Temposonics®
Magnetostrictive Linear Position Sensors

RT4 SSI
Data Sheet

- Redundant SSI output
- High temperature rod
- IP68 ingress protection
MEASURING TECHNOLOGY

For position measurement, the absolute, linear Temposonics® position sensors make use of the properties offered by the specially designed magnetostrictive waveguide. Inside the sensor a torsional strain pulse is induced in the waveguide by momentary interaction of two magnetic fields. The interaction between these two magnetic fields produces a strain pulse, which is detected by the electronics at the head of the sensor. One field is produced by a moving position magnet, which travels along the sensor rod with the waveguide inside. The other field is generated by a current pulse applied to the waveguide. The position of the moving magnet is determined precisely by measuring the time elapsed between the application of the current pulse and the arrival of the strain pulse at the sensor electronics housing. The result is a reliable position measurement with high accuracy and repeatability.

RT4 SENSOR

Robust, non-contact and wear-free, the Temposonics® linear position sensors provide best durability and accurate position measurement solutions in harsh industrial environments. Designed for demanding applications that require redundancy and detached electronics due to high temperature or high reliability requirements. The position measurement accuracy is tightly controlled by the quality of the waveguide which is manufactured by Temposonics. The position magnet is mounted on the moving machine part and travels contactlessly over the sensor rod with the built-in waveguide.

RT4 sensor specifications:
- Redundant R-series detached electronics for enhanced safety applications
- High temperature rod (up to +100 °C)
- Detached electronics up to 600 mm from sensor rod
- IP68 ingress protection
- Linear, absolute measurement
- Non-contact sensing technology
- Linearity deviation less than 0.02 %
- Direct 24/25/26 bit SSI output, gray/binary formats
- LEDs for sensor status and diagnostics

Applications:
- Steel, wood, power generation, fluid power
**TECHNICAL DATA**

**Output**

- **Interface**: SSI (Synchronous Serial Interface) - differential signal in SSI standard (RS 422)
- **Data protocol**: Binary or Gray, optional: parity and error bit
- **Data length**: 24, 25, or 26 bit
- **Data transmission rate**: 70 kBaud∗...1 MBaud, depending on cable length:
  - Length < 3 m: 1 MBd
  - 3 m < 50 m: < 400 kBd
  - 50 m < 100 m: < 300 kBd
  - 100 m < 200 m: < 200 kBd
  - 200 m < 400 m: < 100 kBd
- **Measured value**: Position

**Measurement parameters**

- **Resolution**: 1 μm, 2 μm, 5 μm, 10 μm, 20 μm, 50 μm, 100 μm
- **Cycle times**: Stroke length 300 mm, 750 mm, 1000 mm, 2000 mm
- **Measuring rate**: 3.7 kHz, 3.0 kHz, 2.3 kHz, 1.2 kHz
- **Linearity**: < ±0.02 % F.S. (minimum ±50 μm)
- **Repeatability**: 0.001 % F.S. (minimum ±2.5 μm)

**Operating conditions**

- **Operating temperature**: Sensor electronics: -40 °C (-40 °F) to +75 °C (+167 °F)
  - Sensor rod with interconnection cable: -40 °C (-40 °F) to +100 °C (+212 °F)
- **Humidity**: 90% humidity, no condensation
- **Ingress protection**: Sensor electronics: IP67 (with professionally mounted housing and connectors)
  - Sensor housing with interconnection cable: IP68
- **Shock test**: 100 g (single hit) / IEC standard 60068-2-27
- **Vibration test**: 10 g / 10 to 2000 Hz, IEC standard 60068-2-6 (resonance frequencies excluded)
- **EMC test**: Electromagnetic emission: IEC/EN 50081-1
  - Electromagnetic susceptibility: IEC/EN 50082-2
  - IEC/EN 61000-4-2/3/4/6, level 3/4 criterium A
- **Magnet movement velocity**: Any

**Design/Material**

- **Sensor electronics**: Aluminum housing with diagnostic LED display. (LEDs located beside connector/cable exit)
- **Sensor housing**: Stainless steel 1.4305, AISI 304L
- **Stroke length**: 25...2540 mm (1...100 in.)
- **Operating pressure**: 350 bar static, 690 bar peak (5000 psi, 10,000 psi peak)

**Mechanical mounting**

- **Mounting position**: Any orientation
- **Mounting instruction**: Please consult the technical drawings

**Electrical connection**

- **Connection type**: 7 pin connector M16 or integral cable
- **Operating voltage**: +24 VDC (-15% / +20 %)
- **Ripple**: ≤ 0.28 Vpp
- **Current consumption**: 100 mA per sensor electronics
- **Dielectric strength**: 500 VDC (DC ground to machine ground)
- **Polarity protection**: up to -30 VDC
- **Overvoltage protection**: up to 36 VDC

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1/ With position magnet # 201 542-2
2/ Sensor rod and interconnection cable are mounted in a metal housing (e.g. in a cylinder).
TECHNICAL DRAWINGS (Detached electronics with side cable entry)

Controlling design dimensions are in metric units and measurements in ( ) are in inches
Unless otherwise stated, apply to the general tolerances according to DIN ISO 2768-m
**CONNECTOR WIRING**

### M16 connector

<table>
<thead>
<tr>
<th>D70</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Data (−)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Data (+)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Clock (+)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Clock (−)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>+24 VDC (-15 / +20 %)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>DC Ground (0 V)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>n.c.</td>
<td></td>
</tr>
</tbody>
</table>

### Cable outlet

<table>
<thead>
<tr>
<th>Cable</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>GY</td>
<td>Data (−)</td>
</tr>
<tr>
<td>PK</td>
<td>Data (+)</td>
</tr>
<tr>
<td>YE</td>
<td>Clock (+)</td>
</tr>
<tr>
<td>GN</td>
<td>Clock (−)</td>
</tr>
<tr>
<td>BN</td>
<td>+24 VDC (-15 / +20 %)</td>
</tr>
<tr>
<td>WH</td>
<td>DC Ground (0 V)</td>
</tr>
</tbody>
</table>

**FREQUENTLY ORDERED ACCESSORIES** — Additional options available in our [Accessories Catalog](#) 550929

### Position magnets

<table>
<thead>
<tr>
<th>Ø 32.8 mm (Ø 1.29 in.)</th>
<th>Ø 23.8 mm (Ø 0.94 in.)</th>
<th>Ø 13.5 mm (Ø 0.53 in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø 4.3 mm (Ø 0.17 in.)</td>
<td>Ø 13.5 mm (Ø 0.53 in.)</td>
<td>Ø 7.9 mm (Ø 0.31 in.)</td>
</tr>
</tbody>
</table>

- **Standard ring magnet 0032.8**
  - Part no. 201 542-2
  - Material: PA ferrite GF20
  - Weight: ca. 14 g
  - Operating temperature: −40...+105 °C (−40...+221 °F)
  - Surface pressure: max. 40 N/mm²
  - Fastening torque for M4 screws: max. 1 Nm

- **Ring magnet OD25.4**
  - Part no. 400 533
  - Material: PA ferrite
  - Weight: ca. 10 g
  - Operating temperature: −40...+105 °C (−40...+221 °F)
  - Surface pressure: max. 40 N/mm²

- **Ring magnet OD17.4**
  - Part no. 401 032
  - Material: PA neobind
  - Weight: ca. 5 g
  - Operating temperature: −40...+105 °C (−40...+221 °F)
  - Surface pressure: max. 20 N/mm²

- **U-magnet OD33**
  - Part no. 251 416-2
  - Material: PA ferrite GF20
  - Weight: ca. 11 g
  - Operating temperature: −40...+105 °C (−40...+221 °F)
  - Surface pressure: max. 40 N/mm²
  - Fastening torque for M4 screws: max. 1 Nm

### Optional installation hardware

<table>
<thead>
<tr>
<th>Ø 15.3 mm (Ø 0.6 in.)</th>
<th>Ø 16.4 mm (Ø 0.64 in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø 2.2 mm (Ø 0.09 in.)</td>
<td>Ø 2.2 mm (Ø 0.086 in.)</td>
</tr>
</tbody>
</table>

- **O-ring**
  - Part no. 401 133
  - Material: Fluoroelastomer
  - 75 ± 5 durometer
  - Application: M-style housings

- **O-ring**
  - Part no. 560 315
  - Material: Fluoroelastomer
  - 75 ± 5 durometer
  - Application: T and D-style housings

Controlling design dimensions are always in metric units
### ORDER CODE

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| a | b | c | d | e | f | g |

#### a. Sensor model
- **R T 4** Rod version

#### b. Sensor rod style
- **M** Flat faced Metric threaded flange, M18x1.5
- **D** Flat faced US customary threaded flange, 3/4"-16
- **T** Raised face US customary threaded flange, 3/4"-16

#### c. Sensor rod interconnection cable
- **B 1** 250 mm (9.8 in.) Santoprene cable, hanging connector
- **B 2** 400 mm (15.7 in.) Santoprene cable, hanging connector
- **B 3** 600 mm (23.6 in.) Santoprene cable, hanging connector

#### d. Electronics housing style
- **E** Side cable electronics connection

#### e. Stroke length
- **X X X X M** for mm (0025...2540 mm in 5 mm increments)
- **X X X X U** for inches (001.0...100.0 in. in 0.1 in. increments)

#### f. Connection type
- **Integral connector**
  - **D 7 0** 7pin M16 connector

#### Integral Cables (box No. 13, 14, 15)
- **P** Integral high-performance cable, orange jacket with pigtail termination
- **R** Integral cable, PVC jacket, pigtail termination, standard
- **F** Integral cable, black polyurethane jacket with pigtail termination

#### Cable length
- Encode in feet if using US customary stroke length
- Encode in meters if using metric stroke length

- **3 (03) to 98 (98) ft. or 1 (01) to 30 (30) meters.**

#### Operating voltage
- Without selection input voltage, 24 VDC

#### g. Output (continued)

#### Format (box no. 18)
- **B** Binary
- **G** Gray

#### Resolution (box no. 19)
- **1** 0.005 mm
- **2** 0.01 mm
- **3** 0.05 mm
- **4** 0.1 mm
- **5** 0.02 mm
- **6** 0.002 mm
- **8** 0.001 mm

#### Filtering performance (box no. 20)
- **8** Noise reduction filter (8 values)
- **G** Noise reduction filter (8 values) + error delay 10 cycles

#### Signal options (box no. 21 and 22)
- **0 0** Measuring direction forward
- **0 1** Measuring direction reverse
- **0 2** Measuring direction forward, synchronized measurement
- **0 5** Measuring direction forward, Bit 25 = Alarm, Bit 26 = Parity even
- **9 9** Advanced Signal Options (Use next fields 23, 24, 25)

#### Measurement contents (box no. 23)
- **1** Position
- **Direction and Sync mode (box no. 24)**
- **1** Forward async
- **2** Forward sync
- **5** Reverse async
- **6** Reverse sync

#### Communication Diagnostics (box no. 25)
- **0** No further option
- **2** Additional alarm bit + parity even bit

### DELIVERY

Sensor, O-ring

Accessories have to be ordered separately.

Operation manuals & software are available at: [www.temposonics.com](http://www.temposonics.com)