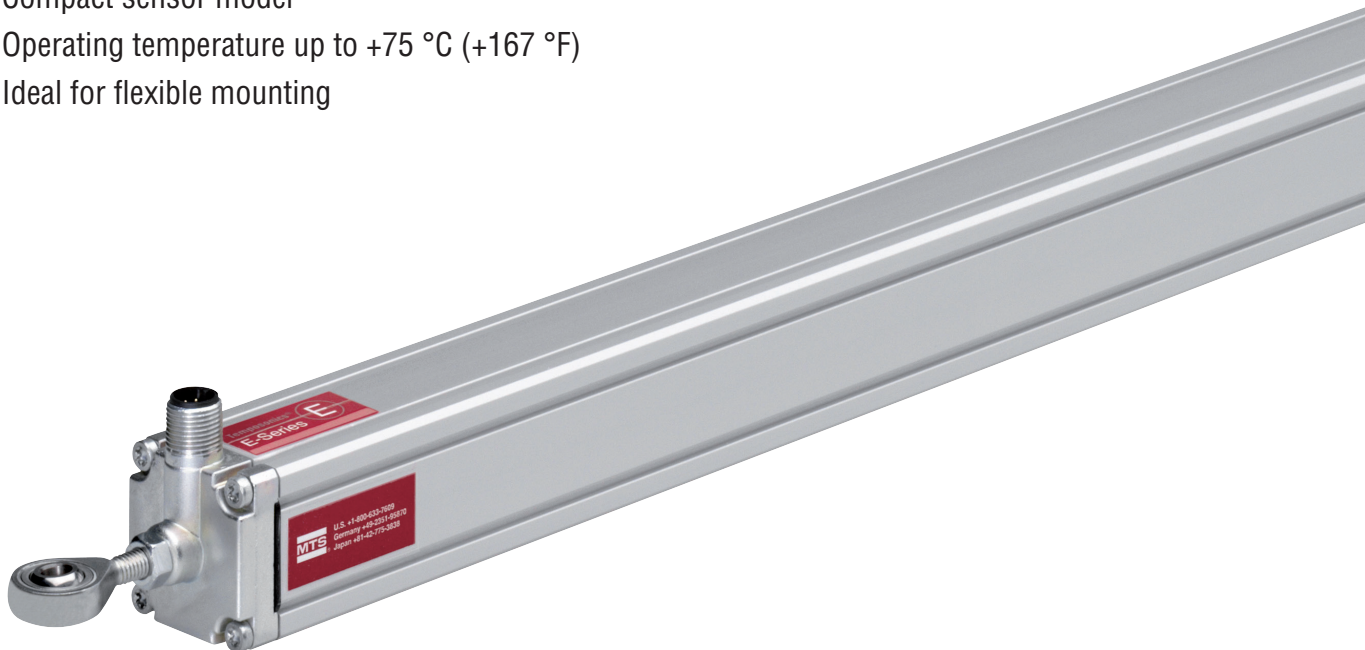


Temposonics®

Magnetostrictive Linear Position Sensors

ER Analog Data Sheet

- Compact sensor model
- Operating temperature up to +75 °C (+167 °F)
- Ideal for flexible mounting



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.

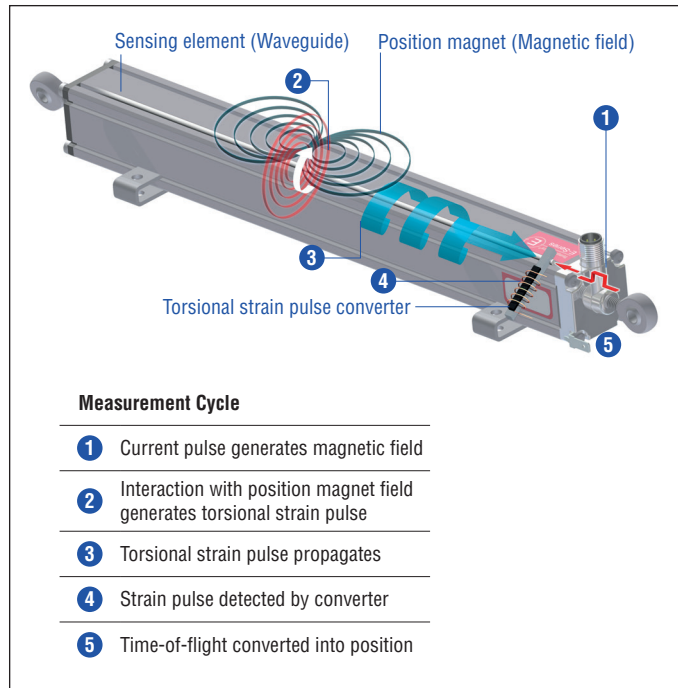


Fig. 1: Time-of-flight based magnetostrictive position sensing principle

ER 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 Temposonics® ER has an aluminum rod-and-cylinder design where the rod can extend and retract from the sensor housing to measure linear position. Inside, a magnet is secured to the end of the rod and remains protected within the sensor electronics housing. Accessory rod ends are available for attaching the rod to the machine's moving part. The rod-and-cylinder sensor design can be installed in any orientation, and provides a convenient and versatile position feedback solution. Typical fields of applications are printing and paper industry, machine tools and plastics industry as well as control systems.



Fig. 2: Typical application: Paper industry

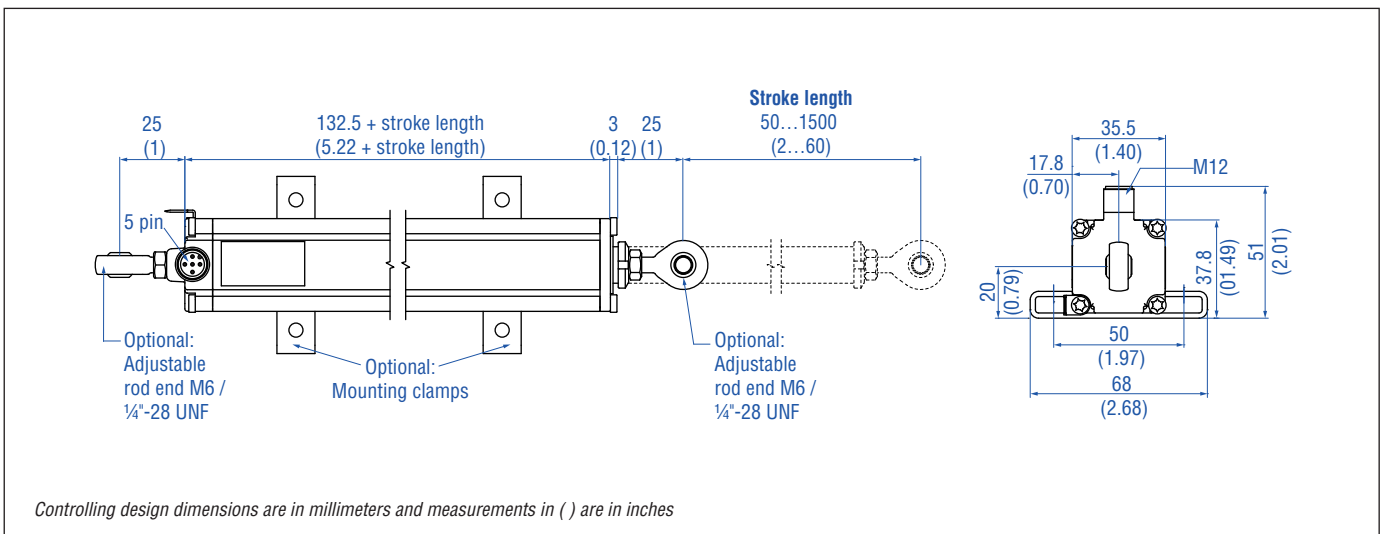
TECHNICAL DATA

| Output | |
|-----------------------------------|---|
| Voltage | 0...10 VDC or 10...0 VDC, 0...10 VDC and 10...0 VDC (controller input resistance $R_i > 5 \text{ k}\Omega$) |
| Current | 4...20 mA or 20...4 mA (minimum / maximum load: 0 / 500 Ω) |
| Measured value | Position |
| Measurement parameters | |
| Resolution | Infinite |
| Cycle time | Typ. 0.3 ms < t < 2 ms (depending on stroke lengths) |
| Linearity | $\leq \pm 0.02 \%$ F.S. (minimum $\pm 60 \mu\text{m}$) |
| Repeatability | $\leq \pm 0.005 \%$ F.S. (minimum $\pm 20 \mu\text{m}$) |
| Operating conditions | |
| Operating temperature | $-40...+75 \text{ }^\circ\text{C}$ ($-40...+167 \text{ }^\circ\text{F}$) |
| Humidity | 90 % rel. humidity, no condensation |
| Ingress protection ^{1,2} | IP67 (if mating connectors are correctly fitted) |
| Shock test | 100 g (single shock) IEC standard 60068-2-27 |
| Vibration test | 5 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 | $\leq 5 \text{ m/s}$ |
| Design / Material | |
| Sensor electronics housing | Aluminum |
| Guided driving rod | Aluminum |
| Stroke length | 50...1500 mm (2...60 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 | $\leq 0.28 \text{ V}_{pp}$ |
| 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/ The IP rating is not part of the UL recognition

²/ The IP rating IP67 is only valid for the sensor electronics housing, as water and dust can get inside the profile

TECHNICAL DRAWING



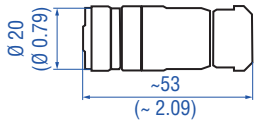
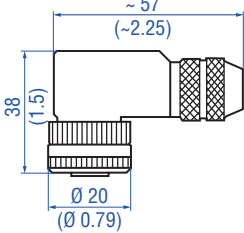
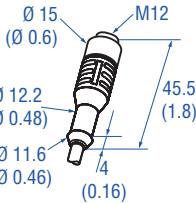
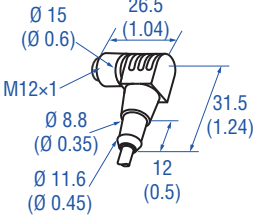
CONNECTOR WIRING

D34

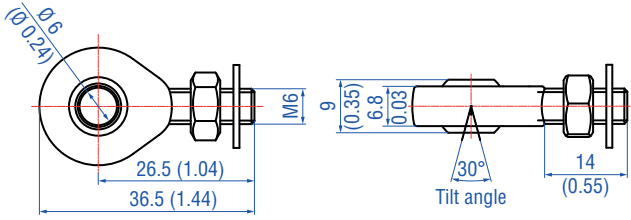
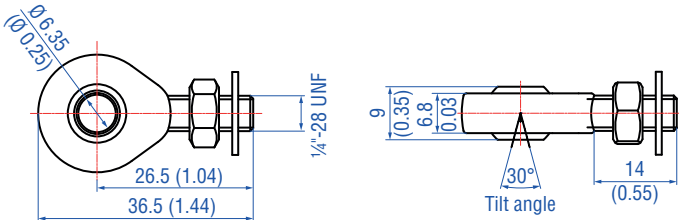
| M12 A-coded | Pin | Function |
|-------------|-----|-----------------------|
| | 1 | +24 VDC (-15 / +20 %) |
| | 2 | Output 1 |
| | 3 | DC Ground (0 V) |
| | 4 | Output 2 |
| | 5 | DC Ground |

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

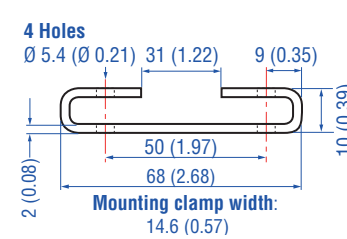
Cable connectors³ Cord sets

| | | | |
|--|--|---|---|
|  |  |  |  |
| <p>M12 (5 pin) female, straight Part no. 370 677</p> | <p>M12 (5 pin) female, angled Part no. 370 678</p> | <p>M12 (5 pin) female, straight Part no. 370 673</p> | <p>M12 (5 pin) female, angled Part no. 370 675</p> |
| <p>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</p> | <p>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</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> |

Rod ends

| | |
|--|--|
|  |  |
| <p>Rod end with M6 thread (for metric stroke length measurement) Part no. 254 210</p> | <p>Rod end with 1/4"-28 UNF thread (for US customary stroke length measurement) Part no. 254 235</p> |

Mounting clamp



Mounting clamp
Part no. 403 508

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

³ 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 | R | | | | | | | D | 3 | 4 | 1 | | | |
| a | | b | c | | | | | d | | | e | f | | |

| | |
|----------|---|
| a | Sensor model |
| E R | Aluminum cylinder with a guided driving rod |

| | |
|----------|---|
| b | Design |
| M | Inside thread M6 at end of rod (For metric stroke length measurement) |
| S | Inside thread 1/4"-28 UNF at end of rod (For US customary stroke length measurement) |

| | |
|-----------|----------------------|
| c | Stroke length |
| X X X X M | 0050...1500 mm |
| X X X X U | 002.0...060.0 in. |

Standard stroke length (mm)*

| Stroke length | Ordering steps |
|---------------|----------------|
| 50 ... 500 mm | 25 mm |
| 500...1500 mm | 50 mm |

Standard stroke length (in.)*

| Stroke length | Ordering steps |
|---------------|----------------|
| 2...22 in. | 1.0 in. |
| 22...60 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) |
| V 1 1 | 10...0 VDC (1 output channel) |
| V 0 3 | 0...10 VDC and 10...0 VDC (2 output channels) |
| Current | |
| A 0 1 | 4...20 mA (1 output channel) |
| A 1 1 | 20...4 mA (1 output channel) |

DELIVERY



Sensor

Accessories have to be ordered separately.

Select mounting accessories regarding your application:

- 1 or 2 rod ends M6 / 1/4"-28 UNF or / and
- 2 mounting clamps up to 1250 mm (50 in.) stroke length, 3 mounting clamps for 1500 mm (60 in.) stroke length

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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