Data Sheet

C-Series Off-Highway
Magnetostrictive Linear Position Sensors

- 4…20 mA output for mobile hydraulic standards
- Rugged design for off-highway applications
- Stroke length up to 275 mm
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.

C-SERIES SENSOR

The Temposonics® C-Series is the smallest sensor series on the market that offers all the advantages of magnetostrictive measurement technology. The C-Series mobile sensor is designed for battery powered off-highway applications found on mobile paving machines, agricultural equipment, watercraft, recreational vehicles, and others. It is ideal for measuring small cylinder strokes that are restricted by size and weight. Due to the contact-free measuring principle, the sensor is completely wear-free and does not have to be readjusted again.
## TECHNICAL DATA

### Output
- Analog: 4…20 mA
- Measured variable: Position

### Measurement parameters
- Resolution: < 0.3 mm
- Linearity: 0.5 mm
- Zero tolerance: ±1 mm
- Hysteresis: < 0.3 mm
- Repeatability: < 0.3 mm
- Update time: 500 Hz (2 ms)

### Operating conditions
- Storage temperature: -20…+85 °C
- Operating temperature standard: -40…+85 °C
- Ingress Protection: IP30
- Shock test: Survival test with pressure pipe:
  - IEC 60068-2-27, 100 g (6 ms) single shock per axis; IEC 60068-2-29, 50 g (11 ms) at 1000 shocks per axis
- Vibration test: Survival random vibration test with pressure pipe:
  - IEC 60068-2-64 15 g RMS 20…2000 Hz 12 h per axis
  - Operational sine vibration test with pressure pipe:
  - IEC 60068-2-6 (5…2000 Hz) 25 g (10 mm) 6 sweeps per axis
- EMC test: Compliant with:
  - ISO 13766-1:2018
  - EN ISO 14982:2009
  - EN 13309:2010
  - ISO 16750-2:2012
- EMI: Tested with bare sensor and unshielded harness:
  - 200 V/m (ISO 11452-2: 2019 200…2000 MHz)
  - 200 mA (ISO 11452-4: 2011 20…200 MHz)
- Pressure: Up to 300 bar according DIN EN ISO 19879 (with optional pressure pipe)

### Design
- Screw mounting: User determined, provisions for two M3 screws, 37 mm or longer (knock out of plastic seal barriers required)
- Stroke length: 72, 109, 128, 148, 162, 186, 194, 217, 250, 275 mm

### Electrical connection
- Operating voltage: 12/24 VDC (8…32 VDC)
- Power consumption: Max. 1 W
- Overvoltage protection (VDC-GND): Up to +36 VDC
- Polarity protection (GND-VDC): Up to –36 VDC
TECHNICAL DRAWING

Sensor

Null zone
16.7
Stroke length
72…275
Dead zone
22.7

Sensor assembled with pressure pipe E2

Null zone
16.7
Stroke length
72…275
Dead zone
33

Controlling design dimensions are in millimeters

Fig. 3: Tempsonics® C-Series sensor

CONNECTOR WIRING

<table>
<thead>
<tr>
<th>Connector Pin</th>
<th>Function</th>
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<tbody>
<tr>
<td>1</td>
<td>DC Ground</td>
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<tr>
<td>2</td>
<td>Signal</td>
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<tr>
<td>3</td>
<td>VDC</td>
</tr>
<tr>
<td>4</td>
<td>not connected</td>
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Fig. 4: Connector wiring
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<td></td>
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</table>

### a. Type
- **C**: C-Series Off-Highway

### b. Operating voltage
- **T**: 12/24 VDC

### c. Stroke length
- 0 7 2: 72 mm
- 1 0 9: 109 mm
- 1 2 8: 128 mm
- 1 4 8: 148 mm
- 1 6 2: 162 mm
- 1 8 6: 186 mm
- 1 9 4: 194 mm
- 2 1 7: 217 mm
- 2 5 0: 250 mm
- 2 7 5: 275 mm

### d. Connection type
- **A**: Standard (Integrated Connector)

### e. Output
- **A**: 4…20 mA

### f. Housing Type
- **S 1**: Sensor only
- **E 2**: Sensor assembled with pressure pipe

## DELIVERY

- • Position sensor

  Accessories have to be ordered separately
FREQUENTLY ORDERED ACCESSORIES

Position magnets

<table>
<thead>
<tr>
<th>Ring magnet OD9</th>
<th>Ring magnet OD28</th>
<th>Ring magnet OD20</th>
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</thead>
<tbody>
<tr>
<td>Part no. 401 842</td>
<td>Part no. 400 424</td>
<td>Part no. 254 812</td>
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<tr>
<td>Material: Strontium ferrite compound nylon 12</td>
<td>Material: Composite PA ferrite GF20</td>
<td>Material: Composite neobonded</td>
</tr>
<tr>
<td>Weight: ca. 1 g</td>
<td>Weight: Approx. 6 g</td>
<td>Weight: Approx. 8.5 g</td>
</tr>
<tr>
<td>Operating temperature: −40…+85 °C (−40…+185 °F)</td>
<td>Operating temperature: −40…+100 °C (−40…+212 °F)</td>
<td>Operating temperature: −40…+75 °C (−40…+167 °F)</td>
</tr>
</tbody>
</table>

Ring magnet OD9

- Ø 9
- Ø 6.5

Ring magnet OD28

- Ø 28
- Ø 19.3
- 4.7

Ring magnet OD20

- Ø 20
- Ø 13.5
- 10.5

Material: Composite PA ferrite GF20

- Weight: Approx. 6 g
- Surface pressure: Max. 20 N/mm²
- Operating temperature: −40…+100 °C (−40…+212 °F)

Material: Composite neobonded

- Weight: Approx. 8.5 g
- Surface pressure: Max. 20 N/mm²
- Operating temperature: −40…+75 °C (−40…+167 °F)

Cable Flange

C-Series Sensor to M12 connector

- Part no. 201 989-1 (50 mm)
- Part no. 201 989-2 (75 mm)
- Part no. 201 989-3 (100 mm)
- Part no. 201 989-4 (150 mm)

Material flange: Brass nickel-plated

Material O-ring: 13×1.6 NBR70

Wiring

<table>
<thead>
<tr>
<th>Pin</th>
<th>M12 male connector (4 pin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VDC</td>
</tr>
<tr>
<td>2</td>
<td>not connected</td>
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<tr>
<td>3</td>
<td>DC Ground</td>
</tr>
<tr>
<td>4</td>
<td>Signal</td>
</tr>
</tbody>
</table>

Controlling design dimensions are in millimeters
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