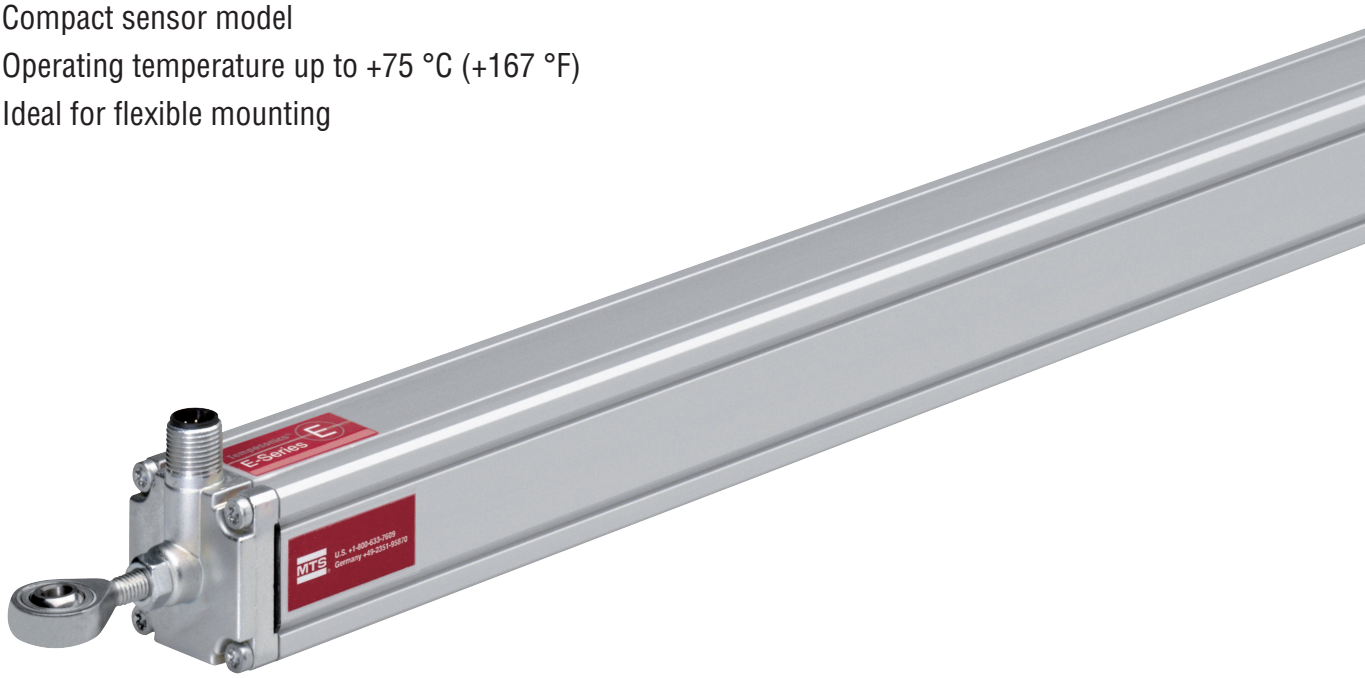
MTS SENSORS

# Temposonics®

Magnetostrictive Linear Position Sensors

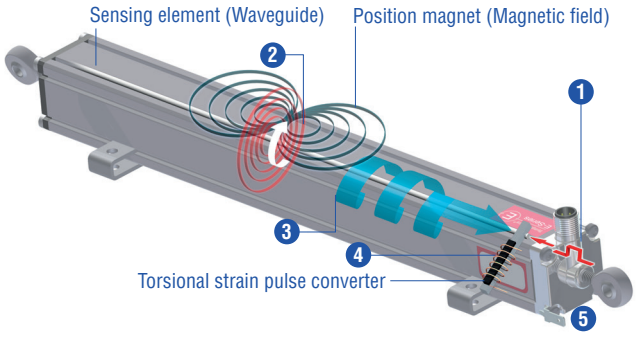
## ER SSI
Data Sheet

– 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.




**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*

## 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.

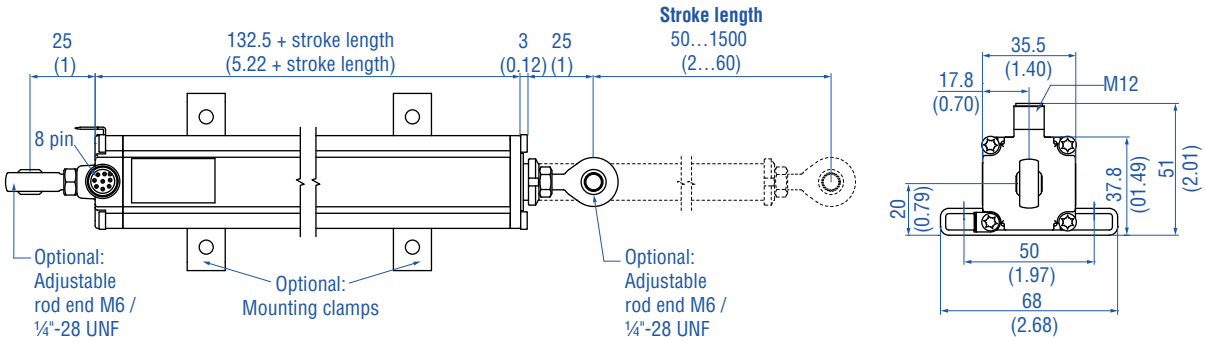
*Fig. 2: Typical application: Paper industry*

## TECHNICAL DATA

| | |
|---|---|
| **Output** | |
| Interface | SSI (Synchronous Serial Interface) |
| Data format | Binary or gray |
| Data length | 24, 25 bit |
| Data transmission rate | 70 kBaud*…1 MBaud, dependent on cable length:<br>Cable length: < 3 m \| < 50 m \| < 100 m \| < 200 m \| < 400 m<br>Baud rate: 1,0 MBd \| < 400 kBd \| < 300 kBd \| < 200 kBd \| < 100 kBd |
| Measured value | Position |
| **Measurement parameters** | |
| Resolution | 20 µm, 50 µm or 100 µm |
| Cycle time | Stroke length: 300 mm \| 750 mm \| 1000 mm \| 2000 mm<br>Measurement rate: 3,7 kHz \| 3,0 kHz \| 2,3 kHz \| 1,2 kHz |
| Linearity | ≤ ±0.02 % F.S. (minimum ±60 µm) |
| Repeatablity | ≤ ±0.005 % F.S. (minimum ±20 µm) |
| **Operating conditions** | |
| Operating temperature | –40…+75 °C (–40…+167 °F) |
| Humidity | 90 % reative humidity, no condensation |
| Ingress protection [1,2] | IP67 (connectors 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<br>Electromagnetic immunity according to EN 61000-6-2<br>The sensor meets the requirements of the EC directives and is marked with CE. |
| Magnet movement velocity | ≤ 5 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 (8 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 | Typ. 90 mA |
| Dielectric strength | 500 VDC (DC ground to machine ground) |
| Polarity protection | Up to –30 VDC |
| Overvoltage protection | Up to 36 VDC |

*/ With standard one shot of 16 µs.
**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




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

*Fig. 3: Temposonics® ER*

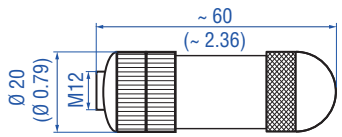
## CONNECTOR WIRING

| D84 | | |
|---|---|---|
| **Signal + power supply** | | |
| **M12 male connector (A-coded)** | **Pin** | **Function** |
|  View on sensor | 1 | Clock (+) |
| | 2 | Clock (–) |
| | 3 | Data (+) |
| | 4 | Data (–) |
| | 5 | Not connected |
| | 6 | Not connected |
| | 7 | +24 VDC (–15 / +20 %) |
| | 8 | DC Ground (0 V) |

*Fig. 4: Connector wiring D84*

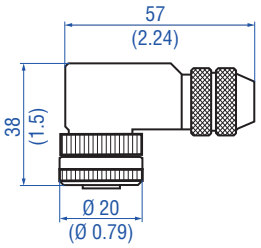
## FREQUENTLY ORDERED ACCESSORIES – Additional options available in our Accessories Guide 551444

### Cable connectors [3]




**M12 A-coded female connector (8 pin), straight**
**Part no. 370 694**

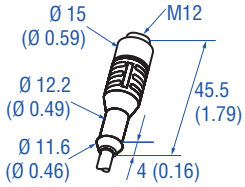
Housing: GD-ZnAL
Termination: Screw
Contact insert: CuZn
Cable Ø: 4…9 mm (0.16…0.35 in.)
Wire: 0.75 mm²
Operating temperature:
–25…+90 °C (–13…+194 °F)
Ingress protection: IP67 (correctly fitted)
Fastening torque: 0.6 Nm




**M12 A-coded female connector (8 pin), angled**
**Part no. 370 699**

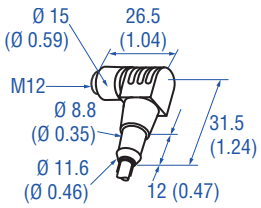
Housing: GD-ZnAL
Termination: Screw
Contact insert: CuZn
Cable Ø: 6…8 mm (0.24…0.31 in.)
Wire: 0.5 mm²
Operating temperature:
–25…+85 °C (–13…+185 °F)
Ingress protection: IP67 (correctly fitted)
Fastening torque: 0.6 Nm

### Cord sets




**Cable with M12 A-coded female connector (8 pin), straight – pigtail**
**Part no. 370 674**

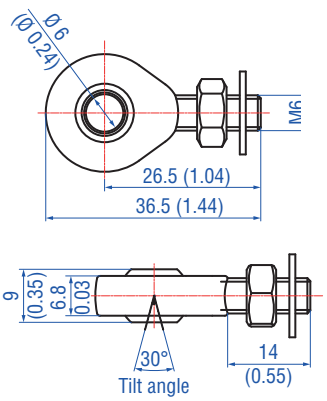
Material: PUR jacket; black
Features: Shielded
Cable length: 5 m (16.4 ft)
Ingress protection: IP67, IP69K (correctly fitted)
Operating temperature:
–25…+80 °C (–13…+176 °F)




**Cable with M12 A-coded female connector (8 pin), angled – pigtail**
**Part no. 370 676**

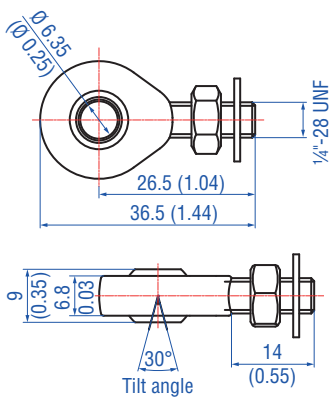
Cable: Shielded
Cable length: 5 m (16.4 ft)
Ingress protection: IP67 (correctly fitted)

### Rod ends




**Rod end with M6 thread**
**Part no. 254 210**

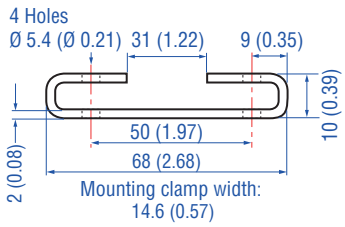
Material: Galvanized steel




**Rod end with ¼"-28 UNF thread**
**Part no. 254 235**

Material: Galvanized steel

### 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 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E | R | | | | | | | D | 8 | 4 | 1 | S | | | | 1 | 0 | 0 |
| 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<br>(For metric stroke length measurement) |
| S | Inside thread ¼"-28 UNF at end of rod<br>(For US customary stroke length measurement) |

| c | Stroke length | |
|---|---|---|
| X X X X M | 0050…1500 mm | |
| **Standard stroke length (mm)*** | | **Ordering steps** |
| 50 … 500 mm | | 25 mm |
| 500…1500 mm | | 50 mm |
| X X X X U | 002.0…060.0 in. | |
| **Standard stroke length (in.)*** | | **Ordering steps** |
| 2…22 in. | | 1.0 in. |
| 22…60 in. | | 2.0 in. |

| d | Connection type |
|---|---|
| D 8 4 | M12 (8 pin) male connector |

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

| f | Output |
|---|---|
| S | **(14) (15) (16) (17) (18) (19)** = Synchronous Serial Interface |
| **Data length (box no. 14)** | |
| 1 | 25 bit |
| 2 | 24 bit |
| **Output format (box no. 15)** | |
| B | Binary |
| G | Gray |
| **Resolution (box no. 16)** | |
| 3 | 0.05 mm |
| 4 | 0.1 mm |
| 5 | 0.02 mm |
| **Performance (box no. 17)** | |
| 1 | Standard |
| **Signal option (box no. 18 and 19)** | |
| 0 0 | Measuring direction forward |

## DELIVERY

- Sensor

Select mounting accessories regarding your application:

- 1 or 2 rod ends M6 / ¼“-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

Accessories have to be ordered separately.

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

*/ Non standard stroke lengths are available; must be encoded in 5 mm / 0.1 in. increments.
Some preferred stroke lengths may be available with faster lead time. Contact MTS Sensors for details.

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