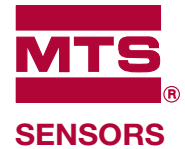


Temposonics®

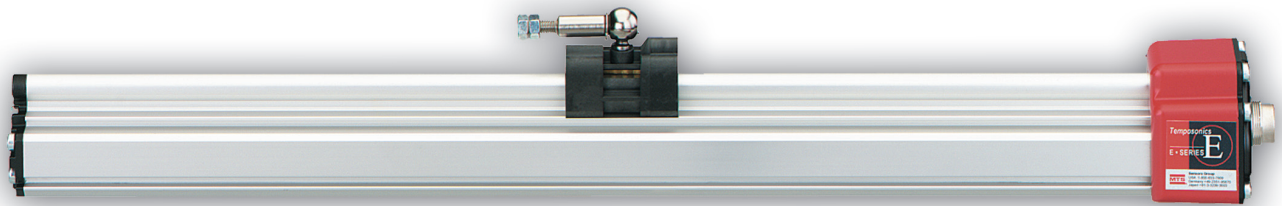
Magnetostrictive Linear-Position Sensors

E-Series Model EP
Analog or Start/Stop Outputs



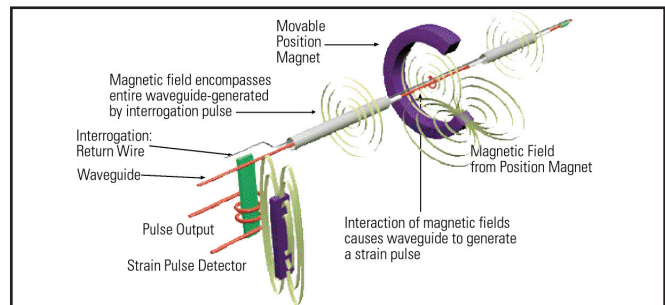
550741 B

Product Specification



Model EP Profile-Style position sensor

- Linear, absolute measurement
- Non-contact sensing technology
- Rugged industrial sensor, EMC shielded and CE certified
- Non-linearity less than 0.02%
- Repeatability within 0.001%
- Direct position outputs:
 - Analog (V/mA)
 - Digital position output: Start/Stop pulse
- Simple sensor parameter upload



E-Series low profile-style position sensor

Temposonics model EP sensors are highly repeatable, absolute position sensors for linear measurement. Absolute measurement offers safety for machine and automation devices. With absolute output, position information is instantly available; power-down situations do not require rehoming of the device.

Using the unique magnetostrictive principle, that MTS pioneered, the sensor precisely senses the position of an external magnet through the housing

wall, to measure position with a high degree of resolution and accuracy. The Temposonics EP sensor's innovative design is a result of MTS's experience in magnetostrictive technology combined with solid engineering, extremely rugged construction and modern electronics.

The Temposonics EP is a precise, durable and cost effective alternative to linear potentiometers. It offers all of the advantages of a non-contact position sensor suitable for a wide range of machines and automation applications.

The benefits of magnetostrictive sensing

Temposonics linear-position sensors use the time-based magnetostrictive position sensing principle developed by MTS. Within the sensing element, a sonic strain pulse is induced in a specially designed magnetostrictive waveguide by the momentary interaction of two magnetic fields. One field comes from a movable permanent magnet that passes along the outside of the sensor. The other field comes from an "interrogation" current pulse applied along the waveguide. The resulting strain pulse travels at ultrasonic speed along the waveguide and is detected at the head of the

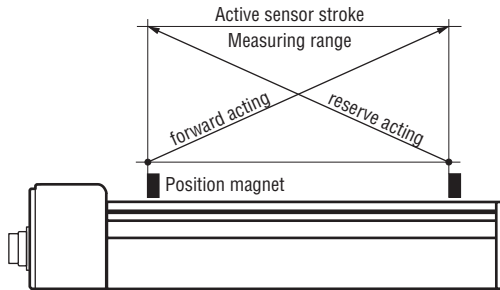
sensing element. The position of the magnet is determined with high precision and speed by accurately measuring the elapsed time between the application of the interrogation pulse and the arrival of the resulting strain pulse with a high speed counter. Using the elapsed time to determine position of the permanent magnet provides an absolute position reading that never needs recalibration or re-homing after a power loss. Non-contact sensing eliminates wear, and guarantees the best durability and output repeatability.



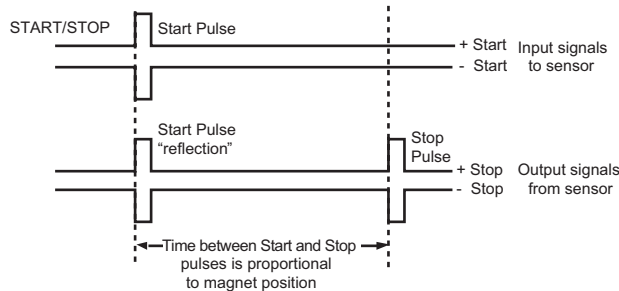
All specifications are subject to change. Please contact MTS for specifications that are critical to your needs.

Temposonics low profile-style EP linear-position sensor parameters

Temposonics E-Series model EP sensors are available with analog output or digital-pulse output. The analog outputs include voltage, (0 to 10 Vdc, forward and reverse acting), and current, (4 to 20 mA, forward or reverse acting). Since the outputs are direct, no signal conditioning electronics are needed when interfacing with controllers or meters.



The available digital-pulse output is Start/Stop. Here the sensor requires a start signal from a controller or interface card to initiate the measurement cycle. The sensor generates a stop signal at the end of the measurement cycle that is used to stop the controller's counter clock. The elapsed time between the Start and Stop signals is directly proportional to the magnet's position along the active stroke length. The controller can calculate the absolute position of the magnet from the time value and the sensor's unique gradient value, (inverse of the speed for the ultrasonic pulse traveling in the sensor's waveguide).



For applications using smart sensor interfaces the Start/Stop output, (option R3), can provide a sensor parameter upload ability. The following sensor parameters are available for upload:

- **Measuring range**
- **Offset**
- **Gradient** (Inverse speed of sensing pulse)
- **Status**
- **Manufacturer number**

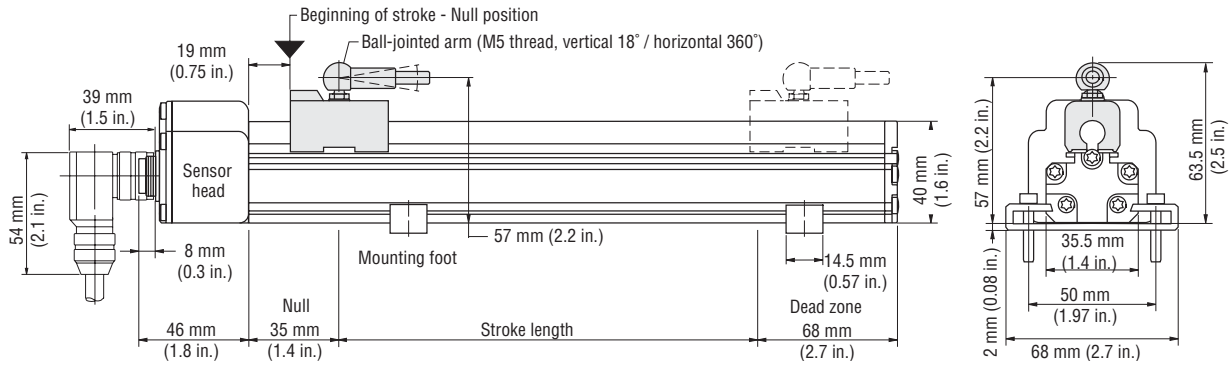
The sensor also features over-voltage protection to 36 Vdc and reverse polarity protection to 30 Vdc on input voltage connections. All outputs are absolute rather than incremental so that power-down situations do not require re-homing.

Parameters	Specification
Measured Variable:	Displacement
Resolution:	Analog: Infinite Digital: $1 \div [\text{gradient} \times \text{crystal freq. (MHz)} \times \text{circulations}]$; controller dependent.
Non-Linearity:	$<\pm 0.02\%$ Full stroke (minimum $\pm 60\mu\text{m}$)
Repeatability:	$<\pm 0.001\%$ Full stroke
Outputs:	Voltage: 0 to 10 Vdc and 10 to 0 Vdc (controller input resistance $R_L > 5k\Omega$) Current: 4 to 20 mA or 20 to 4 mA (min/max load: 0/500 Ω) Start/Stop: RS-422 differential signal (Serial parameter upload available for: measuring range, offset, gradient, status, and manufacturer number)
Update Frequency:	Voltage or Current: $> 1.5 \text{ kHz}$ Start/Stop: Controller dependent
Measuring Range:	50 to 1525 mm (2 to 60 in.)
Operating Conditions:	Temperature: -40 to 75°C (-40 to 167°F) Relative humidity: 90% no condensation. Ingress protection: IP65 if mating cable connector is correctly fitted. Shock test: 100 g (single hit) IEC-Standard 68-2-27 Vibration rating: 10 g/10 - 2000 Hz IEC-Standard 68-2-6
EMC Test:	Electromagnetic emission EN 50081-1 Electromagnetic immunity EN 50082-2 EN 61000-4-2/3/4/6, Level 3/4, Criteria A, CE qualified
Operating Voltage:	+24 Vdc nominal (-15 or $+20\%$) Polarity protection: up to -30 Vdc Overvoltage protection: up to 36 Vdc Current drain: Analog: 50 - 140 mA Start/Stop: 50 - 100 mA (stroke length dependent) Dielectric withstand voltage: 500 V, (DC ground to machine ground)
Connection type:	6-pin male D60 connector
Electronic head:	Aluminum housing
Sensor extrusion:	Aluminum (Temposonics profile style)
Mounting:	Adjustable mounting feet or T-slot nut (M5 threads) in base channel.
Magnet type:	Captive-sliding magnets or floating magnets, (open ring or block).

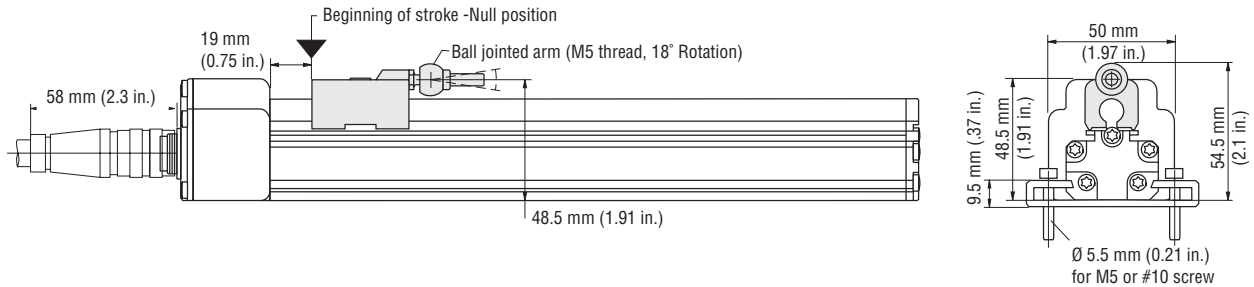
Temposonics low profile-style EP linear-position sensor

The Temposonics model EP sensor offers modular construction, flexible mounting configurations and easy installation. Position measurements are non-contact via a permanent magnet that is moved along the profile extrusion housing.

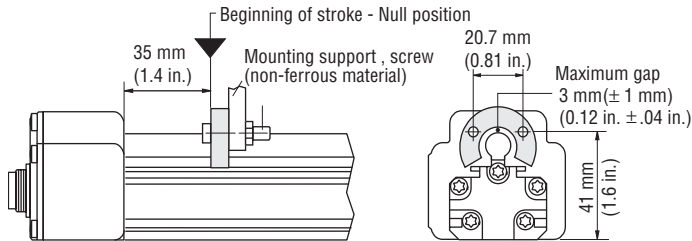
EP sensor with style "S" captive-sliding magnet



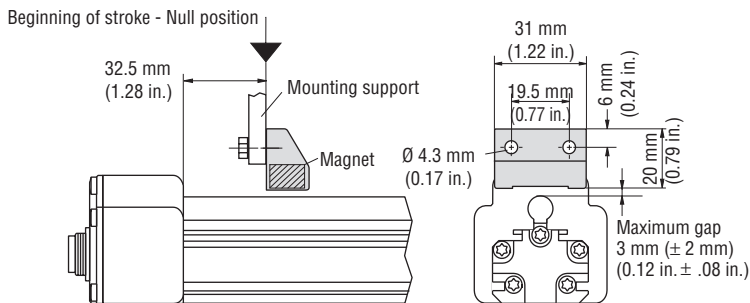
EP sensor with style "V" captive-sliding magnet



EP sensor with floating style "M" (open ring) magnet



EP sensor with block style "L" magnet



Temposonics low profile-style EP linear-position sensor

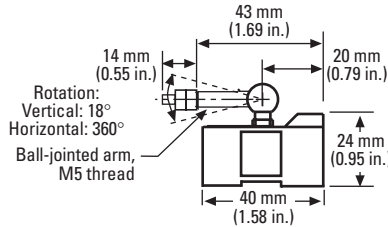
Selection of position magnets (included with sensor)

A choice of two magnet mounting configurations are available with the EP model sensor; the captive-sliding magnet or the “floating” type magnet. Captive-sliding magnets utilize slide bearings of special material that reduce friction, and if required, help mitigate dirt build up. The slide bearings are designed to operate dry, requiring no external lubrication or maintenance.

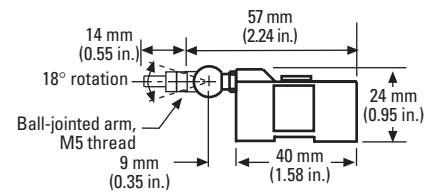
The floating magnets (open ring or block style) mount on the moving machine part and travel just above the sensor's profile extrusion. The open ring magnet (style M) requires a minimum distance away from ferrous metals to allow proper sensor output. It must be mounted using non-ferrous screws and a non-ferrous support bracket, or utilize a non-ferrous spacer of at least 5 mm (0.2 in.) thickness.

The block magnet (style L) can be mounted using ferrous metal screws and support bracket. However, the support bracket can not extend beyond 11 mm (0.43 in.) from the top of the magnet, unless it is made of non-ferrous material. The magnet should be installed with a perpendicular orientation relative to the top surface of the sensor extrusion as shown on page 3. Optimal performance is achieved when this orientation remains consistent throughout the full measurement stroke range.

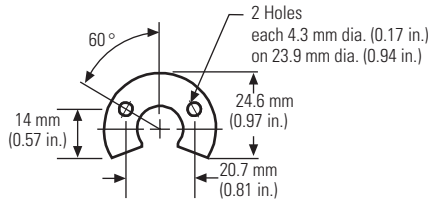
Captive-sliding magnet, style S
part no. 252182



Captive-sliding magnet, style V
part no. 252184

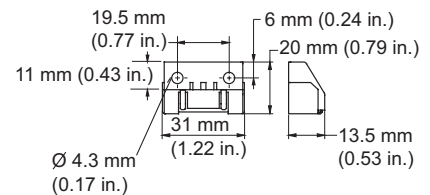


Floating (open ring) magnet, style M
part no. 251416-2



ID: 13.5 mm (0.53 in.)
OD: 32.8 mm (1.29 in.)
Thickness: 7.9 mm (0.312 in.)

Block magnet, style L
part no. 252887



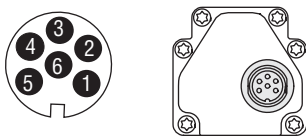
Wiring and connectors

Sensor integral connector (D60 Male)

Pinout/wire color code (extension cable)

Pin no.	Wire color	Function	Function
		Digital-pulse outputs	Analog outputs
1	Gray	(-) Stop for Start/Stop	0 to 10 Vdc or 4 to 20 mA
2	Pink	(+) Stop for Start/Stop	Return for pin 1
3	Yellow	(+) Start for Start/Stop	10 to 0 Vdc or 20 to 4 mA
4	Green	(-) Start for Start/Stop	Return for pin 3
5	Red or Brown	+24 Vdc (+20%, -15%)	+24 Vdc (+20%, -15%)
6	White	DC Ground (for supply)	DC Ground (for supply)

Integral D6 connector (male) as viewed from end of sensor

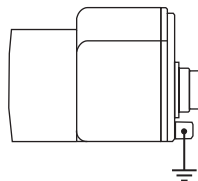


Note:

Appropriate grounding of cable shield is required at the controller end.

Attention:

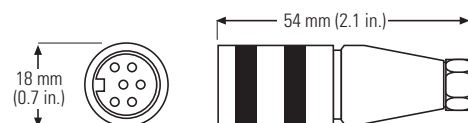
A grounding lug is provided near the connector end of the sensor for a convenient connection to earth ground. Since the EP sensor's aluminum housing has an anodic coating the sensor mounting feet, (part no. 400802), do not provide proper grounding. A ground wire connection to the grounding lug is required.



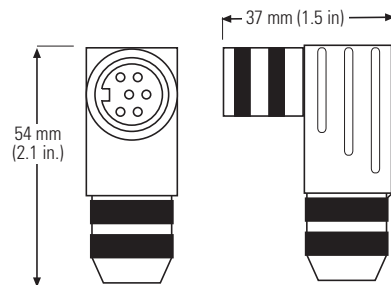
Cable connectors (field-installed D6 female)

Mates with sensor's integral connector

D6 Straight-exit connector
part no. 560700



D6 90° connector
part no. 560778



How to order

Position sensor

When placing an order, build the model number using the model number guide (to the right). A wide range of E-Series position sensor configurations are available to meet the demands of your particular application.

If you have any questions about how to apply E-Series position sensors, contact MTS Applications Engineering or your local MTS distributor. Both of these resources are available to assist you in designing an effective position sensing system to fit your application.

	E	P						D	6	0	1			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14

SENSOR MODEL
EP = Profile style

HOUSING STYLE
Magnets included with all EP sensors:
S = Captive-sliding magnet with joint at top (Part no. 252182)
V = Captive-sliding magnet with joint at front (Part no. 252184)
M = Floating Magnet, (open ring) (part no. 251416-2)
L = Floating Magnet, (block style) (part no. 252887)

STROKE LENGTH
--- **M** = Millimeters (Encode in 5 mm increments)
--- **U** = Inches and tenths (Encode in 0.1 in. increments)

CONNECTION TYPE
Connector
D60 = 6-pin DIN connector, integral, standard

INPUT VOLTAGE
1 = +24 Vdc (+20%, -15%)

OUTPUT
Analog - voltage
VO = 0 to +10 Vdc and +10 to 0 Vdc
Analog - current
A0 = 4 to 20 mA
A1 = 20 to 4 mA
Digital - pulse
R0 = Start/Stop
R3 = Start/Stop with sensor parameters upload function

Stroke length notes:
Profile (EP) stroke range = 2 - 60 in. (50 - 1525 mm.)

Note:

Temposonics EP sensors include two mounting feet (part number 400802). One additional mounting foot is included for every additional 500 mm (20 in.).

Accessories

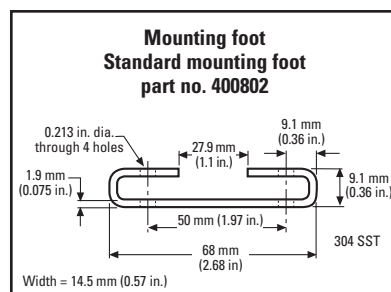
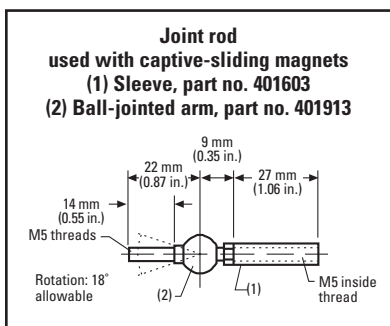
Description	Function/Notes	Part no.
Mounting feet, standard (spares)	Model EP sensors come with mounting feet	400802
Joint-rod Sleeve (1 in.)	For use with model EP sensors with "S" or "V" style magnets	401603
Ball-jointed arm, straight	For use with model EP sensors with "S" or "V" style magnets	401913

Magnets and float options

Description	Function/Notes	Part no.
Small open ring magnet (spare)	Style M, "floating" magnet (included with EP sensors)	251416-2
Block style magnet (spare)	Style L "floating" magnet (included with EP sensors)	252887
Captive-sliding magnet (spare)	Style S captive-sliding magnet with joint at top (included with EP sensors)	252182
Captive-sliding magnet (spare)	Style V captive-sliding magnet with joint at front (included with EP sensors)	252184

Field-installed connectors

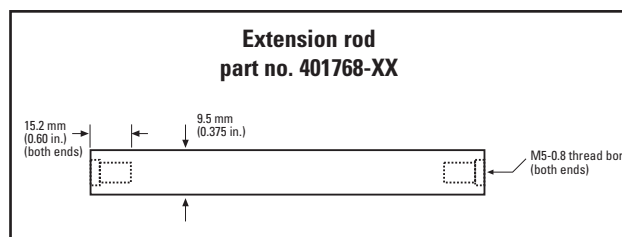
Description	Function/Notes	Part no.
6-Pin DIN connector, straight	Female, straight exit, mates to D60 connection type (see page 4).	560700
6-Pin DIN connector, 90°	Female, 90° exit, mates to D60 connection type (see page 4).	560778



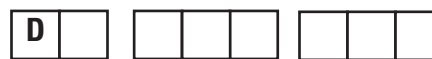
How to order (continued)

Optional extension rods (for use with captive-sliding magnets)

Extension rod lengths	Part no.	Extension rod lengths	Part no.
60.3 mm (2.375 in.)	401768-2	390.5 mm (15.375 in.)	401768-15
85.7 mm (3.375 in.)	401768-3	466.7 mm (18.375 in.)	401768-18
111.1 mm (4.375 in.)	401768-4	517.5 mm (20.375 in.)	401768-20
161.9 mm (6.375 in.)	401768-6	542.9 mm (21.375 in.)	401768-21
187.3 mm (7.375 in.)	401768-7	619.1 mm (24.375 in.)	401768-24
212.7 mm (8.375 in.)	401768-8	771.5 mm (30.375 in.)	401768-30
238.1 mm (9.375 in.)	401768-9	923.9 mm (36.375 in.)	401768-36
263.5 mm (10.375 in.)	401768-10	1076.3 mm (42.375 in.)	401768-42
314.3 mm (12.375 in.)	401768-12	1228.7 mm (48.375 in.)	401768-48
365.1 mm (14.375 in.)	401768-14	1533.5 mm (60.375 in.)	401768-60



Extension cable with connectors for the D6, (D60), connection type



SENSOR CONNECTION TYPE

- D6** = Female connector, (straight exit), and standard (part no. 530026) cable (PVC jacket) for sensors with D6 or D60 connector
- DA** = Female connector, (90° exit), and standard (part no. 530026) cable (PVC jacket) for sensors with D6 or D60 connector
- DJ** = Female connector, (straight exit), and (part no. 530045) cable, (black polyurethane jacket for higher resistance to moisture and oil), for sensors with D6 or D60 connector
- DK** = Female connector, (90° exit), and (part no. 530045) cable, (black polyurethane jacket for higher resistance to moisture and oil), for sensors with D6 or D60 connector

CABLE LENGTHS

For standard length cables up to 100 ft

- 005** = 5 ft. **050** = 50 ft.
015 = 15 ft. **100** = 100 ft.
025 = 25 ft.

For custom length cables over 100 ft

--- = Cable length (maximum cable length is dependent on the output selected; consult MTS Applications Engineering.)

CABLE TERMINATION (2 or 3 characters depending on option selected)

- P0** = Pigtail connection, (no connector).
- D6M** = D6 male connector, (straight exit). Only available with the D6 option above.
- D6F** = D6 Female connector, (straight exit). Only available with the D6 option above.
- DAF** = D6 Female connector, (90 degrees exit). Only available with the DA option above.

Part Number: 05-06 550741 Revision B

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All Temposonics sensors are covered by US patent number 5,545,984. Additional patents are pending.

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