Temposonics®
Absolute, Non-Contact Position Sensors

Data Sheet
R-Series EtherCAT®

Temposonics® RP and RH
Stroke length 25…7600 mm

- Rugged industrial sensor
- Linear and absolute measurement
- LEDs for sensor diagnostics
- Non-contact sensing with highest durability
- Superior accuracy: Linearity better 0.01 % F. S.
- Resolution 1 μm
- Repeatability 0.001 % F. S.
- Direct EtherCAT output
- Position + velocity with 5 magnets
- Positions with up to 20 magnets

Advanced communication
...offers multi-position measurement

Discontinued

EtherCAT® is a registered trademark and patented technology licensed by Beckhoff Automation GmbH, Germany.
R-Series EtherCAT

Sensor diagnostic display
Integrated LEDs (green/red) provide basic visual feedback for normal sensor operation and troubleshooting.

<table>
<thead>
<tr>
<th>Green</th>
<th>Red</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flashing</td>
<td>OFF</td>
<td>Normal function</td>
</tr>
<tr>
<td>Flashing</td>
<td>ON</td>
<td>Magnet not detected or Wrong quantity of magnets</td>
</tr>
</tbody>
</table>

Further diagnostic features programmable.

Operation mode
There are two versions available:

**E101** 1 - 5 magnet measurement
Measuring in parallel the position and velocities of up to 5 magnets.
The data telegram contains from each magnet:
- Position (32 bit)
- Velocity (32 bit)
- Long status information (16 bit)

**E102** 1 - 20 multi-magnet measurement
Measuring in parallel the positions of up to 20 magnets.
The data telegram contains from each magnet:
- Position (32 bit)
- Velocity (32 bit)
- Long status information (16 bit)

Characteristics of the EtherCAT® sensor

**Sensor's output**
- Position as an absolute value
- Velocity and direction of the drive
- Diagnostics (Status information)
- Error status (e.g. of magnet)

The EtherCAT® Interface
The sensor fulfills the requirements of the EtherCAT field-bus and can be connected as a slave to this bus system. EtherCAT is an open field-bus system which is based on the EtherNet technology (IEEE 802.3) with a high data rate, short response time and a good real-time performance, it is standardized in the IEC/PAS 62407 and it is part of the ISO 15745-4. The integration in the IEC 61158, IEC 61784 and IEC 61800-7 is in the way.

It is very easy to implement the Temposonics® sensor with the EtherCAT interface into an EtherCAT field-bus system. The System-Manager (e.g. TwinCAT from Beckoff) gets all the parameters of the sensor from the XML-file, which part of the delivery. There are no settings on the sensor. The measurement can be synchronized by the PLC, by switching the sensor to the “distributed clock mode” (1 - 5 magnets only).
## Technical Data

### Input

<table>
<thead>
<tr>
<th>Measured value</th>
<th>Position / Velocity 1 - 5 magnet measurement option 1 - 20 magnet measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke length</td>
<td>Profile 25…5000 mm / Rod 25…7600 mm</td>
</tr>
</tbody>
</table>

### Output

<table>
<thead>
<tr>
<th>Output signal</th>
<th>EtherCAT Ethernet Control Automation Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data format</td>
<td>EtherCAT 100 Base-Tx, Fast Ethernet</td>
</tr>
<tr>
<td>Data transmission rate</td>
<td>100 MBit/s max.</td>
</tr>
</tbody>
</table>

### Accuracy

#### Resolution

- **Position**: 1…1000 μm selectable
- **Speed**: 1 μm/s (Quality rating) adjustable according to velocity and stroke length

**Linearity**

- Option internal linearization
- **Linearity tolerance**:
  - RP/RH: < 300 mm: typ. ± 15 μm, max. ± 25 μm, > 300…600 mm: typ. ± 20 μm, max. ± 30 μm
  - > 600…1200 mm: typ. ± 30 μm, max. ± 50 μm
  - 1200…3000 mm: typ. ± 45 μm, max. ± 90 μm, 3…5 m: typ. ± 85 μm, max. ± 150 μm

#### Repeatability

- Option internal linearization
- **Repeatability**: < ± 0.001 % F.S. (Minimum ± 2.5 μm)

#### Cycle time

- **Cycle time**: Stroke length dependent

#### Data transmission rate

- **Data transmission rate**: ≤ 10 kHz (oversampling is active while the scanning cycle is shorter than the measuring cycle.)

#### Temperature coefficient

- **Temperature coefficient**: < 15 ppm/°C

#### Ripple

- **Ripple**: < 5 μm

#### Hysteresis

- **Hysteresis**: < 4 μm

### Operating conditions

- **Magnet speed**: any
- **Operating temperature**: -40 °C…+75 °C
- **Dew point, humidity**: 90 % rel. humidity, no condensation
- **Ingress protection**:
  - Profile: IP65, Rod: IP67, if mating connector is correctly fitted, RS: IP69K
- **Shock test**: 100 g single hit, IEC-Standard 60068-2-27
- **Vibration test**: 15g / 10 - 2000 Hz, IEC-Standard 60068-2-6
- **Electromagnetic emission EN 61000-6-4**
- **Electromagnetic immunity EN 61000-6-2**
- **Standards, EMC test**: EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified

### Design, Material

#### Diagnostic display

- **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) for hydraulic rod
- **Position magnet**: Ring magnets, U-magnets

### Installation

#### Mounting position

- **Mounting position**: any orientation

#### Profile

- **Profile**: Movable mounting clamps or T-slot nuts M5 in base channel

#### U-magnet, removable

- **U-magnet, removable**: Mounting plate and screws from antimagnetical material

#### Rod

- **Rod**: Threaded flange M18 x 1.5 or ¾” -16 UNF-3A, Hex nut M18

#### Position magnet

- **Position magnet**: Mounting plate and screws from antimagnetical material

### Electrical connection

#### Connection type

- **Connection type**: 2 x 4 pin connector M12-D

#### Supply voltage

- **Supply 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

- **Polarity protection**: up to -30 VDC

#### Overvoltage protection

- **Overvoltage protection**: up to 36 VDC

#### Current drain

- **Current drain**: 80 mA typical

#### Ripple

- **Ripple**: ≤ 0.28 Vpp

#### Electric strength

- **Electric strength**: 500 VDC (DC ground to machine ground)

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1 The IP rating is not part of the UL recognition
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.

+24 VDC (-15 / +20 %)

Standard position magnet included in delivery (see chapter accessories)

Connection types
- Cable connector (part no. 530 066)
- Cable connector (part no. 530 064)
- 4 pin Bus cable connector (part no. 370 523)

All dimensions in mm
High pressure rod design

Tempsonics® RH with a pressureresistant 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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**Standard position magnets** (not included in delivery, please order separately)

<table>
<thead>
<tr>
<th>Magnet Type</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring OD33</td>
<td>201 542-2</td>
<td>Composite PA-Ferrite-GF20&lt;br&gt;Weight ca. 14 g&lt;br&gt;Operating temperature: -40...+100 °C&lt;br&gt;Surface pressure max. 40 N/mm²&lt;br&gt;Fastening torque for M4 screws max. 1 Nm</td>
</tr>
<tr>
<td>U-magnet OD33</td>
<td>251 416-2</td>
<td>PA-Ferrite-GF20&lt;br&gt;Weight ca. 11 g&lt;br&gt;Operating temperature: -40...+100 °C&lt;br&gt;Surface pressure max. 40 N/mm²&lt;br&gt;Fastening torque for M4 screws max. 1 Nm</td>
</tr>
</tbody>
</table>

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All dimensions in mm
Tempsonics®

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

**Design**

**Profile Tempsonics® RP:**
- **S** - Magnet slider, joint at top
- **V** - Magnet slider, joint at front
- **G** - Magnet slider, joint at top, backlash free
- **M** - U-magnet, OD33

**Rod Tempsonics® RH:**
- **M** - Flange M18 x 1.5 (Standard)
- **V** - Flange M18 x 1.5 (Fluorelastomer housing-seal)
- **D** - Flange M18 x 1.5 with bushing on rod end
- **R** - Flange M18 x 1.5 with thread M4 at rod end
- **J** - Flange M22 x 1.5, rod Ø 12.7 mm, 800 bar
- **S** - Flange ¾” - 16 UNF - 3A

**Stroke length**

**Profile - 0025…5000 mm**
**Rod - 0025…7600 mm**

Standard: See chart
Other length upon request.

**Connection type**

D56 - 2 x 4 pin female receptacle M12-D, 1 x 4 pin male receptacle M8

**Supply voltage**

T - +24VDC
A - +24 VDC, high vibration resistant (stroke length 25…2000 mm)

**Output**

E 101 - EtherCAT, Single- and multi-position measurement, 1 - 5 positions and velocity distributed clock mode selectable
E 102 - EtherCAT, Single- and multi-position measurement, 1 - 20 positions and velocity
E 103 - EtherCAT, Single-position measurement, position and velocity, internal linearization

**Magnet number for Multi-Position measurement**

Z02 - Z20 = 2 - 20 pcs

*Note: Please specify magnet numbers for your sensing application and order separately

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**Included in delivery profile model:**
Sensor, magnet slider or U-magnet, 2 mounting clamps up to 1250 mm stroke + 1 clamp for every additional 500 mm.
Installation guide + CD-ROM (XML-File).

**Included in delivery rod model:**
Magnets must be ordered separately. Use signed magnets for sensors w/LCO

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**Stroke Length Standard RP**

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>Ordering steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 500 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>500…2500 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>2500…5000 mm</td>
<td>100 mm</td>
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**Stroke Length Standard RH**

<table>
<thead>
<tr>
<th>Stroke length</th>
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<tr>
<td>&lt; 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…2500 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>2500…5000 mm</td>
<td>100 mm</td>
</tr>
<tr>
<td>&gt; 5000 mm</td>
<td>250 mm</td>
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Accessories page 67 and following.
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<th>Email Address</th>
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<tr>
<td>UNITED STATES</td>
<td>Americas &amp; APAC Region</td>
<td>3001 Sheldon Drive, Cary, N.C. 27513</td>
<td>+1 919 677-0100</td>
<td><a href="mailto:info.us@temposonics.com">info.us@temposonics.com</a></td>
</tr>
<tr>
<td>GERMANY</td>
<td>EMEA Region &amp; India</td>
<td>Auf dem Schüffel 9, 58513 Lüdenscheid</td>
<td>+49 2351 9587-0</td>
<td><a href="mailto:info.de@temposonics.com">info.de@temposonics.com</a></td>
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<td>ITALY</td>
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<td>Phone: +39 030 988 3819</td>
<td>E-mail: <a href="mailto:info.it@temposonics.com">info.it@temposonics.com</a></td>
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<tr>
<td>SCANDINAVIA</td>
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</tbody>
</table>

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