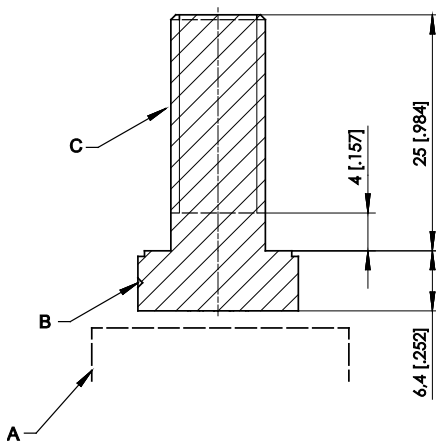
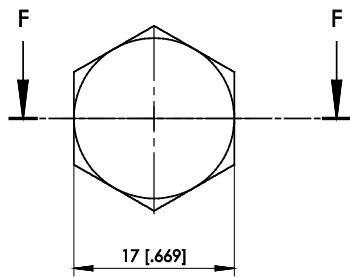
A – Sensor
B – Marking

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

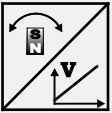
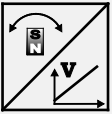
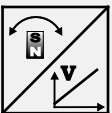
Order code	Weight	Material	Moment of inertia
PRMAG-M10	approx. 30 g	stainless steel A2	1.3 kgmm ²

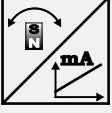
A misalignment of the position magnet has an effect on the linearity.

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

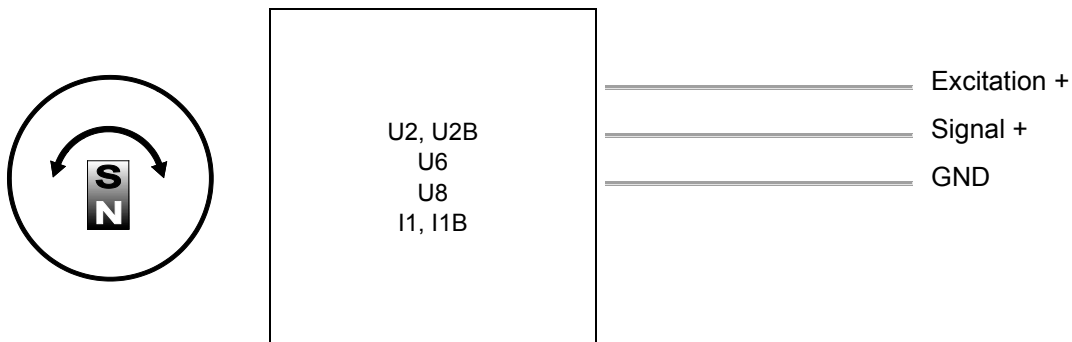
Output specification

Analog output

U2 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)	$\pm 50 \times 10^{-6} / ^\circ\text{C}$ f.s. (typical for $90^\circ \dots 360^\circ$) $\pm 100 \times 10^{-6} / ^\circ\text{C}$ f.s. (typical for $<90^\circ$)
	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 $\pm 10\%$
	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)	$\pm 50 \times 10^{-6} / ^\circ\text{C}$ f.s. (typical for $90^\circ \dots 360^\circ$) $\pm 100 \times 10^{-6} / ^\circ\text{C}$ f.s. (typical for $<90^\circ$)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013
U8 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)	$\pm 50 \times 10^{-6} / ^\circ\text{C}$ f.s. (typical for $90^\circ \dots 360^\circ$) $\pm 100 \times 10^{-6} / ^\circ\text{C}$ f.s. (typical for $<90^\circ$)
	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	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)	$\pm 50 \times 10^{-6}$ / °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

Signal diagram



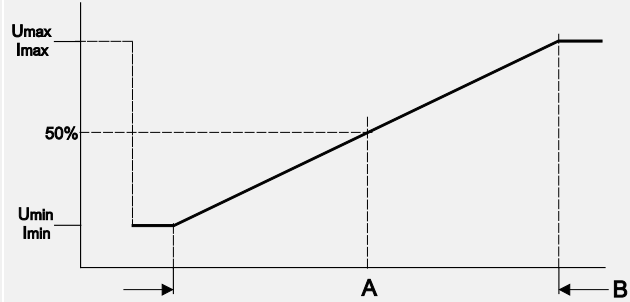
**Signal wiring
(connector and cable output)**

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	

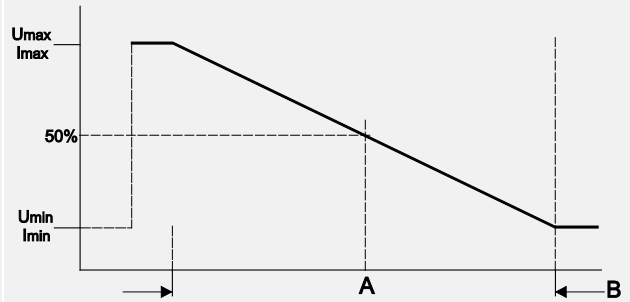
3-wire current 4...20 mA interface: GND has to be connected!

Characteristics for magnetic angle sensors

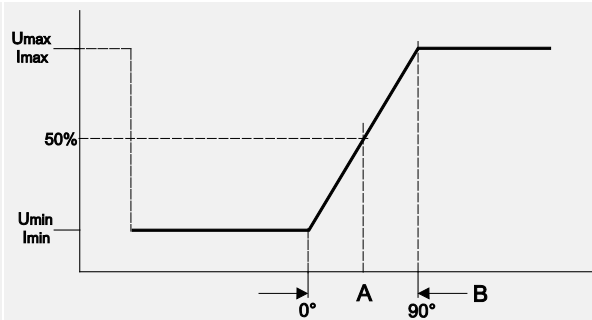
Output signal CW
(clockwise increasing)



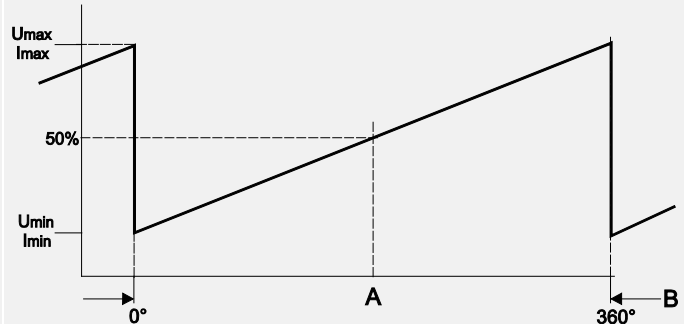
Output signal CCW
(counterclockwise increasing)



Example angular range 90°



Example angular range 360°



A – Marking
B – Measurement range [°]

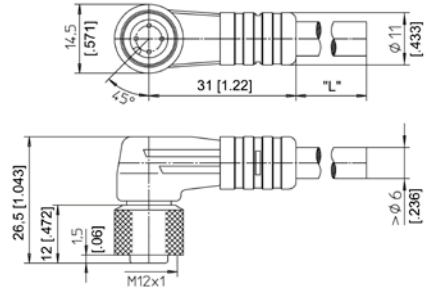
Accessories

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 mm²
Cable diameter: 5.6 ±0.2 mm



Order code

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

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

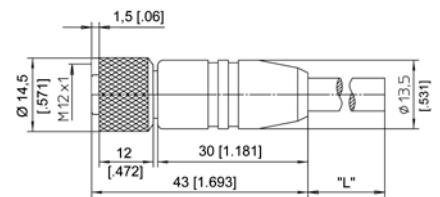
xM = length in m

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 mm²
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	Plug connection / cable color			
	1	2	3	4
M12, 4 pin	brown	white	blue	black

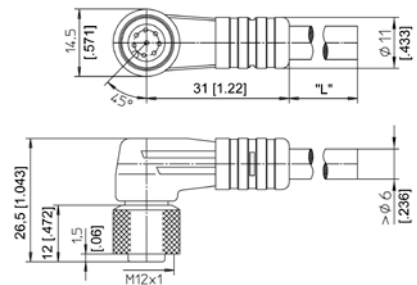
Applicable for cable carriers

Maximum movement speed	3 m/s
Maximum acceleration	5 m/s ²
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 mm² Cable diameter: 6.3 ±0.2 mm



Order code

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

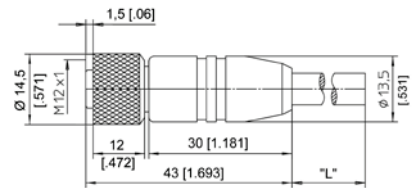
IP69: **KAB - xM - M12/8F/W/69K - LITZE**

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 mm² 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

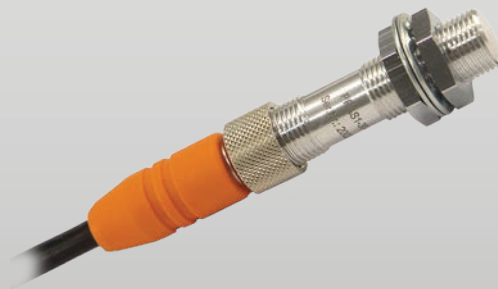
Maximum movement speed	3 m/s
Maximum acceleration	5 m/s ²
Minimum bending radius	10 x cable diameter

POSIROT[®]

Magnetic Angle Encoders

PRDS1
Magnetic Angle Encoder

Datasheet



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Am Bleichbach 18-24
85452 Moosinning
Germany

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ASM makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

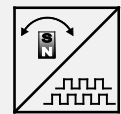
Incremental output	4
Specifications	4
Order code	5
Digital output SSI	6
Specifications	6
Order code	7
Dimensions	8
Position magnets	9
Output specification	13
Incremental output	13
SSI output	17
Characteristics for magnetic angle sensors	19
Accessories	20
Connector cable M12, 8 pin	20

Incremental output



Sensor features

- Measurement range 0 ... 360°
- Protection class IP67/IP69
- Incremental output
- Magnetic measurement principle
- Non-contact with external position magnet, no wear
- Housing: Stainless steel



Specifications

Output	Incremental encoder output, RS422-/HTL compatible
Measurement range	0 ... 360°
Resolution (pulses per revolution)	1 / 2 / 4 / 8 / 16 / 25 / 32 / 45 / 50 / 64 / 75 / 90 / 100 / 125 / 128 / 256 / 512 / 1024
Linearity	±1% (typical)
Rated distance sensor / magnet	Depending on the position magnet
Protection class	IP67/IP69 (with IP67/IP69 connector cable)
Max. output frequency	200 kHz (the quadrature counter of the subsequent circuit must be able to process >200 kHz)
Material	Stainless steel
Mounting	M12 x 1
Connection	8-pin connector M12
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	35 g approx.
EMC	DIN EN 61326-1:2013

Order code

PRDS1 - 1 - 2 KHZ - 3 - 4

1 Resolution (pulses per revolution)

1 / 2 / 4 / 8 / 16 / 25 / 32 / 45 / 50 / 64 / 75 / 90 / 100 / 125 / 128 / 256 / 512 / 1024

2 Maximum pulse frequency

50 = 50 kHz (standard)
200 = 200 kHz

3 Output

RS5V = RS422 compatible output with excitation 5 V DC
RS24V = RS422 compatible output with excitation 10 ... 36 V
HT24V = HTL compatible output with excitation 18 ... 36 V

4 Connection

M12A8 = 8-pin connector M12

Order example

PRDS1 - 1024 - 50 KHZ - RS5V - M12A8

Accessories:

Connector cable (see page 20)

Position magnets (see from page 9)

Digital output SSI



Sensor features

- Measurement range 0 ... 360°
- Protection class IP67/IP69
- Digital output SSI
- Magnetic measurement principle
- Non-contact with external position magnet, no wear
- Housing: Stainless steel



Specifications

Output	Synchronous serial SSI
Measurement range	0 ... 360°
Resolution	12 Bit (4096 steps) per revolution
Repeatability	±0.1° (typical)
Linearity	±1% (typical)
Rated distance sensor / magnet	Depending on the position magnet
Protection class	IP67/IP69 (with IP67/IP69 connector cable)
Material	Stainless steel
Mounting	M12 x 1
Connection	8-pin connector M12
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	35 g approx.
EMC	DIN EN 61326-1:2013

Order code

PRDS1 - 1 - 2 - 3

1 Output

RSSI5V = Synchronous serial output with excitation 5 V DC
RSSI24V = Synchronous serial output with excitation 10 ... 36 V

2 Code characteristics

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

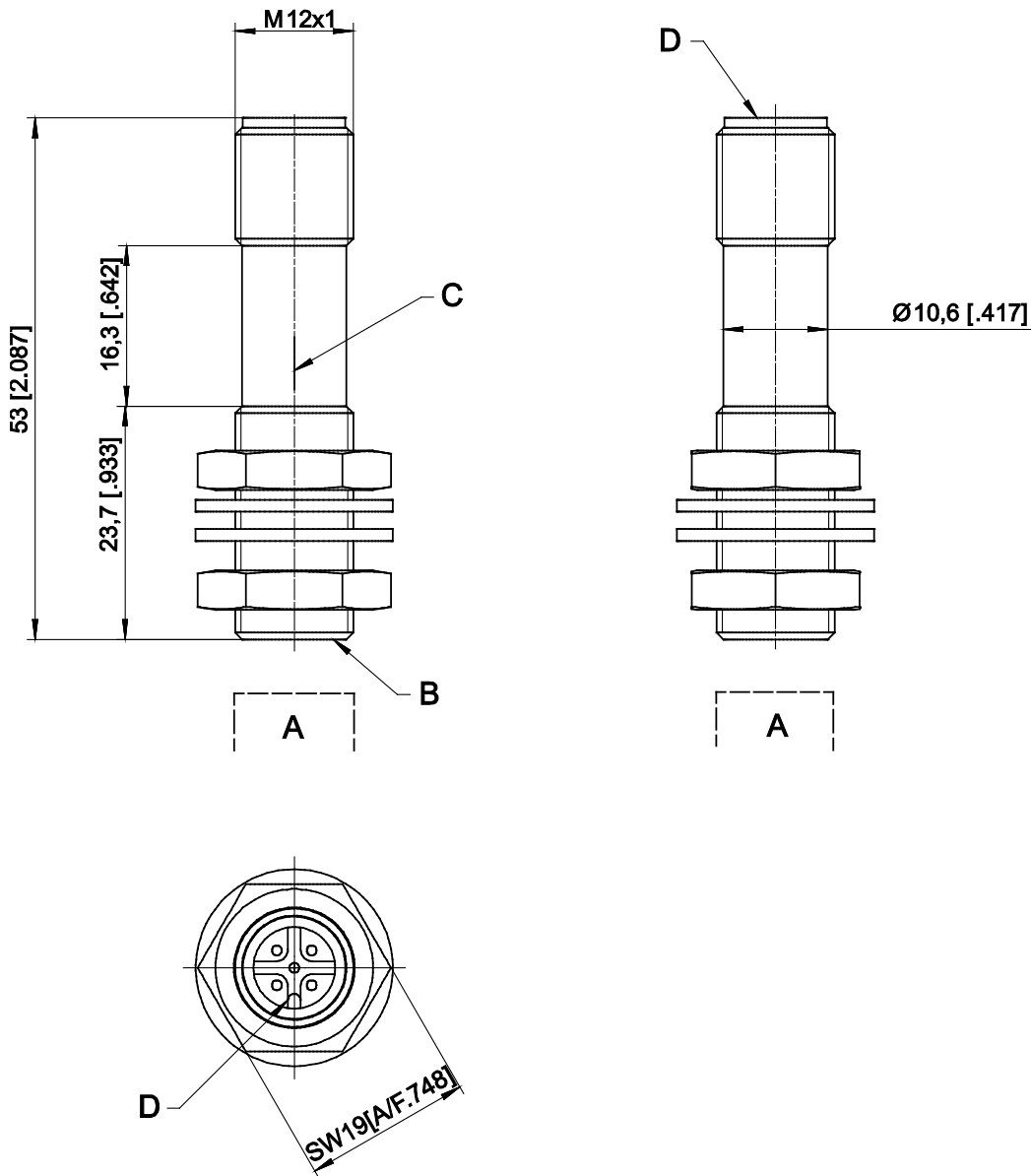
3 Connection

M12A8 = 8-pin connector M12

Order example

PRDS1 - RSSI5V - CW - M12A8

Dimensions

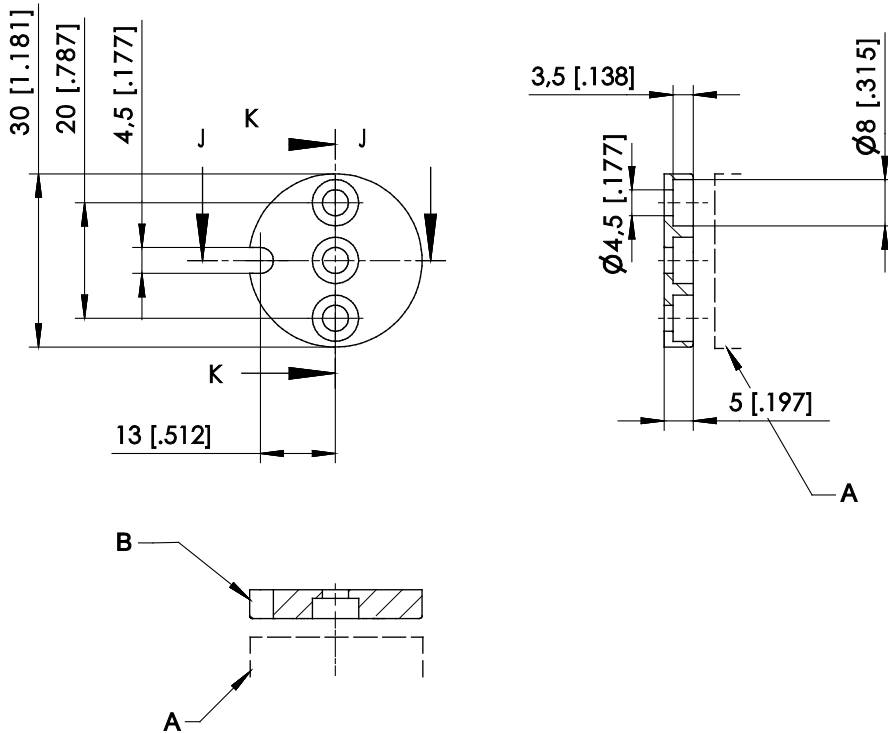


- A – Position magnet
- B – Measuring area
- C – Marking
- D – Connector M12

Dimensions in mm [inch]. Weight approx. 35 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

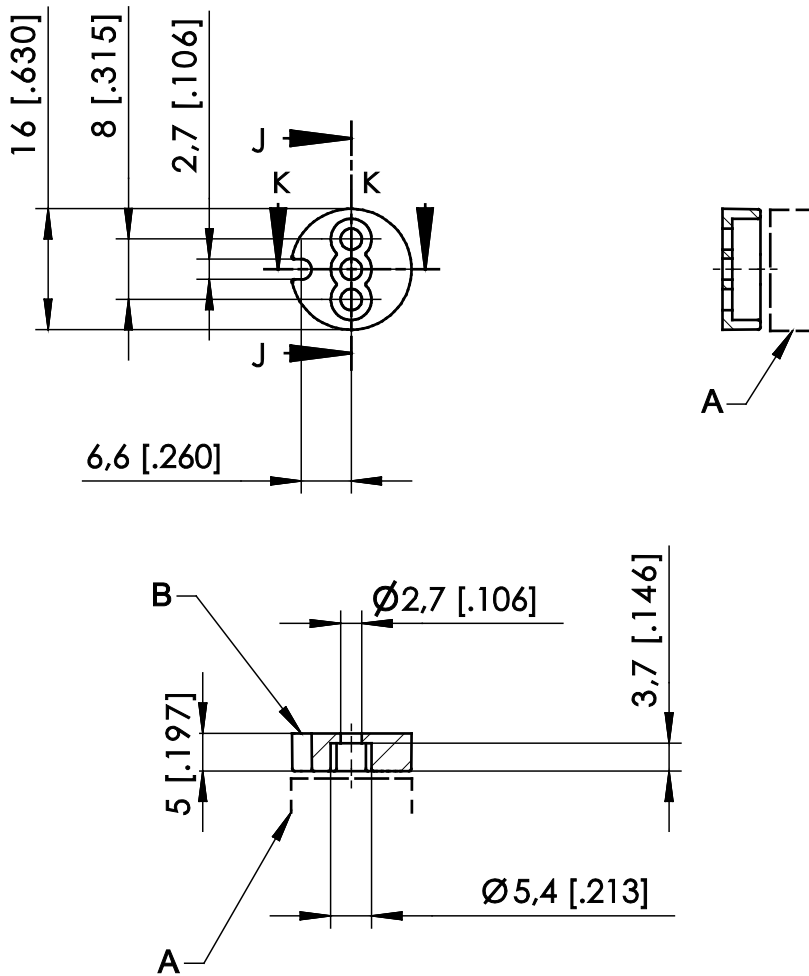
A misalignment of the position magnet has an effect on the linearity.

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

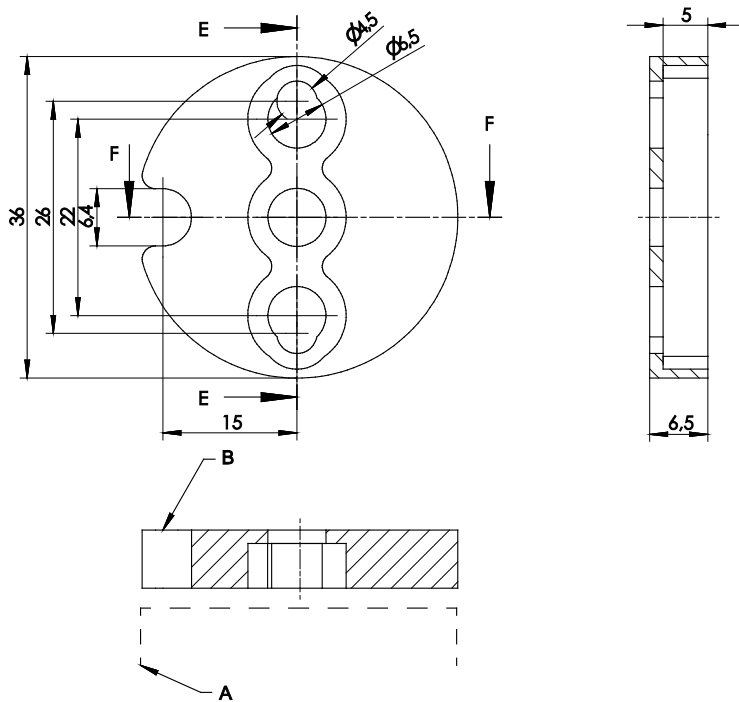
A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch]

Dimensions informative only.

For guaranteed dimensions please consult factory.

PRMAG22



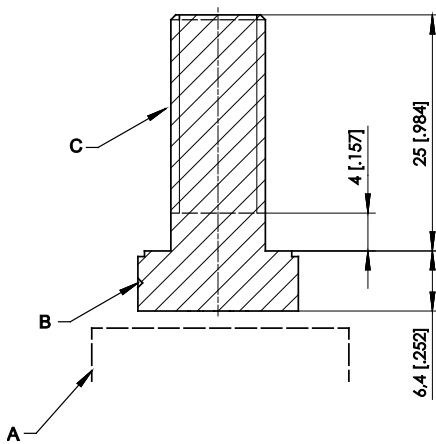
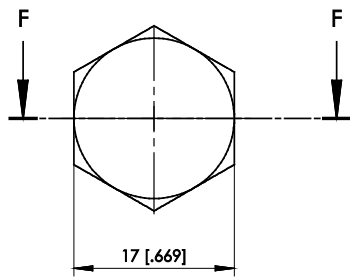
A – Sensor
B – Marking

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

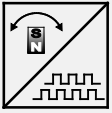
Order code	Weight	Material	Moment of inertia
PRMAG-M10	approx. 30 g	stainless steel A2	1.3 kgmm ²

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

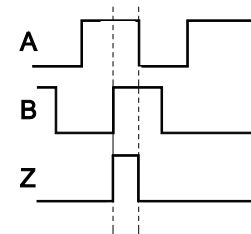
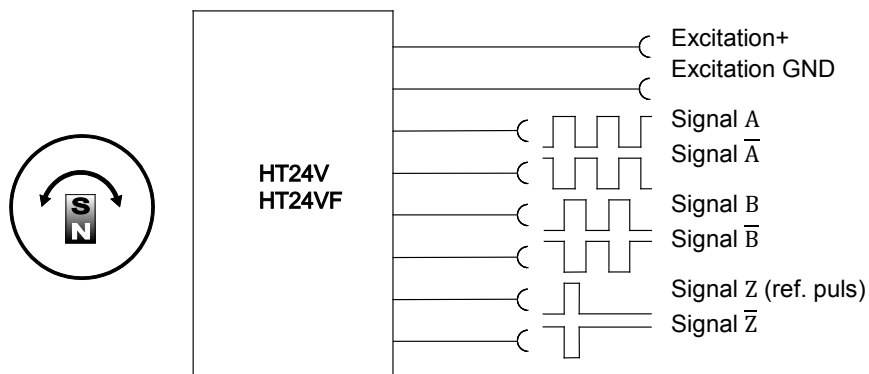
Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions please consult factory.

Output specification

Incremental output

HT24V(F) Incremental 	Interface	EIA RS-422
	Excitation voltage	18 ... 36 V DC
	Excitation current	100 mA max., depending on the load
	Pulse frequency	<500 kHz
	Output signals	A, \bar{A} , B, \bar{B} , Z, \bar{Z} Push-Pull
	Output current	10 mA max.
	Stability (temperature)	$\pm 50 \times 10^{-6} / ^\circ\text{C}$ f.s. (typical)
	Operating temperature	-40 ... +85 °C
	Protection	Short circuit
	EMC	DIN EN 61326-1:2013

Output signals



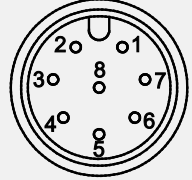
Unfiltered output HT24V

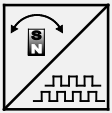
A preferred maximum pulse frequency has to be defined within the product code. This will take account for limited bandwidth of downstream counter.

Filtered output HT24VF

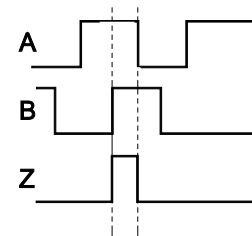
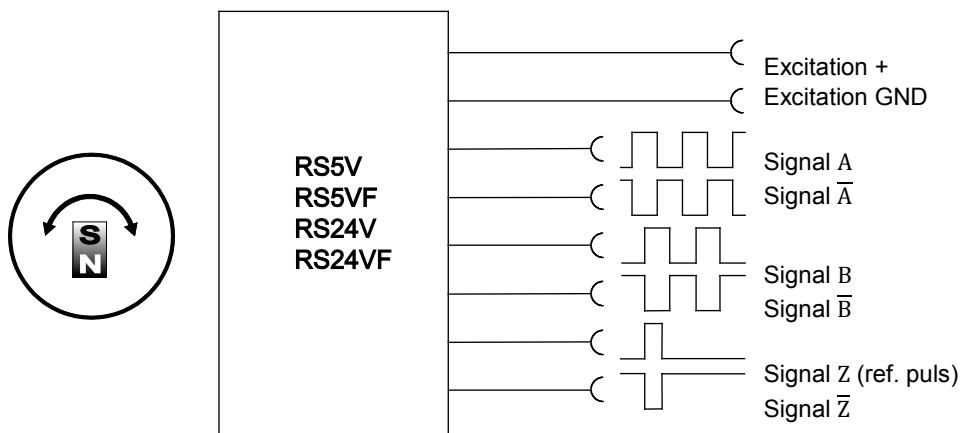
Option for filtered jitter free position value. The filter does not introduce velocity or acceleration error.

Signal wiring

Output signals	Connector pin no.	Cable color	View to the sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
A	4	yellow	
\bar{A}	6	pink	
B	3	green	
\bar{B}	5	grey	
Z	7	blue	
\bar{Z}	8	red	

RS5V(F)/RS24V(F) Incremental 	Interface	EIA RS-422
	Excitation voltage	RS5V(F): 5 V DC ±10 % RS24V(F): 10 ... 36 V DC
	Excitation current	100 mA max., depending on the load
	Pulse frequency	<500 kHz
	Output signals	A, \bar{A} , B, \bar{B} , Z, \bar{Z} Push-Pull
	Output current	10 mA max.
	Stability (temperature)	$\pm 50 \times 10^{-6}$ / °C f.s. (typical)
	Operating temperature	-40 ... +85 °C
	Protection	Short circuit
	EMC	DIN EN 61326-1:2013

Output signals



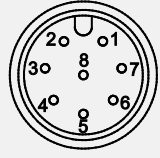
Unfiltered output RS5V / RS24V

A preferred maximum pulse frequency has to be defined within the product code. This will take account for limited bandwidth of downstream counter.


Filtered output RS5VF / RS24VF

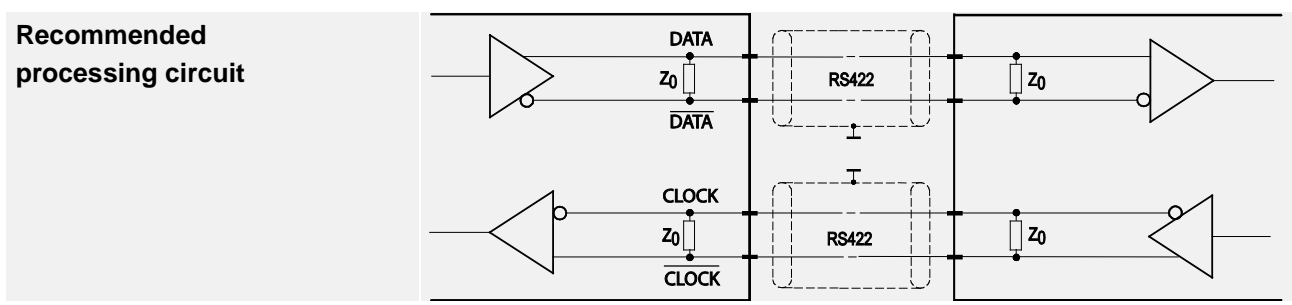
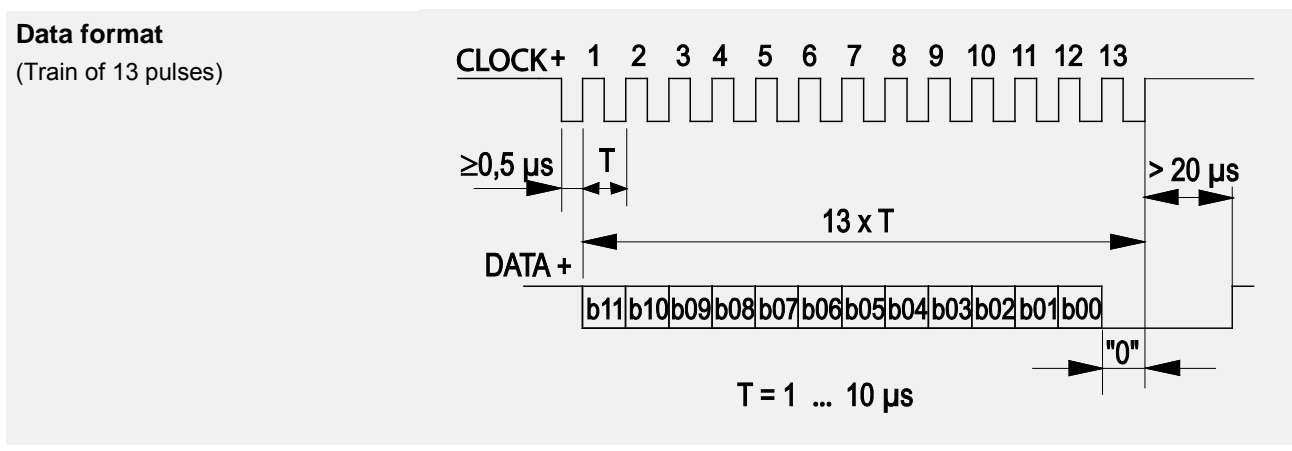
Option for filtered jitter free position value. The filter does not introduce velocity or acceleration error.

Signal wiring

Signal	Connector pin no.	Cable color	View to the sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
A	4	yellow	
\bar{A}	6	pink	
B	3	green	
\bar{B}	5	grey	
Z	7	blue	
\bar{Z}	8	red	

SSI output

RSSI5V/RSSI24V Synchronous serial SSI 	Interface	EIA RS-422
	Excitation voltage	RSSI5V: 5 V DC ±10% RSSI24V: 10 ... 36 V DC
	Excitation current	100 mA max. without load
	Clock frequency	100 kHz ... 500 kHz
	Code	Gray-Code, continuous progression, 12 bit
	Delay between pulse trains	20 µs min.
	Stability (temperature)	±50 x 10 ⁻⁶ / °C f.s. (typical)
	Operating temperature	-40 ... +85 °C
	Protection	Short circuit
	EMC	EN 61326-1:2013

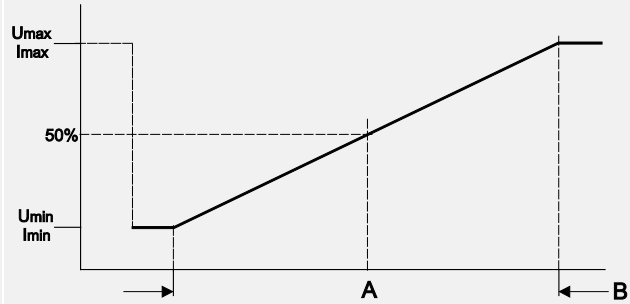


Transmission rate	Cable length	Baud rate	Note:
	50 m	100 - 1000 kHz	Extension of the cable length will reduce the maximum transmission rate. The signals CLOCK / $\overline{\text{CLOCK}}$ and DATA/ $\overline{\text{DATA}}$ must be connected in a twisted pair cable, shielded per pair and common.
	100 m	100 - 300 kHz	

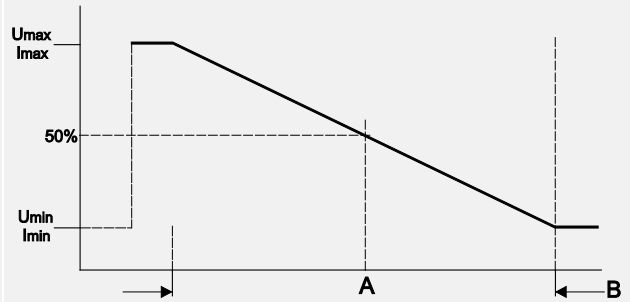
Signal wiring	Connector pin no.	Cable color	View to the sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
CLOCK	3	green	
$\overline{\text{CLOCK}}$	4	yellow	
DATA	5	grey	
$\overline{\text{DATA}}$	6	pink	
-	7	blue	
-	8	red	

Characteristics for magnetic angle sensors

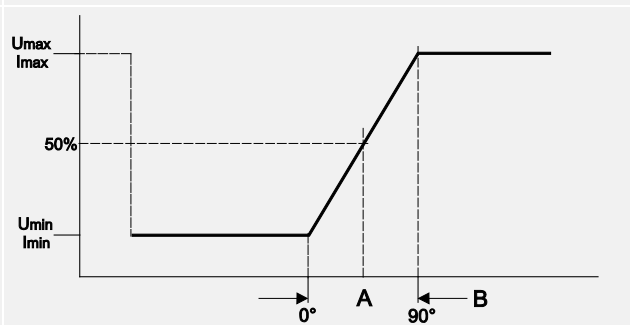
Output signal CW
(clockwise increasing)



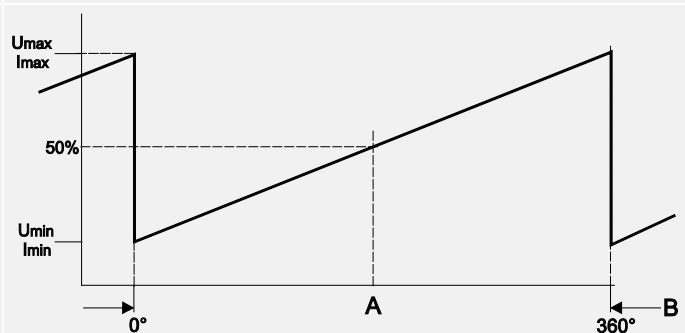
Output signal CCW
(counterclockwise increasing)



Example angular range 90°



Example angular range 360°



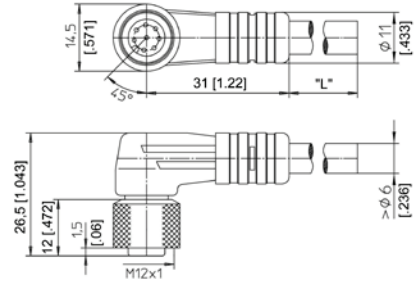
A – Marking
B – Measurement range [°]

Accessories

Connector cable M12, 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 mm² Cable diameter: 6.3 ±0.2 mm



Order code

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

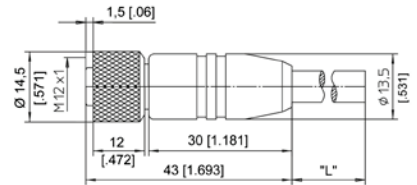
IP69: **KAB - xM - M12/8F/W/69K - LITZE**

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 mm² 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 ²
Minimum bending radius	10 x cable diameter