## **MAGNOSENS**

# **Magnetostrictive Displacement Transducers**

Model series MPK / MSK with EtherCAT interface

**MXK** 11791 DE

11 / 2011

Model MPK: Profile versionModel MSK: Rod version

■ Measuring strokes from 25 to 7600 mm

■ Contactless, robust system

■ Resolution up to 1 µm

■ Up to 5 positions measurable simultaneously

- Speed signal
- Transmission rate up to 100 MBit/s
- Parameterisable via the bus
- Protection types up to IP 67
- Operating temperature range -40°C ... +75°C
- Rod version pressure stability up to 350 bar



## Structure and operation

The displacement transducers operate according to the principle of run time measurement between two points of a magnetostrictive waveguide. One point is determined by a moveable position ring, whose distance from the null point corresponds to the section to be measured. The run time of an emitted impulse is directly proportionate to this section. Conversion to a displacement signal takes place in the downstream electronics.

The waveguide is housed in a pressure-resistant stainless steel tube or extruded profile. To the rear of this is a die-cast aluminium housing containing the electronics in SMD technology.

In the rod version, the position magnet is located in a ring, which is guided over the rod without contact. In the profile version, it is located either in a slider, which is linked to the moving part of the machine via a ball joint, or it moves as a liftable position magnet, without wear, over the profile.

## Standard measuring strokes

- $\hfill\square$  Up to 1000 mm in 50 mm steps
- ☐ Up to 5000 mm in 250 mm steps (profile version: MPK)
- ☐ Up to 7600 mm in 250 mm steps (rod version: MSK)

## **Characteristics of the EtherCAT interface**

The MXK magnetostrictive displacement transducers meet all EtherCAT requirements and can be connected directly to the field bus. Their measured data are converted to displacement-proportionate, bus-capable output signals in the sensor and are transmitted directly to the control system.

In addition to useful data transmission, software integrated into the sensor supports extensive monitoring and diagnostic functions, which can be configured via the enclosed XML file during installation. Use of the CANopen over EtherCAT message enables parameters and diagnostic data to be handled as usual in the case of CANopen. The most important key data of the displacement sensors with EtherCAT interface include:

## Sensor output signals:

- 4-byte position data
- 4-byte speed data
- 2-byte status and error messages

## Selectable parameters:

- Measuring direction: Forwards/backwards
- Resolution
- Extrapolation

#### Address setting:

Manual setting of the node address and the baud rate is omitted. The network subscribers only have to be selected and arranged according to their sequence in the EtherCAT master.

#### XML file:

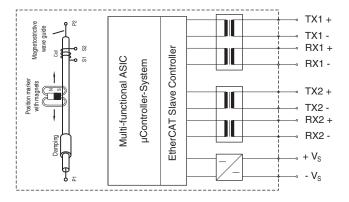
The XML file for integrating the sensor into the EtherCAT master system and the user manual in PDF format are contained in the enclosed CD-ROM.

# **Diagnosis**

The LEDs (green/red) in the sensor head are used for setting and additionally provide information on the sensor status.

Green	Red / Green	Meaning
Flashing	off	Normal function
Flashing	red	Magnet not in the setting range, incorrect number of magnets
Flashing	Flashing red	Undervoltage
Flashing	green	Initialisation

### **Block diagram**



## **Technical data**

Operating voltage

range Vs: 24VDC (+20 / -15%) Operating current Is: 80 mA (typical)

Resolution

□ Displacement in μm: 1 ... 1000 μm □ Speed: 1 mm/s

Linearity:  $< \pm 0.01\%$  (min.  $\pm 50 \mu m$ ) Repeatability:  $< \pm 0.001\%$  (min.  $\pm 2.5 \mu m$ )

Hysteresis:  $< 4 \mu m$ Temperature drift: < 15 ppm / °C

Measurement cycle time: Depending on meas. length

Process data rate: Max. 10 kHz,

data are extrapolated

Operating temperature

range:

 40°C to + 75°C Dew point, humidity: 90% rel. humidity, no condensation

100 g to IEC Standard 68-2-27 Shock test: 15 g / 10 to 2000 Hz to IEC Vibration test:

Standard 68-2-6

Protection type

**IP 65** □ Profile: □ Rod: **IP 67** 

Operating

pressure for rod: Max. 350 bar

EMC test: EN 50081-1. EN 50082-2. EN 61000-4-2/3/4/6

Output:

**EtherCAT** Interface:

Fast Ethernet, 100 Base-Tx Signal transmission:

Transmission rate: Max. 100 MBit/s

# **EtherCAT mating connector**

Connection type: M12 connector D-coded 4-pin Die-cast zinc, nickel-plated, Housing:

straight

Contacts: Pins, gold

Wire connection: Cage tensioning spring

Max. 0.75 mm<sup>2</sup> Connection cross-sec.: 6 - 8 mm Cable diameter **IP 67** Protection type:

## Supply mating connector

Connection type: M8 connector, A-coded, 4-pin

Housing: Plastic, straight Contacts: CuZn, CuSn Wire connection: Screws Max. 0.5 mm<sup>2</sup> Connection cross-sec.: Cable diameter: Max. 5 mm

#### Pre-assembled industrial Ethernet data cable

Connection type: M12 connector D-coded 4-pin

Contacts: Pins, gold

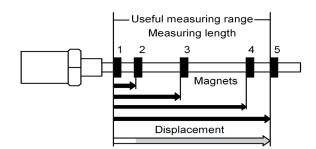
Cable type: PUR, halogen-free, Profinet type C

Cable cross-section: 4 x 0.38 mm<sup>2</sup> (AWG 22)

Cable diameter: 6.2 mm IP 67 Protection type:

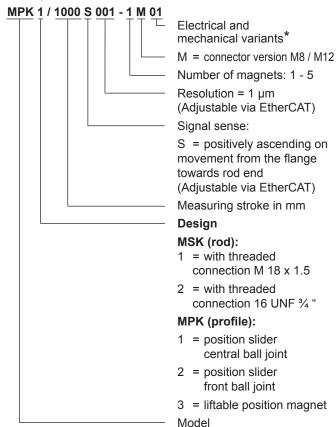
# Multi-magnet measurement

The MXK EtherCAT sensor enables a maximum of 5 positions and 5 speeds to be measured simultaneously with one sensor. Please note that the distance between the individual magnets must be at least 75 mm in this case.



#### **Order code formats**

■ Displacement transducer



<sup>\*</sup> The basic versions according to the data sheet bear the number 01. Deviations are identified with a variant number and are documented in the factory.

MPK = profile version

MSK = rod version

# Scope of delivery:

Rod: Sensor, nut (order magnet separately)

**Profile:** Sensor, 1 position magnet, 2 mounting clamps up to 1250 mm + 1 clamp for each additional 500 mm.

## Accessories:

STK4GS64

Position magnets for MSK

PR02 Standard position ring (ø 33 mm)

PR03 Liftable position magnet

Position magnets for MPK

PS01 Position slider, central ball joint PS02 Position slider, ball joint at side PR03 Liftable position magnet

24 VDC supply (M8)

Straight mating connector M (M8 / M12)STK4GP81 EtherCAT IN/OUT (M12)

Our recommendation:

Industrial Ethernet data cable with M12 connectors, D-coded, moulded on at both ends

**KABEL-XXX-114** (XXX = length in metres)

Standard lengths: 1, 2, 3 and 5 m

■ KABEL-XXX-118: Ethernet data cable M12 on

RJ45 IP20 (XXX = length in metres)

Installation material:

MB-MP-01 Mounting clamps for profile version
NT-MP-01 M5 sliding block for profile version
ML-MSX Mounting shackle for rod version

# Electrical connections version M (M8/M12) Connection M8 (24 VDC)



Socket: View of the clamping side of the mating connector.

PIN	Signal	
1	+ UB (+24 VDC)	
2	not assigned	
3	- UB (0 VDC)	
4	not assigned	

#### Connection M12 (bus IN/OUT)



Pins: View of the clamping side of the mating connector.

PIN	Signal	Colour *
1	Tx +	yellow
2	Rx +	white
3	Tx -	orange
4	Rx -	blue

<sup>\*</sup> Industrial Ethernet cable colours according to ISO / IEC 8802-3.

# **Further documentation:**

#### On www.twk.de:

- ☐ MWA 10318 installation instructions
- ☐ EtherCAT manual MXK 11809
- ☐ Available position magnets MXX 11469

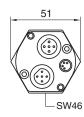
#### On www.ethercat.org:

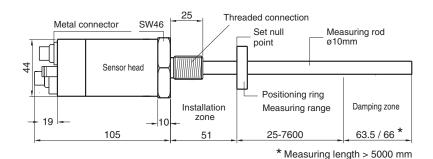
☐ Specifications, introduction to EtherCAT, publications...



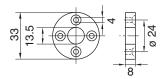
#### **Dimensions in mm**

## Model: MSK (rod version)





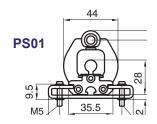
# **Standard position ring PR02**



With measuring strokes of 1000 mm and over, mechanical rod support is recommended.

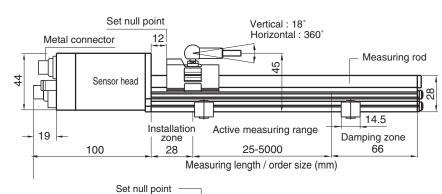
The sensor's fastening should be manufactured from non-magnetic materials (e.g.: brass, plastic). Note installation instruction **MWA10318** on installation in magnetisable materials.

# Model: MPK (profile version)

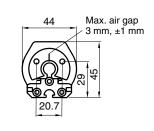


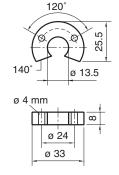


# Central ball joint PS01 Front ball M5 PS02 Front ball M5



# Liftable position magnet PR03





Metal connector

Sensor head

Sensor head

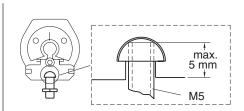
Installation zone
28

Measuring rod

Measuring range
14.5 Mounting bracket
Damping zone
66

Damping zone
66

Liftable position magnet: Wherever possible, use non-magnetisable material for fastening this. If magnetisable material is used, the position magnet must be mounted via a non-magnetisable spacer washer with a minimum thickness of 5 mm using non-magnetisable bolts.



Sliding block: Studded nut in T slot

**Note**: On installation of the MAGNOSENS, careful shielding from magnetic and electromagnetic fields must be ensured. The cable shield must be mounted on the connector and connected to ground at the evaluation electronics.