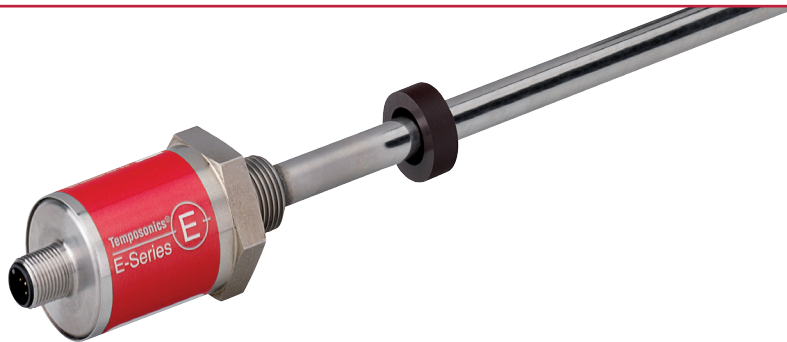


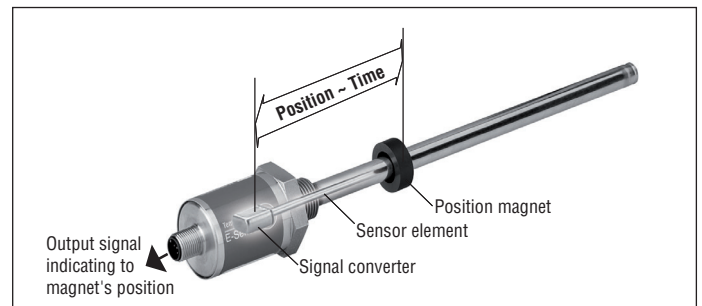
## E-Series CANopen

**Temposonics® EH**  
Stroke length 50...2500 mm

**Document Part Number**  
**551296 Revision D**



- Linear, absolute measurement
- Contactless sensing with highest durability
- Rugged industrial sensor
- EMC tested and CE marked
- Linearity deviation less than 0.02 % F.S.
- Repeatability 0.005 % F.S.
- Direct signal output for position  
- CANopen
- Stroke length 50...2500 mm
- Also with stainless steel 1.4404 / AISI 316L available



### Magnetostriction

The Temposonics® linear position transducers are based on magnetostriction technology. Magnetostriction is a ferromagnetic material phenomenon which relates a dimensional change of the material to its magnetization properties. It is the product of a general coupling between the magnetic and elastic transport properties of the materials crystal lattice. This affect is typically on the scale of a few parts per million. It is quasi linear with the material's magnetization, may be positive or negative, and reaches a maximum at magnetic saturation. It is reversible, but exhibits a hysteric affect if the magnetization does so. Magnetostriction was characterized in the late 19th century, the longitudinal version is called the "Joule" effect, the torsional version is called the "Wiedemann" effect, and the reciprocal effect where mechanical stress changes the magnetic properties is referred to as the "Villari" effect.

### Design

Inherently robust, non-contact and wear free, the Temposonics® linear positions transducers provide the best durability and accurate position measurement solutions in harsh industrial environments. The position measurement technique is similar to the radar principle but using magnetostrictive effects. The position measurement accuracy is tightly controlled by the quality of our waveguide which is manufactured by MTS. The sensors are completely modular in electrical and mechanical design. They provide flexibility of use in many different applications. In the EH sensors, a stainless steel pressure rod and mounting flange protects the sensor element from hydraulic cylinder pressures. The sensor head houses the modular electronics which provide the measurement and the choice of various different signal output interfaces. The external position measurement target is a magnet. It is attached to the moving part of the cylinder (the piston) while the transducer itself can be stationary.

**CANopen**  
certified  
CiA201202-301V402/20-0151



### Temposonics®-EH

**High Pressure Compact Sensor - Stroke length 50...2500 mm.**

MTS Sensors continues to establish new performance standards for low-cost, fully-industrial, durable position sensors using the widely preferred magnetostrictive technology. This principle for accurate and non-contact measurement of linear-position sensing was developed 30 years ago by MTS and is used with outstanding success in a large variety of industrial applications. The Temposonics® EH sensor provides all the performance you need for your application: the full advantages of magnetostrictive position measurement at optimum costs.

The Temposonics® EH Sensor features a pressure resistant sensor rod for direct stroke measurement inside hydraulic cylinders. With its minimized sensor head and either a 7 mm or 10 mm rod, it is the ideal solution when space is critical. For long strokes, the EH is available with measuring ranges up to 2500 mm. The EH Sensor offers completely sealed stainless-steel housing for long life position measurement in rugged environments. When installed with the appropriate mating connector and cable, it features protection up to IP69K and is suitable for high-pressure washdown applications.

### Technical Data

#### Input

Measuring Variable	Position
Stroke length	50...2500 mm

#### Output

Interface	CAN System ISO-DIS 11898				
Data protocol	CANopen: CIA Standard DS 301 V3.0 / Encoder Profile DS 406 V3.1				
Baud rate, kBit/s	1000	800	500	250	125
Cable length, m	< 25	< 50	< 100	< 250	< 500

The sensor will be supplied with ordered baud rate, which is changeable by customer

#### Accuracy

Resolution	10 µm, 20 µm
Velocity	1 mm / s
Linearity, deviation <sup>1</sup>	< ± 0.02 % F.S. (Minimum ± 60 µm)
Repeatability	< ± 0.005 % F.S. (Minimum ± 10 µm)
Temperature coefficient	≤ 15 ppm/°C
Update frequency	1 ms

#### Operating conditions

Magnet speed	Any
Operating temperature	-40° C...+75° C
Dew point, humidity	90 % rel. humidity, no condensation
Ingress protection <sup>2</sup>	IP67, IP69K with proper mating connector
Shock test	100 g (single shock) IEC-Standard 60068-2-27
Vibration test	15 g / 10 - 2000 Hz IEC-Standard 60068-2-6 (resonance frequencies excluded)
EMC-Test	Electromagnetic emission EN 61000-6-4 (for use in industrial environment) Electromagnetic immunity EN 61000-6-2 The sensor meets the requirements of the EC directives and is marked with CE

#### Design / Material

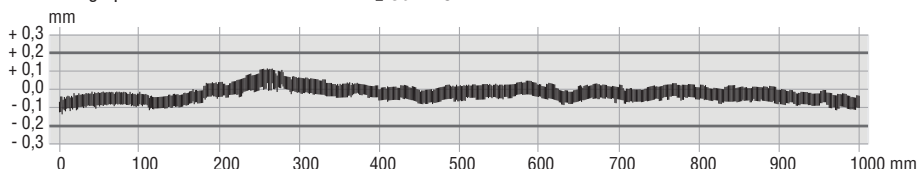
Sensor housing	stainless steel 1.4305 / AISI 303; stainless steel 1.4404 / AISI 316L
Rod	stainless steel 1.4306 / AISI 304L; stainless steel 1.4404 / AISI 316L for Ø 10 mm rod only
Pressure Rating	7 mm Rod: 300 bar, 350 bar peak 10 mm Rod: 350 bar, 450 bar peak
Position encoder	Ring magnet, PA-Ferrite

#### Installation

Mounting type	Threaded flange M18×1.5 or 3/4 - 16 UNF 3A
Mounting position	Any orientation

#### Electrical Connection

Connection type	5 pin connector M12
Supply voltage	24 VDC (+20 % / -15 %); UL Recognition requires an approved power supply with energy limitation (UL 61010-1), or Class 2 rating according to the National Electrical Code (USA) / Canadian Electrical Code.
Current consumption	40-60 mA depending on stroke length
Ripple	< 0.288 Vpp
Dielectric strength	500 VDC (DC ground to machine ground)
Polarity protection	≥ -30 VDC
Overvoltage protection	< 36 VDC



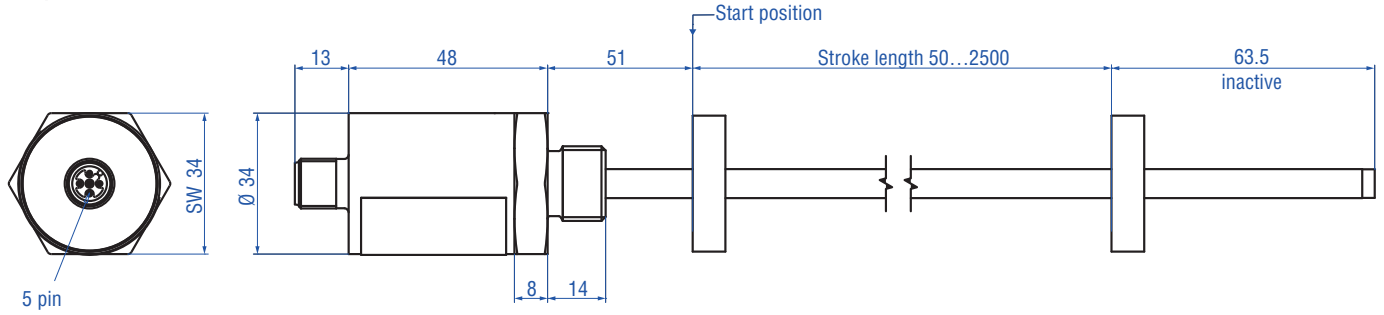
#### Linearity protocol example

Sensor Temposonics®-EH, Stroke length 1000 mm  
Tolerance allowed: ± 0.2 mm  
Tolerance measured: typical ± 0.09 mm

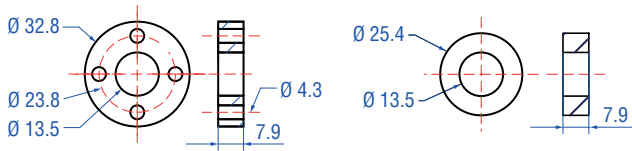
<sup>1</sup> with position magnet # 251 416-2

<sup>2</sup> The IP rating is not part of the UL recognition

**Temposonics® EH**



**Position magnets** (not included in delivery, please order separately)



**Ring magnet OD33**  
**Part no. 201 542-2**

Composite PA-Ferrite-GF20  
Weight: ca. 14 g  
Operating temperature: -40...+100°C  
Surface pressure max. 40 N/mm<sup>2</sup>  
Fastening torque for M4 screws  
max. 1 Nm

**Ring magnet OD25.4**  
**Part no. 400 533**

Composite PA-Ferrite  
Weight: ca. 10 g  
Operating temperature: -40...+100°C  
Surface pressure max. 40 N/mm<sup>2</sup>

**Other magnets on request.**

**Mounting**

The EH sensor is designed for direct stroke measurement inside prepared hydraulic cylinders. At the head of the sensor, a threaded flange and O-Ring provides for mounting and sealing the sensor into a port opening in the cylinder end cap. The sensor's pressure resistant rod fits into a bore drilled through the center of the piston head and rod assembly. The sensor's position magnet is mounted on the top of the piston head or installed in a shallow counter-bore inside the piston head.

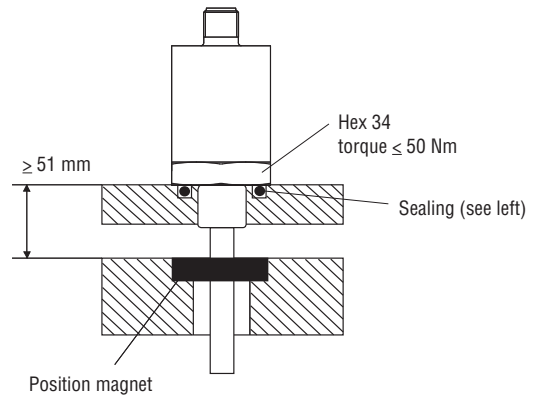
The position magnet requires minimum distances away from ferrous metals to allow proper sensor output. The minimum distance from the front of the magnet to the cylinder end cap is 15 mm. The minimum distance from the back of the magnet to the piston head is 5 mm. The nonferrous spacer (part no. 400633), provides this minimum distance when used along with the standard ring magnet (part no. 201542-2).

The magnet is usually secured using non-ferrous fastening material (customer supplied). Screws must be made of nonmagnetic stainless steel or brass. In the event that a ferrous circlip or retaining ring will be used to secure the magnet in a counter-bore then an additional non-ferrous spacer (> or = 5 mm) must be placed between the circlip or retaining ring and the front side of the magnet. The cylinder's design ratings for hydraulic pressure and piston velocity will determine the appropriate size for the bore that is drilled through the center of the piston head and rod assembly. The recommended minimum size for this bore is 10 mm when using the 7 mm diameter sensor rod.

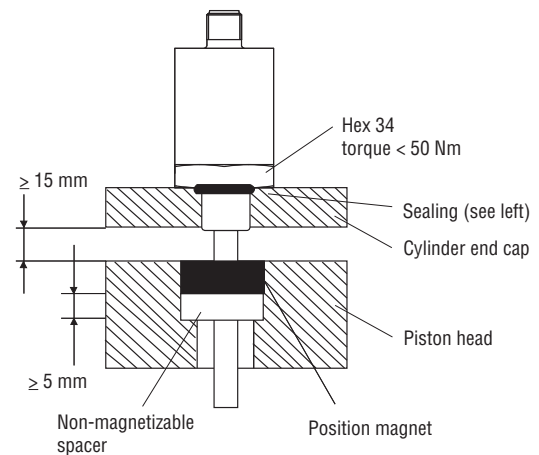
Likewise, the recommended minimum size of 13 mm should be used when installing the 10 mm diameter sensor rod. Some applications using long sensor rods may benefit by adding a bushing (e.g. made of flourelastomer material) to prevent wear on the magnet and sensor rod (customer supplied).

**Caution!**  
For threading the sensor please use only the hexnut at the bottom of the sensor head. Maximum tightening torque is 50 Nm.

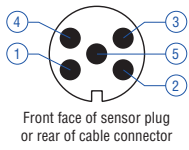
**1. Non-magnetizable material**



**2. Magnetizable material**

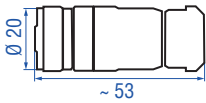


**Connector wiring**



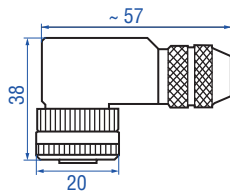
Connector D34	Function
Pin 1	Shield
Pin 2	+24 VDC
Pin 3	0V (GND)
Pin 4	CAN_H
Pin 5	CAN_L

**Connectors** (not included in delivery, please order separately)



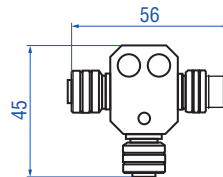
**5 pin female connector M12×1\***  
Part no.: 370 677

Housing: GD-Zn, Ni / IP67  
Termination: screw terminals  
Contact insert: CuZn  
Max. cable: Ø 4...8 mm



**5 pin 90° female connector M12×1\***  
Part no.: 370 678

Housing: GD-Zn, Ni / IP67  
Termination: screw terminals  
Contact insert: CuZn  
Max. cable: Ø 6...8 mm



**5 pin T-Connector \***  
Part No.: 370 691

Selfcuring coupling nut  
2 × cable connector female  
1 × cable connector male

\* Maximum recommended torque: 0.6 Nm

# Temposonics®-EH

## CANopen

Temposonics®

EH

M

D

3

4

1

C

1

Z

### Specification

**K** – Flange M18x1.5 / Rod-Ø 7 mm  
**M** – Flange M18x1.5 / Rod-Ø 10 mm  
**W** – Flange M18x1.5, 316L / Rod-Ø 10 mm  
**L** – Flange 3/4"-UNF / Rod-Ø 7 mm  
**S** – Flange 3/4"-UNF / Rod-Ø 10 mm  
**F** – Flange 3/4" - UNF, 316L / Rod-Ø 10 mm

### Stroke length

0050...2500 mm

### Connection type

D34 – 5 pin cable connector M12

### Supply voltage

1 – +24 VDC

### Output

C [1] [2] [3] [4] [5] [6] – CAN-Bus

[1] [2] [3] Protocol: **404** – CANopen (active Duo Terminator) **304** – CANopen  
 [4] Baud rate: **1** – 1000 kBit/s **2** – 500 kBit/s **3** – 250 kBit/s **4** – 125 kBit/s  
 [5] Resolution: **5** – 20 µm **4** – 10 µm  
 [6] Type: **1** – Standard

### Magnet number for Multi-Position measurement\*

Z02 – 2 pcs.

\*Note: Please specify magnet numbers for your sensing application and order separately

### Delivery includes:

- Sensor, mounting clamps  
 Please order separately: accessories (see below)

### Stroke length standard:

Stroke length	Ordering steps
≤ 500 mm	5 mm
> 500...≤ 750 mm	10 mm
> 750...≤ 1000 mm	25 mm
> 1000...≤ 2500 mm	50 mm

### Accessories

Description	Part No.
Ring magnet OD33	201 542-2
Ring magnet OD25,4	400 533
5 pin female connector M12	370 677
5 pin 90° female connector M12	370 678
5 pin T-connector	370 691
Terminator	370 700



**Document Part Number: 551296 Revision D (EN) 06/2014**

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