**R-Series**
DeviceNet

**Temposonics RP and RH**
Measuring length 25 - 7600 mm

Temposonics® Magnetostrictive Position Sensors

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**Magnetostriction**

The absolute Temposonics® linear position sensors are based on the MTS developed magnetostrictive measurement principle. That combines various magneto-mechanical effects and uses the physical high precise speed-measurement of an ultrasonic wave (torsion pulse in its sensor element) for position detecting. Sensor integrated signal processing transforms the measurements directly into market standard outputs. The contactless principle - an external movable magnet marks the position - eliminates the wear, noise and erroneous signal problems and guarantees the best durability without any recalibration.

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**Intelligent Design**

- Rugged Industrial Sensor
- Linear and Absolute Measurement
- LEDs for Sensor Diagnostic
- Contactless Sensing with Highest Durability
- Superior Accuracy: Resolution up to 2 µm
- Linearity better 0.01 %
- Repeatability 0.001 %
- Sensor-based intelligence
- Direct DeviceNet Output

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The extremely robust sensor, ideal for continuous operation under harshest industrial conditions is completely modular in mechanic and electronic design.
- A profile or rod-shaped sensor housing protects the sensing element in which gives rise to the measurement signal.
- The sensor head accommodates the complete modular electronic interface with active signal conditioning.
- Double encapsulation ensures high operating safety and optimum EMC protection.

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**Magnetostriiction**

<table>
<thead>
<tr>
<th>Magnetic Force</th>
<th>Form factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output signal proportional to magnet position</td>
<td></td>
</tr>
</tbody>
</table>

**Displacement - Time**

- Position magnet
- Sensor element
- Signal converter

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**ISO 9001 Certified**

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US
**Temposonics-RP+RH**

*DeviceNet*

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### New...a sensor diagnostic display

Bi-color LEDs in the cover of sensor electronics head inform on the actual sensor condition and the DeviceNet communication.

<table>
<thead>
<tr>
<th>Network Status LED</th>
<th>Module Status LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Green flashing</td>
<td>Normal function</td>
</tr>
<tr>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Red flashing</td>
<td>No Magnet</td>
</tr>
</tbody>
</table>

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### CAN Bus Interface

Temposonics position sensors fulfill - as slave devices - all requirements of the CAN-Bus (ISO 11898). The sensors electronics convert the displacement measurements into bus oriented outputs and transfer these data directly to the control unit. The bus interface is appropriate for serial data transfer of 500 Mbit/s maximum. Sensor integrated software supports the DeviceNet protocol for a comprehensive customized configuration of the sensor-bus system.

**DeviceNet Protocol**

The DeviceNet Data Protocol of Tempsonics Sensors for standard 1-magnet-measurement always includes following applications data:

- **Position**
- **Error detection**
- **Polling & Bit-strobe communications modes**

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**Plug and Play**

makes the installation of the Temposonics position sensor with DeviceNet interface quick and easy. After initial system configuration, the user is not required to have extensive knowledge concerning network timing and sensor technology. Each sensor is provided with an Electronic Data Sheet EDS, an operation manual and a detailed Statement of Conformance. All sensor specific parameters are installed into the network using the ESD file.

A PC programming tool, such as DeviceNet Manager offered by Rockwell, is used to set the node identifier and baud rate. The Statement of Conformance contains the network regulations defined and recommended by the Open DeviceNet Vendor Association (ODVA), that the DeviceNet specifications. Temposonics sensors with DeviceNet output can be directly connected to a DeviceNet Bus.
Technical Data

**Input**

<table>
<thead>
<tr>
<th>Measured variables</th>
<th>Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>Profile 25 - 5000 mm / Rod 25 - 7600 mm</td>
</tr>
</tbody>
</table>

**Output**

<table>
<thead>
<tr>
<th>Interface</th>
<th>CAN-Fieldbus System ISO 11898</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data protocol</td>
<td>DeviceNet Release 2.0</td>
</tr>
<tr>
<td>Baud rate, kBit/s</td>
<td>500 250 125</td>
</tr>
<tr>
<td>Cable length, m</td>
<td>&lt; 100 &lt; 250 &lt; 500</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>up to 36 VDC</td>
</tr>
</tbody>
</table>

The sensor will be supplied with ordered baud rate, which is changeable by customer

**Accuracy**

| Resolution | - Displacement 5 µm 2 µm |
| Update time | 0,5 ms up to 1200 mm / 1,0 ms up to 2400 / 2,0 ms up to 4800 / 4,0 ms up to 7600 mm stroke length |
| Lineararity | < ± 0,01 % F.S. (Minimum ± 0,40 µm), independent of outside temperatures |
| Repeatability | < ± 0,001 % F.S. (Minimum ± 2,5 µm) |
| Temperature coefficient | < 15 ppm/°C |
| Hysteresis | < 4 µm |

**Operating conditions**

| Magnet speed | Any |
| Operating temperature | -40 °C ... +75 °C |
| Dew point, humidity | 90% rel. humidity, no condensation |
| Protection 1 | Profile style: IP65 / Rod style: IP67, IP68 for cable outlet |
| Shock test | 100 g, single hit, IEC-Standard 68-2-27 |
| Vibration test | 15g / 10 - 2000 Hz, IEC-Standard 68-2-6 |
| Standards, EMC test | Electromagnetic emission EN 50081-1, Electromagnetic immunity EN 50082-2, EN 61000-4-2/3/4/5, Level 3/4, Criterion A, CE-qualified |

**Form factor, material**

| Diagnostic display | LEDs beside connector |
| Profile model: | |
| Sensor head | Aluminum |
| Sensor stroke | Aluminum |
| Position magnet | Magnet slider or removable U-magnet |
| Rod model: | |
| Sensor head | Aluminum |
| Rod with flange | Stainless steel 1.4301 / AISI 304 |
| -Pressure rating | 350 bar, 700 bar peak |
| Position magnet | Ring magnets, U-magnets |

**Installation**

| Mounting position | Any orientation |
| Profile | Movable mounting clamps or T-slot nuts M5 in base channel |
| U-Magnet, removable | Mounting plate and screws from antimagnetical material |
| Rod | Threaded flange M18 x 1,5 or 3/4" -16 UNF-3A, Hex nut M18 |
| Position magnet | Mounting plate and screws from antimagnetical material |

**Electrical connection**

| Connection type | 5 pin DeviceNet connector M12x1 |
| Input 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. |
| - Polarity protection | up to -30 VDC |
| - Overvoltage protection | up to 36 VDC |
| Current drain | 90 mA typical |
| Ripple | < 1 % S-S |
| Electric strength | 500 V (DC ground to machine ground) |

**Linearity protocol**

![Linearity protocol graph]

| Temposonics-RP, stroke 2500 mm |
| Tolerance allowed: ± 0,25 mm |
| Tolerance measured: ± 0,116 mm |

1 The IP rating is not part of the UL recognition
Selection of position magnets (on delivery)

- **Magnet slider S**
  - Part No. 252 182
  - GFK, Magnet Hardferrite
  - Ball joint CuZn39Pb3 nickel plated
  - Weight: ca. 30 g
  - Operating temperature: -40 ... +75°C

- **Magnet slider V**
  - Part No. 252 184
  - GFK, Magnet Hardferrite
  - Ball joint CuZn39Pb3 nickel plated
  - Weight: ca. 30 g
  - Operating temperature: -40 ... +75°C

- **U-Magnet MD33**
  - Part No. 251 416-2
  - Composite Pk-Ferrite-GF20
  - Weight: ca. 11 g
  - Operating temperature: -40 ... +100°C
  - Surface pressure max. 90 N/mm²
  - Fastening Torque for M4 screws max. 1 Nm

Stable Profile Design

Temposonics-RP offers modular construction, flexible mounting configurations and easy installation. Position measurement is contactless via two versions of permanent magnets.

- A sliding magnet running in profile housing rails. Connection with the mobile machine part is via a ball jointed arm to taking up axial forces.
- A floating magnet, mounted directly on the moving machine part, travels over the profile at a low distance. Its air-gap allows the correction of small misalignments at installation.

Connection types

- **Connector outlet D51**
  - 5 pin male receptacle M12x1

All measurements in mm
Temposonics-RP+RH
DeviceNet

**High Pressure Rod Design**

Temposonics-RH with a pressure-resistant stainless steel flange and sensing rod is suitable for use in hydraulic cylinders and externally in all applications where space is a problem. Position measurement is via ring or U-magnets travelling along the sensing rod without any mechanical contact.

**Advantage...**

the completely operable sensor cartridge can be replaced for servicing easily without opening the fluid circuit.

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**Selection of position magnets** (not on delivery)

- **Ring magnet OD33**
  - Part No. 201 542-2
  - Composite PA-Ferrite-GF20
  - Weight ca. 14g
  - Operating temperature: -40 ... +100°C
  - Surface pressure max. 40 N/mm²
  - Fastening Torque for M4 screws max. 1 Nm

- **U-magnet M OD33**
  - Part No. 251 416-2
  - Composite PA-Ferrite-GF20
  - Weight ca. 11g
  - Operating temperature: -40 ... +100°C
  - Surface pressure max. 40 N/mm²
  - Fastening Torque for M4 screws max. 1 Nm

- **Ring magnet OD25.4**
  - Part No. 400 533
  - Composite: PA-Ferrite
  - Weight ca. 10g
  - Operating temperature: -40 ... +100°C
  - Surface pressure max. 40 N/mm²
Flexible installation in any position

Profile model
Normally, the sensor is firmly installed - fixed on a straight surface of the machine with movable mounting clamps or M5 screws in base channel - whilst the magnet is mounted at the mobile machine part.

Rod model
Mount the sensor via flange thread or a hex nut. If possible, non-magnetizable material should be used for mounting support (dimensions as shown). With horizontal mounting, longer sensors (from 1 meter) must be provided with mechanical support.

Hydraulic sealing
Recommended is sealing of the flange facing with O-Ring (e.g. 22.4 x 2.65) in a cylinder cover nut or an O-Ring 15.3 x 2.2 in undercut.

Minimum assembly distance

Hydraulic sealing

Recommended hydraulic sealing

Alternatives sealing
O-Ring 15.3 x 2.2

Cylinder installation

When used for direct stroke measurement in fluid cylinders, the sensor’s high pressure, stainless steel rod installs into a bore in the piston head/rod assembly as illustrated. That guarantees a long life and trouble-free operation - independent of used hydraulic fluid.

The sensor cartridge can be removed from the flange and rod housing while still installed in the cylinder. This procedure allows quick and easy sensor cartridge replacement, without the loss of hydraulic pressure.

<table>
<thead>
<tr>
<th>Wiring</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 shield</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 +24 VDC (+20% / -15%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 DC Ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 CAN (+)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 CAN (-)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Connector plug (recommended, not on delivery)

5 pol. female connector M12x1
DeviceNet “Micro”
Part No. 370 618

Notice!
DeviceNet cable specification:
Thin cable, Table B.3 - B.6
e.g. Belden YR 399 39E 349 72

5 pol. female connector M12x1
DeviceNet “Micro”
insert adjustable in 90° positions
Part No. 370 619
Temposonics

**Sensor model**
- **RP** - Profile
- **RH** - Rod

**Form factor**
- **Profile Temposonics-RP:**
  - **S** - Magnet slider, joint to top
  - **V** - Magnet slider, joint at front
  - **M** - U-Magnet, OD33

- **Rod Temposonics-RH:**
  - **M** - Flange M18 x 1.5 (Standard)
  - **V** - Flange M18 x 1.5 (Fluorelastomer housing-seal)
  - **S** - Flange 3/4" - 16 UNF - 3A

**Measuring length**
- **Profile** - 0025...5000 mm
- **Rod** - 0025...7600 mm

Standard: up to 1000 in 50 mm, greater 1000 in 250 mm steps
Other length upon request

**Connection type**
- D51 - 5 pin female cable connector M12, DeviceNet Micro

**Input voltage**
- 1 = +24 VDC

**Output**

- [4] Baud rate: 2 = 500 kBit/s  • 3 = 250 kBit/s  •  4 = 125 kBit/s
- [5] Resolution: 1 = 5 µm  •  2 = 2 µm
- [6] Type: 1 = Standard

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**On delivery Profile model**:
Sensor, Position magnet, 2 mounting clamps up to 1250 mm + 1 clamp for every additional 500 mm.

**On delivery Rod model**:
Sensor, hex nut, pls. order magnet (see below) separately.

**CANopen only**: Installation guide + CD-ROM (Electronic Data Sheet)

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**Accessories (selection)**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>252 182</td>
<td>Magnet slider type «S»</td>
</tr>
<tr>
<td>252 184</td>
<td>Magnet slider type «V»</td>
</tr>
<tr>
<td>251 416-2</td>
<td>U-Magnet OD33, corresponding type «M»</td>
</tr>
<tr>
<td>201 542-2</td>
<td>Ring magnet OD33, Standard</td>
</tr>
<tr>
<td>400 533</td>
<td>Ring magnet OD25,4</td>
</tr>
<tr>
<td>401 133</td>
<td>O-Ring 15,3 x 2.2 Fluorelastomer FPM 75</td>
</tr>
<tr>
<td>400 802</td>
<td>Mounting clamp</td>
</tr>
<tr>
<td>401 602</td>
<td>T-slot nut M5 for base channel mounting</td>
</tr>
<tr>
<td>370 618</td>
<td>5 pin female cable connector M12 DeviceNet Micro</td>
</tr>
<tr>
<td>370 619</td>
<td>5 pin 90°-female cable connector M12 DeviceNet Micro</td>
</tr>
</tbody>
</table>