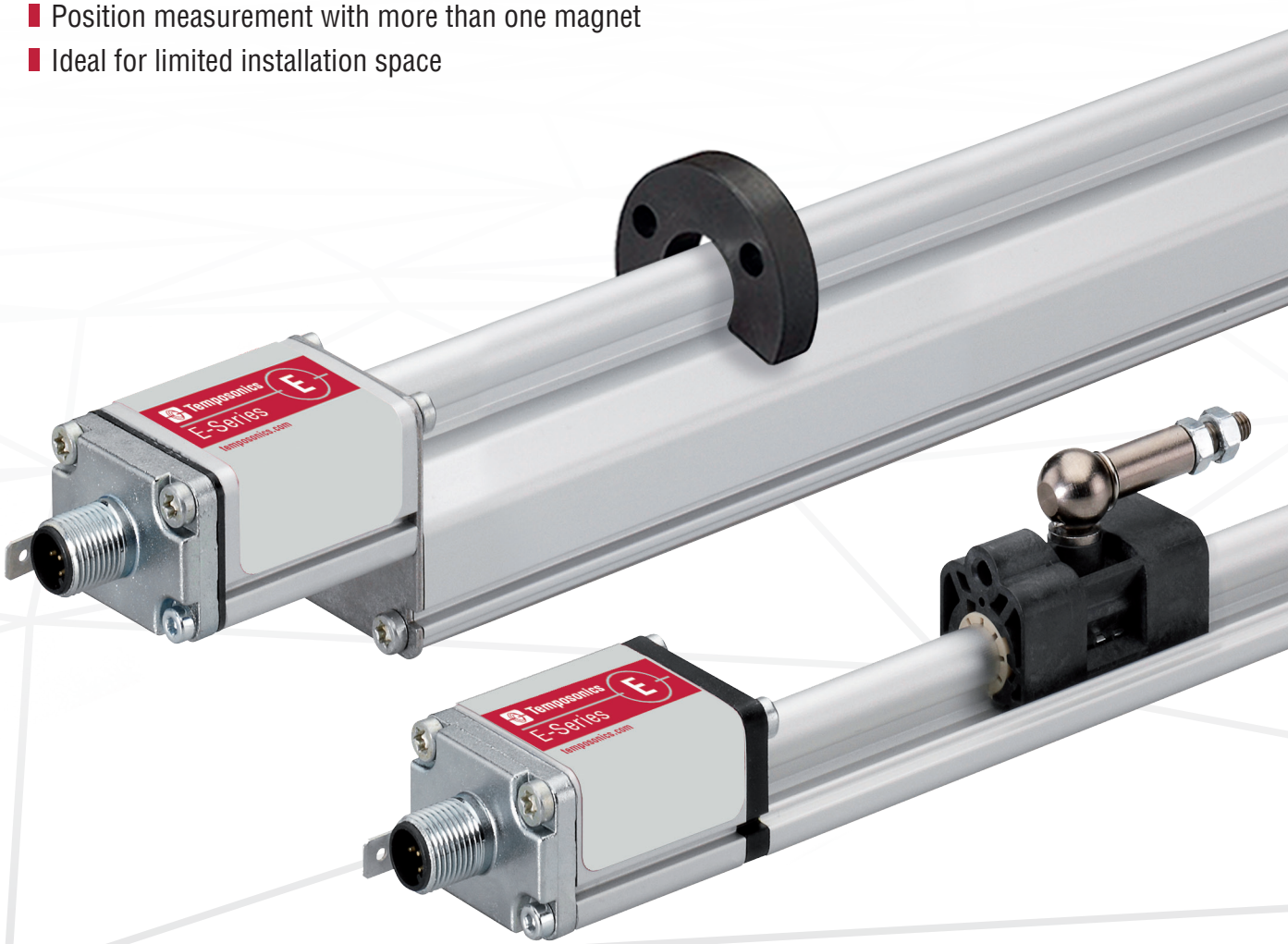
Temposonics
AN AMPHENOL COMPANY

Data Sheet

E-Series EP/EL Analog

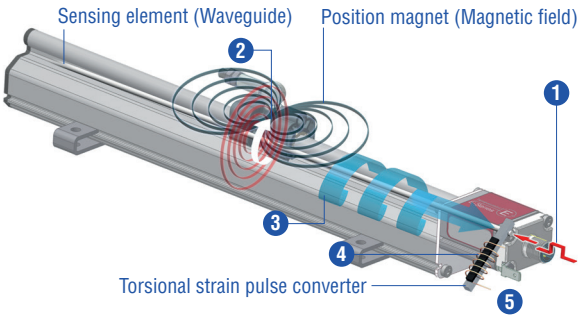
Magnetostrictive Linear Position Sensors

- For standard applications
- Position measurement with more than one magnet
- Ideal for limited installation space



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

EP/EL SENSOR

Robust, non-contact and wear free, the Temposonics® linear position sensors 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.

The compact Temposonics® EP as well as the ultra low Temposonics® EL are profile sensors suitable for standard applications and in particularly for applications with limited installation space. The evaluation electronics is accomodated in an aluminum sensor housing. Typical fields of applications are plastics industry, metal forming and woodworking as well as factory automation.

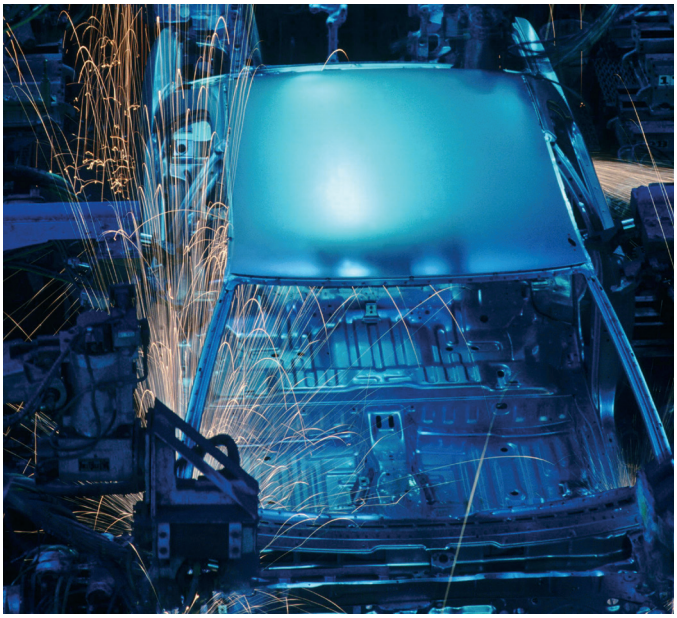


Fig. 2: Typical application: Factory automation

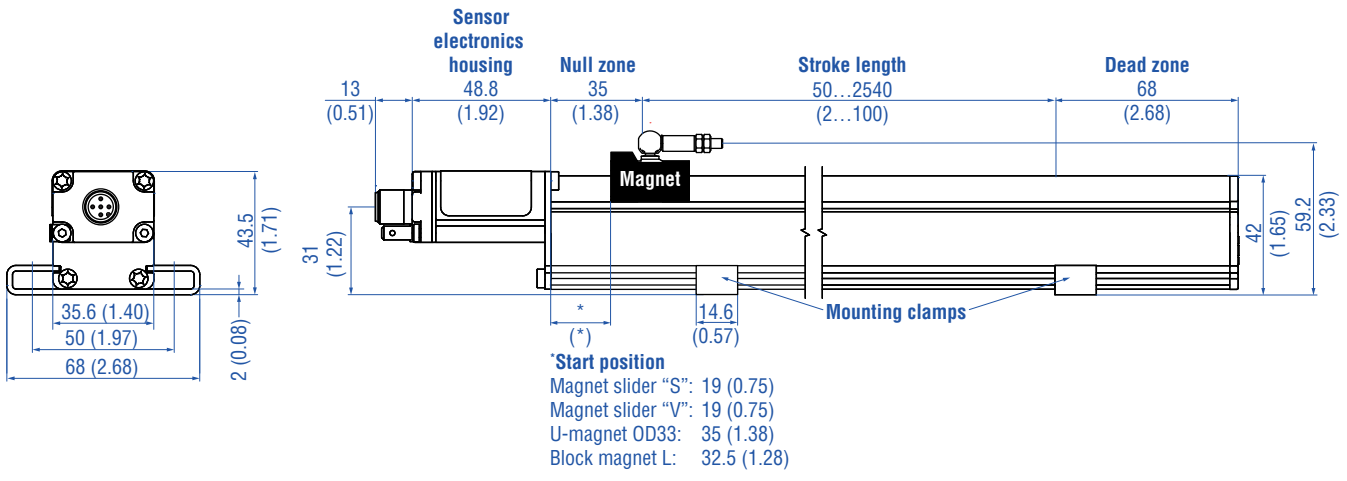
TECHNICAL DATA

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 variable	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 [2]	IP67 (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 EP/EL sensors fulfill the requirements of the EMC Directives 2014/30/EU, UKSI 2016 No. 1091 and TR ZU 020/2011
Magnet movement velocity	Magnet slider: ≤ 5 m/s; U-magnet: Any; block magnet: Any
Design/Material	
Sensor electronics housing	Aluminum
Sensor profile	Aluminum
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 drawings on page 4
Electrical connection	
Connection type	M12 male connector (5 pin)
Operating voltage	+24 VDC (–15/+20 %); The EP/EL 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

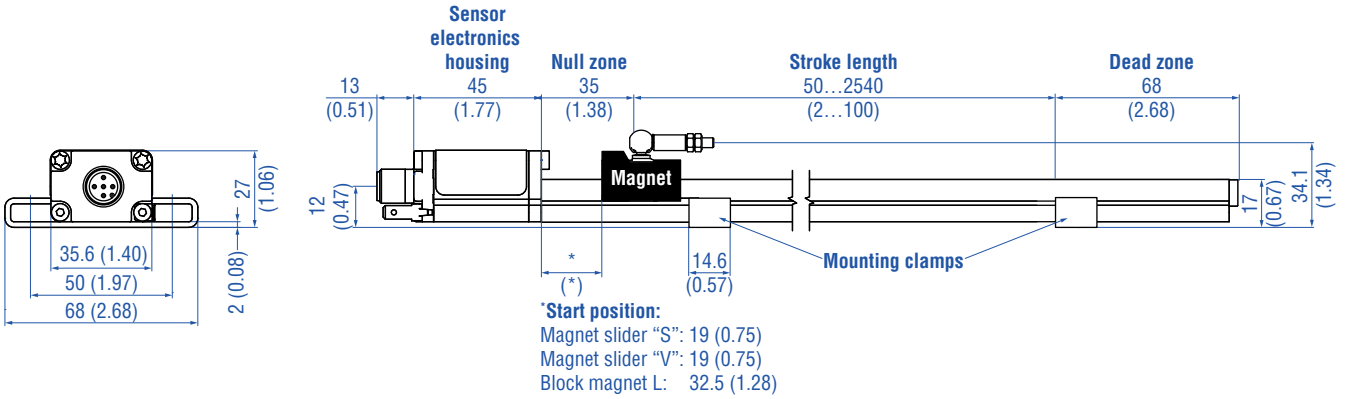
1/ With magnet slider # 252 182 and # 252 184, U-magnet # 251 416-2
2/ The IP rating IP67 is only valid for the sensor electronics housing, as water and dust can get inside the profile.

TECHNICAL DRAWING

EP



EL



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

Fig. 3: Temposonics® EP/EL with magnet slider

CONNECTOR WIRING

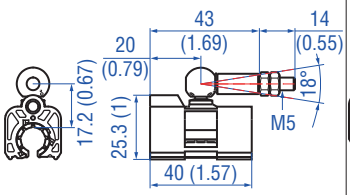
D34

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

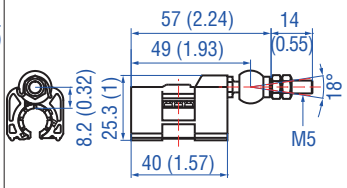
FREQUENTLY ORDERED ACCESSORIES – Additional options available in our Accessories Catalog 551444

Position magnets



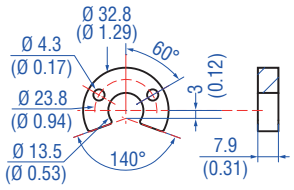
Magnet slider S,
joint at top
Part no. 252 182

Material: GRP, magnet hard ferrite
Weight: Approx. 35 g
Operating temperature:
–40…+85 °C (–40…+185 °F)



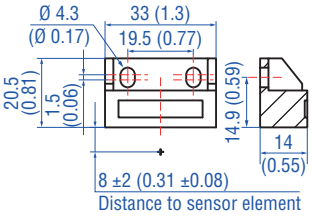
Magnet slider V,
joint at front
Part no. 252 184

Material: GRP, magnet hard ferrite
Weight: Approx. 35 g
Operating temperature:
–40…+85 °C (–40…+185 °F)



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…+120 °C (–40…+248 °F)

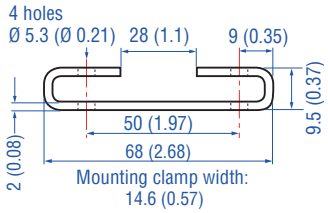


Block magnet L
Part no. 403 448

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.

Mounting accessory

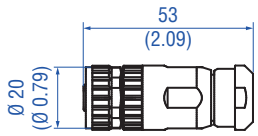


Mounting clamp
Part no. 403 508

Material: Stainless steel 1.4301/1.4305
(AISI 304/303)

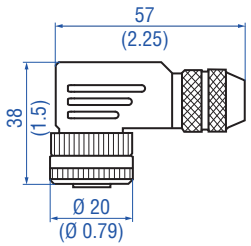
Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Cable connectors*



M12 A-coded female connector (4 pin/5 pin), straight
Part no. 370 677

Material: GD-Zn, Ni
Termination: Screw
Contact insert: CuZn
Cable Ø: 4…8 mm (0.16…0.31 in.)
Wire: max. 1.5 mm² (16 AWG)
Operating temperature:
–30…+85 °C (–22…+185 °F)
Ingress protection: IP67 (correctly fitted)
Fastening torque: 0.6 Nm



M12 A-coded female connector (5 pin), angled
Part no. 370 678

Material: GD-Zn, Ni
Termination: Screw
Contact insert: CuZn
Cable Ø: 5…8 mm (0.2…0.31 in.)
Wire: max 0.75 mm² (18 AWG)
Operating temperature:
–25…+85 °C (–13…+185 °F)
Ingress protection: IP67 (correctly fitted)
Fastening torque: 0.4 Nm

Cable sets

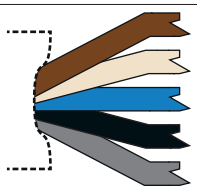
Cable with M12 A-coded female connector (5 pin), straight – pigtail
Part no. 370 673

Material: PUR jacket; black
Feature: Shielded
Cable length: 5 m (16.4 ft)
Ingress protection: IP67 (correctly fitted)
Operating temperature:
–25…+80 °C (–13…+176 °F)

Cable with M12 A-coded female connector (5 pin), angled – pigtail
Part no. 370 675

Material: PUR jacket; black
Feature: Shielded
Cable length: 5 m (16.4 ft)
Ingress protection: IP67 (correctly fitted)
Operating temperature:
–25…+80 °C (–13…+176 °F)

Wiring



Wires	Color		Pin
	BN	↔	1
	WH	↔	2
	BU	↔	3
	BK	↔	4
	GY	↔	5

*/ Follow the manufacturer's mounting instructions
Color of connectors and cable jacket may change. Color codes for the individual wires and technical properties remain unchanged.
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
E		0						D	3	4	1			
a		b	c					d			e	f		

a	Sensor model
E P	Profile
E L	Low profile

b	Design
0	Without position magnet

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

Standard stroke length (mm)	Ordering steps
50… 500 mm	25 mm
500…2540 mm	50 mm

X X X X U	002.0…100.0 in.

Standard stroke length (in.)	Ordering steps
2… 20 in.	1.0 in.
20…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
- 2 mounting clamps up to 1250 mm (50 in.) stroke length + 1 mounting clamp for each 500 mm (20 in.)

Accessories have to be ordered separately.

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

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