RH Powerlink V2
Data Sheet

– Rugged industrial sensor
– Suitable for hydraulic cylinder integration
– Diagnostics LEDs
MEASURING TECHNOLOGY

The absolute, linear position sensors provided by MTS Sensors rely on the company’s proprietary Temposonics® 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 end 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.

RH SENSOR

Robust, non-contact and wear-free, the Temposonics® linear position sensors provide the best durability and accurate position measurement solutions in harsh industrial environments. The position measurement accuracy is tightly controlled by the quality of the waveguide which is manufactured by MTS Sensors. The position magnet is mounted on the moving machine part and travels contactlessly over the sensor rod with the built-in waveguide.

Temposonics® RH is a robust, high-performance rod-style sensor for installation into a hydraulic cylinder. The sensor is suitable for long-term operation under harsh industrial environments such as steel industry and metalworking plants.

POWERLINK V2 INTERFACE

Temposonics® position sensors fulfil the requirements of the Ethernet Powerlink Standardization Group (EPSG). Ethernet Powerlink V2 is an open protocol based on the Ethernet-standard according to IEEE 802.3. It is an extension to the Ethernet protocol which allows real-time data communication. Within the Ethernet Powerlink protocol a CANopen based communication protocol for user data is specified. Powerlink is the only Ethernet protocol that meets the high real-time requirements with a software-only concept. No special Powerlink hardware is needed.

Delivered information:
- Absolute position
- Velocity
- Status
**TECHNICAL DATA**

### Output
- **Interface**: Ethernet POWERLINK
- **Data protocol**: POWERLINK V2 according to IEEE 802.3
- **Measured value**: Position, velocity / option: Multi-position measurement (2…4 positions) ¹

### Measurement parameters
- **Resolution**: 1 μm, 2 μm, 5 μm, 10 μm, 50 μm or 100 μm (selectable)
- **Cycle time**
  - Stroke length: up to 2400 mm / up to 4800 mm / up to 7620 mm
  - Cycle time: 1.0 ms / 2.0 ms / 4.0 ms
- **Linearity** ²: < ±0.01 % F.S. (minimum ±50 μm)
- **Repeatability**: < ±0.001 % F.S. (minimum ±2.5 μm) typical
- **Hysteresis**: < 4 μm typical
- **Temperature coefficient**: < 15 ppm/K typical

### Operating conditions
- **Operating temperature**: −40…+75 °C (−40…+167 °F)
- **Humidity**: 90 % relative humidity, no condensation
- **Ingress protection**: IP67 (correctly fitted)
- **Shock test**: 100 g (single shock), IEC standard 60068-2-27
- **Vibration test**: 15 g / 10…2000 Hz, IEC standard 60068-2-6 (excluding resonant frequencies)
- **EMC test**
  - Electromagnetic emission according to EN 61000-6-3
  - Electromagnetic immunity according to EN 61000-6-2
  - The sensor meets the requirements of the EU directives and is marked with ☑
- **Operating pressure**: 350 bar (5076 psi) / 700 bar (10,153 psi) peak (at 10 × 1 min), RH-J: 800 bar (11,603 psi)

### Design / Material
- **Sensor electronics housing**: Aluminum
- **Sensor flange**: Stainless steel 1.4305 (AISI 303)
- **Sensor rod**: Stainless steel 1.4306 (AISI 304L) / RH-J: Stainless steel 1.4301 (AISI 304)
- **Stroke length**: 25…7620 mm (1…300 in.)

### Mechanical mounting
- **Mounting position**: Any
- **Mounting instruction**: Please consult the technical drawings and the operation manual (document number: 551657)

### Electrical connection
- **Connection type**: 2 × M12 female connector (5 pin), 1 × M8 male connector (4 pin)
- **Operating voltage** ⁴: +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.
- **Ripple**: ≤ 0.28 Vₚₚ
- **Current consumption** ⁴: 110 mA typical
- **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 The number of magnets depends on the stroke length
² With position magnet # 251 416-2
³ The IP rating is not part of the UL approval
⁴ Power supply must be able to provide current of 1 A for power up process
TECHNICAL DRAWINGS

RH-H / -M / -S / -V

Sensor electronics housing

Null zone  51

Stroke length  25…7620

Dead zone  63.5 / 66*

Threaded flange «M» / «V»: M18×1.5-6g
Threaded flange «S» / «H»: ⅜”-16 UNF-3A

* Stroke length > 5000 mm (196.9 in.)

RH-D

Threaded flange «D»:
M18×1.5-6g

* Stroke length > 5000 mm (196.9 in.)

RH-T / -U

Threaded flange «T» / «U»:
⅜”-16 UNF-3A

* Stroke length > 5000 mm (196.9 in.)

RH-R

Threaded flange «R»:
M18×1.5-6g

* Stroke length > 5000 mm (196.9 in.)

Controlling design dimensions are in millimeters and measurements in () are in inches

Fig. 3: Temposonics® RH with ring magnet, part 1
### CONNECTOR WIRINGS

#### RH-J

![Diagram of RH-J](image)

Controlling design dimensions are in millimeters and measurements in ( ) are in inches.

Fig. 4: Temposonics® RH with ring magnet, part 2

#### D56

<table>
<thead>
<tr>
<th>Signal</th>
<th>M12 female connector (D-coded)</th>
<th>Pin</th>
<th>Function</th>
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<tbody>
<tr>
<td></td>
<td>1</td>
<td>Tx (+)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Rx (+)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Tx (−)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Rx (−)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Not connected</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>View on sensor</th>
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<table>
<thead>
<tr>
<th>Power supply</th>
<th>M8 male connector</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>+24 VDC (−15 / +20 %)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Not connected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>DC Ground (0 V)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Not connected</td>
<td></td>
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</tbody>
</table>

Fig. 5: Connector wirings D56
FREQUENTLY ORDERED ACCESSORIES — Additional options available in our Accessories Guide 551444

Position magnets

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

Ring magnet OD33
Part no. 201 542-2
Material: PA ferrite
Weight: Approx. 10 g
Surface pressure: Max. 40 N/mm²
Operating temperature: −40…+105 °C (−40…+221 °F)

Ring magnet OD25.4
Part no. 400 533
Material: PA ferrite coated
Weight: Approx. 13 g
Surface pressure: Max. 20 N/mm²
Operating temperature: −40…+100 °C (−40…+212 °F)

Position magnet

Magnet spacer

O-rings

Block magnet L
Part no. 403 448
Material: Hard ferrite
Weight: Approx. 20 g
Fastening torque for M4 screws: 1 Nm
Operating temperature: −40…+75 °C (−40…+167 °F)
This magnet may influence the sensor performance specifications for some applications.

O-ring

Mounting accessories

O-ring for threaded flange
M18x1.5-6g
Part no. 401 133
Material: Fluoroelastomer
Durometer: 75 ± 5 Shore A
Operating temperature: −40…+204 °C (−40…+400 °F)

Fixing clip for rod with Ø 10 mm
Part no. 561 481
Material: Brass, non-magnetic
Application: Used to secure sensor rods (Ø 10 mm (Ø 0.39 in.)) when using an U-magnet or block magnet

Controlled design dimensions are in millimeters and measurements in ( ) are in inches.
## Cable Connectors *

### M12 D-coded Male Connector (4 pin), Straight

- **Part no. 370 523**
- **Material:** Zinc nickel-plated
- **Termination:** Insulation-displacement
- **Cable Ø:** 5.5…7.2 mm (0.2…0.28 in.)
- **Wire:** 24 AWG – 22 AWG
- **Operating temperature:** −25…+85 °C (−13…+185 °F)
- **Ingress protection:** IP65 / IP67 (correctly fitted)
- **Fastening torque:** 0.6 Nm

### M8 Female Connector (4 pin), Straight

- **Part no. 370 504**
- **Material:** CuZn nickel plated
- **Termination:** Solder
- **Cable Ø:** 3.5…5 mm (0.14…0.28 in.)
- **Wire:** 0.25 mm²
- **Operating temperature:** −40…+85 °C (−40…+185 °F)
- **Ingress protection:** IP67 (correctly fitted)
- **Fastening torque:** 0.5 Nm

### M12 Connector End Cap

- **Part no. 370 537**
- **Material:** Brass nickel-plated
- **Ingress protection:** IP67 (correctly fitted)
- **Fastening torque:** 0.39…0.49 Nm

### PUR Cable

- **Part no. 530 125**
- **Material:** PUR jacket; green
- **Features:** Cat 5, highly flexible
- **Cable Ø:** 6.5 mm (0.26 in.)
- **Cross section:** 2 × 2 × 0.35 mm²
- **Operating temperature:** −20…+60 °C (−4…+140 °F)

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## Cables

### PVC Cable

- **Part no. 530 108**
- **Material:** PVC jacket; gray
- **Features:** Shielded, flexible
- **Cable Ø:** 4.9 mm (0.19 in.)
- **Cross section:** 3 × 0.34 mm²
- **Operating temperature:** −30…+80 °C (−22…+176 °F)

### Cable with M12 D-coded Male Connector (4 pin), Straight – M12 D-coded, Male Connector (4 pin), Straight

- **Part no. 530 064**
- **Material:** PUR jacket; green
- **Features:** Cat 5e
- **Cable length:** 5 m (16.4 ft)
- **Cable Ø:** 6.5 mm (0.26 in.)
- **Ingress protection:** IP65, IP67, IP68 (correctly fitted)
- **Operating temperature:** −30…+70 °C (−22…+158 °F)

### Cable with M12 D-coded Male Connector (4 pin), Straight – RJ45 Male Connector, Straight

- **Part no. 530 065**
- **Material:** PUR jacket; green
- **Features:** Cat 5e
- **Cable length:** 5 m (16.4 ft)
- **Cable Ø:** 6.5 mm (0.26 in.)
- **Ingress protection:** M12 connector: IP67 (correctly fitted)
- **RJ45 connector:** IP20 (correctly fitted)
- **Operating temperature:** −30…+70 °C (−22…+158 °F)

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**NOTICE**

* Follow the manufacturer’s mounting instructions

Controlling design dimensions are in millimeters and measurements in ( ) are in inches
Temposonics® RH Powerlink V2

**ORDER CODE**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| a | b | c | d | e | f | g | h | i | j | k | l | m | n | o | p | q | r |

*a* | **Sensor model**
---|---
R | H | Rod

*b* | **Design**
---|---
B | Base unit (only for replacement)*
D | Threaded flange M18×1.5-6g (bushing on rod end)
H | Threaded flange ¾”-16 UNF-3A (with fluoroelastomer housing-seal)
J | Threaded flange M22×1.5-6g (rod Ø 12.7 mm, 800 bar)
M | Threaded flange M18×1.5-6g (standard)
R | Threaded flange M18×1.5-6g thread M4 at rod end
S | Threaded flange ¾”×16UNF - 3A (standard)
T | Threaded flange ¾”×16UNF - 3A (with raised-face)
U | Threaded flange ¾”-16 UNF-3A (with raised-face & fluoroelastomer housing-seal)
V | Threaded flange M18×1.5-6g (with fluoroelastomer housing-seal)

*c* | **Stroke length**
---|---
X | X | X | X | M | 0025…7620 mm

<table>
<thead>
<tr>
<th>Standard stroke length (mm)*</th>
<th>Ordering steps</th>
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<tbody>
<tr>
<td>25... 500 mm</td>
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<td>500... 750 mm</td>
<td>10 mm</td>
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<td>750...1000 mm</td>
<td>25 mm</td>
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<tr>
<td>1000...2500 mm</td>
<td>50 mm</td>
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<tr>
<td>2500...5000 mm</td>
<td>100 mm</td>
</tr>
<tr>
<td>5000...7620 mm</td>
<td>250 mm</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard stroke length (in.)*</th>
<th>Ordering steps</th>
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</thead>
<tbody>
<tr>
<td>1... 20 in.</td>
<td>0.2 in.</td>
</tr>
<tr>
<td>20... 30 in.</td>
<td>0.4 in.</td>
</tr>
<tr>
<td>30... 40 in.</td>
<td>1.0 in.</td>
</tr>
<tr>
<td>40...100 in.</td>
<td>2.0 in.</td>
</tr>
<tr>
<td>100...200 in.</td>
<td>4.0 in.</td>
</tr>
<tr>
<td>200...300 in.</td>
<td>10.0 in.</td>
</tr>
</tbody>
</table>

**d** | **Connection type**
---|---
D | 5 | 6 | 2 × M12 female connectors (5 pin),
| | | 1 × M8 male connector (4 pin)

**e** | **Operating voltage**
---|---
1 | +24 VDC (−15/+20 %)

**f** | **Output**
---|---
U | 3 | 0 | 1 | Powerlink V2

**g** | **Magnet number for multi-position measurement**
---|---
Z | 0 | 2 | 2 magnets
| | 0 | 3 | 3 magnets
| | 0 | 4 | 4 magnets

**NOTICE**

Use magnets of the same type for multi-position measurement, e.g. 2 × U-magnets (part no. 251 416-2).

**DELIVERY**

**RH-B:**
- Base unit
- 2 socket screws M4

**RH-D / -H / -J / -M / -R / -S / -T / -U / -V:**
- Sensor
- O-ring

Accessories have to be ordered separately.

Manuals, Software & 3D models available at: www.mtssensors.com

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* / Non standard stroke lengths are available; must be encoded in 5 mm / 0.1 in. increments
5/ For more information see operation manual R-Series Powerlink (document number: 551657)
6/ Note: Specify magnet numbers for your sensing application and order separately