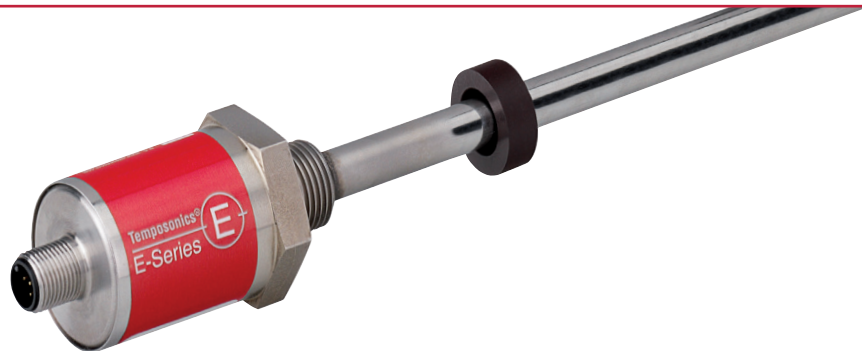


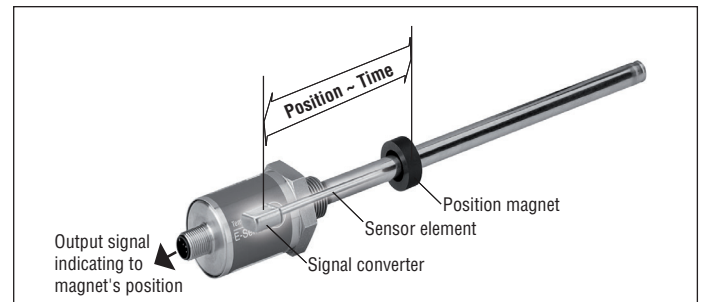
E-Series Analog or Start/Stop

Temposonics® EH
Stroke length 50...2500 mm

Document Part Number
551247 Revision H



- Linear, absolute measurement
- Contactless sensing with highest durability
- Rugged industrial sensor
- EMC tested and marked with CE
- Linearity less than 0.02 % F.S.
- Repeatability: 0.005 % F.S.
- Direct signal output for position:
 - Analog (V/mA)
 - Start/Stop + sensor-parameter upload
- Stroke length 50...2500 mm
- Also with stainless steel 1.4404 / AISI 316L available



Magnetostriction

The Temposonics® linear position transducers are based on magnetostrictive 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 material's crystal lattice. This effect 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 hysteresis effect 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

Temposonics® are extremely robust sensors, ideal for continuous operation under harshest industrial conditions.

- A rod-shaped sensor housing protects the sensing element in which gives rise to the measurement signal.
- The sensor head accommodates the complete electronic interface with active signal conditioning.
- The position transmitter, a permanent magnet - fixed at the mobile machine part - drives contactlessly over the sensor's stroke and starts measuring through the housing wall.

Temposonics® EH

High pressure compact sensor - Stroke length 50...2500 mm.

The new compact stainless steel position sensors are designed for installation into hydraulic cylinders, specifically for use in standard clevis head cylinders or any space limited cylinder applications. The EH type sensors are ideal choices for a wide range of standard hydraulic cylinders. Magnetostrictive position sensors, high quality cylinders and precise control valves form ideal driving systems for technically demanding machine industries.

The extremely rugged sensor consists of 3 main parts:

1. The sensor head, a robust housing with built-in electronics.
2. The pressure-proof sensor pipe (up to 530 bar) with threaded flange protects the internal sensing element, the waveguide system. It fits into the hollow drilled piston rod.
3. The position magnet, the only moving part is mounted on the piston head.

This permanent magnet travels wearfree and contactless along the stationary sensor tube. Its magnetic field starts the measurement signal through sensor's rod wall. Temposonics® EH sensors provide analog output of voltage and current. The output signal is proportional to the position magnet position along the active measuring stroke of the sensor. The measuring range is factory setted and does not need recalibration. The outputs are direct, no signal-conditioning electronics are needed when interfacing with controllers or meters.

Technical data

Input

Measuring variable	position
Stroke length	50...2500 mm

Output

1. Voltage	0...10 VDC or 10...0 VDC, 0...10 VDC and 10...0 VDC (controller input resistance $R_L > 5$ kOhms)
2. Current	4...20 mA or 20...4 mA (min/max. load: 0/500 Ohms)
3. Start/Stop	RS-422 differential signal additionally available: serial parameter upload of stroke length, offset, gradient, status and manufacturer number

Accuracy

Resolution	analog: infinite start/stop: controller dependent
Linearity ¹	$\leq \pm 0.02$ % F.S. (minimum ± 60 μ m)
Repeatability	$\leq \pm 0.005$ % F.S. (minimum ± 20 μ m)
Update time, stroke dependent	analog: < 3 kHz / digital: controller dependent
Ripple	analog: ≤ 0.01 % F.S. / digital: controller dependent

Operating conditions

Mounting position	any
Magnet speed	any
Operating temperature	-40...+75 °C
Dew point, humidity	90 % rel. humidity, no condensation
Ingress protection ²	IP67, IP69K if mating cable connector is correctly fitted
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 susceptibility EN 61000-6-2 the sensor meets the requirements of the EC directives and is marked with CE

Design/Material

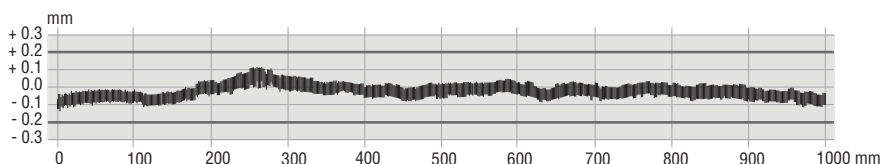
Sensor housing	stainless steel 1.4305 / AISI 303; stainless steel 1.4404 / AISI 316L
Rod	stainless steel 1.4306 / AISI 304L; stainless steel 1.4404 / AISI 316L for $\varnothing 10$ mm rod only
Pressure rating	7 mm rod: 300 bar, 450 bar peak 10 mm rod: 350 bar, 530 bar peak
Position magnet	U-magnet, PA-Ferrite

Installation

Mounting type	threaded flange M18x1.5 or 3/4" - 16 UNF - 3A
Mounting position	any

Electrical connection

Connection type	5 pin connector M12 (analog); 8 pin connector M12 (start/stop)
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	50...140 mA (digital 50...100 mA)
Ripple	≤ 0.28 Vpp
Electric strength	500 VDC (DC ground to machine ground)
Polarity protection	up to -30 VDC
Overvoltage protection	up to 36 VDC



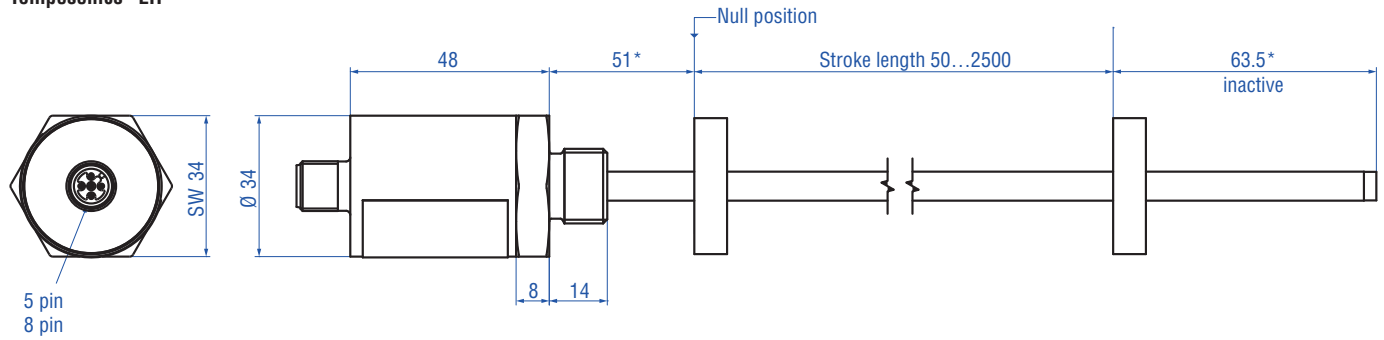
Linearity protocol

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

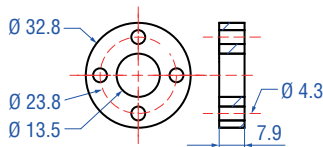
¹ with position magnet # 251 416-2

² The IP rating is not part of the UL recognition

Temposonics® EH

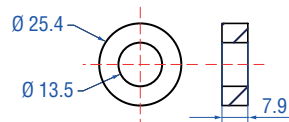


Position magnets (not included in delivery, please order separately)



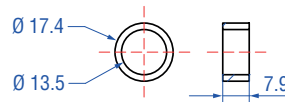
Ring magnet OD33
Part no. 201 542-2

Composite PA-Ferrite-GF20
 Weight: ca. 14 g
 Operating temperature: -40...+100°C
 Surface pressure max. 40N/mm²
 Fastening torque for M4 screws
 max. 1 Nm



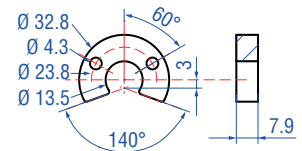
Ring magnet OD25.4
Part no. 400 533

Composite PA-Ferrite
 Weight: ca. 10 g
 Operating temperature: -40...+100°C
 Surface pressure max. 40N/mm²



Ring magnet OD17.4
Part no. 401 032

Composite PA-Neobond
 Weight: ca. 5 g
 Operating temperature: -40...+100 °C
 Surface pressure max. 20 N/mm²



U-Magnet OD33
Artikel Nr. 251 416-2

PA-Ferrit-GF20
 Weight: ca. 11 g
 Operating temperature: -40...+100 °C
 Surface pressure max. 40 N/mm²
 Fastening torque for M4 screws
 max. 1 Nm

Other position magnets on request.

All dimensions in mm

* 30 mm null position and 60 mm inactive zone use prefix CP11009 to the ordering code.

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 position magnet to the cylinder end cap is 15 mm. The minimum distance from the back of the position 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).

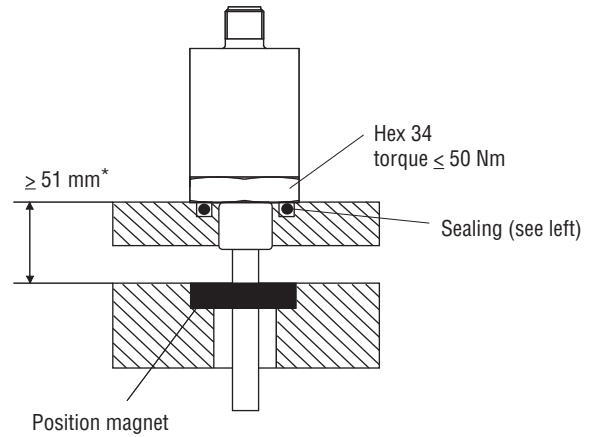
The position magnet is usually secured using non-ferrous fastening material (customer supplied). Screws must be made of nonmagnetic stainless steel or brass. In the event that a ferrous circlip or retaining ring will be used to secure the position magnet in a counter-bore then an additional non-ferrous spacer (> or = 5 mm) must be placed between the circlip or retaining ring and the front side of the position 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.

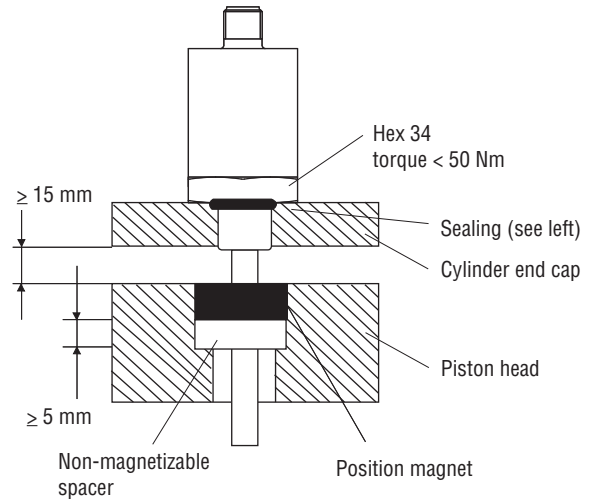
Likewise, the recommended minimum size of 13 mm should be used when installing the 10 mm diameter sensor rod. Some applications using long sensor rods may benefit by adding a bushing (e.g. made of flourelastomer material) to prevent wear on the position magnet and sensor rod (customer supplied).

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



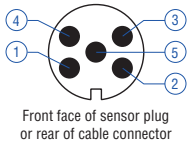
2. Magnetizable material



All dimensions in mm

* 30 mm for CP11009

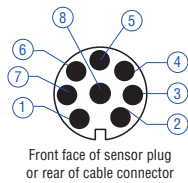
Connector wiring



Front face of sensor plug
or rear of cable connector

Connector D34	Analog (V)
Pin 1	+24 VDC
Pin 2	Signal
Pin 3	GND (power supply)
Pin 4	2. Signal
Pin 5	GND (Signal)

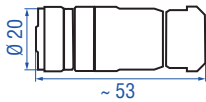
Cable shield is soldered on connector housing and must be grounded in the control unit.



Front face of sensor plug
or rear of cable connector

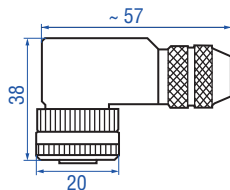
Connector D84	Start/Stop
Pin 1	Start +
Pin 2	Start -
Pin 3	Stop +
Pin 4	Stop -
Pin 5	n.c.
Pin 6	n.c.
Pin 7	+24 VDC
Pin 8	GND

Connectors (not included in delivery, please order separately)



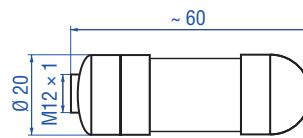
5 pin female connector M12 x 1*
Part no.: 370 677

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



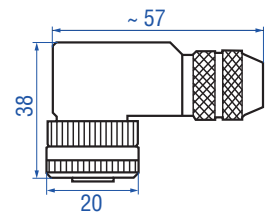
5 pin 90° female connector M12 x 1*
Part no.: 370 678

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



8 pin female connector M12 x 1*
Part no.: 370 694

Housing: GD-ZnAL / IP67
Termination: screw terminals
Contact insert: CuZn
Max. cable: Ø 4...9 mm



8 pin 90° female connector M12 x 1*
Part no.: 370 699

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

All dimensions in mm

*Maximum recommended torque: 0.6 Nm

Temposonics® EH

Analog or Start/Stop

Temposonics® ordering information

EH					M				1			
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Specification

- K** – Flange M18×1.5 / Rod-Ø 7 mm
- M** – Flange M18×1.5 / Rod-Ø 10 mm
- W** – Flange M18×1.5, 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 (analog)
- D84** – 8 pin cable connector M12 (start/stop)

Supply voltage

1 – +24 VDC

Output

Analog voltage

- V01** – 0...10 VDC (1 output channel with 1 position magnet)
- V11** – 10...0 VDC (1 output channel with 1 position magnet)
- V02** – 0...10 VDC (2 output channels with 2 position magnets)
- V12** – 10...0 VDC (2 output channels with 2 position magnets)
- V03** – 0...10 VDC and 10...0 VDC (2 output channels with 1 position magnet)

Analog current

- A01** – 4...20 mA (1 output channel with 1 position magnet)
- A11** – 20...4 mA (1 output channel with 1 position magnet)
- A02** – 4...20 mA (2 output channels with 2 position magnets)
- A12** – 20...4 mA (2 output channels with 2 position magnets)

Start/Stop

R3 – Start/Stop with sensor parameters upload function.

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

Delivery includes:

- Sensor
- Please order separately: accessories (see below)

Accessories

Description	Part no.
Ring magnet OD33	201 542-2
Ring magnet OD25.4	400 533
Ring magnet OD17.4	401 032
U-magnet OD33	251 416-2
5 pin female connector M12	370 677
5 pin 90° female connector M12	370 678
8 pin female connector M12	370 694
8 pin 90° female connector M12	370 699
5 pin M12 cordset, 5 m PUR shielded cable	370 673
8 pin M12 cordset, 5 m PUR shielded cable	370 674
5 pin 90° M12 cordset, 5 m PUR shielded cable	370 675
8 pin 90° M12 cordset, 5 m PUR shielded cable	370 676
Adapter cable M12 to M16	on request

Document Part Number: 551247 Revision H (EN) 06/2014

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