Temposonics
AN AMPHENOL COMPANY

Data Sheet

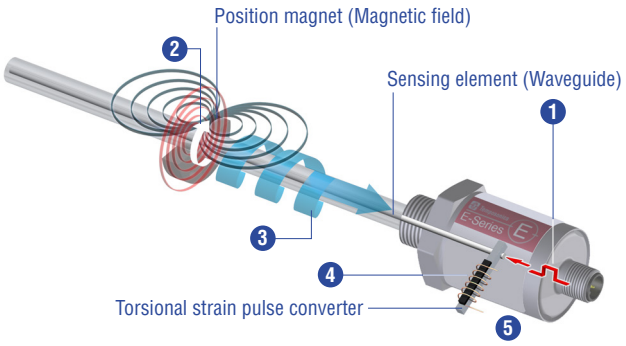
E-Series EH Analog

Magnetostrictive Linear Position Sensors

- High pressure resistant sensor rod
- Position measurement with more than one magnet
- Small & compact – Ideal for standard hydraulic cylinders

MEASURING TECHNOLOGY

The absolute, linear position sensors provided by Temposonics rely on the company's proprietary 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 beginning 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.



Measurement cycle

1	Current pulse generates magnetic field
2	Interaction with position magnet field generates torsional strain pulse
3	Torsional strain pulse propagates
4	Strain pulse detected by converter
5	Time-of-flight converted into position

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 Temposonics.

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

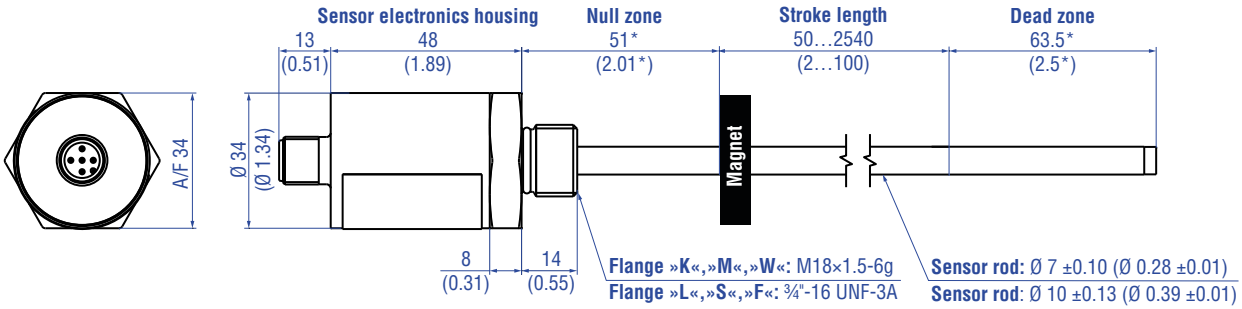
TECHNICAL DATA

Output	
Analog	Voltage: 0…10 VDC/10…0 VDC (controller input resistance R_L > 5 kΩ) Current: 4…20 mA/20…4 mA (minimum/maximum load: 0/500 Ω)
Measured value	Position/option: Multi-position measurement (2 positions)
Measurement parameters	
Resolution	Infinite
Cycle time	Typical 0.3 ms < t < 2 ms (depending on stroke length)
Linearity deviation [1]	≤ ±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 % relative humidity, no condensation
Ingress protection	IP67/IP69K (connectors 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 (excluding resonant frequencies)
EMC test	Electromagnetic emission according to EN 61000-6-3 Electromagnetic immunity according to EN 61000-6-2 The EH sensors meet the requirements of EMC Directives 2014/30/EU, UKSI 2016 No. 1091 and TR ZU 020/2011
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
Magnet movement velocity	Any
Design/Material	
Sensor electronics housing	Stainless steel 1.4305 (AISI 303); option: Stainless steel 1.4404 (AISI 316L)
Sensor flange	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)
RoHS compliance	The used materials are compliant with the requirements of EU directive 2011/65/EU and EU regulation 2015/863 as well as UKSI 2022 No. 622 with amendments
Stroke length	50…2540 mm (2…100 in.)
Mechanical mounting	
Mounting position	Any
Mounting instruction	Please consult the technical drawing on page 4
Electrical connection	
Connection type	M12 male connector (5 pin)
Operating voltage	+24 VDC (–15/+20 %); The EH sensors must be power supplied via an external Class 2 power source in accordance with the UL approval
Ripple	≤ 0.28 V_{PP}
Current consumption	50…140 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

TECHNICAL DRAWING

EH with threaded flange M18×1.5-6g or ¾"-16 UNF-3A



* Contact Temposonics if you require a null zone of 30 mm and a dead zone of 60 mm (data sheet "CP11009")

Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Fig. 3: Temposonics® EH with ring magnet

CONNECTOR WIRING

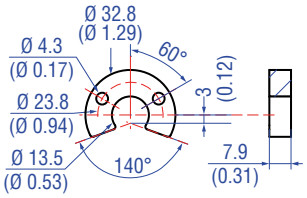
D34		
Signal + power supply		
M12 male connector (A-coded)	**Pin**	**Function**
 View on sensor	1	+24 VDC (–15/+20 %)
	2	Output 1
	3	DC Ground (0 V)
	4	Output 2
	5	Signal Ground for Output 1/2

Fig. 4: Connector wiring D34

*****Contact Temposonics for null zone of 30 mm (1.18 in.) and 60 mm (2.36 in.) dead zone

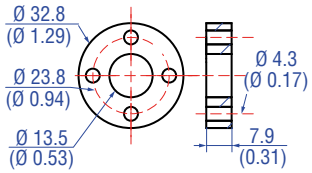
FREQUENTLY ORDERED ACCESSORIES – Additional options available in our Accessories Catalog 551444

Position magnets



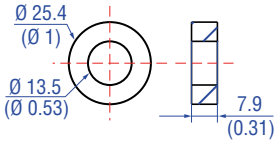
U-magnet OD33
Part no. 251 416-2

Material: PA ferrite GF20
Weight: Approx. 11 g
Surface pressure: Max. 40 N/mm²
Fastening torque for M4 screws: 1 Nm
Operating temperature:
–40…+105 °C (–40…+221 °F)



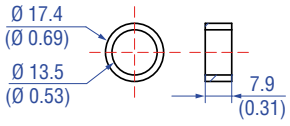
Ring magnet OD33
Part no. 201 542-2

Material: PA ferrite GF20
Weight: Approx. 14 g
Surface pressure: Max. 40 N/mm²
Fastening torque for M4 screws: 1 Nm
Operating temperature:
–40…+105 °C (–40…+221 °F)



Ring magnet OD25.4
Part no. 400 533

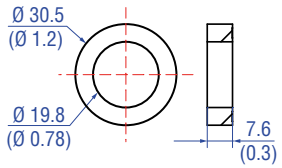
Material: PA ferrite
Weight: Approx. 10 g
Surface pressure: Max. 40 N/mm²
Operating temperature:
–40…+105 °C (–40…+221 °F)



Ring magnet OD17.4
Part no. 401 032

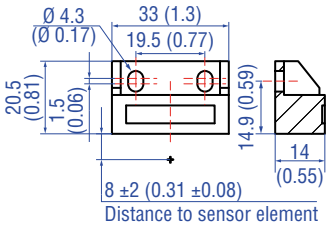
Material: PA neobond
Weight: Approx. 5 g
Surface pressure: Max. 20 N/mm²
Operating temperature:
–40…+105 °C (–40…+221 °F)

Position magnets



Ring magnet
Part no. 402 316

Material: PA ferrite coated
Weight: Approx. 13 g
Surface pressure: Max. 20 N/mm²
Operating temperature:
–40…+100 °C (–40…+212 °F)

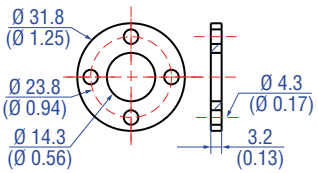


Block magnet L
Part no. 403 448

Material: Plastic carrier with neodymium magnet
Weight: Approx. 20 g
Fastening torque for M4 screws: 1 Nm
Operating temperature:
–40…+75 °C (–40…+167 °F)

This magnet may influence the sensor performance specifications for some applications.

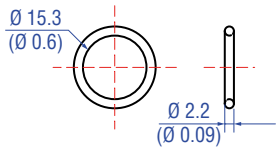
Magnet spacer



Magnet spacer
Part no. 400 633

Material: Aluminum
Weight: Approx. 5 g
Surface pressure: Max. 20 N/mm²
Fastening torque for M4 screws: 1 Nm

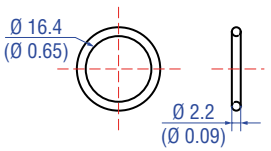
O-ring



O-ring for threaded flange
M18×1.5-6g
Part no. 401 133

Material: Fluoroelastomer
Durometer: 75 ±5 Shore A
Operating temperature:
–40…+204 °C (–40…+400 °F)

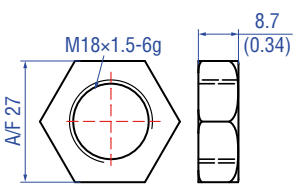
O-ring



O-ring for threaded flange
¾"-16 UNF-3A
Part no. 560 315

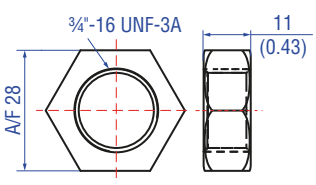
Material: Fluoroelastomer
Durometer: 75 ±5 Shore A
Operating temperature:
–40…+204 °C (–40…+400 °F)

Mounting accessories



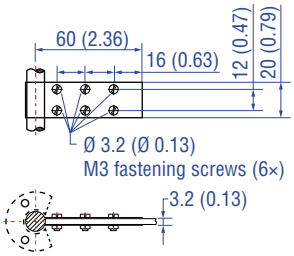
Hex jam nut M18×1.5-6g
Part no. 500 018

Material: Steel, zinc plated



Hex jam nut ¾"-16 UNF-3A
Part no. 500 015

Material: Steel, zinc plated

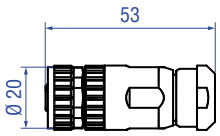


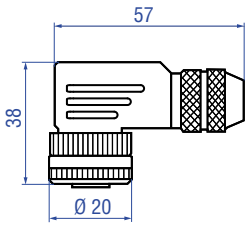
Fixing clip
Part no. 561 481

Application: Used to secure sensor rods (Ø 10 mm (Ø 0.39 in.)) when using an U-magnet or block magnet
Material: Brass, non-magnetic

Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Kabelsteckverbinder*





M12-A-codierte Buchse (4 pol./5 pol.), gerade
Artikelnr. 370 677

Material: GD-Zn, Ni
Anschlussart: Schraubanschluss
Kontakteinsatz: CuZn
Kabel Ø: 4…8 mm
Ader: max. 1,5 mm² (16 AWG)
Betriebstemperatur: –30…+85 °C
Schutzart: IP67 (fachgerecht montiert)
Anzugsmoment: 0,6 Nm

M12-A-codierte Buchse (5 pol.), gewinkelt
Artikelnr. 370 678

Material: GD-Zn, Ni
Anschlussart: Schraubanschluss
Kontakteinsatz: CuZn
Kabel Ø: 5…8 mm
Ader: max 0,75 mm² (18 AWG)
Betriebstemperatur: –25…+85 °C
Schutzart: IP67 (fachgerecht montiert)
Anzugsmoment: 0,4 Nm

Kabelsets

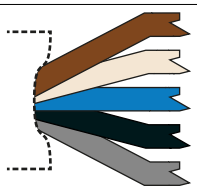
Kabel mit M12-A-codierter Buchse (5 pol.), gerade – offenes Kabelende
Artikelnr. 370 673

Material: PUR-Ummantelung; schwarz
Eigenschaft: Geschirmt
Kabellänge: 5 m
Schutzart: IP67 (fachgerecht montiert)
Betriebstemperatur: –25…+80 °C

Kabel mit M12-A-codierter Buchse (5 pol.), gewinkelt – offenes Kabelende
Artikelnr. 370 675

Material: PUR-Ummantelung; schwarz
Eigenschaft: Geschirmt
Kabellänge: 5 m
Schutzart: IP67 (fachgerecht montiert)
Betriebstemperatur: –25…+80 °C

Anschlussbelegung



Adern	Farbe		Pol.
	BN	↔	1
	WH	↔	2
	BU	↔	3
	BK	↔	4
	GY	↔	5

M12-A-codierte Buchse (5 pol.)

*/ Beachten Sie die Montagehinweise des Herstellers
Farbe der Stecker und Kabelmantel können sich ggf. ändern. Dabei bleiben Farben der Adern sowie technische Eigenschaften unverändert
Alle Maße in mm

ORDER CODE

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

a	Sensor model
E	H	Rod

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

c	Stroke length
X	X	X	X	M	0050…2540 mm

Standard stroke length (mm)	Ordering steps
50… 500 mm	5 mm
500… 750 mm	10 mm
750…1000 mm	25 mm
1000…2540 mm	50 mm

X	X	X	X	U	002.0…100.0 in.

Standard stroke length (in.)	Ordering steps
2… 20 in.	0.2 in.
20… 30 in.	0.4 in.
30… 40 in.	1.0 in.
40…100 in.	2.0 in.

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

d	Connection type
D	3	4	M12 male connector (5 pin)

e	Operating voltage
1	+24 VDC (–15/+20 %)

f	Output
Voltage	
V	0	1	0…10 VDC (1 output channel with 1 position magnet)
V	1	1	10…0 VDC (1 output channel with 1 position magnet)
V	0	2	0…10 VDC (2 output channels with 2 position magnets)
V	1	2	10…0 VDC (2 output channels with 2 position magnets)
V	0	3	0…10 VDC and 10…0 VDC (2 output channels with 1 position magnet)
Current			
A	0	1	4…20 mA (1 output channel with 1 position magnet)
A	1	1	20…4 mA (1 output channel with 1 position magnet)
A	0	2	4…20 mA (2 output channels with 2 position magnets)
A	1	2	20…4 mA (2 output channels with 2 position magnets)

NOTICE

- The number of magnets is limited by the stroke length. The minimum allowed distance between magnets (i.e. front face of one to the front face of the next one) is 75 mm (3 in.)
- Use magnets of the same type for multi-position measurement.

DELIVERY

- Sensor
- O-ring

Accessories have to be ordered separately.

**Manuals, Software & 3D models available at:
www.temposonics.com**

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