

MAGLINE<sup>MICRO</sup>  
MAGLINE<sup>BASIC</sup>  
MAGLINE<sup>MACRO</sup>  
**MAGLINE<sup>ROTO</sup>**



Magnetic Rotation  
and Angle Measuring Systems...  
**...Complete orientation  
at all times.**



## MAGLINE<sup>MICRO</sup>

Especially suitable for precise and highly dynamic processes on linear guide systems and applications in the field of motive power engineering. MAGLINE<sup>MICRO</sup> is a magnetically sensing incremental system with programmable resolutions of up to 1  $\mu\text{m}$  and a measuring accuracy of max. 10  $\mu\text{m}$ . MAGLINE<sup>MICRO</sup> operates without wear, with measuring values captured contactlessly. This makes the system a robust and economic alternative to optical measuring systems.

## MAGLINE<sup>BASIC</sup>

This system combines all advantages of the contactless magnetic measuring technology and offers resolutions of up to 5  $\mu\text{m}$  and a measuring accuracy of up to 50  $\mu\text{m}$ . MAGLINE<sup>BASIC</sup> is available as both an incremental or absolute measuring system. MAGLINE<sup>BASIC</sup> either provides digital encoder signals or directly displays the values measured at the position the sensor is placed.

## MAGLINE<sup>MACRO</sup>

Especially designed for very long measuring lengths. A system for measuring lengths of 160 meters and more – incrementally or absolutely. Digital signal outputs allow data transmission of the measured values via the standard interfaces with a resolution and accuracy of up to 1 mm to a display unit or a master control.

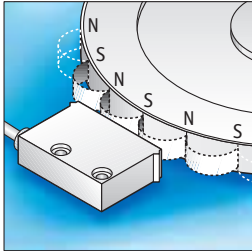
## MAGLINE<sup>ROTO</sup>

Primarily developed for direct angle and rotation recording with all the advantages of magnetic, contactless sensing. Appropriate sensors register the incremental segmentation of magnetic rings and provide a maximum resolution of up to 20,000 pulses per revolution.



# MAGLINE<sup>ROTO</sup> in robust application

The Magnetic Measuring System for Rotation and Angle Recording  
exactly the right rotation sensor.



MAGLINE<sup>ROTO</sup> operates in a contactless manner according to the principle of magnetic sensing. From the signals, the distance and direction information is produced

In modern and economically performing equipment, MAGLINE products from SIKO

have been in operation for many years and have proven themselves in an outstanding manner. The contactless measuring principle operates completely wear-free and extremely reliable. As a result of its insensitivity to nearly all kinds of contamination, the system is an ideal solution even in the most difficult environments.

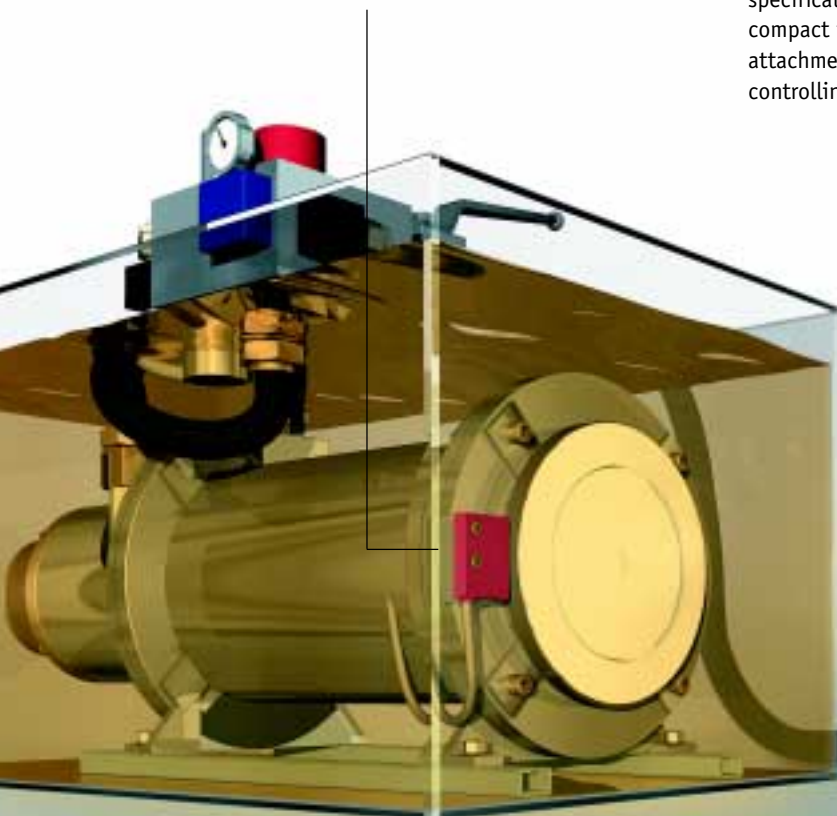
MAGLINE<sup>ROTO</sup> is especially suited for applications that have until now used incremental rotation encoders. These rotation encoders work as a rule on the principle of optical sensing and must therefore be protected against exterior influences such as soiling as well as against mechanical effects such as shock and vibration. With the ROTO System and its magnetic and contactless sensing, such measures are not required. In addition this product offers protection to IP67.

Typical areas of application of the system are rotational speed recording on drive units such as those common on gearbox motors. Also precise angle measurements on turntables, for example, can be implemented in this manner. For mounting, various components with different dimensions and specifications are available. The compact installation allows attachment directly to or near the controlling or processing elements.

The mounting can even be made on the drive shaft without coupling.

The main component of the MAGLINE<sup>ROTO</sup> is the carrier material for the coding that is mounted on the circumference of a ring. This unit is magnetised over its entire length in defined intervals and therefore represents a coded scale. The associated sensory device detects these magnetic variations in a contactless manner. By means of a special conversion process applied to the measuring signals gained in this manner, incremental square wave signals are generated. The further processing of the information takes place either in the local direct display, in a higher level controller or regulator.

## MAGLINE<sup>ROTO</sup>





High levels of safety for lifts require that the drive and the measuring equipment used function in a robust and reliable manner



## At the Customer

### Typical applications

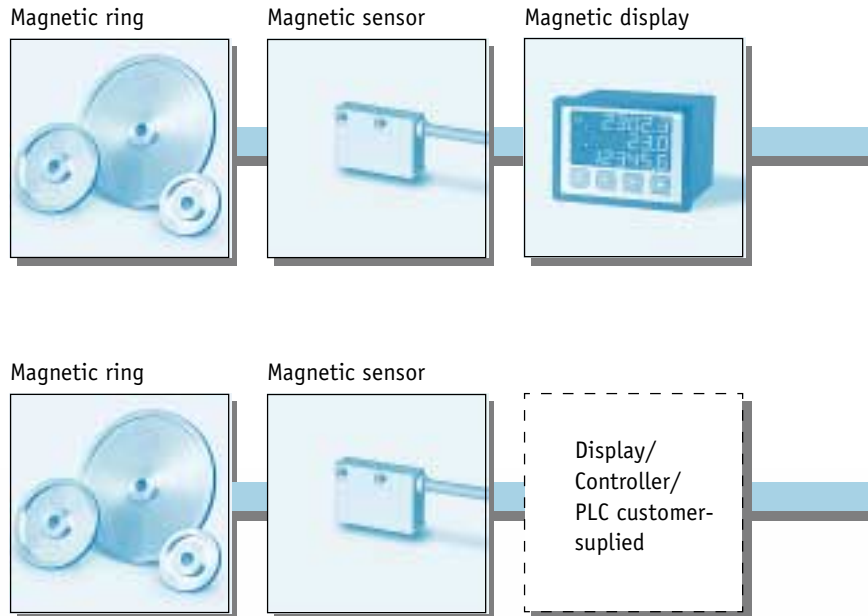
Subjected to continuous operation, lifts must contend with heavy mechanical loads which are also transmitted to the measurement systems. Taking the high safety requirements into account, care must be taken that these system cannot be damaged as a result. MAGLINE<sup>RO10</sup> makes possible their application without problem since, as a result of the operating method of these systems, the interfering mechanical effects cannot be transmitted. High reliability in the daily use of a balancing machine is also a necessity. Robust rotational speed measuring which is characterised by long service life can easily be implemented in these cases. A number of application possibilities can also be implemented with the system for angle recording on turntables.

Drive axles often provide a possibility for simple mounting of the magnet ring.



# Product Survey

MAGLINE<sup>ROTO</sup> and its components

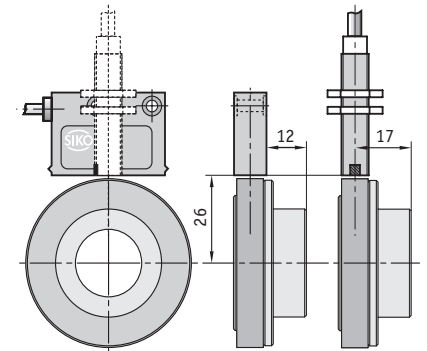
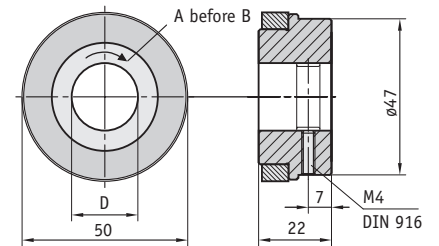


## Possible system combinations:

	MSK320	MSK500
MR320	•	-
MR500	-	•
MRI01	•	-

# Magnetic ring MRI01

On this ring, the carrier material for the coding is attached and magnetized in defined intervals. The magnetic ring is used as a scale and together with the MSK320 sensor unit it forms a robust measuring system for angle and rotation measurement.



## Features:

- easy mounting due to hollow shaft
- insensitive to dust, shavings, humidity, liquids, and oils
- rotary encoder system with IP67 protection class (in combination with MSK320)
- up to 512 pulses  $\pm$  2048 increments after 4x pulse multiplication

Feature	Ordering data	Technical data	Additional information
Pole pitch	<b>64</b> <b>A</b>	<b>64 poles distrib. over the circumference</b>	<b>Standard</b> $\varnothing$ 50 / U = 0.157 m
Bore D <sup>H8</sup>	<b>20</b> <b>B</b> 9	<b>inside diameter 20 <sup>H8</sup></b> inside diameter 9 <sup>H8</sup>	<b>Standard</b> others on request
Resolution		512 / 256 / 128 / 64 pulses	(calculation see appendix)
Gap ring / sensor		max. 2.0 mm	
System accuracy		$\pm$ 0.5 °	
Material		aluminium	
Working temperature		0 ... + 60 °C	
Storage temperature		-20 ... + 85 °C	
Humidity		100% rF, condensation permitted	
Max. rotational speed		calculation: see appendix	

Ordering example: MRI01 - 64 - 20 64 poles; inside diameter of bore 20 <sup>H</sup>

Your ordering data: MRI01 -  -  **Please supply standard version**  (cross if YES)

A B

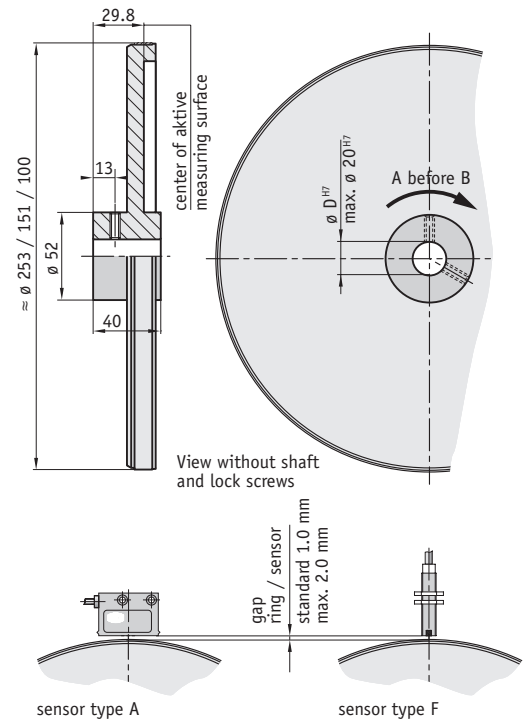
# Magnetic ring MR320

On this ring, the carrier material for the coding is attached and magnetized in defined intervals. The magnetic ring is used as a scale and together with the MSK320 sensor unit it forms a robust measuring system for angle and rotation measurement.



## Features:

- easy mounting due to hollow shaft
- insensitive to dust, shavings, humidity, liquids, and oils
- rotary encoder system with IP67 protection class (in combination with MSK320)
- up to 2 000 pulses  $\pm$  8 000 increments after 4x pulse multiplication



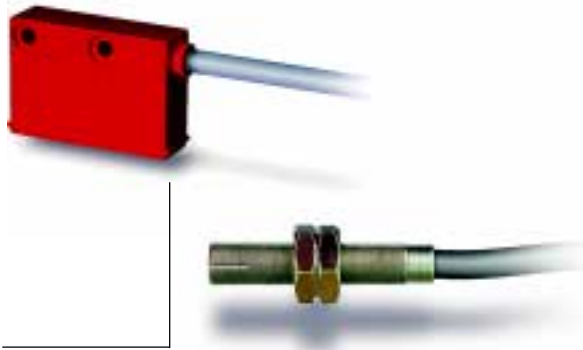
Feature	Ordering data	Technical data	Additional information
Pole pitch	150	<b>150 poles, distrib. over the circumference</b>	<b>Standard</b> $\varnothing$ ca. 153 mm / U = 0.48 m
	100	100 poles, distrib. over the circumference	$\varnothing$ ca. 102 mm / U = 0.32 m
	250	250 poles, distrib. over the circumference	$\varnothing$ ca. 255 mm / U = 0.80 m
Bore D H7	20	<b>20 H7</b>	<b>Standard</b> (max. 20 H7)
Mounting mode	N	<b>hub thread</b>	<b>standard</b>
Resolution		800 / 400 / 200 / 100 pulses	with pole pitch 100 (calculation: see appendix)
		1200 / 600 / 300 / 150 pulses	with pole pitch 150 (calculation: see appendix)
		2000 / 1000 / 500 / 250 pulses	with pole pitch 250 (calculation: see appendix)
Gap sensor / magnetic ring		max. 2.0 mm	
System accuracy		$\pm 0.1^\circ$	
Material		aluminium	
Working temperature		0 ... + 60 °C	
Storage temperature		-20 ... + 70 °C	
Humidity		100 % rF, condensation permissible	
Max. rotational speed		calculation: see appendix	

Ordering example: MR320 - 150 - 20 - N 150 poles; size of bore 20; hub thread

Your ordering data: MR320 -  -  -  Please supply standard version  (cross, if yes)

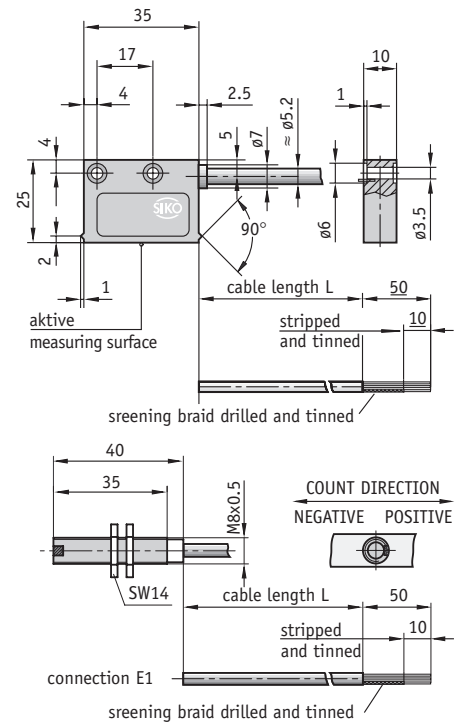
# Magnetic sensor MSK320

As a component of a magnetically operating, open and robust measuring system, this sensor has integrated interpreting electronics and a direct, digital signal output. Used in conjunction with the magnetic rings MR320/MRI01 the sensor forms an open and robust rotary encoder system.



## Features:

- easy mounting, two versions
- insensitive to dust, shavings, humidity
- max. resolution 0.045°, system accuracy  $\pm 0.1^\circ$
- real-time data processing
- rotary encoder system with IP67 protection class (in combination with MR320/MRI01)
- scaling factor factory set

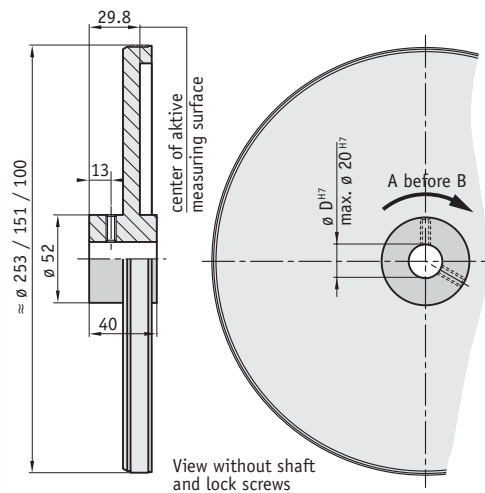


Feature	Ordering data	Technical data	Additional information
Supply voltage	4 5	24 V DC $\pm 20\%$ 5 V DC $\pm 5\%$	standard, with polarity protection
Design	A F	rectangle circular design	standard
Connection / cable length	E1/2.0 E6, E8	2 m cable, flying leads E6, circular plug	standard (cable length max. 20 m) E8, DSUB 9 pins
Output circuit	PP LD TTL	push pull line driver	standard only with non-inverted output signal
Output signal	NI I	not inverted inverted	standard
Reference signal	OR I	without index periodical	standard
Scaling factor	8	factor 8	standard, option 4 / 2 / 1 (see appendix)
Power consumption		max. 50 mA	@ 24 V DC unloaded
Output signals		A, B A, /A, B, /B und A, /A, B, /B, I, /I	quadrature signal only design A, quadrature signal
Gap ring/ sensor		0.1 – 2.0 mm	lateral offset $\pm 1$ mm, angular offset $\pm 3^\circ$
System accuracy		$\pm 0.1^\circ$	repeat accuracy $\pm 1$ increment
Travel speed		(magnetic ring) max. 25 m/s	independent of scaling factor (see appendix)
Interference protection class		3, acc. to IEC 801	humidity: 100 % rF, condensation permissible
Temperature ranges		working temperature: $-10^\circ \dots +70^\circ \text{C}$	storage temperature: $-30 \dots +80^\circ \text{C}$
Protection class		IP67 acc. to DIN 40050 (casing)	test mark: CE
Housing		rectangular housing, plastic red	circular housing, steel
Cable		PUR	

Ordering example: MSK320 - 4 - A - E1/2.0 - PP - NI - OR - 8 24 V DC, rectangular housing, flying leads 2.0 m, output circuit PP, without reference signal, scaling factor 8  
 Your ordering data: MSK320 -  -  -  -  -  -  -  -  Standard version  (cross, if yes)

# Magnetic ring MR500

On this ring, the carrier material for the coding is attached and magnetized in defined intervals. The magnetic ring is used as a scale and together with the MSK500 sensor unit it forms a robust measuring system for angle and rotation measurement.



## Features:

- easy mounting due to hollow shaft
- insensitive to dust, shavings, humidity, liquids, and oils
- rotary encoder system with IP67 protection class (in combination with MSK500)
- up to 20 000 pulses  $\triangleq$  80 000 increments with 4-fold resolution

Feature	Ordering data	Technical data	Additional information
Pole number	<b>96</b>	<b>96 poles, distrib. over the circumference</b>	<b>standard</b> dia. appr. 153 mm / U = 0.48 m
	64	64 poles, distrib. over the circumference	dia. appr. 102 mm / U = 0.32 m
	160	160 poles, distrib. over the circumference	dia. appr. 255 mm / U = 0.80 m
Bore D <sup>H7</sup>	<b>20</b>	<b>20 H7</b>	<b>standard</b> max. 20 H7
Mounting mode	<b>N</b>	<b>hub thread</b>	<b>standard</b>
Resolution		20000/16000/10000/8000/4000/2000 pul.	with pole pitch 64 (calculation: see appendix)
		12000/9600/6000/4800/2400/1200 pulses	with pole pitch 96 (calculation: see appendix)
		8000/6400/4000/3200/1600/800 pulses	with pole pitch 160 (calculation: see appendix)
Gap ring / sensor		max. 2.0 mm	
System accuracy		$\pm 0.1^\circ$	
Material		aluminium	
Working temperature		0 ... + 60 °C	
Storage temperature		-20 ... + 70 °C	
Humidity		100 % rF, condensation permissible	
Max. rotational speed		calculation: see appendix	

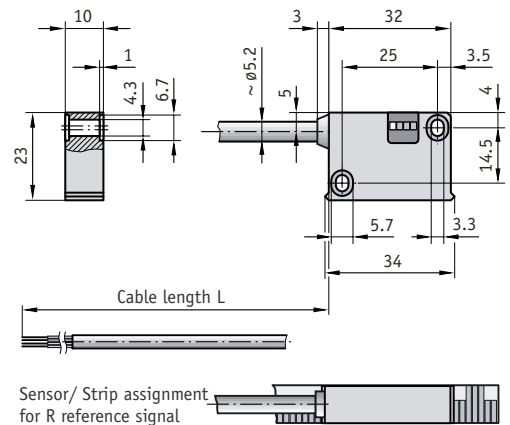
Ordering example: **MR500** - **96** - **20** - **N** 96 poles; diameter of bore 20; hub thread

Your ordering data: **MR500** -  -  -  **Please supply standard version**  (cross if YES)

**A**     **B**     **C**

# Magnetic Sensor MSK5000

Contactless measuring sensor unit with integrated translation module and digital signal output. In combination with the magnetic band MB500, the sensor forms an open, robust and linear measuring system with high resolution at a reading distance of 2,0 mm.



## Features:

- Resolution up to 0,001mm
- Free programmable parameters (e.g. resolution) via optical interface
- Status LEDs
- Real-time data processing
- Scale MB500 (linear) / MR500 (radial)
- Fix and periodical reference signals

Resolution [mm]	travel speed Vmax. [m/s]								
0.001	0.01	0.03	0.05	0.10	0.20	0.32	0.80	1.60	4.00
0.005	0.06	0.13	0.25	0.50	1.00	1.60	4.00	8.00	20.00
0.010	0.12	0.25	0.50	1.00	2.00	3.20	8.00	16.00	25.00
0.025	0.30	0.63	1.25	2.50	5.00	8.00	20.00	25.00	25.00
0.050	0.61	1.25	2.50	5.00	10.00	16.00	25.00	25.00	25.00
0.100	1.21	2.50	5.00	10.00	20.00	25.00	25.00	25.00	25.00
Puls interval [µs]	66.00	32.00	16.00	8.00	4.00	2.50	1.00	0.50	0.20
Counter frequenz [kHz]	3.79	7.81	15.63	31.25	62.50	100.00	250.00	500.00	1250.00

Feature	Ordering data	Technical data	Additional information
Operating voltage	4	24 V DC ± 20 %	standard, with polarity protection
	5	5 V DC ± 5 %	
Type of connection/cable length	E1/1.0	stripped lead, 1 m cable	standard (max. 20 m cable length) E8, D-SUB 9-pin
	.../...	E6, circular plug	
Output circuit	PP	push-pull	standard RS422
	LD	line driver	
Reference signal	0	without	standard 1 increment 1 increment
	I	index periodic	
	R	index fixed	
Resolution	0.005	0.005 mm	standard, option 0.001/0.01/0.025/0.05/0.1
Pulse interval	1	1 µs	standard, option 0.2/0.5/2.5/4/8/16/32/66
Power consumption		<25 mA	unloaded
Output signals		A, /A, B, /B, option: I, /I or R, /R	quadrature signal
LED status signals		A, B, I or R, power	
Gap sensor / magnetic strip		0.1–2.0 mm, reference signal R 0.1–1.5 mm	lateral offset ± 2 mm, with reference signal R ± 0.5 mm
System accuracy		± (0.025 + 0.01 × L) mm, [L in m]	repeat accuracy max. ±0.01 mm, with T <sub>u</sub> = 20 °C
Velocity		depending on resolution and pulse interval	
Temperature ranges		operating temperature: -10 ... +70 °C	storage temperature: -30 ... +80 °C
Interference protection class		3, according to IEC 61000	humidity: 100 % rF, condensation permitted contact surface
Type of protection		IP67 acc. to DIN 40050 (housing)	test mark CE
Housing		ABS (black plastic)	encapsulating material Henkel Macromelt
Cable		PUR	max. 20 m cable length

**Note:** The internal translation module can generate fast counting pulses, the lengths of which are limited by the pulse interval. The follower electronics must be adjusted accordingly. Select the pulse interval in advance, if necessary.

Your order:  -  -  -  -  -  -

# Appendix: Output circuits, Signal illustration

## MSK320 version A

Output signal A / B  
Output circuit PP not short-circuit proof

Power supply	Output driver	$U_{\text{HIGH}}$ (unloaded)	$U_{\text{LOW}}$ (unloaded)	$I_{\text{max}}$ /channel
24 V	transistor	$> U_B - 1 \text{ V}$	$< 0.15 \text{ V}$	50 mA

Output signal A / B  
Output circuit TTL

Power supply	Output driver	$U_{\text{HIGH}}$ (unloaded)	$U_{\text{LOW}}$ (unloaded)	$I_{\text{max}}$ /channel
24 V	AM26C31	$> 4.5 \text{ V}$	$< 0.15 \text{ V}$	5 mA
5 V	AM26C31	$> 4.5 \text{ V}$	$< 0.15 \text{ V}$	5 mA

Output signal A / B and I inverted  
Output circuit PP

Power supply	Output driver	$U_{\text{HIGH}}$ (unloaded)	$U_{\text{LOW}}$ (unloaded)	$I_{\text{max}}$ /channel
24 V	OL7272	$> U_B - 0.8 \text{ V}$	$< 0.5 \text{ V}$	50 mA

Output signal A / B and I inverted  
Output circuit LD; 120 ohm connection

Power supply	Output driver	$U_{\text{HIGH}}$ (unloaded)	$U_{\text{LOW}}$ (unloaded)	$I_{\text{max}}$ /channel
24 V / 5 V	AM26C31	RS422 spec.	RS422 spec.	RS422 spec.

## MSK320 version F

Output signal A / B  
Output circuit PP not short-circuit proof

Power supply	Output driver	$U_{\text{HIGH}}$ (unloaded)	$U_{\text{LOW}}$ (unloaded)	$I_{\text{max}}$ /channel
24 V	transistor	$> U_B - 1 \text{ V}$	$< 0.15 \text{ V}$	50 mA

Output signal A / B  
Output circuit TTL

Power supply	Output driver	$U_{\text{HIGH}}$ (unloaded)	$U_{\text{LOW}}$ (unloaded)	$I_{\text{max}}$ /channel
24 V	74HC04	$> 4.5 \text{ V}$	$< 0.15 \text{ V}$	5 mA
5 V	74HC04	$> 4.5 \text{ V}$	$< 0.15 \text{ V}$	5 mA

## MSK5000

Output signal A / B and I inverted  
Output circuit PP

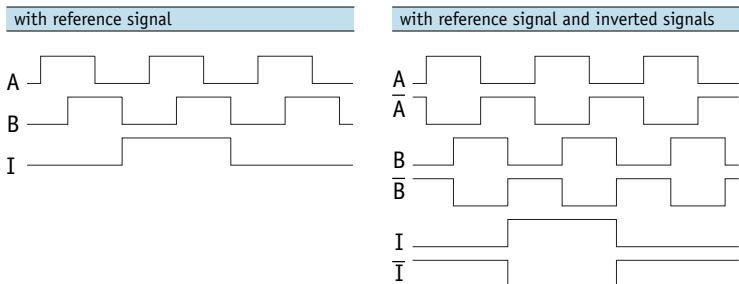
Power supply	Output driver	$U_{\text{HIGH}}$ (unloaded)	$U_{\text{LOW}}$ (unloaded)	$I_{\text{max}}$ /channel
24 V	OL7272	$> U_B - 0.8 \text{ V}$	$< 0.5 \text{ V}$	50 mA

Output signal A / B and I inverted  
Output circuit LD; 120 ohm connection

Power supply	Output driver	$U_{\text{HIGH}}$ (unloaded)	$U_{\text{LOW}}$ (unloaded)	$I_{\text{max}}$ /channel
24 V / 5 V	AM26C31	RS422 spec.	RS422 spec.	RS422 spec.

## Signal illustration

The logical allocation of the A and B signals to the reference signal I can change. The number of the reference signals I corresponds to the number of poles of the respective magnetic ring.



# Appendix: Calculation tables

## Resolution

The calculation of the resolution (number of pulses) is dependent on the number of poles and the scaling factor and is calculated with the formula:

$$\text{Resolution} = \text{Scaling factor} \times \text{pole pitch}$$

## MR320 and MSK320

Resolution (pulses)			Scaling factor
800	1200	2000	8
400	600	1000	4
200	300	500	2
100	150	250	1
100	150	250	pole pitch

## MRI01 and MSK320

Resolution (pulses)			Scaling factor
512			8
256			4
128			2
64			1
64			pole pitch

## MR500 and MSK5000

Resolution (pulses)			Scaling factor
8000	12000	20000	125
6400	9600	16000	100
4000	6000	10000	62.5
3200	4800	8000	50
1600	2400	4000	25
800	1200	2000	12.5
64	96	160	pole pitch

## Rotational Speed

The calculation of the maximum rotational speed takes place with respect to the circumferential speed where the circumference of the magnetic ring used is decisive. For the MSK320 sensor, the circumferential speed is 25 m/s whereas the speed for the MSK500 sensor is variable and results from the selection of the pulse interval and the scaling factor (see MSK500 table).

The rotational speed is calculated with the formula:

$$\text{rotational speed } n = \frac{v \cdot 60}{U}$$

v = circumferential speed [m/s]; U = circumference[m]  
60 = expansion factor [60 s/min]

$$\text{MSK320 for instance: } n = \frac{25 \cdot 60}{0.32} = 4687.50 \text{ [1/min]}$$

$$\text{MSK500 for instance: } n = \frac{6 \cdot 60}{0.32} = 1125 \text{ [1/min]}$$

## MR320

Pole pitch	U [m]	n [1/min]
100	0.32	4687.50
150	0.48	3125.00
250	0.80	1875.00

## MRI01

Pole pitch	U [m]	n [1/min]
64	0.157	9554.14

## MR5000

Pole pitch	U [m]	n [1/min]
64	0.32	variable
96	0.48	variable
160	0.80	variable

# Appendix/Pin outs

## MSK320 + MSK5000

Connection type E1



Connection type E6



Connection type E8



Signals not inverted (only MSK320)

PIN (E8)	PIN (E6)	Color (E1)	Signal
1	1	black	GND
2	2	brown	+UB
3	3	red	A
4	4	orange	B

Signals inverted

PIN (E8)	PIN (E6)	Color (E1)	Signal
1	1	red	A
2	2	orange	B
3	3	-	N.C.
4	4	brown	+UB
5	5	black	GND
6	6	yellow	A/
7	7	green	B/

Signals inverted with reference signal

PIN (E8)	PIN (E6)	Color (E1)	Signal
1	1 (A)	red	A
2	2 (B)	orange	B
3	3 (C)	blue	I
4	4 (D)	brown	+UB
5	5 (E)	black	GND
6	6 (F)	yellow	A/
7	7 (G)	green	B/
8	8 (H)	violet	I/