

# Temposonics®

Magnetostrictive Linear Position Sensors

## **EH SSI** Data Sheet

- High pressure resistant sensor rod
- Operating temperature up to +75 °C (+167 °F)
- Small & compact – Ideal for standard hydraulic cylinders



## MEASURING TECHNOLOGY

The absolute, linear position sensors provided by MTS Sensors rely on the company's proprietary Temposonics® magnetostrictive technology, which can determine position with a high level of precision and robustness. Each Temposonics® position sensor consists of a ferromagnetic waveguide, a position magnet, a strain pulse converter and supporting electronics. The magnet, connected to the object in motion in the application, generates a magnetic field at its location on the waveguide. A short current pulse is applied to the waveguide. This creates a momentary radial magnetic field and torsional strain on the waveguide. The momentary interaction of the magnetic fields releases a torsional strain pulse that propagates the length of the waveguide. When the ultrasonic wave reaches the end of the waveguide it is converted into an electrical signal. Since the speed of the ultrasonic wave in the waveguide is precisely known, the time required to receive the return signal can be converted into a linear position measurement with both high accuracy and repeatability.

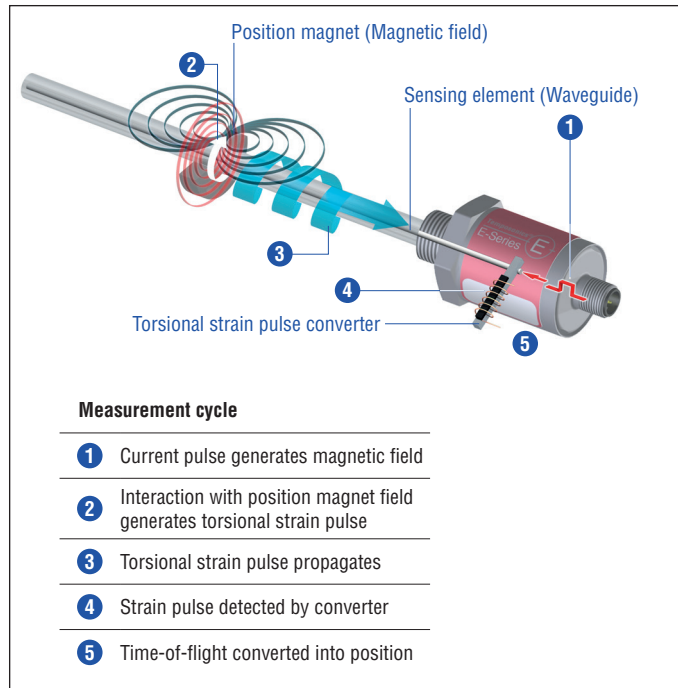


Fig. 1: Time-of-flight based magnetostrictive position sensing principle

## EH SENSOR

Robust, non-contact and wear free, the Temposonics® linear position sensor provide the best durability and precise position measurement feedback in harsh industrial environments. Measurement accuracy is tightly controlled by the quality of the waveguide manufactured exclusively by MTS Sensors.

Temposonics® EH is a compact rod-style sensor and the ideal solution for direct stroke measurement in small hydraulic cylinders. The position magnet mounted on the piston head of the hydraulic cylinder travels over the sensor rod with the built-in waveguide to provide a precise, non-contact position measurement. The EH is ideal for a variety of applications including: fluid power, food industry, plastic industry, glass and ceramics, energy sector, machine tools and testing machines.



Fig. 2: Typical application: Plastics processing

## TECHNICAL DATA

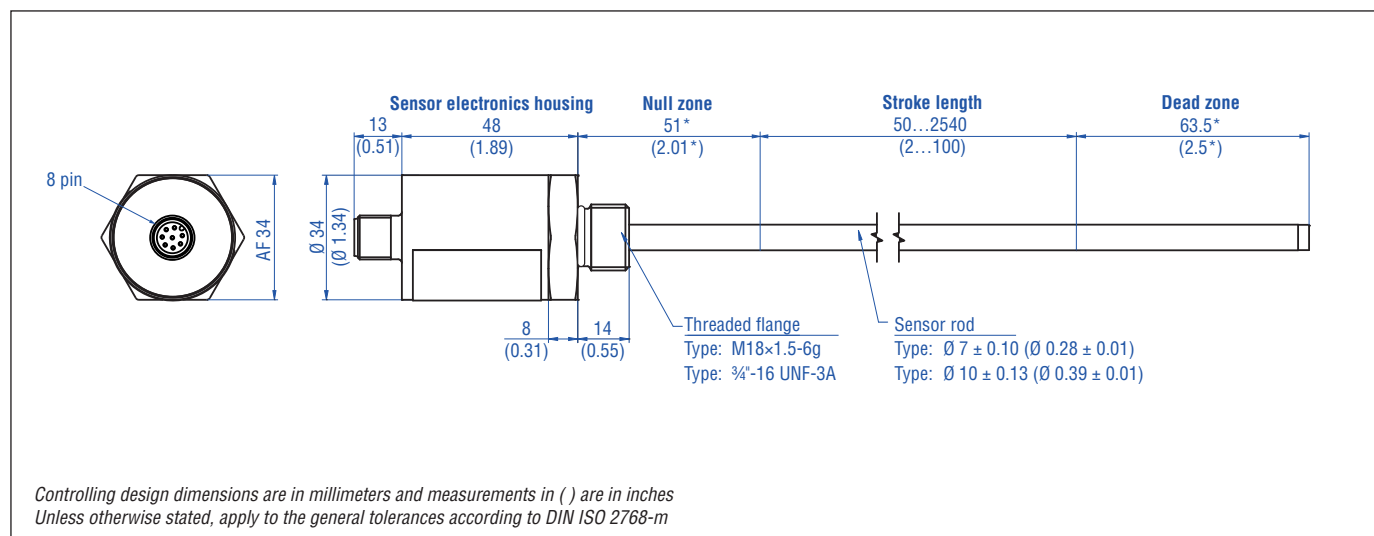
Output	
Interface	SSI (Synchronous Serial Interface)
Data format	Binary or gray
Data length	24, 25 bit
Data transmission rate	70 kBaud*...1 MBaud, dependent on cable length: Cable length < 3 m    < 50 m    < 100 m    < 200 m    < 400 m Baud rate    1.0 MBd    < 400 kBd    < 300 kBd    < 200 kBd    < 100 kBd
Measured value	Position
Measurement parameters	
Resolution	20 µm, 50 µm or 100 µm
Cycle time	Stroke length    300 mm    750 mm    1000 mm    2000 mm Measurement rate 3.7 kHz    3.0 kHz    2.3 kHz    1.2 kHz
Linearity <sup>1</sup>	≤ ±0.02 % F.S. (minimum ±60 µm)
Repeatability	≤ ±0.005 % F.S. (minimum ±20 µm)
Operating conditions	
Operating temperature	-40...+75 °C (-40...+167 °F)
Humidity	90 % rel. humidity, no condensation
Ingress protection <sup>2</sup>	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 according to EN 61000-6-3 Electromagnetic immunity according to EN 61000-6-2 The sensor meets the requirements of the EC directives and is marked with <b>CE</b> .
Magnet movement velocity	Any
Design / Material	
Sensor electronics housing	Stainless steel 1.4305 (AISI 303); option: Stainless steel 1.4404 (AISI 316L)
Sensor rod	7 mm (0.28 in.) rod-Ø: Stainless steel 1.4301 (AISI 304) 10 mm (0.39 in.) rod-Ø: Stainless steel 1.4306 (AISI 304L); option: Stainless steel 1.4404 (AISI 316L)
Stroke length	50...2540 mm (2...100 in.)
Operating pressure	7 mm (0.28 in.) rod-Ø: 300 bar (4351 psi), 450 bar (6527 psi) peak 10 mm (0.39 in.) rod-Ø: 350 bar (5076 psi), 530 bar (7687 psi) peak
Mechanical mounting	
Mounting position	Any
Mounting instruction	Please consult the technical drawings and the brief instructions (document number: <a href="#">551684</a> )
Electrical connection	
Connection type	M12 (8 pin) male connector
Operating voltage	+24 VDC (-15 / +20 %); 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.
Ripple	≤ 0.28 V <sub>pp</sub>
Current consumption	Typ. 90 mA
Dielectric strength	500 VDC (DC ground to machine ground)
Polarity protection	Up to -30 VDC
Overvoltage protection	Up to 36 VDC

1/ With position magnet # 251 416-2. Not applied for customized version (CP11009)

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

\*/ With standard monoflop of 16 µs

## TECHNICAL DRAWING




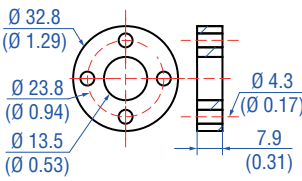
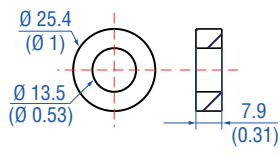
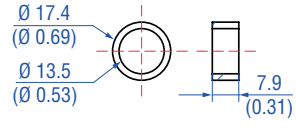
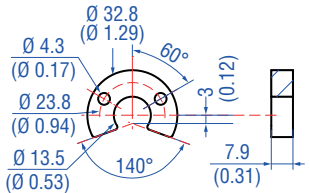
## CONNECTOR WIRING

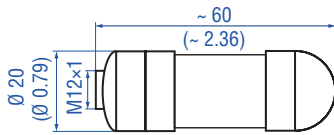
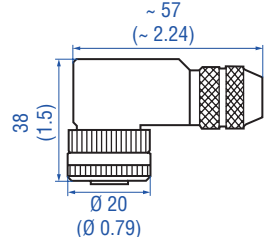
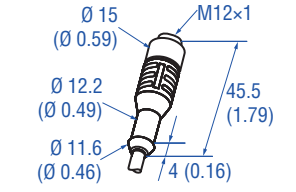
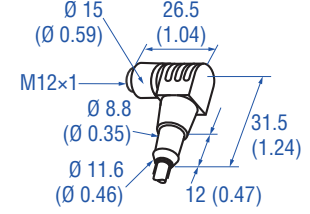
### D84

M12 A-coded	Pin	Function
	1	Clock (+)
	2	Clock (-)
	3	Data (+)
	4	Data (-)
	5	Not connected
	6	Not connected
	7	+24 VDC (-15 / +20 %)
	8	DC Ground (0 V)

\*Use prefix CP11009 to the order code for start position of 30 mm (1.18 inch) and 60 mm (2.36 inch) dead zone.

**FREQUENTLY ORDERED ACCESSORIES** – Additional options available in our [Accessories Guide](#)  [551444](#)

Position magnets			
			
<p><b>Standard ring magnet</b> Part no. 201 542-2</p>	<p><b>Ring magnet OD25.4</b> Part no. 400 533</p>	<p><b>Ring magnet OD17.4</b> Part no. 401 032</p>	<p><b>U-magnet OD33</b> Part no. 251 416-2</p>
<p>Material: PA ferrite GF20 Weight: Ca. 14 g Operating temperature: –40...+105 °C (–40...+221 °F) Surface pressure: Max. 40 N/mm<sup>2</sup> Fastening torque for M4 screws: 1 Nm</p>	<p>Material: PA ferrite Weight: Ca. 10 g Operating temperature: –40...+105 °C (–40...+221 °F) Surface pressure: Max. 40 N/mm<sup>2</sup></p>	<p>Material: PA neobind Weight: Ca. 5 g Operating temperature: –40...+105 °C (–40...+221 °F) Surface pressure: Max. 20 N/mm<sup>2</sup></p>	<p>Material: PA ferrite GF20 Weight: Ca. 11 g Operating temperature: –40...+105 °C (–40...+221 °F) Surface pressure: Max. 40 N/mm<sup>2</sup> Fastening torque for M4 screws: 1 Nm</p>

Cable connectors <sup>3</sup>		Cord sets	
			
<p><b>M12 (8 pin) female, straight</b> Part no. 370 694</p>	<p><b>M12 (8 pin) female, angled</b> Part no. 370 699</p>	<p><b>M12 (8 pin) female, straight</b> Part no. 370 674</p>	<p><b>M12 (8 pin) female, angled</b> Part no. 370 676</p>
<p>Housing: GD-ZnAL / IP67 Termination: Screw; 0.75 mm<sup>2</sup> Contact insert: CuZn Cable Ø: 4...9 mm (0.16...0.35 in.) Fastening torque: 0.6 Nm</p>	<p>Housing: GD-ZnAL / IP67 Termination: Screw; max. 0.5 mm<sup>2</sup> Contact insert: CuZn Cable Ø: 6...8 mm (0.24...0.31 in.) Fastening torque: 0.6 Nm</p>	<p>Ingress protection: IP67 Cable: Shielded, pigtail end Cable length: 5 m (16.4 ft.)</p>	<p>Ingress protection: IP67 Cable: Shielded, pigtail end Cable length: 5 m (16.4 ft.)</p>

<sup>3</sup>/ Follow the manufacturer's mounting instructions when connecting the connectors  
Controlling design dimensions are in millimeters and measurements in ( ) are in inches

## ORDER CODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
E	H							D	8	4	1	S						
a		b	c					d			e	f						

18, 19: optional

<b>a</b>	<b>Sensor model</b>
E H	Rod

<b>b</b>	<b>Design</b>
	<b>EH rod-style sensor with housing material 1.4305 (AISI 303) and rod material 1.4301 (AISI 304)</b>
K	Flange M18×1.5-6g, 7 mm rod-Ø
L	Flange ¾"-16 UNF-3A, 7 mm rod-Ø
	<b>EH rod-style sensor with housing material 1.4305 (AISI 303) and rod material 1.4306 (AISI 304L)</b>
M	Flange M18×1.5-6g, 10 mm rod-Ø
S	Flange ¾"-16 UNF-3A, 10 mm rod-Ø
	<b>EH rod-style sensor with housing material 1.4404 (AISI 316L) and rod material 1.4404 (AISI 316L)</b>
F	Flange ¾"-16 UNF-3A, 10 mm rod-Ø
W	Flange M18×1.5-6g, 10 mm rod-Ø

<b>c</b>	<b>Stroke length</b>
X X X X M	0050...2540 mm
X X X X U	002.0...100.0 in.

### Standard stroke length (mm)\*

Stroke length	Ordering steps
50 ... 500 mm	5 mm
500 ... 750 mm	10 mm
750...1000 mm	25 mm
1000...2540 mm	50 mm

### Standard stroke length (in.)\*

Stroke length	Ordering steps
2 ... 20 in.	0.2 in.
20 ... 30 in.	0.5 in.
30 ... 40 in.	1.0 in.
40...100 in.	2.0 in.

<b>d</b>	<b>Connection type</b>
D 8 4	M12 (8 pin) male connector

<b>e</b>	<b>Operating voltage</b>
1	+24 VDC (-15 / +20 %)

<b>f</b>	<b>Output</b>
S	(14) (15) (16) (17) (18) (19) = Synchronous Serial Interface
<b>Data length (box no. 14)</b>	
1	25 bit
2	24 bit
<b>Output format (box no. 15)</b>	
B	Binary
G	Gray
<b>Resolution (box no. 16)</b>	
3	0.05 mm
4	0.1 mm
5	0.02 mm
<b>Performance (box no. 17)</b>	
1	Standard
<b>Optional (box no. 18 and 19)</b>	
0 0	Measuring direction forward

## DELIVERY



Sensor, O-ring

Accessories have to be ordered separately.

Operation manuals & software are available at:  
[www.mtssensors.com](http://www.mtssensors.com)

\* / Non standard stroke lengths are available; must be encoded in 5 mm / 0.1 in. increments

**UNITED STATES** 3001 Sheldon Drive  
MTS Systems Corporation Cary, N.C. 27513  
Sensors Division Phone: +1 919 677-0100  
E-mail: info.us@mtssensors.com

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**GERMANY** Auf dem Schüffel 9  
MTS Sensor Technologie 58513 Lüdenscheid  
GmbH & Co. KG Phone: +49 2351 9587-0  
E-mail: info.de@mtssensors.com

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**ITALY** Phone: +39 030 988 3819  
Branch Office E-mail: info.it@mtssensors.com

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**FRANCE** Phone: +33 1 58 4390-28  
Branch Office E-mail: info.fr@mtssensors.com

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**GREAT BRITAIN** Phone: +44 79 44 15 03 00  
Branch Office E-mail: info.uk@mtssensors.com

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**CHINA** Phone: +86 21 6485 5800  
Branch Office E-mail: info.cn@mtssensors.com

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**JAPAN** Phone: +81 42 707 7710  
Branch Office E-mail: info.jp@mtssensors.com

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