

# MAGNETOSTRIKTIV

## *Magnetostruktiver Transducer*



*Series MAZ*

- *Range 100...4000 mm*
- *Linearity of 0,02%*
- *pressure up to 350 bar, positive operating pressure max. 750 bar*
- *compact housing*
- *IP67 Protection*
- *Displacement speed < 10 m/s*
- *Resolution < 0,1 mV or <0,2  $\mu$ A, 5  $\mu$ m (2  $\mu$ m on request)*
- *Working temperature range -40...+70°C*
- *Vibration resistant*
- *Analogue output 0...10 VDC, 4...20 mA, 0...20 mA, CANopen, SSI*

## Description

An electric impulse is produced in the headpipe and creates a circular magnetic field. The permanent magnet related to the object to be measured is the sensor. The lines of the magnetic field of the permanent magnet are in a 90° angle with the ones produced by impulse of the electric current. The interaction of the magnetic fields causes a flexible deformation (magnetostriction) in the waveguide. This deformation spreads to either ends in the waveguide. The propagation speed reaches 2,850 m/sec. The mechanical impulse is absorbed at one end of the waveguide and changed at the other end into an electrical signal, by reversal of the magnetostrictive effect. A controller calculates the travel speed of the impulse which is proportional to the displacement.

This principle enables a contactless, wear-free and absolute measurement. The sensors operate reliably in hydraulic cylinders, machine tools, presses, woodworking machines, rolling systems, packaging machines, portal robot, cutting machines, in the mining industry and in the conveying engineering.

There are two different types of magnetostrictive sensors. The series of MAB is used in the automated measuring technique for the position and distance measurement. The object to be measured is connected thereby with the sliding cursor or the floating magnet. By the different installation possibilities these sensors are suitable for a multiplicity of applications. The series of MAZ is conceived for the installation in hydraulic cylinders. The ring permanent magnet move along a rod without any contact. The different execution of the ring magnets permits a simple installation in hydraulic systems. The sensors can be installed in systems with pressure up to 350 bar (overpressure 700 bar).

## Technical Data

### Range

100/130/150/200/225/300/400/450/500/600/700/750/800/900/1000/1250/1500/1750/2000/2250/2500/2750/3000/3250/3500/3750/4000

<b>Output signal</b>	0...10 VDC / 4...20 mA 0...20 mA and inv. Signal Start/Stop (RS422 compatible) PWM(pulse width modulated) SSI (RS422/485), CANopen (DS-301)	<b>Output load (analogue)</b>	> 5 KOhm
		<b>Protection against polarity inversion</b>	ja
		<b>Type of magnet</b>	Ring magnet MAZ
<b>Update time of the analogue output</b>	< 1 ms (Length depending)	<b>Protection</b>	IP67
<b>Scanning rate for Position</b>	CANopen: from 1 to 4 ms SSI: from 0.5 to 3 ms	<b>Displacement speed</b>	<10 m/s
<b>Linearity</b>	s. table	<b>Force required to move the sliding cursor</b>	<1 N
<b>Resolution</b>	< 0.1 mV o < 0.2 µA (analogue) 0,1 mm (digital) 5 µm CANopen (2 µm on request) 5, 10, 20 or 40 µm SSI (2 µm on request)	<b>Max. acceleration</b>	<100 m/s <sup>2</sup>
		<b>Temperature stability</b>	<0.01% MB / °C
<b>Nominal power supply</b>	24 VDC ± 20%	<b>Humidity</b>	0...90% (non-condensing)
<b>Max. power supply ripple</b>	1 Vpp	<b>Working Temperature</b>	-40...+70°C
<b>Max. consumption</b>	100 mA type	<b>Storage Temperature</b>	-40...+100°C
		<b>Shock Test</b>	100g / 11 ms (IEC68T2-27)
		<b>Vibration</b>	12g / 10...2,000 Hz (IEC68T2-6)

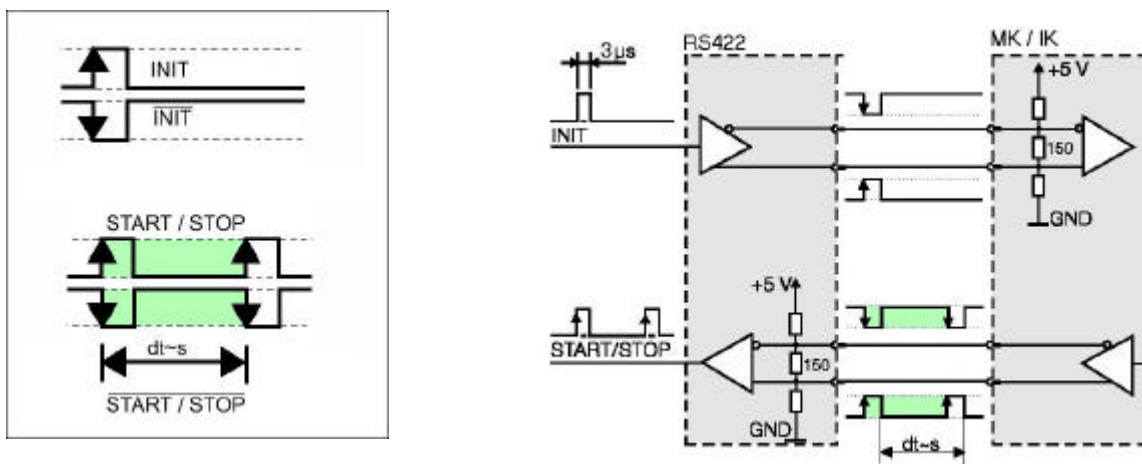
range	mm	100	130	150	200	225	300	400	450	500	600	700	750	800	900	1000
Model C. E.					1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000
Linearity	±%	0.03	0.025		< 0,02 of the electrical stroke (C. E.)											
Max. length A	mm	Range + 200														
Repeatability	±%	0,001 of the electrical stroke (C. E.)														
Hysteresis	mm	< 0.01														

## Digital - Output

Two different digital output signals are available on the magnetostrictive sensors of the MAB D and the Maz D series: the Start-Stop signal and the PWM signal (Pulse Width Modulated). Both signals are RS422 compatible. Thus the signal transmission is free from interference up to 500 m.

Start-Stop signal:

The receiver module (e.g. SPS) supplies an impulse and determines thus the data transmission rate. With the first rising flank the electronics begins to capture the information of the displacement to be measured. At the same time a start pulse at the output is generated, which activates a counter in the receiver module. At the end of the measurement - the magnet is at a fixed position - the electronics produces a stop pulse. The counter of the receiver module is stopped and the time unit is multiplied by 2,850 m/s.



PWM signal:

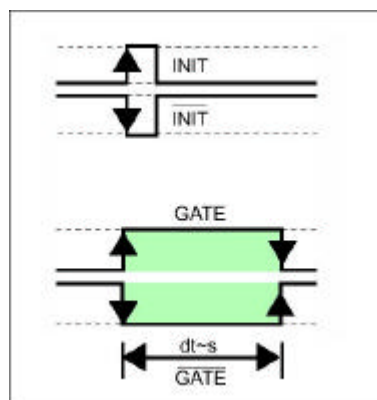
The Pulse Width Modulation is the second possibility for a digital position entry. In contrast to the start stop transfer, the output signal is permanently available at the receiver module. At the PWM transfer two data request options are to be chosen:

A) external data request

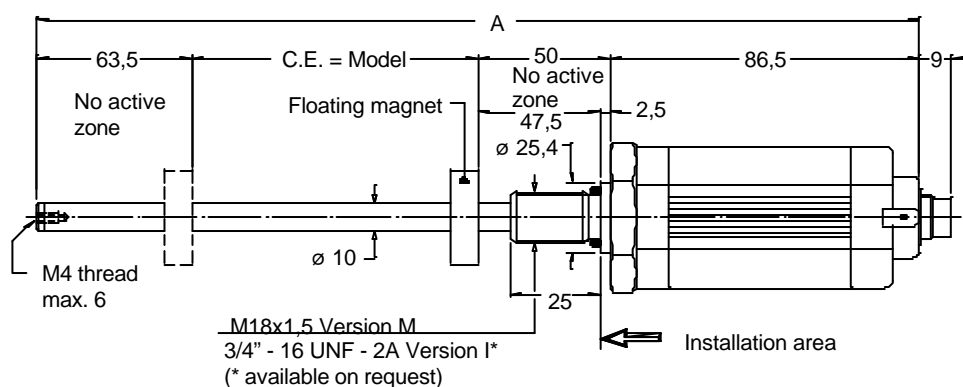
Electronics needs a signal from the receiver module to determine the position of the permanent magnet.

b) internal data request

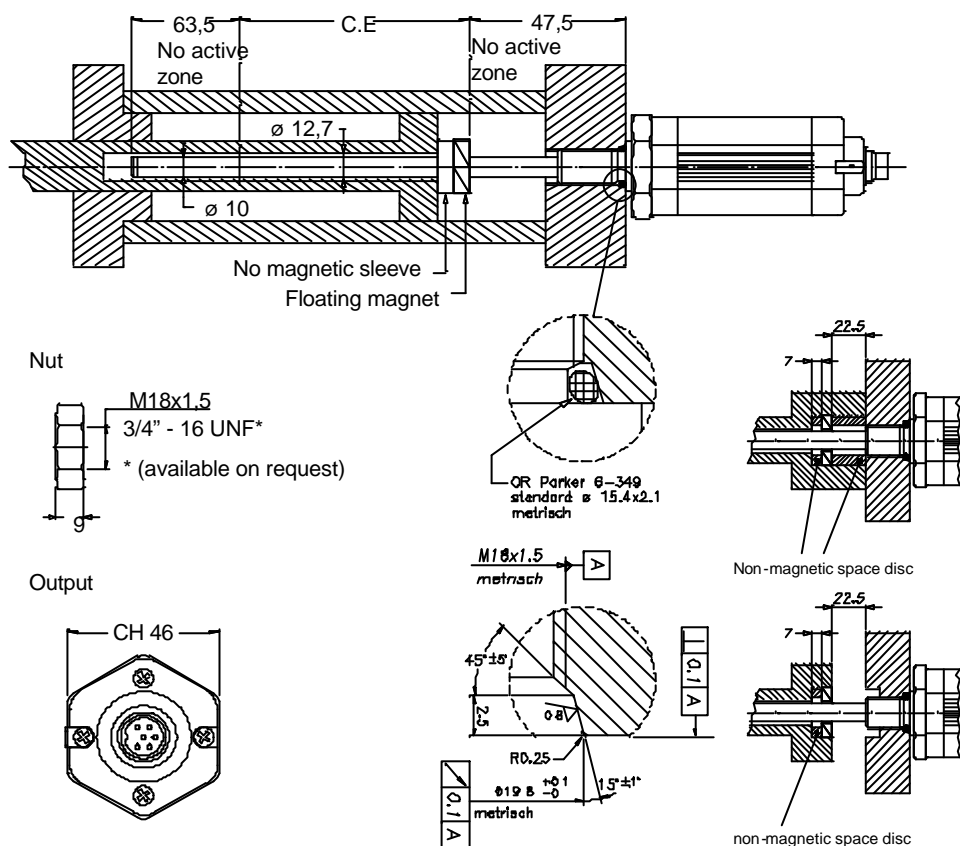
Electronics transmits automatically the output signal every 2 m/sec to the receiver module.



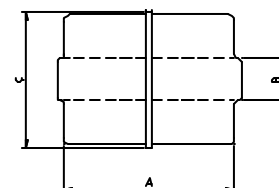
## Hydraulic



## Mounting example



## Float



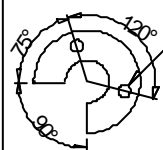
Type	PCUR026	PCUR027
Length A		52,4
ø B mm	12	15
ø C mm		42
Material	steel	AISI 316

**Floating magnet**  
**PCUR 024**



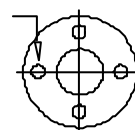
int. ø 13,5  
ext. ø 25,4  
depth 7.9

## PCUR 023



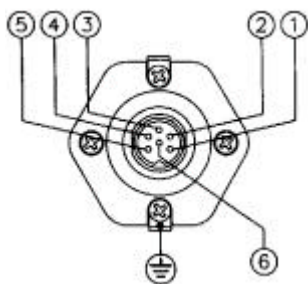
2 x Ø 4,1  
on Ø 23,9  
int. Ø 13,5  
ext. Ø 32,8  
depth 7,9

## PCUR 022



4 x Ø 4,1  
on Ø 23,9  
int. Ø 13,5  
ext. Ø 32,8  
depth 7,9

## Electrical connections



Pin	analogue	digital	ssi	can
1	0...10 Vdc 4...20 mA 0...20 mA	(-) Gate	(-) Data	CAN L
2	GND Pin 1	(+) Gate	(+) Data	CAN H
3	10...0 Vdc 20...4 mA 20...0 mA	(+) Inquire	(+) Clock	CAN GND
4	GND Pin 3	(-) Inquire	(-) Clock	--
5	Power +Vdc	Power +Vdc	Power +Vdc	Power +Vdc
6	Power GND	Power GND	Power GND	Power GND

**Warning:** Do not connect Pin 2 or Pin 4 to the electrical ground or to the cable screen.

## Protocol CANopen

SOF	Arbitration		Control	Data Field	CRC	ACK			EOF	Interframe Space
1	11	1	6	0-8 Bytes	15	1	1	1	7	> 3 Bits

## Order Code

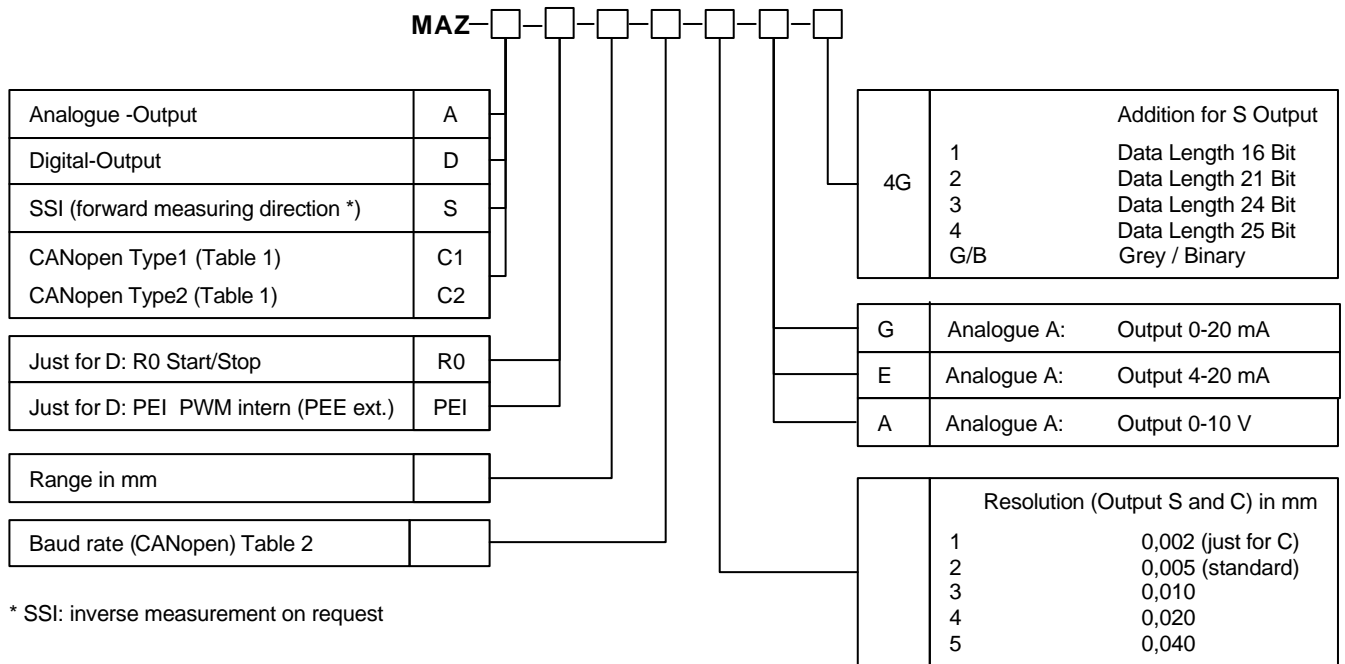
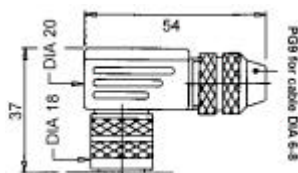


Table 1 - Number of magnet position for CANopen (C)		
1 Typ1 (C1)	Position 4 Byte integer, displacement. 2	—
2 Typ2 (C2)	Position1, 4 Byte integer, displacement 1, 2	Position2, 4 Byte integer, displacement 2, 2

Table 2 - Baudrate (CAN) depends on cable length		
1 = 1MBaud	4 = 250 kBaud	7 = 50 kBaud
2 = 800 kBaud	5 = 125 kBaud	8 = 20 kBaud
3 = 500 kBaud	6 = 100 kBaud	9 = 10 kBaud

### Mating connector

CON 023  
IP67



Cable length	Baud rate (Kbaud)	Cable length	Baud rate (Kbaud)
<25 m	1000	<500 m	125
<50 m	800	<1000 m	100
<100 m	500	<1250	50
<250 m	250	<2500	20 / 10

The magnet receiver must be ordered separately:

<b>MAZ</b> — [ ]	PCUR 022	4-drill ring magnet
	PCUR 023	2-drill ring magnet
	PCUR 024	0-drill ring magnet