EP2 CANopen
Magnetostrictive Linear Position Sensors

- Optimal price-/performance ratio
- Position measurement with more than one magnet
- Flat & compact
MEASURING TECHNOLOGY

The absolute, linear position sensors provided by Temposonics rely on the company’s proprietary 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.

EP2 SENSOR

Robust, non-contact and wear free, the Temposonics linear position sensor provide high durability and precise position measurement feedback in harsh industrial environments. Measurement accuracy is tightly controlled by the quality of the waveguide manufactured exclusively by Temposonics.

The compact and flat aluminum profile offers flexible mounting options and easy installation. Moreover, the position magnet can travel along the entire flat housing profile. The EP2 has an attractive price-/performance ratio and is ideal for industrial applications including plastics molding and processing, factory automation and packaging.
## TECHNICAL DATA

### Output

<table>
<thead>
<tr>
<th>Interface</th>
<th>CAN System ISO-DIS 11898</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data protocol</td>
<td>CANopen: CIA standard DS 301 V3.0/encoder profile DS 406 V3.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Baud rate, kBit/s</th>
<th>1000</th>
<th>800</th>
<th>500</th>
<th>250</th>
<th>125</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable length, m</td>
<td>&lt; 25</td>
<td>&lt; 50</td>
<td>&lt; 100</td>
<td>&lt; 250</td>
<td>&lt; 500</td>
</tr>
</tbody>
</table>

The sensor will be supplied with ordered baud rate, changeable by customer via LSS.

### Measured variable

Position, option: Multi-position measurement with a maximum of 2 magnets

### Measurement parameters

<table>
<thead>
<tr>
<th>Resolution</th>
<th>10 µm, 20 µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle time</td>
<td>1 ms</td>
</tr>
<tr>
<td>Linearity</td>
<td>≤ ±0.02 % F.S. (minimum ±90 µm)</td>
</tr>
<tr>
<td>Repeatability</td>
<td>≤ ±0.005 % F.S. (minimum ±20 µm)</td>
</tr>
</tbody>
</table>

### Operating conditions

<table>
<thead>
<tr>
<th>Operating temperature</th>
<th>−40…+75 °C (−40…+167 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidity</td>
<td>90 % relative humidity, no condensation</td>
</tr>
<tr>
<td>Ingress protection¹ ²</td>
<td>IP67 (if mating cable connector is correctly fitted)</td>
</tr>
<tr>
<td>Shock test</td>
<td>100 g (single shock) IEC standard 60068-2-27</td>
</tr>
<tr>
<td>Vibration test</td>
<td>8 g/10…2000 Hz IEC standard 60068-2-6 (resonance frequencies excluded)</td>
</tr>
</tbody>
</table>

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

Any

### Design/Material

| Sensor lid | Zinc die-cast |
| 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 Vpp |
| Current consumption | 40…60 mA depending on stroke length |
| 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 sensors electronics housing, as water and dust can get inside the profile
**TECHNICAL DRAWING**

![EP2 Technical Drawing](image)

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

**Fig. 3:** E-Series EP2 with block magnet

**CONNECTOR WIRING**

<table>
<thead>
<tr>
<th>D34</th>
<th>Signal + power supply</th>
</tr>
</thead>
</table>

**M12 male connector (A-coded)**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
</tr>
<tr>
<td>2</td>
<td>+24 VDC (-15/+20 %)</td>
</tr>
<tr>
<td>3</td>
<td>DC Ground (0 V)</td>
</tr>
<tr>
<td>4</td>
<td>CAN_H</td>
</tr>
<tr>
<td>5</td>
<td>CAN_L</td>
</tr>
</tbody>
</table>

**Fig. 4:** Connector wiring D34 (M12 connector)
### FREQUENTLY ORDERED ACCESSORIES

- **Position magnet**
  - **Block magnet L**
    - Part no. 403 448
    - Material: Plastic carrier with hard ferrite magnet
    - Weight: Approx. 20 g
    - Fastening torque for M4 screws: 1 Nm
    - Operating temperature: 
      - −40...+75 °C (−40...+167 °F)
    - This magnet may influence the sensor performance specifications for some applications.

- **Cable connectors**
  - **M12 A-coded female connector (4 pin/5 pin), straight**
    - Part no. 370 677
    - Material: GD-Zn, Ni
    - Termination: Screw
    - Contact insert: CuZn
    - Cable Ø: 4...8 mm (0.16...0.31 in.)
    - Wire: 1.5 mm²
    - Operating temperature: 
      - −30...+85 °C (−22...+185 °F)
    - Ingress protection: IP67 (correctly fitted)
    - Fastening torque: 0.6 Nm
  - **M12 A-coded female connector (5 pin), angled**
    - Part no. 370 678
    - Material: GD-Zn, Ni
    - Termination: Screw
    - Contact insert: CuZn
    - Cable Ø: 5...8 mm (0.2...0.31 in.)
    - Wire: 0.75 mm² (18 AWG)
    - Operating temperature: 
      - −25...+85 °C (−13...+185 °F)
    - Ingress protection: IP67 (correctly fitted)
    - Fastening torque: 0.4 Nm
  - **M12 A-coded male connector (5 pin), straight**
    - Part no. 561 665
    - Housing: GD-Zn, Ni
    - Termination: Screw
    - Contact insert: CuZn
    - Cable Ø: 4...8 mm (0.16...0.31 in.)
    - Wire: 1.5 mm²
    - Operating temperature: 
      - −30...+85 °C (−22...+185 °F)
    - Ingress protection: IP67 (correctly fitted)
    - Fastening torque: 0.6 Nm

- **Cord sets**
  - **Cable with M12 A-coded female connector (5 pin), straight – pigtail**
    - Part no. 370 673
    - Material: PUR jacket; black
    - Features: Shielded
    - Cable length: 5 m (16.4 ft)
    - Ingress protection: IP67 (correctly fitted)
    - Operating temperature: 
      - −25...+80 °C (−13...+176 °F)
  - **Cable with M12 A-coded female connector (5 pin), angled – pigtail**
    - Part no. 370 675
    - Material: PUR jacket; black
    - Features: Shielded
    - Cable length: 5 m (16.4 ft)
    - Ingress protection: IP67 (correctly fitted)
    - Operating temperature: 
      - −25...+80 °C (−13...+176 °F)
  - **M12 A-coded T connector (5 pin)**
    - Part no. 370 691
    - Material: PUR
    - Termination: Screw
    - Contact insert: Au
    - Feature: Shielded
    - Cable Ø: 4...8 mm (0.16...0.31 in.)
    - Ingress protection: IP68 (correctly fitted)
    - Operating temperature: 
      - −25...+85 °C (−13...+121 °F)

- **Connection accessories**
  - **Selfcuring coupling nut**
    - 2 × female connector
    - 1 × male connector
    - Feature: Shielded
    - Ingress protection: IP67 (correctly fitted)
    - Operating temperature: 
      - −25...+85 °C (−13...+121 °F)
    - Ingress protection: IP68 (correctly fitted)

### Cord sets

- **Mounting clamp**
  - **Part no. 403 508**
  - Material: Stainless steel 1.4301/1.4305 (AISI 304/303)

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*Follow the manufacturer’s mounting instructions when connecting the connectors.
Controlling design dimensions are in millimeters and measurements in ( ) are in inches*
Temposonics® EP2 CANopen
Data Sheet

ORDER CODE

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| E | P | 2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| a |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| b |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| c |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| d |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| e |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| f |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| g |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

a Sensor model
E P 2 Smooth profile

b Stroke length
XX XM 0050…2540 mm

<table>
<thead>
<tr>
<th>Standard stroke length (mm)</th>
<th>Ordering steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>50…500 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>500…2540 mm</td>
<td>50 mm</td>
</tr>
</tbody>
</table>

XX Xu 001.0…128.0 in.

<table>
<thead>
<tr>
<th>Standard stroke length (in.)</th>
<th>Ordering steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>2…20 in.</td>
<td>1.0 in.</td>
</tr>
<tr>
<td>20…100 in.</td>
<td>2.0 in.</td>
</tr>
</tbody>
</table>

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

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

d Operating voltage
1 +24 VDC (−15/+20 %)

f Output
C (14) (15) (16) (17) (18) (19) = CANopen
Protocol (box no. 14, 15, 16)
C 3 0 4 CANopen
C 4 0 4 CANopen (bus terminator)
Baud rate (box no. 17)
1 1000 kBit/s
2 500 kBit/s
3 250 kBit/s
4 125 kBit/s
Resolution (box no. 18)
4 10 µm
5 20 µm
Performance (box no. 19)
1 Standard

Optional

g Magnet number for multi-position measurement
2 0 2 2 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.

Manuals, Software & 3D Models available at: www.temposonics.com