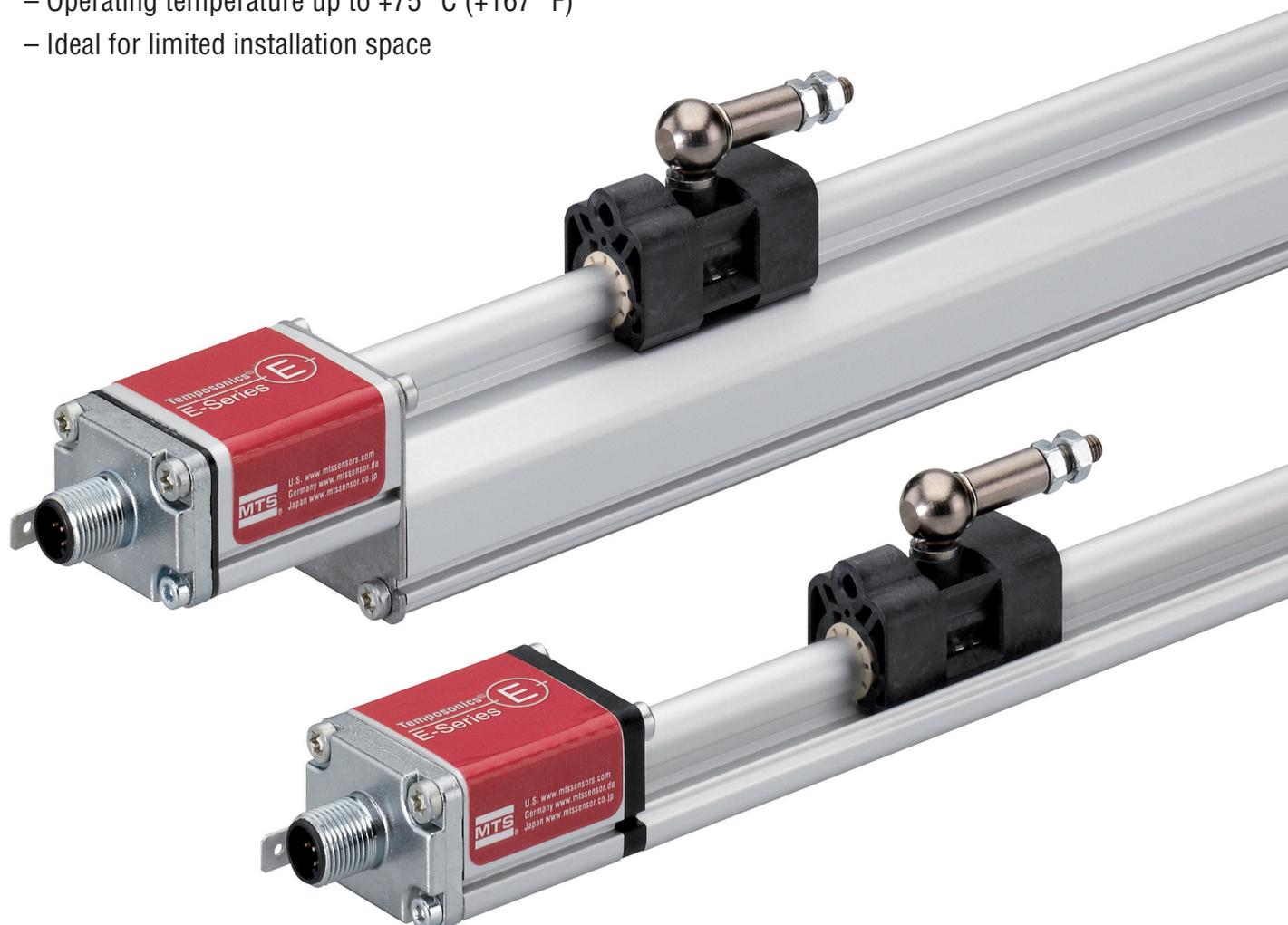


# Temposonics®

Magnetostrictive Linear Position Sensors

## EP / EL SSI Data Sheet

- For standard applications
- Operating temperature up to +75 °C (+167 °F)
- 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.

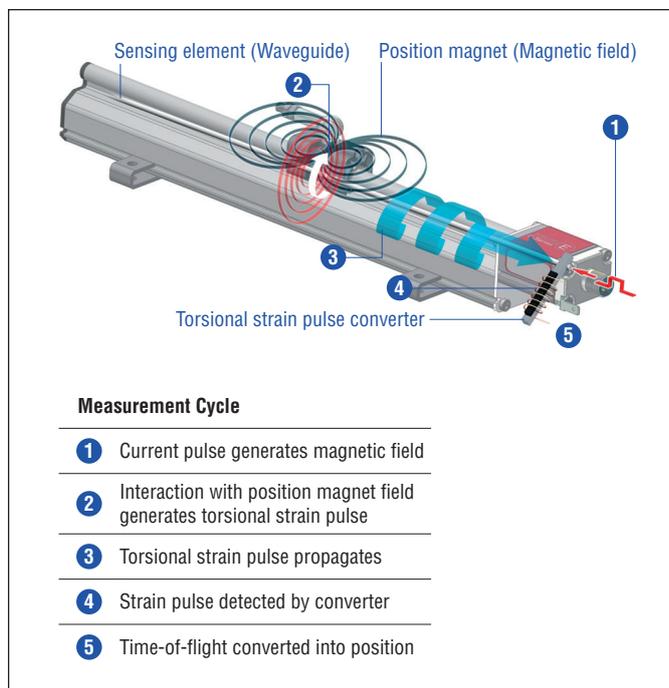


Fig. 1: Time-of-flight based magnetostrictive position sensing principle

## 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 particular for applications with limited installation space. The evaluation electronics is accommodated in an aluminum sensor housing. Typical fields of applications are plastics industry, metal forming and wood-working as well as factory automation.

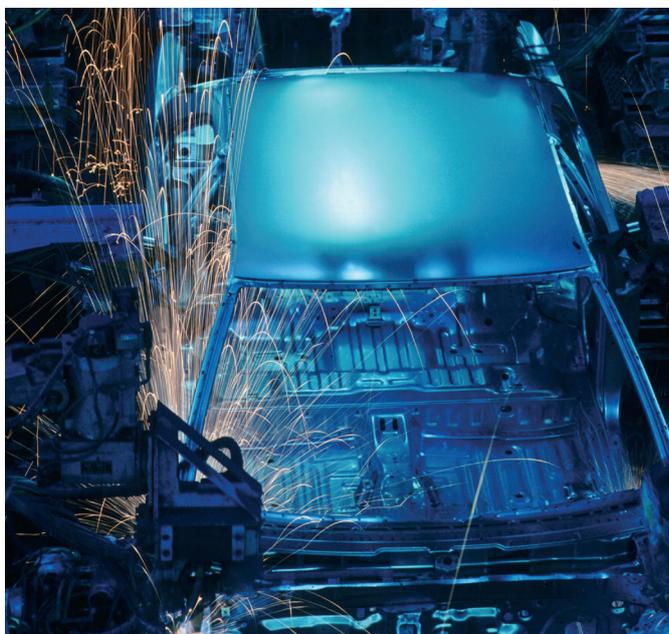


Fig. 2: Typical application: Factory automation

## 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 <sup>1</sup>            | Magnet slider: ≤ ±0.02 % F.S. (minimum ±60 µm), U-magnet: ≤ ±0.02 % F.S. (minimum ±60 µm),<br>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 <sup>2,3</sup> | 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<br>Electromagnetic immunity according to EN 61000-6-2<br>The sensor meets the requirements of the EC directives and is marked with <b>CE</b>            |
| 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: <a href="#">551684</a> )  |
| 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 <sub>pp</sub>   |
| 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   |

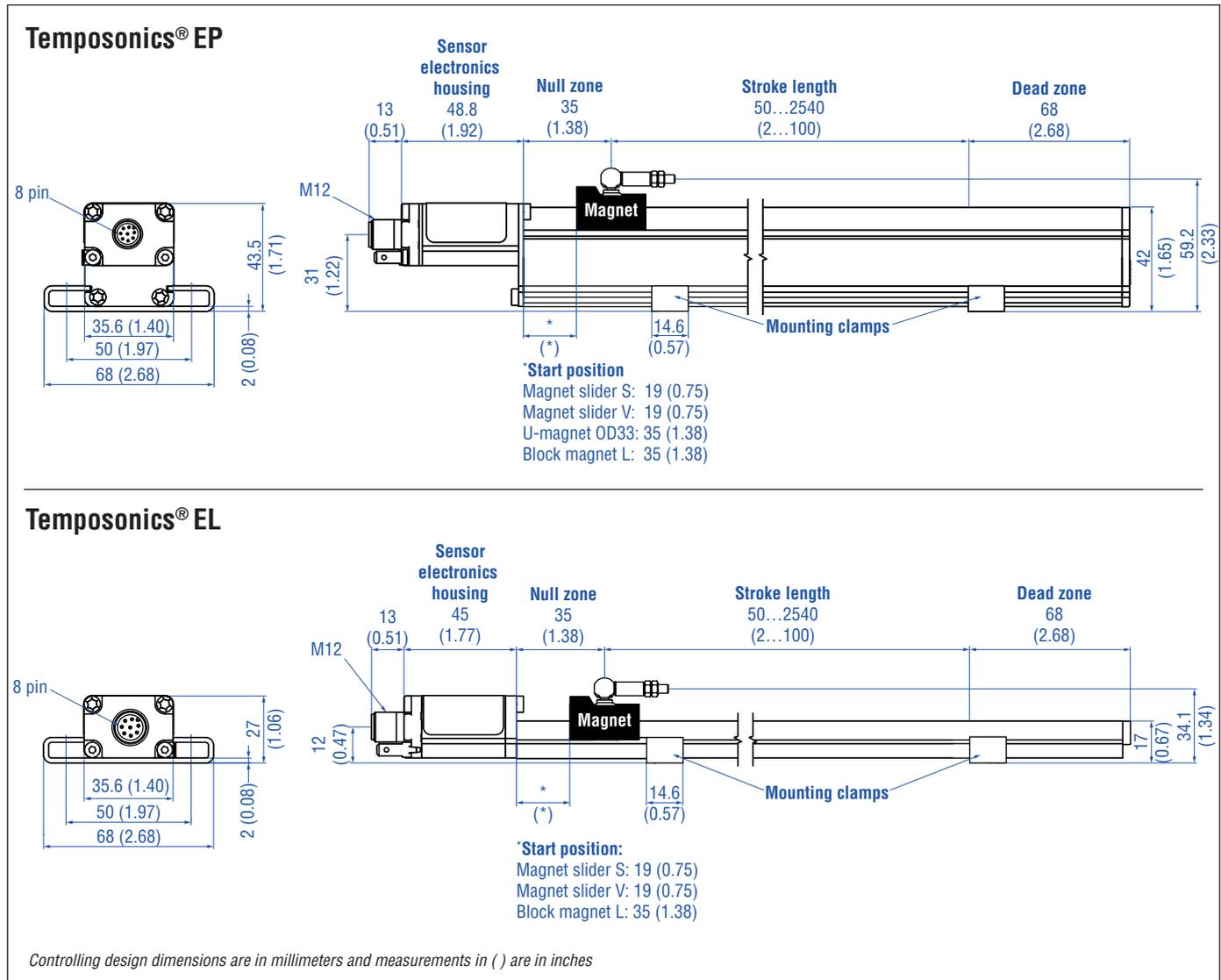
\*/With standard one shot of 16 µs

1/ 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



## CONNECTOR WIRING

### D84

| M12 A-coded | Pin | Function              |
|-------------|-----|-----------------------|
|             | 1   | Clock (+)             |
|             | 2   | Clock (-)             |
|             | 3   | Data (+)              |
|             | 4   | Data (-)              |
|             | 5   | Not connected         |
|             | 6   | Not connected         |
|             | 7   | +24 VDC (-15 / +20 %) |
|             | 8   | DC Ground (0 V)       |

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

| Position magnets   |  |  |   |
|--|--|--|---|
|  |  |  |   |
| <p><b>Magnet slider S</b><br/>Part no. 252 182</p>   | <p><b>Magnet slider V</b><br/>Part no. 252 184</p>   | <p><b>U-magnet OD33</b><br/>Part no. 251 416-2</p>   | <p><b>Block magnet L</b><br/>Part no. 403 448</p>   |
| <p>Material: GFK, magnet hard ferrite<br/>Weight: Ca. 35 g<br/>Operating temperature:<br/>-40...+75 °C (-40...+167 °F)</p> | <p>Material: GFK, magnet hard ferrite<br/>Weight: Ca. 35 g<br/>Operating temperature:<br/>-40...+75 °C (-40...+167 °F)</p> | <p>Only for: <b>EP</b><br/>Material: PA ferrite GF20<br/>Weight: Ca. 11 g<br/>Operating temperature:<br/>-40...+105 °C (-40...+221 °F)<br/>Surface pressure: Max. 40 N/mm<sup>2</sup><br/>Fastening torque for M4 screws: 1 Nm</p> | <p>Material: Hard ferrite<br/>Weight: Ca. 20 g<br/>Operating temperature:<br/>-40...+75 °C (-40...+167 °F)<br/>Fastening torque for M4 screws: 1 Nm</p> |

| Cable connectors <sup>4</sup>  |  | Cord sets   |   |
|--|--|---|---|
|  |  |   |   |
| <p><b>M12 (8 pin) female, straight</b><br/>Part no. 370 694</p>  | <p><b>M12 (8 pin) female, angled</b><br/>Part no. 370 699</p>  | <p><b>M12 (8 pin) female, straight</b><br/>Part no. 370 674</p>                                   | <p><b>M12 (8 pin) female, angled</b><br/>Part no. 370 676</p>                                     |
| <p>Housing: GD-ZnAL / IP67<br/>Termination: Screw; 0.75 mm<sup>2</sup><br/>Contact insert: CuZn<br/>Operating temperature:<br/>-25...+90 °C (-13...+194 °F)<br/>Cable Ø: 4...9 mm (0.16...0.35 in.)<br/>Fastening torque: 0.6 Nm</p> | <p>Housing: GD-ZnAL / IP67<br/>Termination: Screw; max. 0.5 mm<sup>2</sup><br/>Contact insert: CuZn<br/>Operating temperature:<br/>-25...+85 °C (-13...+185 °F)<br/>Cable Ø: 6...8 mm (0.24...0.31 in.)<br/>Fastening torque: 0.6 Nm</p> | <p>Ingress protection: IP67<br/>Cable: Shielded, pigtail end<br/>Cable length: 5 m (16.4 ft.)</p> | <p>Ingress protection: IP67<br/>Cable: Shielded, pigtail end<br/>Cable length: 5 m (16.4 ft.)</p> |

| Mounting clamp  |
|---|
|   |
| <p><b>Mounting clamp</b><br/>Part no. 403 508</p>                     |
| <p>Material: Stainless steel 1.4301 / 1.4305<br/>(AISI 304 / 303)</p> |

<sup>4/</sup> 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 |   | 0 |   |   |   |   |   | D | 8  | 4  | 1  | S  |    |    |    | 1  | 0  | 0  |
| a |   | b | c |   |   |   |   | d |    |    | e  | f  |    |    |    |    |    |    |

|          |                     |
|----------|---------------------|
| <b>a</b> | <b>Sensor model</b> |
| L        | Ultra low profile   |
| P        | Compact profile     |

|          |                         |
|----------|-------------------------|
| <b>b</b> | <b>Design</b>           |
| 0        | Without position magnet |

|           |                      |
|-----------|----------------------|
| <b>c</b>  | <b>Stroke length</b> |
| 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.        |

|          |                            |
|----------|----------------------------|
| <b>d</b> | <b>Connection type</b>     |
| D 8 4    | (M12) 8 pin male connector |

|          |                          |
|----------|--------------------------|
| <b>e</b> | <b>Operating voltage</b> |
| 1        | +24 VDC (-15 / +20 %)    |

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

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

## 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.

Manuals & Software available at:  
[www.mtssensors.com](http://www.mtssensors.com)

**UNITED STATES** 3001 Sheldon Drive  
MTS Systems Corporation Cary, N.C. 27513  
Sensors Division Phone: +1 919 677-0100  
E-mail: info.us@mtssensors.com

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**GERMANY** Auf dem Schüffel 9  
MTS Sensor Technologie 58513 Lüdenscheid  
GmbH & Co. KG Phone: +49 2351 9587-0  
E-mail: info.de@mtssensors.com

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**ITALY** Phone: +39 030 988 3819  
Branch Office E-mail: info.it@mtssensors.com

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**FRANCE** Phone: +33 1 58 4390-28  
Branch Office E-mail: info.fr@mtssensors.com

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**GREAT BRITAIN** Phone: +44 79 44 15 03 00  
Branch Office E-mail: info.uk@mtssensors.com

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**CHINA** Phone: +86 21 6485 5800  
Branch Office E-mail: info.cn@mtssensors.com

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**JAPAN** Phone: +81 42 707 7710  
Branch Office E-mail: info.jp@mtssensors.com

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