Temposonics® RD4

Absolute, Non-Contact Position Sensors

Data Sheet
R-Series Rod Model RD4

Temposonics® RD4
Stroke length 25...5000 mm

Compact sensor for hydraulic cylinders and machine manufacturing

- Rugged industrial sensor
- Linear and absolute measurement
- LEDs for sensor diagnostics
- Non-contact sensing with highest durability
- Superior accuracy: Linearity better 0.02 % F.S.
- Repeatability 0.001 % F.S.
- Direct output for position and velocity
- Analog / SSI / CANbus / Profinet / EtherCAT / Ethernet/IP™ / Powerlink / Profinet
- Multi-position measurement: max. 20 positions with 1 sensor

Temposonics® RD4 the extremely robust sensor, ideal for continuous operation under harshest industrial conditions is completely modular in mechanic and electronic design. A rod-shaped sensor housing protects the sensing element. The sensor head accommodates the complete modular electronic interface with active signal conditioning. Double encapsulation ensures high operation safety and optimum EMC protection. The position transmitter, a permanent magnet fixed at the mobile machine part, drives contactlessly over the sensor’s stroke and starts measuring through the housing wall.
Temposonics® RD4 sensors were designed for installation into hydraulic cylinders, specifically for use in standard clevis head cylinders or any space limited cylinder application. They consist of:
- The pressure proof stainless steel sensor rod with fitting or threaded flange, which protects the sensing element in which the measurement signal arises. It fits into the bored piston rod.
- The external industrial housing (IP67) which accommodates the modular electronic interface with active signal conditioning. The sensor electronics is connected to the basic-sensor via side or bottom cable entry.

**Technical data**

**Input**

| Measured variables | - Position  
| Stroke length | - Velocity  
|              | - Multi-position measurement max. 20 positions (CANbus, Profibus, EtherCAT, Ethernet/IP™, Powerlink, Profinet)  

| Stroke length | 25…5000 mm  

**Output**

| Interfaces | Analog, SSI, CANbus, Profibus-DP, EtherCAT, Ethernet/IP™, Powerlink, Profinet  

**Accuracy**

| Resolution | Output dependent  
| Linearity | < ± 0.02 % F.S. (Minimum ± 50 µm)² < ±  
| Repeatability | 0.001 % F.S. (Minimum ± 2.5 µm) < 4 µm  
| Hysteresis | Analog: 0.01 % F.S. / Digital: < ± 1 0 µm  

**Operating conditions**

| Magnet speed | Any  
| Operating temperature | -40 °C…+75 °C  
| Dew point, humidity | 90% rel. humidity, no condensation  
| Ingress protection | Sensor electronics IP67  
|                     | (with professional mounted housing and connectors)  
|                     | Measuring rod with connecting cable for side cable entry IP65  
|                     | Measuring rod with single wires and flat connector with bottom cable entry IP30 100 g  
| Shock test | (single shock IEC-Standard 60068-2-27)  
| Vibration test | 10 g / 1 0 - 2000 Hz IEC-Standard 60068-2-6  
| Standards, EMC test² | Electromagnetic emission EN 61000-6-4  
|                     | Electromagnetic immunity EN 61000-6-2  
|                     | EN 61000-4-2/3/4/6, Level 3/4, criterium A  

**Design, material**

| Diagnostic display | LED beside connector  
| Sensor electronics | Aluminum  
| Measuring rod with flange | Stainless steel 1.4301 / AISI 304  
| Operating pressure | 350 bar, (700 bar peak) for hydraulic rod Ring  
| Position magnet | magnets  

**Electrical connection**

| Connection type | Connector or cable outlet (output dependent) 24  
| Supply voltage | VDC (-15 / +20 %)  
| - Polarity protection | up to -30 VDC  
| - Overvoltage protection | up to 36 VDC  
| Current drain | 100 mA typical  
| Ripple | ≤ 0.28 Vpp  
| Electric strength | 500 VDC (DC ground to machine ground)  

¹ For rod style “S” the linearity deviation can be higher in the first 30 mm (1.2 in.) of stroke length
² Measuring rod and connecting cable mounted inside metal housing

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**Info:**

For detailed technical data and electrical connection for the outputs please see data sheets: R-Series Analog, SSI, CANbus, Profibus, EtherCAT, Ethernet/IP™, Powerlink, Profinet
Electronics with side cable entry for the measuring rod

Recommended screws
M6x45 ISO4762

Null position
PUR-cable Ø 6 mm
bend radius > 24 mm
length 250 / 400 / 600 mm

Rod Ø 10

SW23
Fastening torque < 50 Nm

O-ring on delivery
15.3 x 2.2 FPM
contour of bore (ISO 6149-1)

Rod Type S
PUR-cable Ø 6 mm
bend radius > 24 mm

Rod Type M
PUR-cable Ø 6 mm
bend radius > 24 mm

Rod Type C
PUR-cable Ø 6 mm
bend radius > 24 mm

All dimensions in mm

- Magnets must be ordered separately (details see chapter accessories)

*Housing length for Profinet, EtherCAT
**Housing length for EtherNet/IP™, Powerlink and Profinet

Measuring length 25 - 5000 mm
63.5 / 66* * up to 4500 mm
Stroke length

Housing length for Profibus, EtherCAT

Housing length for EtherNet/IP™,
Powerlink and Profinet

* up to 4500 mm
Stroke length

Fastening torque < 50 Nm

All dimensions in mm

Electronics with side cable entry for the measuring rod

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Rod Type C
PUR-cable Ø 6 mm
bend radius > 24 mm

All dimensions in mm

- Magnets must be ordered separately (details see chapter accessories)

*Housing length for Profinet, EtherCAT
**Housing length for EtherNet/IP™, Powerlink and Profinet

Measuring length 25 - 5000 mm
63.5 / 66* * up to 4500 mm
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Housing length for Profibus, EtherCAT

Housing length for EtherNet/IP™,
Powerlink and Profinet

* up to 4500 mm
Stroke length

Fastening torque < 50 Nm

All dimensions in mm
**ATTENTION**

To fulfill the EMC standards for emission and susceptibility require a shielded housing for the interconnection cable. This cable has to be connected to machine ground.

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**Connecting example SSI**

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- **Recommended screw:** M6x45 ISO4762
- **O-ring on delivery:** 20 x 2.65 FPM80
- **Housing length for Profinet, EtherCAT:** 70 / 95° / 119.5°
- **Housing length for EtherNet/IP™, Powerlink and Profinet:** 63.5 / 66°
- **Rod Ø:** 10
- **Thread:** M18x1.5
- **Electronics with bottom cable entry for the measuring rod**

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**All dimensions in mm**
Sensor installation with fitting flange »S«

Cylinder mounting

For installation in hydraulic cylinders, we recommend the sensor system consisting of the rod and the mounting flange, and the B type electronics.

Install the rod using the fit and seal it off by means of the O-ring and the supporting ring. Block the rod using a shoulder screw.

The adaptor plate of the separate electronics housing facilitates mounting on the outside of small cylinders. Advantage of this version: Connection to the measuring rod is via the bottom of the housing. Thus the sensor system is fully encapsulated and protected against external disturbances.

Mounting example fitting flange »S« and sensor electronics with bottom cable entry

When installing the cylinder, please note:
- The position magnet should not grind over the measuring rod.
- The bore in the piston rod is dependent on the hydraulic pressure and the piston’s velocity. The minimum drilling should be 13 mm. Do not exceed the peak pressure.
- The measuring rod should be protected against wear.

Mounting ring manget

Mount the magnetic with the non-magnetic material for entrainment, screws, spacers, etc..

Minimum installation dimensions for magnetizable material

Bore in cylinder Ø 13…17 mm to push single wires with flat connector through.

Selection of position magnets (not included in delivery, please order separately)

Standard position magnet not included in delivery (see chapter accessories)

Position magnets
- Ring magnet OD33, Part No. 201 542-2
- Ring magnet OD25,4, Part No. 400 533
- U-magnet OD33, Part No. 251 416-2

Connection types
Connector or cable outlet output dependent
Mounting example fitting flange "S" and sensor electronics with side cable entry

All dimensions in mm

ATTENTION
To fulfill the EMC standards for emission and susceptibility the electronic housing has to be connected to machine ground.
Sensor installation with fitting flange »M« and »C«

Rod
The sensor’s pipe will be fixed via the threaded flange M18 x 1.5. Mounting should be with non-magnetizable material. If using magnetizable material please necessarily follow the displayed installation dimensions.

Mounting example fitting flange »M«
Sealing results from the provided O-ring 15.3×2.2 mounted in the undercut.

Mounting example fitting flange »C«

Hydraulic sealing
Recommended is a sealing of the flange facing with O-ring (e.g. 21.89 × 2.62) in a cylinder cover nut or an O-ring in undercut.

Cylinder mounting
- The position magnet should not grind over the measuring rod.
- The bore in the piston rod is dependent on the hydraulic pressure and the piston’s velocity. The minimum drilling should be 10 mm. Do not exceed the peak pressure.
- The measuring rod should be protected against wear.
- Pressure sealing is defined by cylinder manufacturer

Detail screwing bore

Position magnet
For accurate position measurement mount the magnet with non-magnetizable fastening material (screws, supports etc.).

Non-magnetizable material

Magnetizable material

All dimensions in mm
Temposonics® RD4

**Sensor rod style**
- **S** – Fitting flange
- **M** – Threaded flange M18 x 1.5, HEX23
- **C** – Threaded flange M18 x 1.5, HEX46

**Integral cable of sensor rod**

For side cable entry:
- **D1** - PUR-cable, length 250 mm
- **D2** - PUR-cable, length 400 mm
- **D3** - PUR-cable, length 600 mm

For bottom cable entry:
- **R2** - Single wires with flat connector, length 65 mm
- **R4** - Single wires with flat connector, length 170 mm
- **R5** - Single wires with flat connector, length 230 mm
- **R6** - Single wires with flat connector, length 350 mm

**Sensor electronics**
- **S** - Side cable entry
- **B** - Bottom cable entry

**Stroke length**
- Flange M, C: 0025…5000 mm
- Flange S: 0025…2540 mm
- Standard: See chart

**Further parameter**

See data sheets R-Series according to the required output Analog / SSI / CANbus / EtherCAT / Ether/Net/IP™ / Powerlink / Profinet

**Magnets and Accessories must be ordered separately.**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring magnet OD33, standard</td>
<td>201 542-2</td>
</tr>
<tr>
<td>U-magnet OD33</td>
<td>251 416-2</td>
</tr>
<tr>
<td>Ring magnet OD 25.4 mm</td>
<td>400 533</td>
</tr>
<tr>
<td>Ring magnet OD 17.4 mm</td>
<td>401 032</td>
</tr>
</tbody>
</table>

Connectors and cables see data sheet R-Series

**Spare parts**

| O-ring 15.3 x 2.2 FPM 75             | 401 133  |
| O-ring 21.89 x 2.62 PFPDM 75        | 560 705  |
| Backup ring                         | 560 629  |
| O-ring 20 x 2.65 FPM 80             | 561 435  |

**Stroke Length Standard RD4**

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>Ordering steps</th>
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</thead>
<tbody>
<tr>
<td>&lt; 500 mm</td>
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<tr>
<td>500…750 mm</td>
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<tr>
<td>750…1000 mm</td>
<td>25 mm</td>
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<tr>
<td>1000…2500 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>&gt; 2500 mm</td>
<td>100 mm</td>
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</tbody>
</table>
UNITED STATES
Temposonics, LLC
Americas & APAC Region
3001 Sheldon Drive
Cary, N.C. 27513
Phone: +1 919 677-0100
E-mail: info.us@temposonics.com

GERMANY
Temposonics
GmbH & Co. KG
EMEA Region & India
Auf dem Schüffel 9
58513 Lüdenscheid
Phone: +49 2351 9587-0
E-mail: info.de@temposonics.com

ITALY
Phone: +39 030 988 3819
Branch Office
E-mail: info.it@temposonics.com

FRANCE
Phone: +33 6 14 060 728
Branch Office
E-mail: info.fr@temposonics.com

UK
Phone: +44 79 44 15 03 00
Branch Office
E-mail: info.uk@temposonics.com

SCANDINAVIA
Phone: +46 70 29 91 281
Branch Office
E-mail: info.sca@temposonics.com

CHINA
Phone: +86 21 2415 1000 / 2415 1001
Branch Office
E-mail: info.cn@temposonics.com

JAPAN
Phone: +81 3 6416 1063
Branch Office
E-mail: info.jp@temposonics.com

temposonics.com

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