Data Sheet

R-Series RT4 SSI
Magnetostrictive Linear Position Sensors

- Redundant SSI output
- High temperature rod
- IP68 ingress protection
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 beginning 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.

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.

- Redundant R-series detached electronics for enhanced safety applications
- RT4 sensor specifications:
  - 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/binar y formats
  - LEDs for sensor status and diagnostics

Applications:
- Steel, wood, power generation, fluid power

Fig. 1: Time-based magnetostrictive position sensing principle

Fig. 2: Typical application: metal processing
TECHNICAL DATA

Output

<table>
<thead>
<tr>
<th>Interface</th>
<th>SSI (Synchronous Serial Interface) - differential signal in SSI standard (RS 422)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data protocol</td>
<td>Binary or Gray, optional: parity and error bit</td>
</tr>
<tr>
<td>Data length</td>
<td>24, 25, or 26 bit</td>
</tr>
<tr>
<td>Data transmission rate</td>
<td>70 kBaud*...1 MBaud, depending on cable length:</td>
</tr>
<tr>
<td></td>
<td>Length &lt; 3 &lt; 50 &lt; 100 &lt; 200 &lt; 400 m</td>
</tr>
<tr>
<td>Baud rate</td>
<td>1 MBd &lt; 400 kBd &lt; 300 kBd &lt; 200 kBd &lt; 100 kBd</td>
</tr>
</tbody>
</table>

Measured value

Measurement parameters

| Resolution                | 1 μm, 2 μm, 5 μm, 10 μm, 20 μm, 50 μm, 100 μm                                   |
| Cycle times               | Stroke length 300 750 1000 2000 mm                                               |
| Measurement rate          | 3.7 3.0 2.3 1.2 kHz                                                               |
| Linearity¹                | < ±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 test²
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 velocity¹
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

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**

- **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**

- **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 |
| R | T | 4 |   |   | 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**: for mm (0025...2540 mm in 5 mm increments)
- **U**: for inches (001.0...100.0 in. in 0.1 in. increments)

#### f. Connection type

- **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)