EH CANopen
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 beginning 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.

| 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

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 in-house production.

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.

Fig. 2: Typical application: Plastics processing
TECHNICAL DATA

Output
Interface CAN System ISO 11898
Data protocol CANopen: CIA standard DS 301 V3.0/encoder profile DS 406 V3.1
Baud rate, kBit/s
<table>
<thead>
<tr>
<th>Cable length, m</th>
<th>1000</th>
<th>800</th>
<th>500</th>
<th>250</th>
<th>125</th>
<th>&lt; 25</th>
<th>&lt; 50</th>
<th>&lt; 100</th>
<th>&lt; 250</th>
<th>&lt; 500</th>
</tr>
</thead>
</table>
Cable length, m
| The sensor will be supplied with ordered baud rate, changeable by customer via LSS |
| Measured value | Position, Multi-position measurement with maximum 2 magnets |

Measurement parameters
Resolution 10 µm, 20 µm
Velocity 1 mm/s
Cycle time 1 ms
Linearity ≤ ±0.02 % F.S. (minimum ±60 µm)
Repeatability ≤ ±0.005 % F.S. (minimum ±20 µm)

Operating conditions
Operating temperature –40…+75 °C (–40…+167 °F)
Humidity 90 % relative humidity, no condensation
Ingress protection IP67/IP69K (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
Electromagnetic immunity according to EN 61000-6-2
The sensor meets the requirements of the EU directives and is marked with CE
Magnet movement velocity Any

Design/Material
Sensor electronics housing Stainless steel 1.4305 (AISI 303); option: Stainless steel 1.4404 (AISI 316L)
Flange Stainless steel 1.4305 (AISI 303); option: Stainless steel 1.4404 (AISI 316L)
Sensor rod 7 mm (0.28 in.) rod Ø: Stainless steel 1.4301 (AISI 304)
10 mm (0.39 in.) rod Ø: Stainless steel 1.4306 (AISI 304L); option: Stainless steel 1.4404 (AISI 316L)
Stroke length 50…2540 mm (2…100 in.)
Operating pressure 7 mm (0.28 in.) rod Ø: 300 bar (4351 psi), 450 bar (6527 psi) peak
10 mm (0.39 in.) rod Ø: 350 bar (5076 psi), 530 bar (7687 psi) peak

Mechanical mounting
Mounting position Any
Mounting instruction Please consult the technical drawings and the brief instructions (document number: 551684)

Electrical connection
Connection type M12 male connector (5 pin)
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/ With position magnet # 251 416-2
2/ The IP rating is not part of the UL recognition
TECHNICAL DRAWING

CONNECTOR WIRING

D34

<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. 3: Temposonics® EH with ring magnet

Fig. 4: Connector wiring D34
FREQUENTLY ORDERED ACCESSORIES – Additional options available in our Accessories Guide 551444

Position magnets

<table>
<thead>
<tr>
<th>U-magnet OD33</th>
<th>Ring magnet OD33</th>
<th>Ring magnet OD25.4</th>
<th>Ring magnet OD17.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part no. 251 416-2</td>
<td>Part no. 201 542-2</td>
<td>Part no. 400 533</td>
<td>Part no. 401 032</td>
</tr>
<tr>
<td>Weight: Approx. 11 g</td>
<td>Weight: Approx. 14 g</td>
<td>Weight: Approx. 10 g</td>
<td>Weight: Approx. 5 g</td>
</tr>
<tr>
<td>Surface pressure: Max. 40 N/mm²</td>
<td>Surface pressure: Max. 40 N/mm²</td>
<td>Surface pressure: Max. 40 N/mm²</td>
<td>Surface pressure: Max. 20 N/mm²</td>
</tr>
<tr>
<td>Fastening torque for M4 screws: 1 Nm</td>
<td>Fastening torque for M4 screws: 1 Nm</td>
<td>Operating temperature: −40...+105 °C (−40...+221 °F)</td>
<td>Operating temperature: −40...+105 °C (−40...+221 °F)</td>
</tr>
</tbody>
</table>

Cable connectors*

<table>
<thead>
<tr>
<th>M12 A-coded female connector (4 pin/5 pin), straight</th>
<th>M12 A-coded female connector (5 pin), angled</th>
<th>M12 A-coded male connector (5 pin), straight</th>
<th>M12 A-coded T connector (5 pin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part no. 370 677</td>
<td>Part no. 370 678</td>
<td>Part no. 561 665</td>
<td>Part no. 370 691</td>
</tr>
<tr>
<td>Termination: Screw</td>
<td>Termination: Screw</td>
<td>Termination: Screw</td>
<td>2 × female connector</td>
</tr>
<tr>
<td>Contact insert: CuZn</td>
<td>Contact insert: CuZn</td>
<td>Contact insert: CuZn</td>
<td>1 × male connector</td>
</tr>
<tr>
<td>Cable Ø: 4...8 mm (0.16...0.31 in.)</td>
<td>Cable Ø: 5...8 mm (0.2...0.31 in.)</td>
<td>Cable Ø: 4...8 mm (0.16...0.31 in.)</td>
<td>Feature: Shielded</td>
</tr>
<tr>
<td>Wire: 1.5 mm²</td>
<td>Wire: 0.75 mm² (18 AWG)</td>
<td>Wire: 1.5 mm²</td>
<td>Ingress protection: IP67 (correctly fitted)</td>
</tr>
<tr>
<td>Operating temperature: −30...+85 °C (−22...+185 °F)</td>
<td>Operating temperature: −25...+85 °C (−13...+121 °F)</td>
<td>Operating temperature: −30...+85 °C (−22...+185 °F)</td>
<td>Ingress protection: IP67 (correctly fitted)</td>
</tr>
<tr>
<td>Ingress protection: IP67 (correctly fitted)</td>
<td>Ingress protection: IP67 (correctly fitted)</td>
<td>Ingress protection: IP67 (correctly fitted)</td>
<td></td>
</tr>
<tr>
<td>Fastening torque: 0.6 Nm</td>
<td>Fastening torque: 0.4 Nm</td>
<td>Fastening torque: 0.6 Nm</td>
<td></td>
</tr>
</tbody>
</table>

Connection accessory

Passive M12 A-coded male bus terminator (5 pin)
Part no. 370 700

<table>
<thead>
<tr>
<th>Material: PUR</th>
<th>Termination: Screw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact insert: Au</td>
<td></td>
</tr>
<tr>
<td>Operating temperature: −25...+85 °C (−13...+121 °F)</td>
<td></td>
</tr>
<tr>
<td>Ingress protection: IP68 (correctly fitted)</td>
<td></td>
</tr>
</tbody>
</table>

* Follow the manufacturer’s mounting instructions
Controlling design dimensions are in millimeters and measurements in ( ) are in inches
ORDER CODE

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| a | b | c | d | e | f | g |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|   |   | E | H |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

a  Sensor model
E  Rod

b  Design
EH rod-style sensor with housing material 1.4305 (AISI 303) and rod material 1.4301 (AISI 304)
K  Threaded flange M18×1.5-6g, rod Ø 7 mm
L  Threaded flange ¾”-16 UNF-3A, rod Ø 7 mm
EH rod-style sensor with housing material 1.4305 (AISI 303) and rod material 1.4306 (AISI 304L)
M  Threaded flange M18×1.5-6g, rod Ø 10 mm
S  Threaded flange ¾”-16 UNF-3A, rod Ø 10 mm
EH rod-style sensor with housing material 1.4404 (AISI 316L) and rod material 1.4404 (AISI 316L)
F  Threaded flange ¾”-16 UNF-3A, rod Ø 10 mm
W  Threaded flange M18×1.5-6g, rod Ø 10 mm

c  Stroke length
X  X  X  M  0050…2540 mm
Standard stroke length (mm)   Ordering steps
50… 500 mm  5 mm
500… 750 mm  10 mm
750…1000 mm  25 mm
1000…2540 mm  50 mm
X  X  X  X  U  001.0…100.0 in.
Standard stroke length (in.)   Ordering steps
1… 20 in.  0.2 in.
20… 30 in.  0.4 in.
30… 40 in.  1.0 in.
40…100 in.  2.0 in.
Non-standard stroke lengths are available; must be encoded in 5 mm/0.1 in. increments.

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

e  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
Z 0 2 2 magnets

NOTICE
• Specify magnet numbers for your sensing application and order separately.
• Use magnets of the same type for differential measurement, e.g. 2 × U-magnet (part no. 251 416-2).

DELIVERY

• Sensor
• O-ring

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