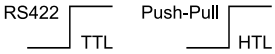
Incremental, programmable magnetic | **RIM2000 / RIM5000 (hollow shaft)** | **Push-pull / RS422**

Maximum flexibility and higher performance thanks to programmability.
With a new technology approach based on digital signal processing independent of previous ASIC solutions, Kübler has expanded the range of applications for bearingless encoders. In conjunction with the available magnetic rings, the best possible accuracy is now always achieved. Influences due to individual installation and temperature differences during operation are automatically compensated in the sensor head. This facilitates integration into applications and makes the overall system even more powerful.

RoHS



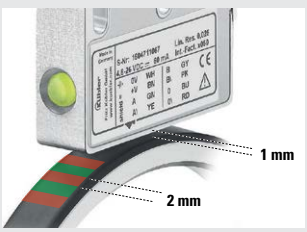
Features and benefits

- **Maximum flexibility thanks to programmability**
  - Programmable via programming device with touch display or via PC software.
  - Freely selectable resolution up to 999 999 ppr independent of the magnetic ring diameter.
  - Systems based on both, 2 mm and 5 mm, pole lengths are available. This allows you to choose between larger operating and mounting tolerances or a focus on the best possible performance.
  - Many variants of magnetic ring and bore diameters.
- **Highest precision**
  Active offset, phase and amplitude control automatically optimizes the sensor to the current operating situation. Influences due to individual installation and temperature differences during operation are automatically compensated in the sensor head.
- **Fast and easy implementation**
  - For use in small installation spaces.
  - Mounting tolerance between magnetic ring and sensor head are compensated by the electronics.
  - Simple adjustment by fastening via slotted holes.
  - Function display via LED.
- **Resistant and robust**
  - Non-contact and wear-free measuring system for a long service life.
  - High shock and vibration resistance.
  - Sturdy housing with degree of protection IP67, optional: Special housing for high resistance to condensation (IP68 / IP69k, Resistance to cyclical humidity acc. to EN 60068-3-38 and humidity-heat acc. to EN 60068-3-78).

Selection of sensor head

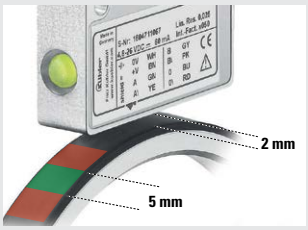
RIM2000

The RIM2000 system with 2 mm pole lenght should be used for high signal quality requirements. This requires good bearings and a stable installation process that allows an air gap of up to 1 mm.



RIM5000

If the application requires a larger air gap (up to max. 2 mm), the RIM5000 system with 5 mm pole lenght is used. High performance is also offered here with equally high signal quality..



Selection of magnetic ring

Outer diameter

Even if a high resolution can be realized for all outer diameters, it is recommended to select the largest possible diameter.

Bore hole

Various diameters and fastening types are available for mounting on the application shaft.

Incremental, programmable magnetic | **RIM2000 / RIM5000 (hollow shaft)** | **Push-pull / RS422**

Order code RIM2000

Pole lenght 2 mm / distance between sensor head and magnetic ring max. 1 mm

8.RIM2000	.	X	X	2	X	A	.	XXX	.	XXXXX	.	XXXXXX	.	XXXX
Type		a	b	c	d	e		f		g		h		i

Combination sensor head LI2000 + magnetic ring RI20 (can also be ordered separately)

a *Mounting type*
1 = Hub screw
2 = Press fit

b *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

c *Zero Pulse*
2 = with zero pulse evaluation [1)]

d *Output circuit / Supply voltage*
1 = RS422 / 4.8 ... 26.4 V DC
2 = Push-pull (HTL/TTL universal) / 4.8 ... 26.4 V DC

e *Type of connection*
A = radial cable, PUR (cable length see **i**)

f *Outer diameter magnetic ring*
see table

g *Bore diameter magnetic ring*
see table

h *Pulses per revolution*
1 ... 999999 (e.g. 001024 for 1024 ppr)

i *Cable length (XXXX = length in dm)*
0020 = 2 m [6.56'] (standard)
0030 = 3 m [9.84']
0050 = 5 m [16.40']
0080 = 8 m [26.25']
0100 = 10 m [32.80']
0150 = 15 m [49.21'] (only with supply voltage >10 V)
0200 = 20 m [65.62'] (only with supply voltage >10 V)

Magnetic ring with hub screw, pole distance 2 mm (for mounting type a = 1)

outer diameter [mm] ±0.10	width [mm] ±0.30	number of poles	zero pulse [1)]	material hub	order code f outer diameter	ø bore [mm]	order code g bore	max. speed min^{-1}	magnet material
31	16	50	no	Aluminum	**031**	8 H7	**00800**	12.000	Ferrit
						10 H7	**01000**		
						12 H7	**01200**		
						15 H7	**01500**		
						15.875 H7	**01587**		
						18 H7	**01800**		
						20 H7	**02000**		
41.2	16	64	no	Aluminum	**041**	8 H7	**00800**	12.000	Ferrit
						10 H7	**01000**		
						12 H7	**01200**		
						15 H7	**01500**		
						18 H7	**01800**		
						20 H7	**02000**		
40.74	16	64	yes	Stainless steel	**041**	8 H7	**00800**	12.000	Ferrit
						20 H7	**02000**		
						25 H7	**02500**		
45	16	72	no	Aluminum	**045**	8 H7	**00800**	12.000	Ferrit
						9.25 H7	**00925**		
						10 H7	**01000**		
						12 H7	**01200**		
						15 H7	**01500**		
						18 H7	**01800**		
						20 H7	**02000**		
						25 H7	**02500**		
						25.4 H7	**02540**		
						28.575 H7	**02875**		
						30 H7	**03000**		

Magnetic ring press fit, pole lenght 2 mm (for mounting type a = 2)

48.90	10.40	80	yes	Steel	**049**	45.4 ±0.05	**04540**	15.000	Vulcanized rubber
87.13	9	140	no	Stainless steel	**087**	76 H7	**07600**	12.000	
202.3	9	180	no	Stainless steel	**202**	180 ±0.10	**18000**	2.000	

1) The sensor head always includes the function of evaluating a zero pulse (**c** = 2).
Whether the RIMxxx system provides a zero pulse as an output signal depends on the choice of magnetic ring (with or without zero pulse).
For magnetic rings with a zero pulse, this is detected once per revolution. For full-track magnetic rings without zero pulse, a signal is detected for every second pole.

Incremental, programmable magnetic | **RIM2000 / RIM5000 (hollow shaft)** | **Push-pull / RS422**

Order code RIM5000

Pole lenght 5 mm / distance between sensor head and magnetic ring max. 2 mm

8.RIM5000	.	X	X	2	X	A	.	XXX	.	XXXXX	.	XXXXXX	.	XXXX
Type		a	b	c	d	e		f		g		h		i

Combination sensor head LI2000 + magnetic ring RI20 (can also be ordered separately)

a *Mounting type*
1 = Hub screw
2 = Press fit

b *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

c *Zero Pulse*
2 = with zero pulse evaluation [1)]

d *Output circuit / Supply voltage*
1 = RS422 / 4.8 ... 26.4 V DC
2 = Push-pull (HTL/TTL universal) / 4.8 ... 26.4 V DC

e *Type of connection*
A = radial cable, PUR (cable length see **i**)

f *Outer diameter magnetic ring*
see table

g *Bore diameter magnetic ring*
see table

h *Pulses per revolution*
1 ... 999999 (e.g. 001024 for 1024 ppr)

i *Cable length (XXXX = length in dm)*
0020 = 2 m [6.56'] (standard)
0030 = 3 m [9.84']
0050 = 5 m [16.40']
0080 = 8 m [26.25']
0100 = 10 m [32.80']
0150 = 15 m [49.21'] (only with supply voltage >10 V)
0200 = 20 m [65.62'] (only with supply voltage >10 V)

Magnetic ring with hub screw, pole distance 5 mm (for mounting type a = 1)

outer diameter [mm] ±0.10	width [mm] ±0.30	number of poles	zero pulse [1)]	material hub	order code f outer diameter	ø bore [mm]	order code g bore	max. speed min^{-1}	magnet material
31	16	20	yes	Stainless steel	**031**	6 H7	**00600**	12.000	Ferrite
						8 H7	**00800**		
						10 H7	**01000**		
						12 H7	**01200**		
						15 H7	**01500**		
						20 H7	**02000**		
48.3	16	32	yes	Stainless steel	**048**	6 H7	**00600**	12.000	Ferrite
						8 H7	**00800**		
						10 H7	**01000**		
						12 H7	**01200**		
						15 H7	**01500**		
						20 H7	**02000**		
						25 H7	**02500**		
						25.4 H7	**02540**		
						28 H7	**02800**		
						30 H7	**03000**		
50.11	16	32	yes	Stainless steel	**050**	20 H7	**02000**	12.000	Vulcan. rubber
54.70	16	36	yes	Stainless steel	**055**	6 H7	**00600**	12.000	Ferrite
						8 H7	**00800**		
						10 H7	**01000**		
						12 H7	**01200**		
						15 H7	**01500**		
						20 H7	**02000**		
						25 H7	**02500**		
						30 H7	**03000**		
						35 H7	**03500**		
102	20	64	no	Stainless steel	**102**	70 H7	**07000**	4.000	Rubber glued on
			yes	Stainless steel	**102**	70 H7	**07000**		

Magnetic ring press fit, pole lenght 5 mm (for mounting type a = 2)

48.90	10.40	32	yes	Steel	**049**	45.4 ±0.05	**04540**	15.000	Vulcan. rubber
202.3	9	128	no	Stainless steel	**202**	180 ±0.10	**18000**	2.000	Vulcanized rubber
			yes	Stainless steel	**202**	180 ±0.10	**18000**		

1) The sensor head always includes the function of evaluating a zero pulse (**c** = 2).
Whether the RIMxxx system provides a zero pulse as an output signal depends on the choice of magnetic ring (with or without zero pulse).
For magnetic rings with a zero pulse, this is detected once per revolution. For full-track magnetic rings without zero pulse, a signal is detected for every second pole.

Incremental, programmable magnetic | **RIM2000 / RIM5000 (hollow shaft)** | **Push-pull / RS422**

Order code sensor head LI2000

Pole lenght 2 mm / distance between sensor head and magnetic ring max. 1 mm
suitable magnetic rings see below

8.LI2000	.X	2	X	A	.XXX	.XXXXXX	.XXXX
Typ	ⓑ	ⓒ	ⓓ	ⓔ	ⓚ	ⓗ	ⓘ

ⓑ *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

ⓒ *Zero Pulse*
2 = with zero pulse evaluation [1)]

ⓓ *Output circuit / Supply voltage*
1 = RS422 / 4.8 ... 26.4 V DC
2 = Push-pull (HTL/TTL universal) / 4.8 ... 26.4 V DC

ⓔ *Type of connection*
A = radial cable, PUR (cable length see ⓘ)

ⓚ *Input periods*
Number of magnetic poles, depending on the magnetic ring
(e.g. 72 magnetic poles = 072)

ⓗ *Pulses per revolution*
1 ... 999999 (e.g. 001024 for 1024 ppr)

ⓘ *Cable length (XXXX =* length in dm*)*
0020 = 2 m [6.56'] (standard)
0030 = 3 m [9.84']
0050 = 5 m [16.40']
0080 = 8 m [26.25']
0100 = 10 m [32.80']
0150 = 15 m [49.21'] (only with supply voltage >10 V)
0200 = 20 m [65.62'] (only with supply voltage >10 V)

Magnetic ring with hub screw, pole lenght 2 mm – suitable for sensor head LI2000

outer diameter [mm] ±0.10	width [mm] ±0.30	number of poles	zero pulse [1)]	material hub	ø bore [mm]	order code	max. speed min^{-1}	magnet material
31	16	50	no	Aluminum	8 H7	**8.RI20.031.0800.111**	12.000	Ferrite
					10 H7	**8.RI20.031.1000.111**		
					12 H7	**8.RI20.031.1200.111**		
					15 H7	**8.RI20.031.1500.111**		
					15.875 H7	**8.RI20.031.1587.111**		
					18 H7	**8.RI20.031.1800.111**		
					20 H7	**8.RI20.031.2000.111**		
41.2	16	64	no	Aluminum	8 H7	**8.RI20.041.0800.111**	12.000	Ferrite
					10 H7	**8.RI20.041.1000.111**		
					12 H7	**8.RI20.041.1200.111**		
					15 H7	**8.RI20.041.1500.111**		
					18 H7	**8.RI20.041.1800.111**		
					20 H7	**8.RI20.041.2000.111**		
40.74	16	64	yes	Stainless steel	8 H7	**8.RI20.041.0800.112**	12.000	Ferrite
					20 H7	**8.RI20.041.2000.112**		
					25 H7	**8.RI20.041.2500.112**		
45	16	72	no	Aluminum	8 H7	**8.RI20.045.0800.111**	12.000	Ferrite
					9.25 H7	**8.RI20.045.0925.111**		
					10 H7	**8.RI20.045.1000.111**		
					12 H7	**8.RI20.045.1200.111**		
					15 H7	**8.RI20.045.1500.111**		
					18 H7	**8.RI20.045.1800.111**		
					20 H7	**8.RI20.045.2000.111**		
					25 H7	**8.RI20.045.2500.111**		
					25.4 H7	**8.RI20.045.2540.111**		
					28.575 H7	**8.RI20.045.2857.111**		
					30 H7	**8.RI20.045.3000.111**		

Magnetic ring press fit, pole lenght 2 mm – suitable for sensor head LI2000

48.90	10.40	80	yes	Steel	45.4 ±0.05	**8.RI20.049.0454.242**	15.000	Vulcanized rubber
87.13	9	140	no	Stainless steel	76 H7	**8.RI20.087.7600.241**	12.000	
202.3	9	180	no	Stainless steel	180 ±0.10	**8.RI20.202.1800.241**	2.000	

1) The sensor head always includes the function of evaluating a zero pulse (ⓒ = 2).
Whether the RIMxxx system provides a zero pulse as an output signal depends on the choice of magnetic ring (with or without zero pulse).
For magnetic rings with a zero pulse, this is detected once per revolution. For full-track magnetic rings without zero pulse, a signal is detected for every second pole.

Incremental, programmable magnetic | **RIM2000 / RIM5000 (hollow shaft)** | **Push-pull / RS422**

Order code sensor head LI5000

Pole lenght 5 mm / distance between sensor head and magnetic ring max. 2 mm
suitable magnetic rings see below

8.LI5000	.	X	2	X	A	.	XXX	.	XXXXXX	.	XXXX
Typ		b	c	d	e		k		h		i

b *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

c *Zero Pulse*
2 = with zero pulse evaluation [1)]

d *Output circuit / Supply voltage*
1 = RS422 / 4.8 ... 26.4 V DC
2 = Push-pull (HTL/TTL universal) / 4.8 ... 26.4 V DC

e *Type of connection*
A = radial cable, PUR (cable length see **i**)

k *Input periods*
Number of magnetic poles, depending on the magnetic ring
(e.g. 32 magnetic poles = 032)

h *Pulses per revolution*
1 ... 999999 (e.g. 001024 for 1024 ppr)

i *Cable length (XXXX = length in dm)*
0020 = 2 m [6.56'] (standard)
0030 = 3 m [9.84']
0050 = 5 m [16.40']
0080 = 8 m [26.25']
0100 = 10 m [32.80']
0150 = 15 m [49.21'] (only with supply voltage >10 V)
0200 = 20 m [65.62'] (only with supply voltage >10 V)

Magnetic ring with hub screw, pole lenght 5 mm – suitable for sensor head LI5000

outer diameter [mm] ±0.10	width [mm] ±0.30	number of poles	zero pulse [1)]	material hub	ø bore [mm]	order code	max. speed min^{-1}	magnet material
31	16	20	yes	Stainless steel	6 H7	**8.RI50.031.0600.112**	12.000	Ferrite
					8 H7	**8.RI50.031.0800.112**		
					10 H7	**8.RI50.031.1000.112**		
					12 H7	**8.RI50.031.1200.112**		
					15 H7	**8.RI50.031.1500.112**		
					20 H7	**8.RI50.031.2000.112**		
48.3	16	32	yes	Stainless steel	6	**8.RI50.048.0600.112**	12.000	Ferrite
					8 H7	**8.RI50.048.0800.112**		
					10 H7	**8.RI50.048.1000.112**		
					12 H7	**8.RI50.048.1200.112**		
					15 H7	**8.RI50.048.1500.112**		
					20 H7	**8.RI50.048.2000.112**		
					25 H7	**8.RI50.048.2500.112**		
					25.4 H7	**8.RI50.048.2540.112**		
					28 H7	**8.RI50.048.2800.112**		
					30 H7	**8.RI50.048.3000.112**		
50.11	16	32	yes	Stainless steel	20 H7	**8.RI50.050.2000.142**	12.000	Vulcan. rubber
54.70	16	36	yes	Stainless steel	6 H7	**8.RI50.055.0600.112**	12.000	Ferrite
					8 H7	**8.RI50.055.0800.112**		
					10 H7	**8.RI50.055.1000.112**		
					12 H7	**8.RI50.055.1200.112**		
					15 H7	**8.RI50.055.1500.112**		
					20 H7	**8.RI50.055.2000.112**		
					25 H7	**8.RI50.055.2500.112**		
					30 H7	**8.RI50.055.3000.112**		
					35 H7	**8.RI50.055.3500.112**		
102	20	64	no	Stainless steel	70 H7	**8.RI50.102.0700.121**	4.000	Vulcanized rubber
			yes	Stainless steel	70 H7	**8.RI50.102.0700.122**		

Magnetic ring press fit, pole lenght 5 mm – suitable for sensor head LI5000

48.90	10.40	32	yes	Steel	45.4 ±0.05	**8.RI50.049.0454.242**	15.000	Vulcanized rubber
202.3	9	128	no	Stainless steel	180 ±0.10	**8.RI50.202.180M.241**	2.000	
			yes	Stainless steel	180 ±0.10	**8.RI50.202.180M.242**	2.000	

1) The sensor head always includes the function of evaluating a zero pulse (**c** = 2).
Whether the RIMxxx system provides a zero pulse as an output signal depends on the choice of magnetic ring (with or without zero pulse).
For magnetic rings with a zero pulse, this is detected once per revolution. For full-track magnetic rings without zero pulse, a signal is detected for every second pole.

Incremental, programmable magnetic	RIM2000 / RIM5000 (hollow shaft)	Push-pull / RS422

Programming units		Order no.
Programming unit with touch display EP1000 	Programming unit for PC-independent use, even in the field 136 x 84 x 38 mm	**8.0010.9000.1000**
Programming unit, PC-based EP500 	For connecting the sensor head to a PC with corresponding programming software. 136 x 84 x 38 mm	**8.0010.9000.1001**

Accessories / Displays		Order no.
Codix 560, preset counter 6-digit 	- Counter, tachometer, time counter and position display in one device - Scalable display - Readable via RS232/485 interface or configurable via MODBUS or CR/LF protocol	**6.560.010.XXX** Details s. datasheet
571T Touch, multifunction preset counters 8-digit 	- Measuring function for RPM, speed, speed from elapsed time, machine cycle time, throughput time (reciprocal rotary speed), as well as numerous count functions such as position display - Fast counting input (250 kHz/HTL, 1 MHz/RS422) - 4 switching outputs as limit values (response time < 1 ms) - Scalable analog output (response time < 150 ms), resolution 16 bit - Serial interface RS232 or RS485 for reading in and out the data	**6.571T.01X.XXX** Details s. datasheet

Further Kübler accessories can be found at: kuebler.com/accessories
Further Kübler cables and connectors can be found at: kuebler.com/connection-technology

Incremental, programmable magnetic | **RIM2000 / RIM5000 (hollow shaft)** | **Push-pull / RS422**

Technical data

Mechanical characteristics

Maximum speed		12000 min^{-1}
Protection	Model 1 Model 2	IP67 acc. to EN 60529 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Operating temperature		-20 °C ... +80 °C [-4 °F ... +176 °F]
Shock resistance		5000 m/s^2, 1 ms
Vibration resistance		300 m/s^2, 10 ... 2000 Hz
Pole lenght		2 mm or 5 mm from pole to pole
Housing (sensor head)		aluminum
Cable		2 m [6.56´] long, PUR 8 x 0.14 mm^2 [AWG 26], shielded, may be used in trailing cable installations
Status LED	green red	ready for operation Magnetic field error, e.g: - Distance between sensor head and magnetic ring too large - Pole lenght of magnetic ring and sensor head do not match

Electrical characteristics

Output circuit		**RS422**	**Push-pull**
Supply voltage		4.8 ... 26.4 VDC	4.8 ... 26.4 VDC
Power consumption (no load)		typ. 25 mA max. 60 mA	typ. 25 mA max. 60 mA
Permissible load / channel		120 Ohm	+/- 20 mA
Output frequency max.		300 kHz	100 kHz
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Zero pulse		For magnetic rings with zero pulse, once per revolution. For full-track magnetic rings without zero pulse, every two poles.	
System accuracy		typ. 0.3° with shaft tolerance g6	

Approvals

CE compliant in accordance with

EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU

Terminal assignment

Output circuit	Type of connection	Cable (insulate unused cores individually before initial start-up)									
1, 2	1, A	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Aderfarbe:	WH	BN	GN	YE	GY	PK	BU	RD	shield [1]

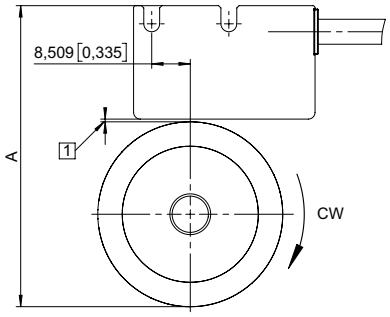
+V: Supply voltage encoder +V DC
0 V: Supply voltage encoder ground GND (0 V)
A, $\overline{A}$: Incremental output channel A / cosine signal
B, $\overline{B}$: Incremental output channel B / sine signal
0, $\overline{0}$: Reference signal
⏚: Sensor housing (shield)

1) Shield is connected to sensor housing.

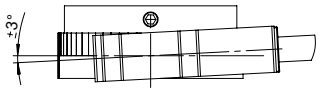
Incremental, programmable magnetic | **RIM2000 / RIM5000 (hollow shaft)** | **Push-pull / RS422**

Mounting orientation and permissible mounting tolerances

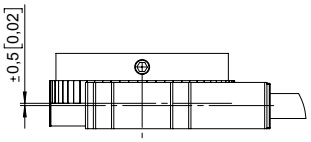
Distances



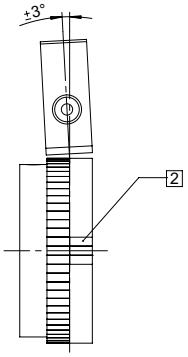
Torsion



Offset



Tilting



1 Distance sensor head / magnetic ring:
RIM2000: 0.1 ... 1.0 mm (0.4 mm [0.016] recommended)
RIM5000: 0.1 ... 2.0 mm (1.0 mm [0.039] recommended)

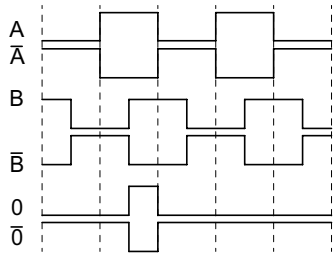
2 Reference signal

A Depending on the magnetic ring used

Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring (with reference signal)!

Signal figures

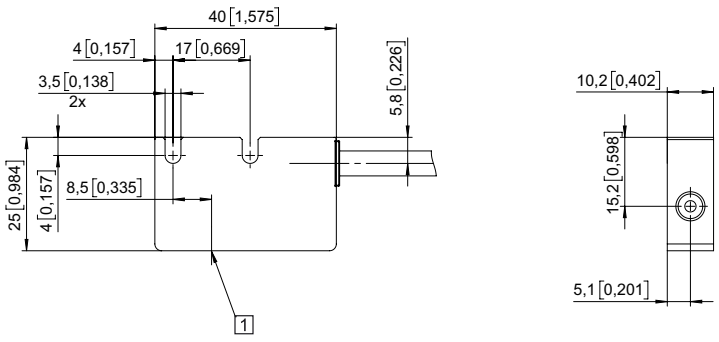
A vor B, when turning clockwise (see above, arrow cw)



Dimensions

Dimensions in mm [inch]

Sensor head



1 Active measuring area

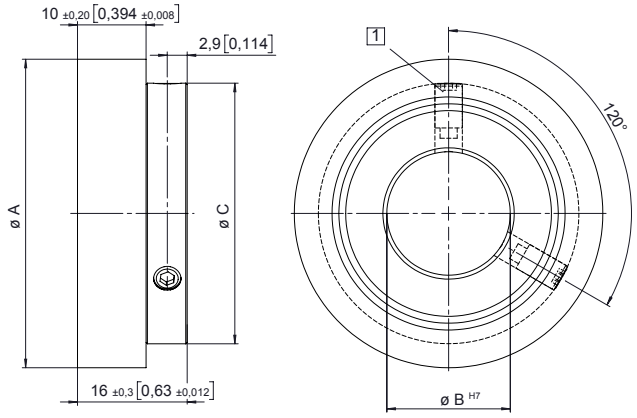
Incremental, programmable magnetic | **RIM2000 / RIM5000 (hollow shaft)** | **Push-pull / RS422**

Dimensions

Dimensions in mm [inch]

Magnetic ring with hub screw, outer diameter 31 mm [1.22] up to 54.7 mm [2.15]

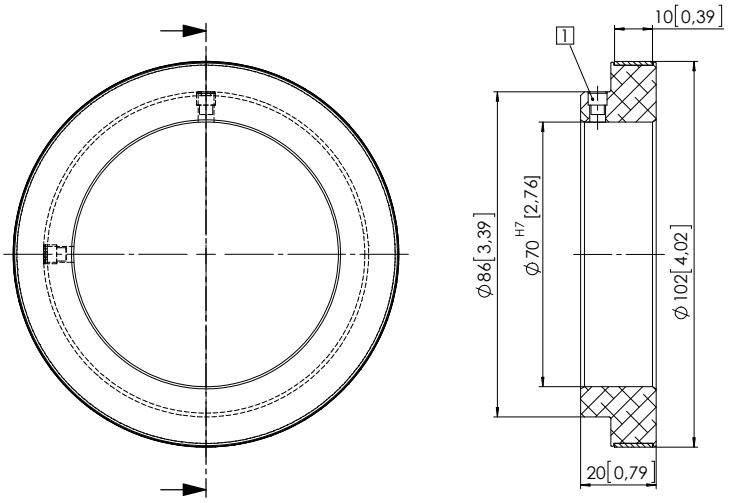
ø A [mm] ±0.10	**ø B** Bore [mm]															**C** [mm] ø Hub
	6	8	9.25	10	12	15	15.875	18	20	25	25.4	28.575	28	30	35	
31	•	•		•	•	•	•	•	•							28 / 29
40.74		•							•	•						28
41.2		•		•	•			•	•							28
45		•	•	•	•	•		•	•	•	•	•		•		38
48.3	•	•		•	•	•			•	•	•		•	•		46
50.11									•							40
54.7	•	•			•	•			•	•				•	•	53



1 Set screw M4

Recommended tolerance of the drive shaft diameter: g6

Magnetic ring with hub screw, outer diameter 102 mm [4.02]



1 Set screw M5

Magnetic ring (press fit)

ø A [mm] ±0.10 Outer diameter	**ø B** [mm] Bore	**C** [mm] ±0.30 Width	**ø D** [mm] **Customer shaft** + recommended tolerance
48.90	45.4 ±0.05	10.40	45.50 m6
87.13	76 H7	9	76 r6
202.30	180 ±0.10	9	180.18 ±0.03