Data Sheet

EH Start / Stop
Magnetostrictive Linear Position Sensors

- High pressure resistant sensor rod
- Position measurement with more than one magnet
- Small & compact – Ideal for standard hydraulic cylinders
**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.

**EH SENSOR**

Robust, non-contact and wear free, the Temposonics linear position sensor 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 Temposonics.

Temposonics® EH is a compact rod-style sensor and the ideal solution for direct stroke measurement in small hydraulic cylinders. The position magnet mounted on the piston head of the hydraulic cylinder travels over the sensor rod with the built-in waveguide to provide a precise, non-contact position measurement. The EH is ideal for a variety of applications including: fluid power, food industry, plastic industry, glass and ceramics, energy sector, machine tools and testing machines.
## TECHNICAL DATA

### Output

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start / Stop</td>
<td>RS-422 differential signal</td>
</tr>
<tr>
<td></td>
<td>Serial parameter upload available for: stroke length, offset, gradient, status, serial number and manufacturer number.</td>
</tr>
<tr>
<td>Measured value</td>
<td>Position, option: Multi-position measurement with a maximum of 2 magnets</td>
</tr>
</tbody>
</table>

### Measurement parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>Controller dependent</td>
</tr>
<tr>
<td>Cycle time</td>
<td>Controller dependent</td>
</tr>
<tr>
<td>Linearity</td>
<td>$\leq \pm 0.02 % \text{ F.S. (minimum } \pm 60 \mu \text{m)}$</td>
</tr>
<tr>
<td>Repeatability</td>
<td>$\leq \pm 0.005 % \text{ F.S. (minimum } \pm 20 \mu \text{m)}$</td>
</tr>
</tbody>
</table>

### Operating conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>$-40 \ldots +75 \ ^\circ \text{C (} -40 \ldots +167 \ ^\circ \text{F)}$</td>
</tr>
<tr>
<td>Humidity</td>
<td>90 % rel. humidity, no condensation</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>IP67 / IP69K (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>15 g / 10…2000 Hz IEC standard 60068-2-6 (resonance frequencies excluded)</td>
</tr>
<tr>
<td>EMC test</td>
<td>Electromagnetic emission according to EN 61000-6-3</td>
</tr>
<tr>
<td></td>
<td>Electromagnetic immunity according to EN 61000-6-2</td>
</tr>
<tr>
<td></td>
<td>The sensor meets the requirements of the EC directives and is marked with $\mathbb{CE}$.</td>
</tr>
<tr>
<td>Magnet movement velocity</td>
<td>Any</td>
</tr>
</tbody>
</table>

### Design / Material

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor electronics housing</td>
<td>Stainless steel 1.4305 (AISI 303); option: Stainless steel 1.4404 (AISI 316L)</td>
</tr>
<tr>
<td>Sensor rod</td>
<td>7 mm (0.28 in.) rod-Ø: Stainless steel 1.4301 (AISI 304)</td>
</tr>
<tr>
<td></td>
<td>10 mm (0.39 in.) rod-Ø: Stainless steel 1.4306 (AISI 304L); option: Stainless steel 1.4404 (AISI 316L)</td>
</tr>
<tr>
<td>Stroke length</td>
<td>50…2540 mm (2…100 in.)</td>
</tr>
<tr>
<td>Operating pressure</td>
<td>7 mm (0.28 in.) rod-Ø: 300 bar (4351 psi), 450 bar (6527 psi) peak</td>
</tr>
<tr>
<td></td>
<td>10 mm (0.39 in.) rod-Ø: 350 bar (5076 psi), 530 bar (7687 psi) peak</td>
</tr>
</tbody>
</table>

### Mechanical mounting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting position</td>
<td>Any</td>
</tr>
<tr>
<td>Mounting instruction</td>
<td>Please consult the technical drawings and the brief instructions (document number: 551684)</td>
</tr>
</tbody>
</table>

### Electrical connection

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection type</td>
<td>M12 (8 pin) male connector</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>$+24 \text{ VDC } (-15 / +20 %)$; 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.</td>
</tr>
<tr>
<td>Ripple</td>
<td>$\leq 0.28 \text{ V}_{pp}$</td>
</tr>
<tr>
<td>Current consumption</td>
<td>50…100 mA</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>500 VDC (DC ground to machine ground)</td>
</tr>
<tr>
<td>Polarity protection</td>
<td>Up to $-30 \text{ VDC}$</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>Up to 36 VDC</td>
</tr>
</tbody>
</table>

1/ With position magnet # 251 416-2. Not applied for customized version (CP11009)
2/ The IP rating is not part of the UL recognition
TECHNICAL DRAWING

CONNECTOR WIRING

D84

<table>
<thead>
<tr>
<th>M12 A-coded</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Start (+)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Start (−)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Stop (+)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Stop (−)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Not connected</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Not connected</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>+24 VDC (−15 / +20 %)</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>DC Ground (0 V)</td>
</tr>
</tbody>
</table>

*Use prefix CP11009 to the order code for start position of 30 mm and 60 mm dead zone.
FREQUENTLY ORDERED ACCESSORIES — Additional options available in our Accessories Guide

Position magnets

<table>
<thead>
<tr>
<th>Diameter</th>
<th>(Ø)</th>
<th>Diameter</th>
<th>(Ø)</th>
<th>Diameter</th>
<th>(Ø)</th>
<th>Diameter</th>
<th>(Ø)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32.8</td>
<td>1.29</td>
<td>25.4</td>
<td>1</td>
<td>17.4</td>
<td>0.69</td>
<td>32.8</td>
<td>1.29</td>
</tr>
<tr>
<td>23.8</td>
<td>0.94</td>
<td>13.5</td>
<td>0.53</td>
<td>13.5</td>
<td>0.53</td>
<td>23.8</td>
<td>0.94</td>
</tr>
<tr>
<td>13.5</td>
<td>0.53</td>
<td>7.9</td>
<td>0.31</td>
<td>7.9</td>
<td>0.31</td>
<td>13.5</td>
<td>0.53</td>
</tr>
<tr>
<td>4.3</td>
<td>0.17</td>
<td>156.5</td>
<td>0.31</td>
<td>156.5</td>
<td>0.31</td>
<td>4.3</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Standard ring magnet
Part no. 201 542-2
Material: PA ferrite GF20
Weight: Ca. 14 g
Operating temperature: −40...+105 °C (−40...+221 °F)
Surface pressure: Max. 40 N/mm²
Fastening torque for M4 screws: 1 Nm

Ring magnet OD25.4
Part no. 400 533
Material: PA ferrite
Weight: Ca. 10 g
Operating temperature: −40...+105 °C (−40...+221 °F)
Surface pressure: Max. 40 N/mm²

Ring magnet OD17.4
Part no. 401 032
Material: PA neobind
Weight: Ca. 5 g
Operating temperature: −40...+105 °C (−40...+221 °F)
Surface pressure: Max. 20 N/mm²
Fastening torque for M4 screws: 1 Nm

U-magnet OD33
Part no. 251 416-2
Material: PA ferrite GF20
Weight: Ca. 11 g
Operating temperature: −40...+105 °C (−40...+221 °F)
Surface pressure: Max. 40 N/mm²
Fastening torque for M4 screws: 1 Nm

Cable connectors

<table>
<thead>
<tr>
<th>Diameter</th>
<th>(Ø)</th>
<th>Diameter</th>
<th>(Ø)</th>
<th>Diameter</th>
<th>(Ø)</th>
<th>Diameter</th>
<th>(Ø)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.79</td>
<td>15</td>
<td>0.59</td>
<td>15</td>
<td>0.59</td>
<td>8.8</td>
<td>0.35</td>
</tr>
<tr>
<td>12.2</td>
<td>0.49</td>
<td>11.6</td>
<td>0.46</td>
<td>11.6</td>
<td>0.46</td>
<td>12.2</td>
<td>0.49</td>
</tr>
</tbody>
</table>

M12 (8 pin) female, straight
Part no. 370 694
Housing: GD-ZnAL / IP67
Termination: Screw; 0.75 mm²
Contact insert: CuZn
Cable Ø: 4...9 mm (0.16...0.35 in.)
Fastening torque: 0.6 Nm

M12 (8 pin) female, angled
Part no. 370 699
Housing: GD-ZnAL / IP67
Termination: Screw; max. 0.5 mm²
Contact insert: CuZn
Cable Ø: 6...8 mm (0.24...0.31 in.)
Fastening torque: 0.6 Nm

Cord sets

<table>
<thead>
<tr>
<th>Diameter</th>
<th>(Ø)</th>
<th>Diameter</th>
<th>(Ø)</th>
<th>Diameter</th>
<th>(Ø)</th>
<th>Diameter</th>
<th>(Ø)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.8</td>
<td>0.35</td>
<td>12</td>
<td>0.47</td>
<td>12</td>
<td>0.47</td>
<td>26.5</td>
<td>1.04</td>
</tr>
<tr>
<td>11.6</td>
<td>0.46</td>
<td>11.6</td>
<td>0.46</td>
<td>11.6</td>
<td>0.46</td>
<td>31.5</td>
<td>1.24</td>
</tr>
</tbody>
</table>

M12 (8 pin) female, straight
Part no. 370 674
Ingress protection: IP67
Cable: Shielded, pigtail end
Cable length: 5 m (16.4 ft.)

M12 (8 pin) female, angled
Part no. 370 676
Ingress protection: IP67
Cable: Shielded, pigtail end
Cable length: 5 m (16.4 ft.)

3/ Follow the manufacturer’s mounting instructions when connecting the connectors
Controlling design dimensions are in millimeters and measurements in ( ) are in inches
### ORDER CODE

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
<td>e</td>
<td>f</td>
<td>g</td>
<td>h</td>
<td>i</td>
<td>j</td>
<td>k</td>
<td>l</td>
<td>m</td>
<td>n</td>
</tr>
</tbody>
</table>

#### a Sensor model

**E H** Rod

#### b Design

**EH rod-style sensor with housing material 1.4305 (AISI 303) and rod material 1.4301 (AISI 304)**

- **K** Flange M18×1.5-6g, 7 mm rod-Ø
- **L** Flange ¾"-16 UNF-3A, 7 mm rod-Ø

**EH rod-style sensor with housing material 1.4305 (AISI 303) and rod material 1.4306 (AISI 304L)**

- **M** Flange M18×1.5-6g, 10 mm rod-Ø
- **S** Flange ¾"-16 UNF-3A, 10 mm rod-Ø

**EH rod-style sensor with housing material 1.4404 (AISI 316L) and rod material 1.4404 (AISI 316L)**

- **F** Flange ¾"-16 UNF-3A, 10 mm rod-Ø
- **W** Flange M18×1.5-6g, 10 mm rod-Ø

#### c Stroke length

**X X X X M** 0050…2540 mm

**X X X X U** 002.0…100.0 in.

**Standard stroke length (mm)**

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>Ordering steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>50…500 mm</td>
<td>5 mm</td>
</tr>
<tr>
<td>500…750 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>750…1000 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>1000…2540 mm</td>
<td>50 mm</td>
</tr>
</tbody>
</table>

**Standard stroke length (in.)**

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>Ordering steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>2…20 in.</td>
<td>0.2 in.</td>
</tr>
<tr>
<td>20…30 in.</td>
<td>0.5 in.</td>
</tr>
<tr>
<td>30…40 in.</td>
<td>1.0 in.</td>
</tr>
<tr>
<td>40…100 in.</td>
<td>2.0 in.</td>
</tr>
</tbody>
</table>

#### d Connection type

**D 8 4** M12 (8 pin) male connector

#### e Operating voltage

1 +24 VDC (−15 / +20 %)

#### f Output

**R 3** Start / Stop with sensor parameters upload function

### DELIVERY

**Sensor, O-ring**

Accessories have to be ordered separately.

Operation manuals & software are available at:

**www.temposonics.com**

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