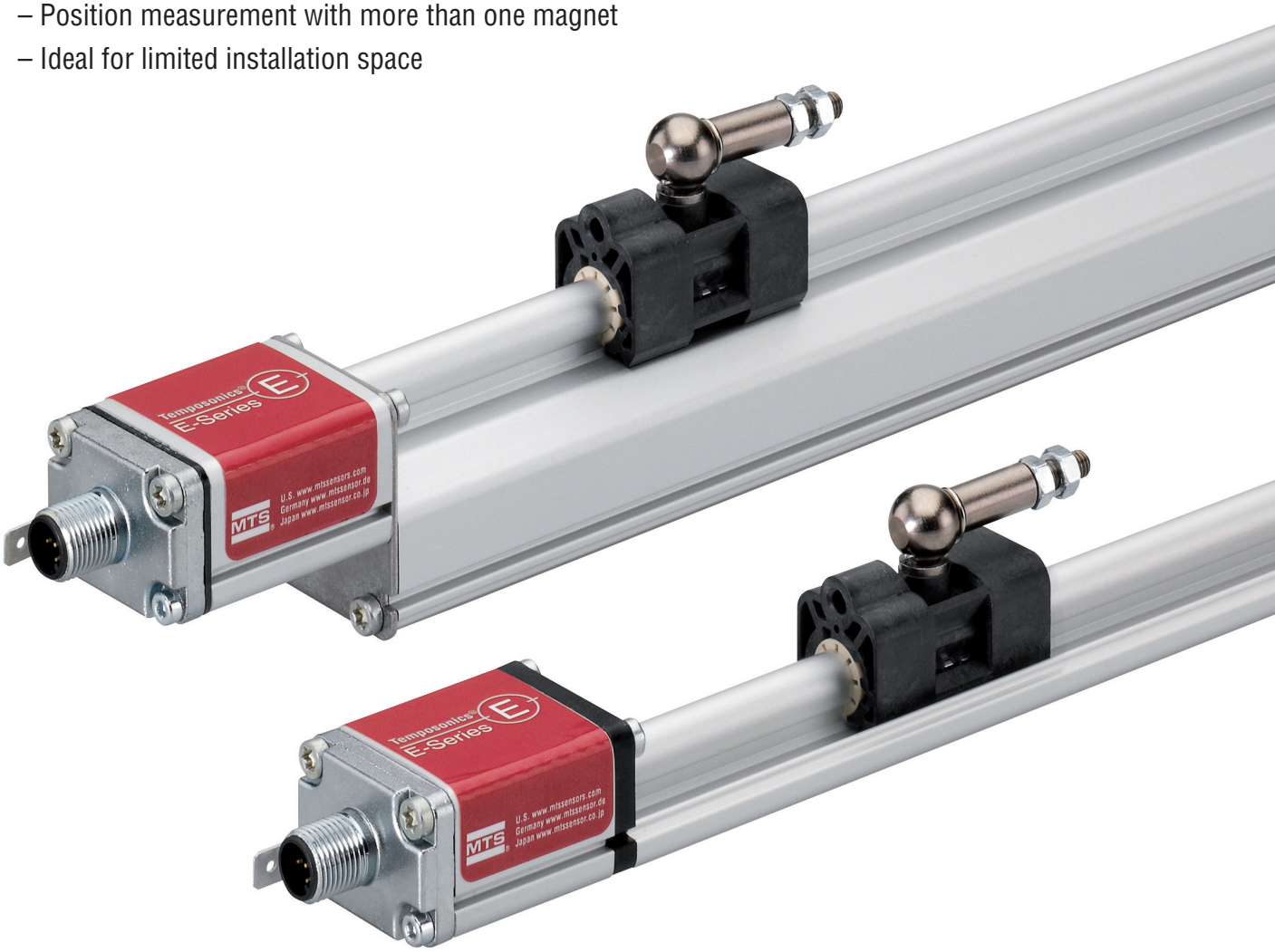
MTS SENSORS

Temposonics®

Magnetostrictive Linear Position Sensors

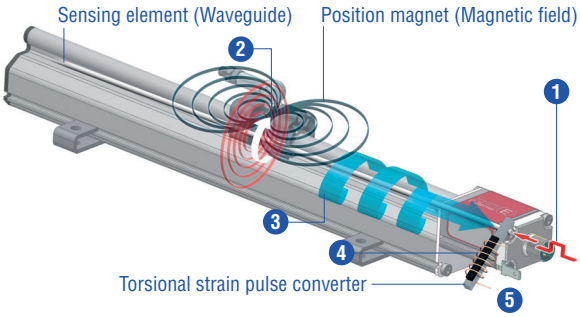
EP / EL Analog
Data Sheet

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



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.



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 MTS Sensors.

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.

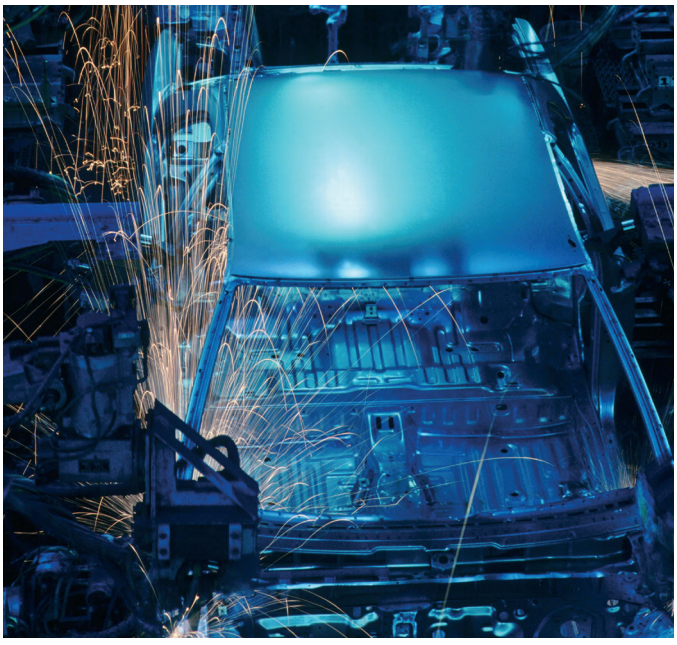


Fig. 2: Typical application: Factory automation

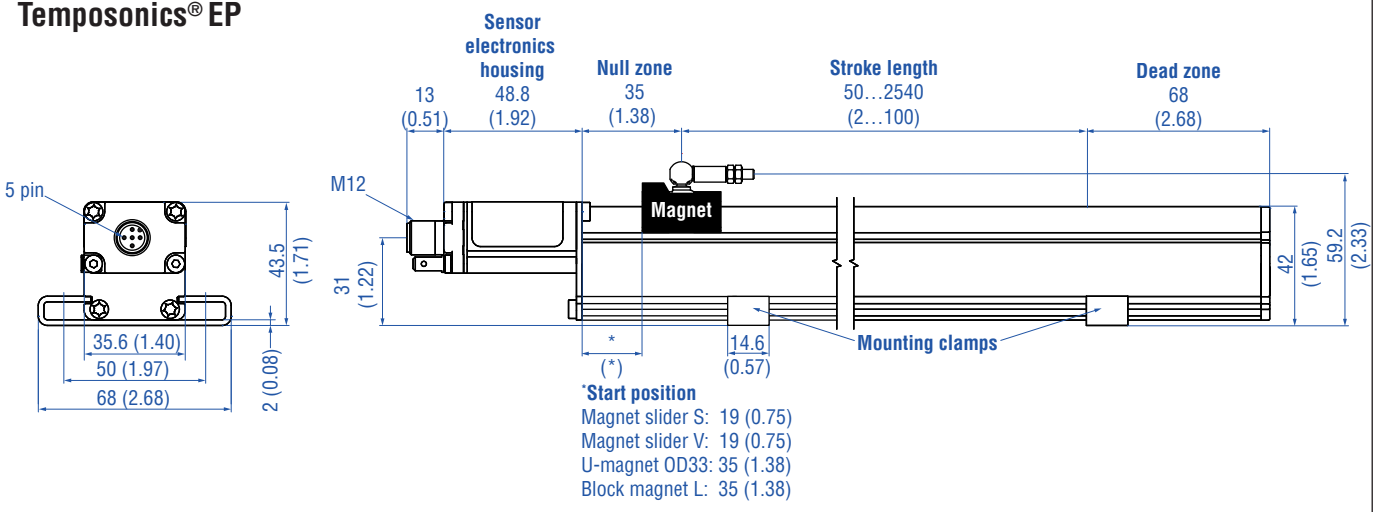
TECHNICAL DATA

Output	
Voltage	0…10 VDC or 10…0 VDC, 0…10 VDC and 10…0 VDC (controller input resistance R_L > 5 kΩ)
Current	4…20 mA or 20…4 mA (minimum / maximum load: 0 / 500 Ω)
Measured variable	Position / option: multi-position measurement (2 positions)
Measurement parameters	
Resolution	Infinite
Cycle time	Typ. 0.3 ms < t < 2 ms (depending on stroke lengths)
Linearity [1]	Magnet slider: ≤ ±0.02 % F.S. (minimum ±60 µm), U-magnet: ≤ ±0.02 % F.S. (minimum ±60 µm), block magnet: ≤ ±0.03 % (minimum ±90 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 [2,3]	IP67 (if mating connectors are 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 CE.
Magnet movement velocity	Magnet slider: ≤ 5 m/s; U-magnet: Any; block magnet: Any
Design / Material	
Sensor electronics housing	Aluminum
Sensor profile	Aluminum
Stroke length	50…2540 mm (2…100 in.)
Mechanical mounting	
Mounting position	Any
Mounting instruction	Please consult the technical drawings and the brief instructions (document number: 551684)
Electrical connection	
Connection type	M12 (5 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_{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

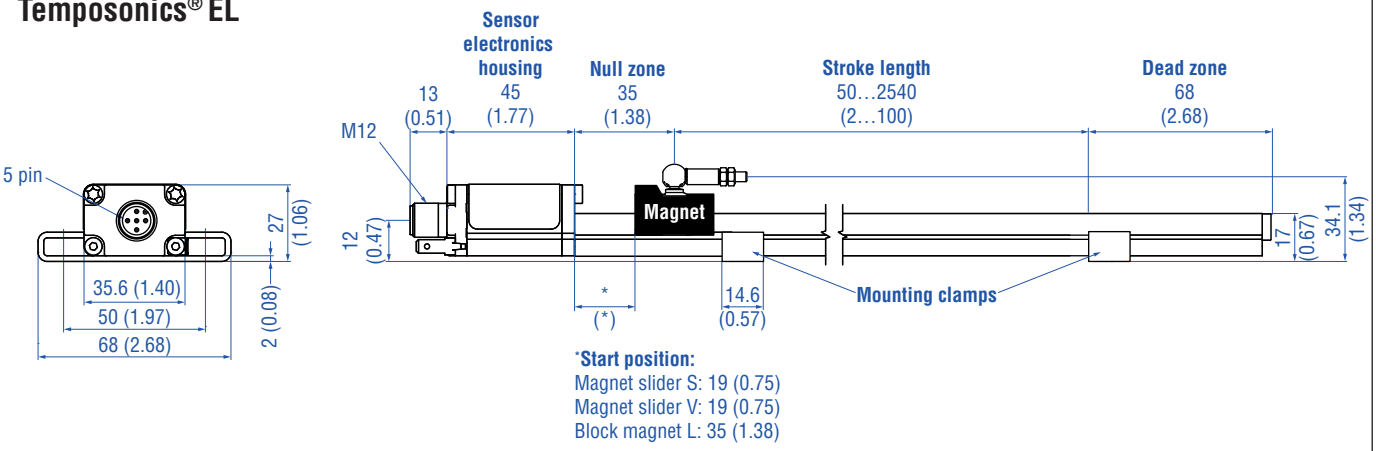
1/ Magnet slider # 252 182 and # 252 184, U-magnet # 251 416-2 and block magnet # 403 448
2/ The IP rating is not part of the UL recognition
3/ The IP rating IP67 is only valid for the sensor electronics housing, as water and dust can get inside the profile

TECHNICAL DRAWING

Temposonics® EP



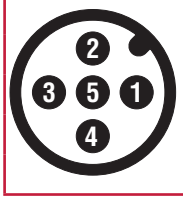
Temposonics® EL



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

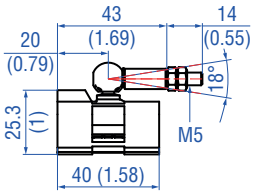
CONNECTOR WIRING

D34

M12 A-coded	Pin	Function
	1	+24 VDC (–15 / +20 %)
	2	Output 1
	3	DC Ground (0 V)
	4	Output 2
	5	DC Ground

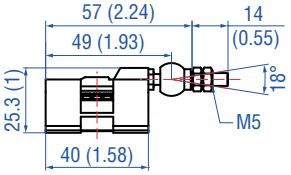
FREQUENTLY ORDERED ACCESSORIES – Additional options available in our Accessories Guide 551444

Position magnets



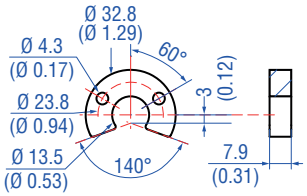
Magnet slider S
Part no. 252 182

Material: GFK, magnet hard ferrite
Weight: Ca. 35 g
Operating temperature:
–40…+75 °C (–40…+167 °F)



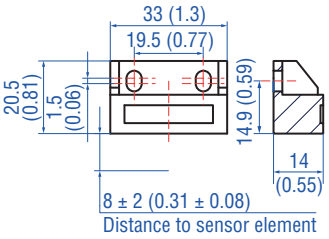
Magnet slider V
Part no. 252 184

Material: GFK, magnet hard ferrite
Weight: Ca. 35 g
Operating temperature:
–40…+75 °C (–40…+167 °F)



U-magnet OD33
Part no. 251 416-2

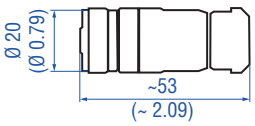
Only for: **EP**
Material: PA ferrite GF20
Weight: Ca. 11 g
Operating temperature:
–40…+105 °C (–40…+221 °F)
Surface pressure: Max. 40 N/mm²
Fastening torque for M4 screws: 1 Nm



Block magnet L
Part no. 403 448

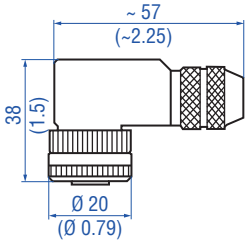
Material: Hard ferrite
Weight: Ca. 20 g
Operating temperature:
–40…+75 °C (–40…+167 °F)
Fastening torque for M4 screws: 1 Nm

Cable connectors [4]



M12 (5 pin) female, straight
Part no. 370 677

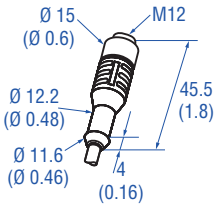
Housing: GD-Zn, Ni / IP67
Termination: Screw; max. 1.5 mm²
Contact insert: CuZn
Operating temperature:
–30…+85 °C (–22…+185 °F)
Cable Ø: 4…8 mm (0.16…0.31 in.)
Fastening torque: 0.6 Nm



M12 (5 pin) female, angled
Part no. 370 678

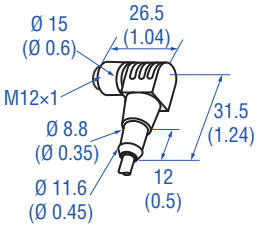
Housing: GD-Zn, Ni / IP67
Termination: Screw; max. 0.75 mm²
Contact insert: CuZn
Operating temperature:
–25…+85 °C (–13…+185 °F)
Cable Ø: 5…8 mm (0.2…0.31 in.)
Fastening torque: 1 Nm

Cord sets



M12 (5 pin) female, straight
Part no. 370 673

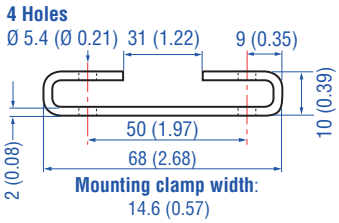
Ingress protection: IP67
Cable: Shielded, pigtail end
Cable length: 5 m (16.4 ft.)



M12 (5 pin) female, angled
Part no. 370 675

Ingress protection: IP67
Cable: Shielded, pigtail end
Cable length: 5 m (16.4 ft.)

Mounting clamp



Mounting clamp
Part no. 403 508

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

4/ Follow the manufacturer's mounting instructions

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
L	Ultra low profile
P	Compact profile

b	Design
0	Without position magnet (order separately)

c	Stroke length
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	25 mm
500…2540 mm	50 mm

Standard stroke length (in.)*

Stroke length	Ordering steps
2 … 20 in.	1.0 in.
20…100 in.	2.0 in.

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

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)

DELIVERY

- Sensor
- 2 mounting clamps up to 1250 mm (50 in.) stroke length + 1 mounting clamp for each 500 mm (20 in.) additional stroke length

Accessories have to be ordered separately.

NOTICE

Use magnets of the same type for multi-position measurement, e.g. 2 × U-magnets (part no. 251 416-2).

Manuals & Software available at:
www.mtssensors.com

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

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