Temposonics®
Absolute, Non-Contact Position Sensors

R-Series Catalogue

1 µm

Analogue
CANbus
Profibus-DP
SSI
EtherCAT

The Measurable Difference
CONTENTS

Company .................................................................................. 3
Principle .................................................................................. 4
Applications ............................................................................ 5
Quality .................................................................................... 6
Glossary .................................................................................. 8
General Data ............................................................................ 9
R-Series Analogue ................................................................... 11-16
R-Series CANbus ...................................................................... 17-22
R-Series EtherCAT .................................................................... 23-28
R-Series Profibus-DP ............................................................... 29-34
R-Series SSI ............................................................................ 35-40
Mounting / Installation RP + RH ........................................... 41
R-Series Flexible ....................................................................... 43-47
R-Series RD4 ........................................................................... 49-56
Accessories .............................................................................. 57-69
Sales Organisation ................................................................. 71
THE COMPANY

The World of MTS

Following the founding of MTS Systems Corporation in 1951, the company rapidly developed into a leading supplier of intelligent hardware and software products in the fields of test and simulation systems and in measuring and automation technology. Today MTS Systems Corporation has over 2,335 employees worldwide – 355 of whom are employed by MTS Sensors at three sites in the USA (Cary, N.C.), Germany (Lüdenscheid) and Japan (Tokyo). At MTS, intensive basic research is efficiently merged with a consistent focus on practical requirements. The results are innovative solutions for a wide range of potential industrial and non-industrial applications.
**MAGNETOSTRICTIVE PRINCIPLE**

Technology at its best

The best linear position sensors provide absolute position measurement resulting in higher productivity and greater safety for machine and automation devices. MTS linear position sensors outperform the competition, deliver accuracy and reliability under the most difficult conditions, resulting in excellent value for our customers. Our success is due to 30 years of technology leadership, vertically integrated manufacturing processes and unsurpassed levels of support. MTS Sensors was the first to realize the promising advantages for linear position measurement contained in the magnetostrictive measuring principle developed by J. Tellermann. Tellerman’s original design, was used to develop Temposonics® brand sensors: the first magnetostrictive position sensors, a technology which guarantees precision and reliability without equal.

Magnetostriction - how it works

The heart of MTS sensors is the ferromagnetic measuring element, also known as the waveguide, and a movable position magnet that generates a direct-axis magnetic field in the waveguide.

When a current or interrogation pulse passes through the waveguide, a second magnetic field is created radially around the waveguide. The interaction between the magnetic field in the waveguide and the magnetic field produced by the position magnet generates a strain pulse which travels at a constant ultrasonic speed from its point of generation, the measurement point, to the end of the waveguide where it is transformed into an electric pulse in the sensor element.

The resulting signal is processed by the specialized electronics of the Temposonics® sensor.

With our extensive know-how of ferromagnetic materials, magnetic effects and ultrasonic processes, MTS remains unrivalled in performance standards for non-contacting position measurement of the highest precision.
APPLICATIONS

Magnetostriction: The best choice for your application
You are under constant pressure to improve your products, reduce your costs and maintain a competitive edge. The choice you make must provide accuracy and repeatability. You need modular solutions that can adapt to your specific application and you need a price/performance ratio that delivers value.
By choosing MTS Temposonics® sensors, you’re choosing the leader in magnetostrictive sensors.
And that means you have a huge competitive advantage.

Increased productivity through innovation
MTS sensors do more than just measure position. Intelligent electronics move some control functions to the sensor, dramatically increasing productivity. When needed, MTS can tailor application-specific software to meet your needs.

Small sensor - great effect
MTS Temposonics® position sensors are used in countless industrial and non-industrial applications, from packaging machines through drinks bottling and canning plants right up to plastics molding machines and steel rolling mills.
The precision and reliability of Temposonics® sensors offer huge benefits that result in high-quality products and efficient processes.

Amazing, where Temposonics® can be found…. 
Temposonics® sensors are often found wherever position must be measured precisely. Our engineers love the challenges of unusual applications, and they have helped customers solve many difficult applications around the world. In the truest sense of the word, Temposonics® paved the way for the planning of the bridge over the Great Belt in the Baltic Sea and the Soccer Stadium “ArenaAuf-Schalke” in Gelsenkirchen (Germany). Temposonics® sensors also helped in the salvage of the capsized Russian submarine “Kursk”.

Temposonics® rod-in-cylinder: Thinking ahead
In order to enable user-friendly use of superior Temposonics® sensor technology in cylinders, MTS has further enhanced the rod-style version. An innovative modular design eliminates the need to break the high-pressure hydraulic seal of the fluid system when installing or replacing the sensor cartridge. The sensor’s pressure housing can stay permanently mounted in the cylinder and the basic sensor can be easily removed. This capability significantly reduces maintenance costs and potential downtime.

A Liquid Level Sensor…. 
By simply mounting the position magnet into a float, the application range of R-Series sensors extends substantially. These highly precise float gauges supply exact level values. In addition, a second float can be added to measure “interface levels” simultaneously (i.e. interface of water / oil, etc.).
QUALITY

Precision is our strength

Maximum precision and uncompromising quality in the service of the customer - those are the characteristic elements of the MTS philosophy. Focused on these targets, MTS Sensors has been setting standards in measuring and automation technology worldwide for three decades. Our ultramodern, fully automated production technology guarantees the consistently high quality and precision of Temposonics® position sensors so that they can reliably pass our stringent quality requirements. Shock and vibration resistance and EMC tests, for example, are monitored on external test facilities and during the final inspection, each sensor passes automatic high profile laser interferometer measuring tables which examine and document linearity in 1 µm steps.

Our engineers enthusiastically take up every challenge and develop position measuring solutions of exemplary precision based on magnetostriction, even for the most unusual applications. Over the decades, we have built up a wealth of experience which we put into practice in the form of intelligent sensors and software for our customers in a wide variety of industrial sectors. And our quality requirements extend to our comprehensive after-sales service.
QUALITY ASSURANCE

The quality of our transducers is our mission and it is black on white certified. The high quality of MTS position sensors and liquid level meters proves itself in count-
less applications world-wide every day.
Asynchronous Mode
Asynchronous data communication occurs when data is sent from one device with its own clock to another device with a separate clock. When the Temposonics® R-Series position sensor is used in the asynchronous mode, the sensor takes measurements at its fastest internal interrogation rate (length dependent) and provides the information upon request.

D Drift
see also Warm-up and Temperature Coefficient.
Drift is the change in the output signal or output value under environmental impact e.g. time or temperature.

G Gradient
The gradient is the inverse of the rate at which a strain pulse propagates through the magnetostrictive waveguide, (velocity of propagation ≈ 2780 m/s). The gradient values will vary slightly from sensor to sensor. The actual measured gradient values for some sensors are indicated in the label attached to the sensor.

H Hysteresis
The difference in indicated position for the same point along a stroke length when reached from opposing directions.

Non-linearity
The degree that the indicated position of the magnet at points along the stroke length of the sensor varies from the actual physical position. In magnetostrictive sensors, this variability is caused by minute differences in the propagation rate of the return signals through the waveguide medium. Non-linearity is expressed in absolute error or as a percentage of the active stroke length.

O Outputs
1. Digitally-derived analogue output: The Temposonics® R-Series product line offers a digitally-derived analogue output. A digital position count of 16 bits is converted to an analogue signal (voltage or current) via a digital/analogue converter.

2. Digital output: The Temposonics® R-Series product line provides digital output in either a SSI, CANbus, DeviceNet®, Profield or EtherCAT. An internal counter is used to precisely measure the time interval between the launching of an interrogation pulse and the receipt of a return signal. The time interval, detected in counts, is then supplied to the customer's interface via the above chosen format or protocol.

R Range
The measurands, over which a sensor is intended to measure, specified by their upper and lower limits.

Repeatability
The deviation in indicated position when a point along a stroke length is approached repeatedly from the same direction. For an example, see the illustration below.

If you leave point “A” and then return to it from the same direction as before, the change in indicated position between the two readings is described by the repeatability specification. For magnetostrictive sensors, repeatability is usually equal to resolution.

T Temperature Coefficient (TC)
Temperature Coefficient (TC) is expressed as ppm°C (ppm = parts per million). TC is the degree to which the indicated position is affected by ambient temperature changes.

Temperature drift is:

\[(TC \times \text{Full Scale Output} \times \theta \text{ temperature}) \times 10^6\]
or

\[(25 \text{ ppm} \times 10 \text{ VDC} \times 5 \degree \text{C}) = 1.25 \text{mV} \times 10^6\]

Example (Sensor with Analogue output):
- Output: 0 to 10 VDC
- Stroke length: 200 mm
- Temperature change: 5°C
- TC = 25 ppm/°C

If the indicated output at 200 mm is 10 VDC, the potential change in indicated output per degree in Celsius. Temperature change is 1.25 mV or 0.025 mm for a 5°C rise.

W Warm-up Period
The time required for the output to stabilize following power-up of the sensor. This error is characterized by a parallel displacement of the entire calibration curve.
**Function**
Non-Contact technology - an external movable magnet marks the position - of the absolute Temposonics® linear sensors eliminates the wear, noise and erroneous signal problems and guarantees the best durability without any recalibration.

**Design enhances reliability**
The extremely robust sensors are modular in mechanics and electronics design.
- A profile or rod-shaped sensor housing protects the sensing element which gives rise to the measurement signal.
- The sensor head accommodates the complete modular electronic interface with active signal conditioning. Double encapsulation ensures high operating safety and optimum EMC protection.
- The position transmitter, a permanent magnet - fixed at the mobile machine part - drives over the sensor’s stroke contactlessly and starts measuring through the housing wall.

**Temposonics® Profile: Rugged sensor in demanding environments**
Temposonics®-RP perform reliability in even the most rugged industrial environment. The profile model has proved to be the ideal choice where extreme dirt and dust are encountered. Complete encapsulation in a profiled aluminum housing effectively protects the sensor element against damage. The sensor offers flexible mounting configurations and easy installation. Position measurement is wearless by means of magnet heads which require no power supply. Here you have a choice of two versions:
- A sliding magnet running in profile housing rails. Connection with the mobile machine part is via a ball jointed arm to take 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 misalignment at installation.

**Temposonics® Rod: High pressure design**
Just like the sturdy profile model, the rod design is also suitable for even the toughest industrial environments. Temposonics® RH with a pressure-resistant stainless steel flange and sensing rod is suitable for use in hydraulic cylinders and externally in all applications where space is a problem. High-precision position measurement is via ring or U-magnets travelling along the sensing rod without any mechanical contact.
**Tempsonics**

**R-Series**

**Analogue**

**Tempsonics® RP and RH**

Measuring length 50 - 7600 mm

- Rugged Industrial Sensor
- Linear and Absolute Measurement
- LEDs for Sensor Diagnostics
- Contactless Sensing with Highest Durability
- Superior Accuracy: Linearity better 0.01 %
- Repeatability 0.001 %
- Direct Analogue Output, Displacement + Speed
- Dual Magnet Position Measurement
Sensor diagnostic display

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

<table>
<thead>
<tr>
<th>LED</th>
<th>Green</th>
<th>Red</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>Normal function</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>Magnet not detected, wrong quantity of magnets</td>
</tr>
<tr>
<td>ON</td>
<td>Flashing</td>
<td>ON</td>
<td>Magnet out of setup range</td>
</tr>
<tr>
<td>Flashing</td>
<td>ON</td>
<td>ON</td>
<td>Programming mode</td>
</tr>
</tbody>
</table>

Output

Smart analogue sensors provide direct analogue outputs including voltage and current. All outputs allow 100% adjustments of zero and span setpoints. Since the outputs are direct, no signal conditioning electronics are needed when interfacing with controllers or meters.

Availability

- Single Magnet Sensor provides one displacement output over the entire active stroke length and one velocity output with 1 magnet.
- Dual Magnets Sensor provides two identical displacement outputs; a separate output is provided for each of two magnets positioned along sensor length.

1. Hand-Programmer R-Analogue for 1 Magnet Sensor

For easy teach-in setups of measuring length and direction by moving the magnet on desired Null/Span positions and pushing the 0/100% buttons.

2. Cabinet-Programmer R-Analogue

Cabinet-Programmer R-Analogue completes the accessories program of MTS absolute position sensors. The unit can be used for adjusting a connected 1-magnet sensor via the leads, using a simple teach-in procedure in the field.

3. USB-Programmer R-Analogue for 1 or 2 Magnets Sensors

This hardware converter is required to communicate via USB-port of a Windows PC to the sensor. Customized settings are possible by using the MTS programming software (CD-ROM) for:
- Zero/Span Magnet 1
- Zero/Span Magnet 2
- Velocity range
- Free assignment of outputs to measured position or velocity
- Error output value (e.g. magnet out of stroke)

Sensor field programming

Temposonics® R-Series sensors are preconfigured at the factory by model code designation. If needed, MTS offers different external service tools for modifying sensor parameters inside the active electrical stroke (minimum 25 mm between setpoints) via the standard connection cable. There is no need to open the sensors electronics. Following tools are available:

Windows sensor programming

[Diagram of Windows sensor programming]
### Technical Data

#### Input

<table>
<thead>
<tr>
<th>Measured variables</th>
<th>Position, Speed / Dual magnets position measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>Profile: 50 - 5000 mm, Rod: 50 - 7600 mm</td>
</tr>
</tbody>
</table>

#### Output

<table>
<thead>
<tr>
<th>Voltage</th>
<th>0...10 / 10...0 / -10...+10 / +10...-10 VDC (min. load controller: &gt; 5 kOhms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>4(0)...20 mA / 20...4(0) mA (min/max. load: 0/500 Ohms)</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>up to 36 VDC</td>
</tr>
</tbody>
</table>

#### Accuracy

**Position measurement:**
- Null/Span adjustment: 100 % of electrical stroke (Min. range 25 mm)
- Resolution: 16 bit; 0.0015 % (Minimum 1 μm)
- Linearity: < ± 0.01 % F.S. (Minimum ± 50 μm)
- Repeatability: < ± 0.001 % F.S. (Minimum ± 1 μm)
- Hysteresis: < 4 μm
- Update time: 0.5 ms up to 1200 mm / 1.0 ms up to 2400 mm / 2.0 ms up to 4800 mm / 5.0 ms up to 7600 mm stroke length
- Ripple: < 0.01 % F.S.

**Speed measurement:**
- Range: 0.025 - 10 m/s
- Deviation: < 0.5 %
- Resolution: 0.1 mm/s Option 0.01 mm/s
- Update time (ms): see position measurement
- Temperature coefficient: < 30 ppm/°C

#### Operating conditions

- Magnet speed: any
- Operating temperature: -40 °C ... +75 °C
- Dev point, humidity: 90% rel. humidity, no condensation
- Protection: Profile: IP 65, Rod: IP 67, IP 68 for cable outlet
- Shock test: 100 g single hit, IEC-Standard 68-2-27
- Vibration test: 15 g / 10 - 2000 Hz, IEC-Standard 68-2-6
- Standards, EMC test: Electromagnetic emission EN 50081-1
  - Electromagnetic immunity EN 50082-2
  - EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified

#### Form factor, material

- 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
  - Position magnet: Ring magnets, U-magnets

#### Installation

- Mounting position: any orientation
- Profile: Movable mounting clamps fixed with M5 x 20 screws or T-slot nuts M5 in base channel
- U-Magnet, removable: Mounting plate and screws from antimagnetical material
- Rod: Threaded flange M18 x 1.5 or 3/4" -16 UNF-3A, Hex nut M18
- Position magnet: Mounting plate and screws from antimagnetical material

#### Electrical connection

- Connection type: 6 pin connector M16 or cable outlet
- Input voltage: 24 VDC (-15 / +20 %)
- Polarity protection: up to -30 VDC
- Overvoltage protection: up to 36 VDC
- Current drain: 100 mA typical
- Ripple: < 1 % S-S
- Electric strength: 500 VDC (DC ground to machine ground)
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.

Analogue Standard position magnet upon delivery (see chapter accessories)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>grey</td>
<td>Output 1: Position # 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0...10 / 10...0 / -10...+10 / +10...-10 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4(0)...20 / 20...4(0) mA</td>
</tr>
<tr>
<td>2</td>
<td>pink</td>
<td>DC Ground</td>
</tr>
<tr>
<td>3</td>
<td>yellow</td>
<td>Output 2: Position # 2 or Speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0...10 / 10...0 / -10...+10 / +10...-10 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4...20 / 20...4 mA</td>
</tr>
<tr>
<td>4</td>
<td>green</td>
<td>DC Ground</td>
</tr>
<tr>
<td>5</td>
<td>brown</td>
<td>+24 VDC (+15% to 20%)</td>
</tr>
<tr>
<td>6</td>
<td>white</td>
<td>DC Ground (0 V)</td>
</tr>
</tbody>
</table>

All dimensions in mm
High Pressure Rod Design

Temposonics®-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.

Standard position magnets (not on delivery)

Ring magnet OD33
Part No. 201 542-2
Composite PA-Ferrite-GF20
Weight ca. 14 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening Torque for M4 screws max. 1 Nm

U-Magnet OD33
Part No. 251 416-2
PA-Ferrite-GF20
Weight ca. 11 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm

Connection types
6 pin female connector (Part No. STC 09131D)
6 pin female connector M16, 90° (Part No. STC 09131-6)

All dimensions in mm
**Temposonics®**

**Sensor model**
- RP - Profile
- RH - Hydraulic rod

**Form factor**

**Profile Temposonics®-RP:**
- S - Magnet slider, joint at top
- V - Magnet slider, joint at front
- M - U-magnet, OD33

**Rod Temposonics®-RH:**
- M - Flange M18 x 1.5 (Standard)
- V - Flange M18 x 1.5 (Fluorelastomer housing-seal)
- S - Flange 3/4” - 16 UNF - 3A

**Measuring length**

**Profile** - 0050...5000 mm
**Rod** - 0050...7600 mm

Standard: up to 1000 in 50 mm, greater 1000 in 250 mm steps
Other length upon request.

**Connection type**
- D60 - 6 pin male receptacle M16
- R02 - 2 m PVC cable w/o connector, Option: R01-R10 (1-10 m)
- H02 - 2 m PUR cable w/o connector, Option: H01-H10 (1-10 m)

**Input voltage**
- 1 - +24 VDC
- A - +24 VDC, high vibration resistant

**Output**

**1 Output with 1 Magnet**

<table>
<thead>
<tr>
<th>Output 1 (Position Magnet 1)</th>
<th>2 Outputs with 2 Magnets</th>
</tr>
</thead>
<tbody>
<tr>
<td>V01 = 0...10 V</td>
<td>V02 = 0...10 V</td>
</tr>
<tr>
<td>V11 = 10...0 V</td>
<td>V12 = 10...0 V</td>
</tr>
<tr>
<td>V21 = -10...+10 V</td>
<td>V22 = -10...+10 V</td>
</tr>
<tr>
<td>V31 = +10...-10 V</td>
<td>V32 = +10...-10 V</td>
</tr>
</tbody>
</table>

**2 Outputs with 1 Magnet**

<table>
<thead>
<tr>
<th>Output 1 (Position Magnet 1)</th>
<th>2 Outputs with 2 Magnets</th>
</tr>
</thead>
<tbody>
<tr>
<td>V01 xxx.x = 0...10 V</td>
<td>V02 = 0...10 V</td>
</tr>
<tr>
<td>V11 xxx.x = 10...0 V</td>
<td>V12 = 10...0 V</td>
</tr>
<tr>
<td>A01 xxx.x = 4...20 mA</td>
<td>A12 = 20...4 mA</td>
</tr>
<tr>
<td>A11 xxx.x = 20...4 mA</td>
<td>A22 = 4...20 mA</td>
</tr>
</tbody>
</table>

**Output 1 (Position Magnet 1) + Output 2 (Absolute Speed Magnet 1)**

<table>
<thead>
<tr>
<th>Magnet direction</th>
<th>Head</th>
<th>Null</th>
<th>Tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>V01 xxx.x = 0...10 V</td>
<td>+10...0...+10 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V11 xxx.x = 10...0 V</td>
<td>+10...0...+10 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A01 xxx.x = 4...20 mA</td>
<td>20...4...20 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A11 xxx.x = 20...4 mA</td>
<td>20...4...20 mA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Output 1 (Position Magnet 1) + Output 2 (Speed Magnet 1)**

<table>
<thead>
<tr>
<th>Magnet direction</th>
<th>Head</th>
<th>Null</th>
<th>Tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>V61 xxx.x = 0...10 V</td>
<td>-10...0...-10 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V71 xxx.x = 10...0 V</td>
<td>+10...0...+10 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A41 xxx.x = 4...20 mA</td>
<td>4...12...20 mA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Output 1 (Position Magnet 1) + Output 2 (Position Magnet 1)**

<table>
<thead>
<tr>
<th>V03 = 0...10 V</th>
<th>10...0 V</th>
</tr>
</thead>
</table>

**Output 1 (Position Magnet 1) + Output 2 (electronics temperature)**

| A04 = 4...20 mA | 4...20 mA (-40ºC...+100ºC) |

**Fill in blanks (xxx.x) with desired max. speed (see above):**

- **Speed range 1**: 0.1...10 m/s (0001 ... 0100)
  - Sample: (-5.5...0...5.5 m/s = 10...0...10 V) = V01 0055
- **Speed range 2**: 25...90 mm/s (1025 ... 1090)
  - Sample: (-50...0...50 mm/s = 4...12...20 mA) = A41 1050

**On delivery profile model:**
Sensor, Position magnet, 2 mounting clamps up to 1250 mm + 1 clamp for every additional 500 mm

**On delivery rod model:**
Sensor and hex nut.
Magnets must be ordered separately.

**Accessories page 57 and following.**
Temposonics®
Absolute, Non-Contact Position Sensors

R-Series
CANopen • CANbasic

Temposonics® RP and RH
Measuring length 25 - 7600 mm

More than just a sensor
Multi-Position Measurement

• Rugged Industrial Sensor
• Linear and Absolute Measurement
• LEDs for Sensor Diagnostic
• Contactless Sensing with Highest Durability
• Superior Accuracy: Resolution up to 2 µm
• Linearity better 0.01 %
• Repeatability 0.001 %
• Sensor-based intelligence
• Direct CAN Output, Displacement + Speed
• Multi-Position Measurement (1 Sensor for 20 Positions)
• Selectable Bus Termination (CANopen)
• CANopen with Heartbeat-Function
CAN Bus Interface

Temposonics® position sensors fulfill - as slave devices - all requirements of the CAN-Bus (ISO 11898). The sensors electronics convert the displacement measurements into bus oriented outputs and transfer these data directly to the control unit. The bus interface is appropriate for serial data transfer of 1 Mbit/s maximum. Sensor integrated software supports the Bus profiles CANopen, CANbasic and DeviceNet for a comprehensive customized configuration of the sensor-bus system.

Operation modes

CAN sensors provide following measurings with one or multiple magnets:

1. Standard measurement:
   - CANbasic: Displacement + speed with 1 magnet
   - CANopen: Displacement + speed with 1 - 4 magnets and electronic temperature

2. Multi-Magnets measurement:
   - CANbasic: Positions for each of 2-20 magnets simultaneously

### Temposonics® CANbus Variations

1. CANopen
   is corresponding to encoder profile DS-406 V3.1 (CiA Standard DS-301 V4.02). CANopen functionality describes communication objects (below), which are set via configuration tool.
   - **Service Data Object (SDO)** main usage is the sensor configuration. Selectable parameters: Resolution for position + speed, 4 set-points, Preset of operation range and null position for 4 magnets.
   - **Process Data Object (PDO)** is used for real-time data transfer of sensor measurements in max. 8 bytes data blocks. The sensor uses PDOS for information about position, speed, limit status, cam-control and operation range of 4 magnets. Data formats: Positions = 32-bit and speed = 16-bit integer value. Limit value = 8-bit.
   - **PDO Transmission Type**: Asynchronous (cycle time of 1 to 65,535 ms) or synchronous.
   - **Synchronisation Object (SYNC)**
   - **Emergency Object**
   - **Nodeguard Object**
   - **Heartbeat Function**
   - **Selectable bus termination**
   - **Electronics temperature can be controlled via CANbus**
   - **CANopen Configuration Tool** is a software (CD-Rom) and is used as an Electronic Data Sheet (EDS) for sensor configuration. Each sensor will be delivered with an operating manual and an EDS.

2. CANbasic (MTS)
   permits a simple, flexible adaption to customized profiles with a short bus access. Here, no configuration tool is needed because parameters are factory set. CANbasic protocol complies with CAN 2.0A standard and always includes the following applications data for 1-Magnet measurement: Position, Speed, Sensor Status and 5 Setpoints.

3. CANbasic Multi-Magnet Measurement
   provides the position measurement with maximum 20 magnets on one sensor. Set-ups and operation are via the on-site control system according to MTS instruction manual.
   Data protocols of above CAN options are factory set in the sensor processor, so all versions can be connected directly to the fieldbus. Conformance Test Certificate No. CiA199902-301V30-0-004 is given by the CANbus user organisation CiA (CAN in Automation) for MTS CANopen sensors.

### 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>ON</td>
<td>OFF</td>
<td>Normal function</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Magnet not detected or wrong quantity of magnets</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>Initialization error</td>
</tr>
<tr>
<td>Flashing</td>
<td>Flashing</td>
<td>Power out of range (high or low)</td>
</tr>
</tbody>
</table>

### Accessory: MTS Servicetool

CANopen Address Programmer is used for setup the Node-Address to sensors with CANopen interface. This setup normally is done by the LMT/LSS-Service of the bus. Since some master systems do not support this standard, or customer controller system can not handle, this tool - connected to the sensor - can be used for direct setup.
### Technical Data

#### Input
- **Measured variables**: Displacement, speed / Option: Multi-Magnet measurement (max. 20 positions simultaneous)
- **Measuring range**: Profile 25 - 5000 mm / Rod 25 - 7600 mm

#### Output
- **Interface**: CAN-Fieldbus System ISO-DIS 11898
- **Data protocol**: CANopen: CIA Standard DS 301 V3.0 / Encoder Profile DS 406 V3.1, CANbasic: CAN 2.0 A
- **Baud rate, kBit/s**: 1000 800 500 250 125 50 20
- **Cable length, m**: < 25 < 50 < 100 < 250 < 500 < 1000 < 250
- **Overvoltage protection**: up to 36 VDC

#### Accuracy
- **Resolution**
  - **CANopen**: 5 μm 2 μm 5 μm 2 μm
  - **CANbasic**: 5 μm 2 μm 5 μm 2 μm
- **Update time**: 1,0 ms up to 2400 / 2,0 ms up to 4800 / 4,0 ms up to 7600 mm stroke length
  - 0,5 ms up to 1200 mm extra for CANbasic
- **Linearity**: < ± 0,01 % F.S. (Minimum ± 40 μm)
- **Repeatability**: < ± 0,001 % F.S. (Minimum ± 2,5 μm)
- **Temperature coefficient**: < 15 ppm/°C
- **Hysteresis**: < 4 μm

#### Operating conditions
- **Magnet speed**: Any
- **Operating temperature**: -40 °C ... +75 °C
- **Dew point, humidity**: 90% rel. humidity, no condensation
- **Protection**: Profile style: IP65 / Rod style: IP67, IP68 for cable outlet
- **Shock test**: 100 g, single hit, IEC-Standard 68-2-27
- **Vibration test**: 15 g / 10 - 2000 Hz, IEC-Standard 68-2-6
- **Standards, EMC test**: Electromagnetic emission EN 50081-1
  - Electromagnetic immunity EN 50082-2
  - EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified

#### Form factor, material
- **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
  - **Position magnet**: Ring magnets, U-magnets

#### Installation
- **Mounting position**: Any orientation
- **Profile**
  - Movable mounting clamps or T-slot nuts M5 in base channel
- **U-Magnet, removable**
  - Mounting plate and screws from antimagnetical material
- **Rod**
  - Threaded flange M18 x 1,5 or 3/4" -16 UNF-3A, Hex nut M18
  - Mounting plate and screws from antimagnetical material

#### Electrical connection
- **Connection type**: Single or dual 6 pin connectors M16 or cable outlet or 2 x 5 pin connector M12 + 4 pin connector M8
- **Input voltage**: 24 VDC (-15 / +20 %)
- **Polarity protection**: up to -30 VDC
- **Overvoltage protection**: up to 36 VDC
- **Current drain**: 90 mA typical
- **Ripple**: < 1 % S-S
- **Electric strength**: 500 VDC (DC ground to machine ground)
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.

**CANbus**

Standard position magnet upon delivery (see chapter accessories)

Position magnets
- Magnet slider S (Part No. 252 182)
- Magnet slider V (Part No. 252 184)
- U-Magnet OD33 (Part No. 251 461-2)

Connection types
- 6 pin female connector (Part No. STC 09131)
- 6 pin female connector M16, 90° (Part No. STC 09131-6)

**CANbus**
High Pressure Rod Design

Temposonics®-RH with a pressure-resistant 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.

All dimensions in mm

Standard position magnets (not on delivery)

- **Ring magnet OD33**
  - Part No. 201 542-2
  - Composite PA-ferrite-GF20
  - Weight ca. 14 g
  - Operating temperature: -40 ... +100°C
  - Surface pressure max. 40 N/mm²
  - Fastening Torque for M4 screws max. 1 Nm

- **U-Magnet OD33**
  - Part No. 251 416-2
  - PA-Ferrit-GF20
  - Weight ca. 11 g
  - Operating temperature: -40 ... +100°C
  - Surface pressure max. 40 N/mm²
  - Fastening torque for M4 screws max. 1 Nm

= Magnet must be ordered separately (details see chapter Accessories)

Standard position magnet not on 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
- 6 pin female connector (Part No. STC 09131D)
- 6 pin female connector M16, 90° (Part No. STC 09131-6)
**Temposonics®**

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

**Form factor**

**Profile Temposonics®-RP:**
- **S** - Magnet slider, joint to top
- **V** - Magnet slider, joint at front
- **M** - U-Magnet, OD33

**Rod Temposonics®-RH:**
- **M** - Flange M18 x 1.5 (Standard)
- **V** - Flange M18 x 1.5 (Fluorelastomer housing-seal)
- **S** - Flange 3/4" - 16 UNF - 3A

**Measuring length**
- **Profile** - 0025...5000 mm
- **Rod** - 0025...7600 mm

Standard: up to 1000 in 50 mm, greater 1000 in 250 mm steps. Other length upon request.

**Connection type**
- **D60** - 6 pin male receptacle M16
- **D62** - 2 x 6 pin male receptacle M16
- **DS4** - 2 x 5 pin male/female receptacle M12, 4 pin male receptacle M8
- **P02** - 2 m PUR cable w/o connector, Option: P01-P10 (1-10 m)

**Input voltage**
- 1 - +24 VDC
- A - +24 VDC, high vibration resistant

**Output**
- C [1][2][3][4][5][6] = CAN-Bus

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[1][2][3] Protocol:</td>
<td>101 = CANbasic (MTS)</td>
<td>207 = Multi-Position measurement</td>
<td>304 = CANopen</td>
<td>504 = CANopen internal linearization</td>
<td></td>
</tr>
<tr>
<td>[4] Baud rate:</td>
<td>1 = 1000 kBit/s</td>
<td>2 = 500 kBit/s</td>
<td>3 = 250 kBit/s</td>
<td>4 = 125 kBit/s</td>
<td></td>
</tr>
<tr>
<td>[5] Resolution:</td>
<td>1 = 5 μm</td>
<td>2 = 2 μm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[6] Type:</td>
<td>1 = Standard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Magnet number** for Multi-Position measurement*
- Z02 - Z20 = 2 - 20 pcs.

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

**On delivery Profile model:**
Sensor, Position magnet, 2 mounting clamps up to 1250 mm + 1 clamp for every additional 500 mm.

**On delivery Rod model:**
Sensor and hex nut. Magnets must be ordered separately.

**CANopen only:**
Installation guide + CD-ROM (Electronic Data Sheet)
Temposonics®
Absolute, Non-Contact Position Sensors

R-Series
EtherCAT

Temposonics®-RP and RH
Measuring length 25 - 7600 mm

- Rugged Industrial Sensor
- Linear and Absolute Measurement
- LEDs for Sensor Diagnostics
- Contactless Sensing with Highest Durability
- Superior Accuracy: Linearity better 0.01 %
- Resolution 1 µm
- Repeatability 0.001 %
- Direct EtherCAT Output
- Displacement + Velocity with 5 Magnets
- Displacement with up to 20 Magnets
**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)

---

**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 Beckhoff) 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 to 5 magnets only).
### Technical Data

#### Input
- **Measured variable**: Displacement / Velocity 1-5 magnet measurement option 1-20 magnet measurement
- **Measuring length**: Profile 25 - 5000 mm / Rod 25 - 7600 mm

#### Output
- **Output signal**: EtherCAT Ethernet Control Automation Technology
- **Data format**: EtherCAT 100 Base-Tx, fast Ethernet
- **Data transmission rate**: 100 MBit/s

#### Accuracy
- **Resolution**
  - Displacement: 1 ... 1000 μm selectable
  - Speed: 1 μm/s (Quality rating) adjustable according to velocity and measuring length
- **Linearity**: < ± 0,01 % F.S. (Minimum ± 50 μm)
- **Repeatability**: < ± 0,001 % F.S. (Minimum ± 2,5 μm)
- **Cycle time**: Measuring length dependent
- **Data transmission rate**: ≤ 10 KHz (Oversampling is active while the scanning cycle is shorter than the measuring cycle.)
- **Temperature coefficient**: < 15 ppm/°C
- **Ripple**: < 5 μm
- **Hysteresis**: < 4 μm

#### Operating conditions
- **Magnet speed**: any
- **Operating temperature**: -40 °C ... +75 °C
- **Dew point, humidity**: 90 % rel. humidity, no condensation
- **Protection**: Profile: IP65, Rod: IP67, if mating connector is correctly fitted
- **Shock test**: 100 g single hit, IEC-Standard 68-2-27
- **Vibration test**: 15 g / 10 - 2000 Hz, IEC-Standard 68-2-6
- **Standards, EMC test**: Electromagnetic emission EN 50081-1
  - Electromagnetic immunity EN 50082-2
  - EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified

#### Form factor, Material
- **Diagnostic display**: LEDs beside connector
- **Profile model**: Aluminum
- **Sensor head**: Aluminum
- **Sensor stroke**: Magnet slider or removable U-magnet
- **Rod model**: Aluminum
- **Sensor head**: Stainless steel 1.4301 / AISI 304
- **Rod with flange**: 350 bar, 700 bar peak
- **Pressure rating**: Ring magnets, U-magnets

#### Installation
- **Mounting position**: any orientation
- **Profile**: Movable mounting clamps or T-slot nuts M5 in base channel
- **U-Magnet, removable**: Mounting plate and screws from antimagnetical material
- **Rod**: Threaded flange M18 x 1.5 or 3/4" -16 UNF-3A, Hex nut M18
- **Position magnet**: Mounting plate and screws from antimagnetical material

#### Electrical connection
- **Connection type**: 2 x 4 pin connector M12-D
- **Input voltage**: 24 VDC (-15 / +20 %)
- **Polarity protection**: up to -30 VDC
- **Overvoltage protection**: up to 36 VDC
- **Current drain**: 80 mA typical
- **Ripple**: < 1 % S-S
- **Electric strength**: 500 VDC (DC ground to machine ground)
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.

**EtherCAT**

Standard position magnet upon delivery (see chapter accessories)

<table>
<thead>
<tr>
<th>Position magnets</th>
<th>Connection types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet slider S (Part No. 252 182)</td>
<td>Cable connector (Part No. 530 066)</td>
</tr>
<tr>
<td>Magnet slider V (Part No. 252 184)</td>
<td>Cable connector (Part No. 530 064)</td>
</tr>
<tr>
<td>U-Magnet OD33 (Part No. 251 461-2)</td>
<td>4 pin Bus cable connector (Part No. 370 523)</td>
</tr>
</tbody>
</table>

All dimensions in mm
High Pressure Rod Design

Temposonics®-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.

Standard position magnets (not on delivery)

<table>
<thead>
<tr>
<th>Magnet Type</th>
<th>Part No.</th>
<th>Dimensions</th>
<th>Weight</th>
<th>Operating Temperature</th>
<th>Surface Pressure</th>
<th>Fastening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring magnet OD33</td>
<td>201 542-2</td>
<td>Ø 33, 13.5</td>
<td>14 g</td>
<td>-60...+100°C</td>
<td>40 N/mm²</td>
<td>M4 max. 1 Nm</td>
</tr>
<tr>
<td>U-Magnet OD33</td>
<td>251 416-2</td>
<td>Ø 33, 11</td>
<td>11 g</td>
<td>-60...+100°C</td>
<td>40 N/mm²</td>
<td>M4 max. 1 Nm</td>
</tr>
</tbody>
</table>

All dimensions in mm
<table>
<thead>
<tr>
<th><strong>Temposonics®</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensor model</strong></td>
<td></td>
</tr>
<tr>
<td>RP - Profile</td>
<td>M</td>
</tr>
<tr>
<td>RH - Rod</td>
<td>E</td>
</tr>
</tbody>
</table>

**Form factor**

**Profile Temposonics®-RP:**
- S - Magnet slider, joint at top
- V - Magnet slider, joint at front
- M - U-Magnet, OD33

**Rod Temposonics®-RH:**
- M - Flange M18 x 1.5 (Standard)
- V - Flange M18 x 1.5 (Fluorelastomer housing-seal)
- S - Flange 3/4" - 16 UNF - 3A

**Measuring length**

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

Standard: up to 1000 mm in 50 mm, greater 1000 mm in 250 mm steps
Other length upon request.

**Connection type**

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

**Input voltage**

1 - + 24 VDC
A - +24 VDC, high vibration resistant

**Output**

E 101 - EtherCAT, 1-5 Magnet measurement, position and velocity
E 102 - EtherCAT, 1-20 Magnet measurement, position and velocity
E 103 - EtherCAT, 1-5 Magnets, 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

**On 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).

**On delivery Rod Model:**

Magnets must be ordered separately.
Temposonics®

Absolute, Non-Contact Position Sensors

R-Series

Profibus

Temposonics® RP and RH
Measuring length 25 - 7600 mm

Advanced Communication
... offers Multi-Position Measurement

- Rugged Industrial Sensor
- Linear and Absolute Measurement
- LEDs for Sensor Diagnostics
- Contactless Sensing with Highest Durability
- Superior Accuracy: Linearity better 0.01 %
- Resolution up to 2 µm
- Repeatability 0.001 %
- Direct Profibus-DP Output, Displacement + Speed
- Multi-Position Measurement: 1 Sensor for max. 20 Positions
**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>ON</td>
<td>OFF</td>
<td>Normal function</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Magnet not detected or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wrong quantity of magnets</td>
</tr>
<tr>
<td>Flashing</td>
<td>OFF</td>
<td>Waiting for Master parameters</td>
</tr>
<tr>
<td>Flashing</td>
<td>ON</td>
<td>Programming mode</td>
</tr>
</tbody>
</table>

**Profibus Interface**

Temposonics® sensors fulfill all requirements of PROFIBUS-DP (EN 50170). The sensor realizes the absolute position measuring with direct transmission of serial, bitsynchronous data in RS485 standard to control units in a baud rate of 12 Mbit/s maximum. PROFIBUS interface is built-up with Siemens buscontroller SPC3. In addition to applications data transmission, PROFIBUS provides powerful functions for diagnostics and configuration, loaded into the bus via the GSD (Electronic Device Data Sheet).

Profibus sensors - corresponding DP-slave Class 2 - featuring

**Sensor outputs:**
- Absolute position measurement
- Speed measurement
- Sensor status
- Error detection (e.g. magnet status)

**Selectable parameters:**
- Offset/Preset for each magnet
- Measuring direction: Forward/reverse
- Resolution
- Different data formats

**Data exchange**

With Multi-Magnet measurement, 1 status byte and 3 bytes of position data for each position are transmitted. The status byte contains e.g. the error bit and the position number of the following measurement value. Dependent on sensor parameters setting, the position data can be transferred to the control unit in different formats (e.g. INTEL or MOTOROLA format).

**Accessory:** MTS Servicetool

Profibus Address-Programmer is used for setup sensor’s slave address. Normally addressing is done by Profibus SetSlaveAddress. Since some master systems do not support this standard, or customers controller can not handle, this tool - connected to the sensor - can be used for direct addressing.
## Technical Data

### Input

<table>
<thead>
<tr>
<th>Measured variable</th>
<th>Displacement / Option: Multi-Magnet measurement (max. 20 positions or 5 positions + 5 velocities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring length</td>
<td>Profile 25 - 5000 mm / Rod 25 - 7600 mm</td>
</tr>
</tbody>
</table>

### Output

<table>
<thead>
<tr>
<th>Output signal</th>
<th>PROFIBUS-DP System according ISO 74498</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data format</td>
<td>PROFIBUS-DP (EN 50 170)</td>
</tr>
<tr>
<td>Data transmission rate</td>
<td>Max. 12 Mbit/s</td>
</tr>
</tbody>
</table>

### Accuracy

<table>
<thead>
<tr>
<th>Resolution</th>
<th>1 μm / other values selectable via GSD-File</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>5 μm displacement resolution: 0,64 mm/s up to 500 mm; 0,43 mm/s up to 2000 mm; 0,21 mm/s up to 4500 mm; 0,14 mm/s up to 7600 mm stroke length</td>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; ± 0,01 % F.S. (Minimum ± 50 μm)</td>
</tr>
<tr>
<td>Option Internal Linearization</td>
<td>Linearity ± 20 μm ... ± 70 μm = 100 mm ... 5000 mm ML</td>
</tr>
<tr>
<td>Repeatability</td>
<td>&lt; ± 0,001 % F.S. (Minimum ± 2,5 μm)</td>
</tr>
<tr>
<td>Cycle time, standard (1 magnet)</td>
<td>0,5 ms at 500 mm / 1 ms at 2000 mm / 2 ms at 4500 mm / 3,1 ms at 7600 mm stroke length</td>
</tr>
<tr>
<td>Cycle time, standard (each additional magnet)</td>
<td>+ 0,05 ms; for speed measurement ca. + 0,03 ms</td>
</tr>
<tr>
<td>Temperature coefficient</td>
<td>&lt; 15 ppm/°C</td>
</tr>
<tr>
<td>Ripple</td>
<td>&lt; 5 μm</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>&lt; 4 μm</td>
</tr>
</tbody>
</table>

### Operating conditions

<table>
<thead>
<tr>
<th>Magnet speed</th>
<th>any</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-40 °C ... +75 °C</td>
</tr>
<tr>
<td>Dew point, humidity</td>
<td>90% rel. humidity, no condensation</td>
</tr>
<tr>
<td>Protection</td>
<td>Profile: IP65, Rod: IP67, if mating connector is correctly fitted</td>
</tr>
<tr>
<td>Shock test</td>
<td>100 g single hit, IEC-Standard 68-2-27</td>
</tr>
<tr>
<td>Vibration test</td>
<td>15 g / 10 - 2000 Hz, IEC-Standard 68-2-6</td>
</tr>
<tr>
<td>Standards, EMC test</td>
<td>Electromagnetic emission EN 50081-1</td>
</tr>
<tr>
<td></td>
<td>Electromagnetic immunity EN 50082-2</td>
</tr>
<tr>
<td></td>
<td>EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified</td>
</tr>
</tbody>
</table>

### Form factor, material

<table>
<thead>
<tr>
<th>Diagnostic display</th>
<th>LEDs beside connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile model:</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Sensor head</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Sensor stroke</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Position magnet</td>
<td>Magnet slider or removable U-magnet</td>
</tr>
<tr>
<td>Rod model:</td>
<td></td>
</tr>
<tr>
<td>Sensor head</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Rod with flange</td>
<td>Stainless steel 1.4301 / AISI 304</td>
</tr>
<tr>
<td>Pressure rating</td>
<td>350 bar, 700 bar peak</td>
</tr>
<tr>
<td>Position magnet</td>
<td>Ring magnets, U-magnets</td>
</tr>
</tbody>
</table>

### Installation

<table>
<thead>
<tr>
<th>Mounting position</th>
<th>any orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile</td>
<td>Movable mounting clamps or T-slot nuts M5 in base channel</td>
</tr>
<tr>
<td>U-Magnet, removable</td>
<td>Mounting plate and screws from antimagnetical material</td>
</tr>
<tr>
<td>Rod</td>
<td>Threaded flange M18 x 1,5 or 3/4&quot; -16 UNF-3A, Hex nut M18</td>
</tr>
<tr>
<td>Position magnet</td>
<td>Mounting plate and screws from antimagnetical material</td>
</tr>
</tbody>
</table>

### Electrical connection

<table>
<thead>
<tr>
<th>Connection type</th>
<th>2 x 6 pin connector M16 or 2 x 5 pin connector M12 + 4 pin. connector M8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable outlet</td>
<td>2 x 0 - 10 m PUR-cable + 4 pin. connector M8</td>
</tr>
<tr>
<td>Input voltage</td>
<td>24 VDC (-15 / +20 %)</td>
</tr>
<tr>
<td>Polarity protection</td>
<td>up to -30 VDC</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>up to 36 VDC</td>
</tr>
<tr>
<td>Current drain</td>
<td>90 mA typical</td>
</tr>
<tr>
<td>Ripple</td>
<td>&lt; 1 % S-S</td>
</tr>
<tr>
<td>Electric strength</td>
<td>500 VDC (DC ground to machine ground)</td>
</tr>
</tbody>
</table>
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.

All dimensions in mm

![Diagram of Temposonics®-RP setup]

Standard position magnet upon delivery (see chapter accessories)

<table>
<thead>
<tr>
<th>Position magnets</th>
<th>Connection types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet slider S</td>
<td>5 pin female connector M12-B (Part No. 560 885)</td>
</tr>
<tr>
<td>Magnet slider V</td>
<td>5 pin male connector M12-B (Part No. 560 884)</td>
</tr>
<tr>
<td>U-Magnet OD33</td>
<td>4 pin cable connector M8, 90° (Part No. 560 886)</td>
</tr>
</tbody>
</table>
High Pressure Rod Design

Temposonics®-RH with a pressure-resistant 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.

Standard position magnets (not on delivery)

- **Ring magnet OD33**
  - Part No. 201 542-2
  - Composite PA-Ferrite-GF20
  - Weight ca. 14 g
  - Operating temperature: -40 ... +100°C
  - Surface pressure max. 40 N/mm²
  - Fastening Torque for M4 screws max. 1 Nm

- **U-Magnet OD33**
  - Part No. 251 416-2
  - PA-Ferrit-GF20
  - Weight ca. 11 g
  - Operating temperature: -40 ... +100°C
  - Surface pressure max. 40 N/mm²
  - Fastening torque for M4 screws max. 1 Nm

All dimensions in mm

Standard position magnet not on 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**
- 5 pin female connector M12-B (Part No. 560 885)
- 5 pin male connector M12-B (Part No. 560 884)
- 4 pin cable connector M8, 90° (Part No. 560 886)
### Profibus – Series R

#### Temposonics®

<table>
<thead>
<tr>
<th>Sensor model</th>
<th>RP - Profile</th>
<th>RH - Rod</th>
</tr>
</thead>
</table>

#### Form factor

**Profile Temposonics®-RP:**
- S - Magnet slider, joint at top
- V - Magnet slider, joint at front
- M - U-Magnet, OD33

**Rod Temposonics®-RH:**
- M - Flange M18 x 1.5 (Standard)
- V - Flange M18 x 1.5  
  (Fluorelastomer housing-seal)
- S - Flange 3/4” - 16 UNF - 3A

#### Measuring length

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

Standard: up to 1000 mm in 50 mm, greater 1000 mm in 250 mm steps
Other length upon request.

#### Connection type

- D63 - 2 x 6 pin male/female receptacle M16
- D53 - 2 x 5 pin male/female receptacle M12, 4 pin male receptacle M8
- A02 - 2 m PUR-cable w/o connector, option: A01-A10 (1-10 m)

#### Input voltage

- 1 - +24 VDC
- A - +24 VDC, high vibration resistant

#### Output

- P = Profibus-DP
- 101 - Profibus-DP, Multi-Magnet measurement, 2 - 20 positions (Standard)
- 102 - Profibus-DP, 1-Magnet measurement (Standard)
- 103 - Profibus-DP, Position/speed measurement (max. 5 positions/velocities)

**Magnet number** for Multi-Position measurement*

- Z02 - Z20 = 2 - 20 pcs

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

---

**Note:** Projecting and parameterizing a Profibus system will be done with servicetool of Profibus mastersystem supplier.

---

**On 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 (Electronic Data Sheet with standardized Device Data Base File)

**On delivery Rod Model:**

Sensor and hex nut. Installation guide + CD-ROM (Electronic Data Sheet with standardized Device Data Base File)  
Magnets must be ordered separately.

---

**Accessories page 57 and following.**
Temposonics®
Absolute, Non-Contact Position Sensors

**R-Series**
SSI

Temposonics® RP and RH
Measuring length 25 - 7600 mm

- Rugged Industrial Sensor
- Linear and Absolute Measurement
- LEDs for Sensor Diagnostics
- Contactless Sensing with Highest Durability
- Superior Accuracy: Resolution up to 1 µm
- Linearity better 0.01 %
- Repeatability 0.001 %
- Direct 24/25/26 Bit SSI Output, Gray/Binary
- Synchronous Measurement for Real-time Sensing

Perfect data processing
1 µm
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>ON</td>
<td>OFF</td>
<td>Normal function</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Magnet not detected</td>
</tr>
<tr>
<td>ON</td>
<td>Flashing</td>
<td>Sensor not synchronous*</td>
</tr>
<tr>
<td>Flashing</td>
<td>ON</td>
<td>Programming mode</td>
</tr>
</tbody>
</table>

SSI (Synchronous Serial Interface)

The sensors fulfill all requirements of the SSI standard for absolute encoders. Its displacement value is encoded in a 24/25/26 code format and transmitted at high speed in SSI standard format to the control device. Main feature of SSI is the synchronized data transfer. Synchronization in a closed-loop control system is made simple. A clock pulse train from a controller is used to gate out sensor data: one bit of position data is transmitted to the controller per one clock pulse received by the sensor. The absolute, parallel position data is continually updated by the sensor and converted by the shift-register into serial information.

Sensor field programming

Temposonics® R-Series sensors are preconfigured at the factory by model code designation. If needed, MTS offers an external service tool for modifying sensor parameters inside the active electrical stroke (minimum 25 mm between set-points) via the standard connection cable. There is no need to open the sensors electronics.

USB-Programmer R-SSI

This hardware converter is required to communicate via USB-port of Windows PC to the sensor. Customized settings are possible by using a MTS programming software (CD-ROM) for:

- Data length
- Data format
- Resolution
- Measuring direction
- Synchronous / asynchronous measurement
- Offset, begin of the measurement range
- Alarm value (Magnet outside)
- Measurement filter
- Differential measurement: Distance between two magnets
- Speed measurement instead of position

Test sensor function permits a fast control of installed sensor. Its position values are shown in a diagram.

Sensor input

Timing diagram

Logic diagram

Programming-Kit, Part No. 253 135-1

(PC-Programmer, Power supply, USB-Cable, Sensor-Cable, Software)

Windows sensor programming
### Technical Data

#### Input

<table>
<thead>
<tr>
<th>Measured variable</th>
<th>Displacement, Displacement difference between 2 magnets, Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>Profile 25 - 5000 mm / Rod 25 - 7600 mm</td>
</tr>
</tbody>
</table>

#### Output

<table>
<thead>
<tr>
<th>Interface</th>
<th>SSI (Synchronous Serial Interface) - Differential signal in SSI standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data format</td>
<td>Binary or Gray, optional Parity and Errorbit</td>
</tr>
<tr>
<td>Data length</td>
<td>8 ... 32 bit</td>
</tr>
<tr>
<td>Update time</td>
<td>Measurements/sec.</td>
</tr>
<tr>
<td></td>
<td>Measuring length 300 750 1000 2000 5000 mm</td>
</tr>
<tr>
<td>Data speed</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></td>
<td>Baud rate 1.0 Mbaud &lt; 400 kbaud &lt; 300 kbaud &lt; 200 kbaud &lt; 100 kbaud</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>up to 36 VDC</td>
</tr>
</tbody>
</table>

#### Accuracy

| Resolution                    | Displacement: 1 μm, 2 μm, 5 μm, 10 μm i.a. / Velocity over 10 measured values: 1 μm/s, 2 μm/s, 5 μm/s... |
| Linearity                     | < ± 0.01 % F.S. (minimum ± 40 μm)                                       |
| Option internal linearisation |                                                                 |
| Linear tolerance:             | Model RP-G ±6 ... ±40 μm = 100 mm ... 5000 mm ML                       |
|                                | RH ±10 ... ±70 μm = 100 mm ... 5000 mm ML                              |
| Repeatability                 | < ± 0.001 % F.S. (minimum ± 2.5 μm)                                    |
| Temperature coefficient       | < 15 ppm/°C                                                            |
| Hysteresis                    | < 4 μm typical 2 μm                                                   |

#### Operating conditions

| Magnet speed                   | Any                                                                      |
| Operating temperature         | -40 °C ... +75 °C                                                      |
| Dew point, humidity           | 90% rel. humidity, no condensation                                     |
| Protection                    | Profile: IP65, Rod: IP67, IP68 for cable outlet                        |
| Shock test                    | 100 g, single hit, IEC-Standard 68-2-27                                |
| Vibration test                | 15 g / 10 - 2000 Hz, IEC-Standard 68-2-6                               |
| Option: Vibration resistant   | 30 g (av)                                                              |
| Standards, EMC test           | Electromagnetic emission EN 50081-1                                   |
|                                | Electromagnetic immunity EN 50082-2                                    |
|                                | EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified               |

#### Form factor, material

| 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 option: 800 bar, 1200 bar peak                   |
| Position magnet              | Ring magnets, U-magnets                                                |
| Differentiation measurement  | Min. magnet distance 50 mm (in the range of 50 - 75 mm double linearity) |

#### Installation

| Mounting position            | Any orientation                                                        |
| Profile                      | Movable mounting clamps or T-slot nuts M5 in base channel              |
| U-Magnet, removable          | Mounting plate and screws from antimagnetical material                  |
| Rod                         | Threaded flange M18 x 1.5 or 3/4" -16 UNF-3A                           |
| Position magnet              | Mounting plate and screws from antimagnetical material                  |

#### Electrical connection

| Connection type              | 7 pin connector M16 or cable outlet                                    |
| Input voltage                | 24 VDC (-15 / +20 %)                                                   |
| Polarity protection          | up to -30 VDC                                                          |
| Overvoltage protection       | up to 36 VDC                                                          |
| Current drain                | 100 mA typical                                                         |
| Ripple                       | < 1 % S-S                                                              |
| Electric strength            | 500 VDC (DC ground to machine ground)                                  |
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.

Position magnets

- Magnet slider S (Part No. 252 182)
- Magnet slider V (Part No. 252 184)
- U-Magnet OD33 (Part No. 251 461-2)

Connection types

- 7 pin female connector M16 (Part No. STC 09131D07PG9)
- 7 pin female connector M16, 90° (Part No. STC 09131-7)

All dimensions in mm
High Pressure Rod Design

Temposonics®-RH with a pressure-resistant 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.

Standard position magnets (not on delivery)

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
- 7 pin female connector M16 (Part No. STC 09131D07PG9)
- 7 pin female connector M16, 90° (Part No. STC 09131-7)

All dimensions in mm
Temposonics®

Sensor model
RP - Profile
RH - Rod

Form factor
Profile Temposonics®-RP:
S - Magnet slider, joint at top
V - Magnet slider, joint at front
G - Magnet slider, joint at top, slasheslash free
M - U-Magnet, OD33

Rod Temposonics®-RH:
M - Flange M18 x 1,5 (Standard)
V - Flange M18 x 1,5 (Fluorelastomer housing-seal)
S - Flange 3/4" - 16 UNF - 3A
J - Flange M22 x 1,5, rod Ø 12,7 mm, 800 bar

Measuring length
Profile - 0025...5000 mm
Rod - 0025...7600 mm
Standard: up to 1000 mm in 50 mm, greater 1000 mm in 250 mm steps
Other length upon request.

Connection type
D70 - 7 pin male receptacle M16
P02 - 2 m PUR-cable w/o connector, option: P01-P10 (1-10 m)

Input voltage / Conditions of use
1 - +24 VDC
A - +24 VDC / vibration resistant (measuring length 25 … 2000 mm)

Output
S [1][2][3][4][5][6] = Synchronous Serial Interface
[1] Data length: 1 - 25 Bit • 2 - 24 Bit • 3 - 26 Bit
[2] Output format: B - Binary • G - Gray
[3] Resolution (mm): 1 - 0,005 • 2 - 0,01 • 3 - 0,05 • 4 - 0,1 • 5 - 0,02 • 6 - 0,002 mm • 8 - 0,001 mm
[5][6] Options:
00 - Measuring direction forward
01 - Measuring direction reverse
02 - Measuring direction forward, synchronized measurement
05 - Measuring direction forward, Bit 25 = Alarm, Bit 26 = Parity even, select data length 26 Bit
11 - Measuring direction forward, synchronized measurement and prediction 0,2 - 10 khz
12 - Differential measurement
13 - Velocity asynchron
16 - Measuring direction forward, internal linearization
19 - Measuring direction forward, internal linearization, synchronized measurement

On delivery Profile model:
Sensor, Position magnet, 2 mounting clamps up to 1250 mm + 1 clamp for every additional 500 mm.

On delivery Rod model:
Sensor and hex nut. Magnets must be ordered separately.

Accessories page 57 and following.
MOUNTING / INSTALLATION

Flexible installation in any position

Profile model

Normally, the sensor is firmly installed - fixed on a straight surface of the machine with movable mounting clamps or M5 screws in base channel (2 mounting clamps up to 1250 mm + 1 clamp for every 500 mm) - whilst the magnet is mounted at the mobile machine part.

Rod model

Mount the sensor via flange thread or a hex nut. If possible, non-magnetisable material should be used for mounting support (dimensions as shown). With horizontal mounting, longer sensors (from 1 meter) must be provided with mechanical support.

Hydraulic sealing

Recommended is sealing of the flange facing with O-Ring (e.g. 22,4 x 2,65) in a cylinder cover nut or an O-Ring 15,3 x 2,2 in undercut.

Minimum assembly distance

1. Non-magnetisable material

   2. Magnetisable material

Cylinder installation

When used for direct stroke measurement in fluid cylinders, the sensor’s high pressure, stainless steel rod installs into a bore in the piston head/rod assembly as illustrated. That guarantees a long life and trouble-free operation - independent of used hydraulic fluid.

The sensor cartridge can be removed from the flange and rod housing while still installed in the cylinder. This procedure allows quick and easy sensor cartridge replacement, without the loss of hydraulic pressure.
CAN YOU IMAGINE...a sensor used in the plastics industry, which increases product quality and productivity and, at the same time, extends the useful life of the machine, by high-accuracy measurement of the mould movement.
Temposonics®

Absolute, Non-Contact Position Sensors

R-Series
Rod Model RF

Temposonics®-RF
Measuring range 100 - 20,000 mm

- Rugged Industrial Sensor
- Linear and Absolute Measurement
- LEDs for Sensor Diagnostics
- Contactless Sensing with Highest Durability
- Superior Accuracy: Linearity better 0.02 %
- Repeatability 0.001 %
- Direct Analogue Output for Displacement:
  - Analogue / SSI / CANbus / Profibus-DP / EtherCAT
- Multi-Position Measurement: max. 20 Positions
- with 1 Sensor
- Cost-effective shipment for long measuring length

Temposonics® RF 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 in which gives rise to the measurement signal. The sensor head accommodates the complete modular electronic interface with active signal conditioning. Double encapsulation ensures high operating 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. The RF sensors are housed in a teflon coated stainless steel housing that is flexible and that can be bent in an arc to an 250 mm min. bend radius arc. Specifications are measured with flexible sensor element at a 0° degree bend radius. Most operating parameters are identical to its rigid cousin.
## Technical Data

### Input

| Measured variables          | - Displacement  
|                            | - Velocity  
|                            | - Multi-Position measurement max. 20 positions (CANbus, Profibus, EtherCAT)  
| Measuring range             | 100 - 20,000 mm  

### Output

| Interfaces                  | Analogue, SSI, CANbus, Profibus-DP, EtherCAT  

### Accuracy

| Resolution                  | output dependent  
| Linearity                   | < ± 0.02 % F.S. (Min ± 100 μm)  
| Repeatability               | < ± 0.001 % F.S. (Minimum ± 2.5 μm)  
| Hysteresis                  | < 4 μm  

### Operating conditions

| Magnet speed                 | any  
| Operating temperature        | -40 °C ... +75 °C  
| Dew point, humidity          | 90% rel. humidity, no condensation  
| Protection                   | IP30 (IP65 rating only for professional mounted guide pipe IP65 and if mating connectors are correctly fitted)  
| Shock test                   | 100 g (single shock IEC-Standard 68-2-27)  
| Vibration test               | 5 g / 10 - 150 Hz IEC-Standard 68-2-C  
| Standards EMC test           | Electromagnetic emission EN 50081-1  
|                             | Electromagnetic immunity EN 50082-2  
|                             | EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified  

### Form factor, Material

| Diagnostic display           | LEDs beside connector  
| Sensor head                  | Aluminum-diecasting housing  
| Sensor stroke                | Flexible stainless steel pipe (teflon coated), min. bend radius 250 mm, radius for shipping 400 mm  
| Position magnet              | Permanent magnet  

### Electrical connection

| Connection type              | Connector or cable outlet (output dependent)  
| Input voltage                | 24 VDC (-15 / +20 %)  
| - Polarity protection        | up to -30 VDC  
| - Overvoltage protection     | up to 36 VDC  
| Current drain                | 100 mA typical  
| Ripple                       | < 1 % S-S  
| Electric strength            | 500 VDC (DC ground to machine ground)  

---

**Info:** For detailed technical data and electrical connection for the outputs please see data sheets: R-Series Analogue, SSI, CANbus, Profibus, EtherCAT.
Pressure housing pipe OD 12.7 and flange

Pressure housing pipe with flange is designed specifically for Temposonics® RF. It provides protection from high pressures, as found in hydraulic cylinders, up to 350 bar static, 700 bar spike. Typically, a bore 18 mm is used to match the large ring magnet.

Position magnets (Please order separately)

<table>
<thead>
<tr>
<th>Magnet Type</th>
<th>Part No.</th>
<th>Description</th>
<th>Operating Temperature</th>
<th>Surface Pressure Max.</th>
<th>Fastening Torque for M4 Screws Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring magnet OD33</td>
<td>201 542-2</td>
<td>PA-Ferrit-GF30 Weigh ca. 14 g</td>
<td>-40 ... +100°C</td>
<td>40 N/mm²</td>
<td>1 Nm</td>
</tr>
<tr>
<td>Ring magnet OD60</td>
<td>202 145</td>
<td>AlCuMgPo Magnets compound-filled Weigh ca. 90 g</td>
<td>-40 ... +75°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ring magnet OD63,5</td>
<td>201 954</td>
<td>PA 66-GF 10 Magnets compound-filled Weigh ca. 25 g</td>
<td>-40 ... +75°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U-Magnet OD33</td>
<td>251 416-2</td>
<td>PA-Ferrit-GF30 Weigh ca. 11 g</td>
<td>-40 ... +100°C</td>
<td>40 N/mm²</td>
<td>1 Nm</td>
</tr>
<tr>
<td>U-Magnet OD63,5</td>
<td>201 954</td>
<td>PA 66-GF 10 Magnets compound-filled Weigh ca. 25 g</td>
<td>-40 ... +75°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black magnet L</td>
<td>252 647</td>
<td>Magnet ground: CuS2N4, zinc-plated Magnet: Hardferrite Weigh ca. 75 g</td>
<td>-40 ... +75°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Position magnet not on delivery (see chapter accessories)

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

All dimensions in mm

---

### Standard position magnet not on delivery

#### 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
Sensor installation
Mounting of sensor head requires the use of 2 non-ferrous screws M4x59. Long sensors require a guide pipe support (inside diameter of 9.4 mm) of non-magnetizable material, straight or bent to the desired shape.
For easy installation the sensor can be supplied with a hex 46 flange (accessorie) bored for above mounting screws.
Optional you can order a pressure housing pipe OD 12.7 mm with flange up to max 7500 mm measuring length.

Note
A flexible sensor requires supports or anchoring to maintain proper alignment between sensor rod and the magnet, otherwise the sensor output signal can be interfered or lost.

Flexible

Required for substitute sensors mounted on flange Part No. 401 035:
Use 2 Screws B-32 x 2.35 Part No. 402 617 which supplied as attachemend with each sensor. The red rubber seal between sensor head and sensor stroke slit carefully and remove.
Temposonics®

Model
RF - Flexible sensor stroke

Form factor
C - Basic sensor

Measuring range
00100...20,000 mm
Up to 1000 in 50 mm steps, up 1000 in 250 mm steps

Connection type
Connector or cable outlet output dependent

Input voltage
1 - +24 VDC

Output
See data sheets R-Series
Analogue / SSI / CANbus / Profibus / EtherCAT

Magnets and Accessories must be ordered separately.

Accessories | Part No.
--- | ---
Ring magnet OD33, Standard | 201 542-2
U-Magnet OD33 | 251 416-2
Ring magnet OD30,5 | 402 316
Ring magnet OD60 | MT 0162
Ring magnet OD63,5 | 201 554
U-Magnet OD63,5 | 201 553
Position magnet 70x37,5 | 252 185
Block magnet L | 252 887
Flange M18x1,5 for pressure housing pipe 12,7 mm | 402 704

Pressure housing pipe (Please order separately)

Temposonics®

Model
HD - Pressure housing pipe OD 12,7 mm with flange for Temposonics® RF M18x1,5

Measuring range
0100...7500 mm
Up to 1000 in 50 mm steps, up 1000 in 250 mm steps
CAN YOU IMAGINE... a hillside threatened by land slipping. An 18 m long MTS Temposonics® sensor detects even smallest ground movements and can predict land slipping. In other words: it is able to prevent catastrophies.

Intelligence, high speed and utmost precision. High-accuracy MTS sensors offer all possibilities for an increase of the efficiency and value of your products.

**Innovation:** The invention of the magnetostrictive measurement method was only a first step.
MTS Sensors are continuously striving to enhance their product functionality and to find new fields of application for magnetostriction technology.

**Flexibility:** MTS customer-oriented engineering means that the technology can be used both for standard and individual product solutions. Whatever the requirements on length, size, pressure resistance or output may be, MTS sensors are versatile and flexible.

**Reliability:** Integrate and forget them. Based on the magnetostrictive technology, high-resolution sensor operation is completely contactless and free of wear. Recalibration is omitted. The absolute measuring principle is a warranty that the sensors are immediately ready for operation also after trouble.

**Quick reaction:** MTS delivery times are extremely short. Delivery within two weeks after ordering supports quick realization of your project.
In urgent cases, MTS has the capacity to complete production and shipment even within 48 hours.
Temposonics®

Absolute, Non-Contact Position Sensors

R-Series

Rod Model RD4

Temposonics®-RD4

Measuring range: 25 - 5000 mm

Rugged Industrial Sensor
Linear and Absolute Measurement
LEDs for Sensor Diagnostics
Contactless Sensing with Highest Durability
Superior Accuracy: Linearity better 0.02 %
Repeatability 0.001 %
Direct Output for Displacement + Velocity
Analogue / SSI / CANbus / Profibus-DP / EtherCAT
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 in which the measurement signal arises. 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

<table>
<thead>
<tr>
<th>Input</th>
<th></th>
</tr>
</thead>
</table>
| Measured variables | - Displacement  
- Velocity  
- Multi-Position measurement max. 20 positions (CANbus, Profibus, EtherCAT)  |
| Measuring range | 25...5000 mm |

<table>
<thead>
<tr>
<th>Output</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interfaces</td>
<td>Analogue, SSI, CANbus, Profibus-DP, EtherCAT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accuracy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>Output dependent</td>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; ± 0.02 % F.S. (Min ± 50 μm)</td>
</tr>
<tr>
<td>Repeatability</td>
<td>&lt; ± 0.001 % F.S. (Minimum ± 2.5 μm)</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>&lt; 4 μm</td>
</tr>
<tr>
<td>Ripple/Jitter</td>
<td>Analogue: 0.01 % F.S. / Digital: &lt; ± 10 μm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet speed</td>
<td>Any</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-40 °C ... +75 °C</td>
</tr>
<tr>
<td>Dew point, humidity</td>
<td>90% rel. humidity, no condensation</td>
</tr>
</tbody>
</table>
| 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 IP 30 |
| Shock test | 100 g (single shock IEC-Standard 68-2-27) |
| Vibration test | 10 g / 10 - 2000 Hz IEC-Standard 68-2-6 |
| Standards, EMC test* | Electromagnetic emission EN 50081-1  
Electromagnetic immunity EN 50082-2  
EN 61000-4-2/3/4/6, Level 3/4, criterion A, CE-qualified |

*Measuring rod and connecting cable mounted inside metal housing

<table>
<thead>
<tr>
<th>Form factor, Material</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic display</td>
<td>LED besides connector</td>
</tr>
<tr>
<td>Sensor electronics</td>
<td>Aluminum-diecasting housing</td>
</tr>
<tr>
<td>Measuring rod with flange</td>
<td>Stainless steel 1.4301 / AISI 304</td>
</tr>
<tr>
<td>Operating pressure</td>
<td>350 bar, 700 bar peak</td>
</tr>
<tr>
<td>Position magnet</td>
<td>Ring magnets</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical connection</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection type</td>
<td>Connector or cable outlet (output dependent)</td>
</tr>
<tr>
<td>Input voltage</td>
<td>24 VDC (-15 / +20 %)</td>
</tr>
<tr>
<td>- Polarity protection</td>
<td>up to -30 VDC</td>
</tr>
<tr>
<td>- Overvoltage protection</td>
<td>up to 36 VDC</td>
</tr>
<tr>
<td>Current drain</td>
<td>100 mA typical</td>
</tr>
<tr>
<td>Ripple</td>
<td>&lt; 1 % S-S</td>
</tr>
<tr>
<td>Electric strength</td>
<td>500 VDC (DC ground to machine ground)</td>
</tr>
</tbody>
</table>

*Info: For detailed technical data and electrical connection for the outputs please see data sheets: R-Series Analogue, SSI, CANbus, Profibus, EtherCAT*
Electronics with side cable entry for the measuring rod

- Rod Typ “S”
  - PUR-cable Ø6mm
  - Bend radius >24mm
  - Length 250 / 400 / 600 mm
  - Ø18
  - 45
  - 50
  - 70 / 95°
  - Housing length for Profibus, EtherCAT

- Rod Typ “M”
  - SW23
  - Fastening torque <50N/m
  - Ø18
  - 45
  - 50
  - 70

- Rod Typ “C”
  - SW46
  - Fastening torque <50N/m
  - Ø18
  - 45
  - 50

R-4

Electronics with side cable entry for the measuring rod.

Recommended screws
M6x45 ISO 4762

I51

= Magnet must be ordered separately
(details see chapter accessories)

All dimensions in mm
Electronics with bottom cable entry for the measuring rod

**Rod Typ “S”**
- Recommended screw M6x45 ISO4762
- PUR-cable Ø 6mm bend radius >24mm

**Rod Typ “M”**
- SW23 Fastening torque <50Nm
- O-Ring on delivery 15.3x2.2 FPM75 contour of bore (ISO 6149-1)

**Rod Typ “C”**
- SW46 Fastening torque <50Nm

---

**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.

---

= Magnet must be ordered separately (details see chapter accessories)

---

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 pistons velocity. The minimum drilling should be 13 mm. Do not exceed the peak pressure.
- The measuring rod should be protected against wear.

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

Minimum installation dimensions for magnetisable material

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

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

Standard position magnet not on delivery (see chapter accessories)

<table>
<thead>
<tr>
<th>Position magnets</th>
<th>Connection types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring magnet OD33 (Part No. 201 542-2)</td>
<td>Connector or cable outlet output dependent</td>
</tr>
<tr>
<td>Ring magnet OD25.4 (Part No. 400 533)</td>
<td></td>
</tr>
<tr>
<td>U-Magnet OD33 (Part No. 251 416-2)</td>
<td></td>
</tr>
</tbody>
</table>

All dimensions in mm
Mounting example fitting flange «S» and sensor electronics with side cable entry

Example mounting detail:
Setscrew M6 - ISO 7379 with internal hexagon

10 - 20 mm-Ø bore for cable to electronic housing

Detail: Fitting flange

ATTENTION
To fulfill the EMC standards for emission and susceptibility the electronic housing has to be connected to machine ground.

All dimensions in mm
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-magnetisable material. If using magnetisable material please necessarily follow the displayed installation dimensions.

Mounting example fitting flange »M«
Sealing results from the provided O-Ring 15.3 x 2.2 mounted in the 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 pistons velocity. The minimum drilling should be 10 mm. Do not exceed the peak pressure.
- The measuring rod should be protected against wear.
- Pressure sealing definite by cylinder manufacturer

Mounting example fitting flange »C«

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

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

Non-magnetisable material

Magnetisable 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:
- **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

**Measuring length**
0025...5000 mm
Standard: up to 1000 mm in 50 mm steps, longer 1000 mm in 250 mm steps

**Connection electronic housing**
Connector or cable outlet output dependent

**Output**
See data sheets R-Series
Analogue / SSI / CANbus / Profibus / EtherCAT

**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>253 572</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 PFPM 75        | 560 705  |
- Backup ring                        | 560 629  |
- O-Ring 20 x 2.65 FPM 80            | 561 435  |
Tempsonics®
Absolute, Non-Contact Position Sensors

Accessories

- Position Magnets
- Floats
- Connectors
- Clamps
- Cables
- Programming Tools
- High Pressure Housing, ...
<table>
<thead>
<tr>
<th>Product</th>
<th>Dimension</th>
<th>Material</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard magnet</strong>&lt;br&gt;Ring magnet OD33&lt;br&gt;Part No. 201 542-2</td>
<td>Ø 4,3 on circle Ø 24&lt;br&gt;Height: 8 mm</td>
<td>Composite PA-Ferrite-GF20&lt;br&gt;Weigh 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>
<td>RH, RF, RD4</td>
</tr>
<tr>
<td><strong>Standard magnet</strong>&lt;br&gt;U-magnet OD33&lt;br&gt;Part No. 251 416-2</td>
<td>Ø 4,3 on circle Ø 24&lt;br&gt;Height: 8 mm</td>
<td>Composite PA-Ferrite-GF20&lt;br&gt;Weigh ca. 11 g&lt;br&gt;Operating temperature: -40 ... +100°C&lt;br&gt;Surface pressure max. 40 N/mm²</td>
<td>RH, RF, RP</td>
</tr>
<tr>
<td><strong>U-magnet OD63,5</strong>&lt;br&gt;Part No. 201 553</td>
<td>Ø 4,5 on circle Ø 42&lt;br&gt;Height: 9,5</td>
<td>PA 66-GF30&lt;br&gt;Magnets compound-filled&lt;br&gt;Weigh ca. 26 g&lt;br&gt;Operating temperature: -40 ... +75°C</td>
<td>RH, RF, RP</td>
</tr>
<tr>
<td><strong>Ring magnet OD25,4</strong>&lt;br&gt;Part No. 400 533</td>
<td>Ø 13,5</td>
<td>Composite: PA-Ferrite&lt;br&gt;Weigh ca. 10 g&lt;br&gt;Operating temperature: -40 ... +100°C&lt;br&gt;Surface pressure max. 40 N/mm²</td>
<td>RH, RF, RD4</td>
</tr>
<tr>
<td><strong>Ring magnet OD30,5</strong>&lt;br&gt;Part No. 402 316</td>
<td>Ø 13,5</td>
<td>Composite: PA-Ferrite&lt;br&gt;Weigh ca. 15 g&lt;br&gt;Operating temperature: -40 ... +100°C&lt;br&gt;Surface pressure max. 40 N/mm²</td>
<td>RH, RF, RD4</td>
</tr>
<tr>
<td><strong>Ring magnet OD17,4</strong>&lt;br&gt;Part No. 253 864</td>
<td>Ø 13,5</td>
<td>PA- Ferrite&lt;br&gt;Operating temperature: -40 ... +100°C</td>
<td>RH, RF, RD4</td>
</tr>
<tr>
<td><strong>Ring magnet OD60</strong>&lt;br&gt;Part No. MT 0162</td>
<td>Ø 4,5 on circle Ø 48&lt;br&gt;Height: 15 mm</td>
<td>Al CuMgPb&lt;br&gt;Magnets compound-filled&lt;br&gt;Weigh ca. 90 g&lt;br&gt;Operating temperature: -40 ... +75°C</td>
<td>RH, RF, RD4</td>
</tr>
</tbody>
</table>

Notice: More magnets available on request.
<table>
<thead>
<tr>
<th>Product</th>
<th>Dimension</th>
<th>Material</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-magnet 70</td>
<td></td>
<td>AlMg4.5Mn, black anodised Magnets compound-filled</td>
<td>RH, RF, RP not for Multi-Position measurement Resolution min. 10 μm</td>
</tr>
<tr>
<td>Part No. 252 185</td>
<td></td>
<td>Weight ca. 75 g</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating temperature: -40...+75°C</td>
<td></td>
</tr>
<tr>
<td>Magnet slider V</td>
<td></td>
<td>GFK, Magnet Hardferrite Weight ca. 30 g</td>
<td>RP</td>
</tr>
<tr>
<td>Part No. 252 184</td>
<td></td>
<td>Operating temperature: -40...+75°C</td>
<td></td>
</tr>
<tr>
<td>Magnet slider S</td>
<td></td>
<td>GFK, Magnet Hardferrite Weight ca. 30 g</td>
<td>RP</td>
</tr>
<tr>
<td>Part No. 252 182</td>
<td></td>
<td>Operating temperature: -40...+75°C</td>
<td></td>
</tr>
<tr>
<td>Magnet slider G</td>
<td></td>
<td>Magnet slider S: Ball joint CuZn 39Pb3 nickel plated</td>
<td></td>
</tr>
<tr>
<td>Part No. 253 421</td>
<td></td>
<td>Magnets slider G - free from float: Socket joint, high-strength plastics Ball joint CuZn39Pb3 nickel plated</td>
<td></td>
</tr>
<tr>
<td>Magnet slider P</td>
<td></td>
<td>GFK, Magnet Hardferrite Weight ca. 30 g</td>
<td>RP</td>
</tr>
<tr>
<td>Part No. 253 673</td>
<td></td>
<td>Operating temperature: -40...+75°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>with additional end plates</td>
<td></td>
</tr>
<tr>
<td>Block magnet L</td>
<td></td>
<td>CuSn6 zinc coated, Magnet Hardferrite Weight: ca. 20 g</td>
<td>RH, RF, RP not for Multi-Position measurement Resolution min. 10 μm</td>
</tr>
<tr>
<td>Part No. 252 887</td>
<td></td>
<td>Operating temperature: -40...+75°C</td>
<td></td>
</tr>
<tr>
<td>Float 50 mm</td>
<td></td>
<td>1.4571 Stainless steel Density: 720 kg/m³ Max. Pressure: &lt; 40 bar Weight: 42 ± 3 g</td>
<td>RH, RF</td>
</tr>
<tr>
<td>Part No. SW0107</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Float 41 mm</td>
<td></td>
<td>1.4404 Stainless steel Density: 740 kg/m³ Max. Pressure: &lt;= 8 bar Weight: 20 ± 2 g</td>
<td>RH, RF</td>
</tr>
<tr>
<td>Collar</td>
<td></td>
<td>1.4301 Stainless steel</td>
<td>RH</td>
</tr>
<tr>
<td>Part No. 560 777</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product</td>
<td>Dimension</td>
<td>Material</td>
<td>Application</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>6 pin Connector (for cable Ø 6 mm)</td>
<td><img src="image1.png" alt="Image" /></td>
<td>Housing: Zinc nickel plated  Termination: Solder  Contact insert: Silver plated  Cable clamp: M16  Max. Cable-Ø 6 mm  Cable clamp: PG9, M16  Max. Cable-Ø 8 mm</td>
<td>Analogue CAN</td>
</tr>
<tr>
<td>6 pin Connector M16, 90°</td>
<td><img src="image2.png" alt="Image" /></td>
<td>Housing: Zinc nickel plated  Termination: Solder  Contact insert: Silver plated  Cable clamp: M16  Max. Cable-Ø 8 mm</td>
<td>Analogue CAN</td>
</tr>
<tr>
<td>5 pin connector, M12x1</td>
<td><img src="image3.png" alt="Image" /></td>
<td>Housing: PA  Termination: Solder  Contact insert: (CuZn/Sn)  Max. Cable-Ø 6-8 mm</td>
<td>CAN</td>
</tr>
<tr>
<td>5 pin connector, M12x1, 90°</td>
<td><img src="image4.png" alt="Image" /></td>
<td>Housing: PA  Termination: Solder  Contact insert: (CuZn/Sn)  Max. Cable-Ø 6-8 mm</td>
<td>CAN</td>
</tr>
<tr>
<td>7 pin Connector, M16</td>
<td><img src="image5.png" alt="Image" /></td>
<td>Housing: Zinc nickel plated  Termination: Solder  Contact insert: Silver plated  Cable clamp: PG9  Max. Cable-Ø 8 mm</td>
<td>SSI</td>
</tr>
<tr>
<td>7 pin Connector, M16, 90°</td>
<td><img src="image6.png" alt="Image" /></td>
<td>Housing: Zinc nickel plated  Termination: Solder  Contact insert: Silver plated  Cable clamp: M16  Max. Cable-Ø 8 mm</td>
<td>SSI</td>
</tr>
<tr>
<td>6 pin Connector, M16</td>
<td><img src="image7.png" alt="Image" /></td>
<td>Housing: Zinc nickel plated  Termination: Solder  Contact insert: Silver plated  Cable clamp: PG9  Max. Cable-Ø 8 mm  Cable type (e.g.) K53</td>
<td>Profibus (D63)</td>
</tr>
</tbody>
</table>
### ACCESSORIES RP + RH MODEL

Position Magnets, Floats, Connectors, Clamps, Cables and Programming Tools

<table>
<thead>
<tr>
<th>Product</th>
<th>Dimension</th>
<th>Material</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 pin Bus endplug M16, male</td>
<td></td>
<td>Housing: Zinc nickel plated Contact insert: Silver plated</td>
<td>Profibus (D63)</td>
</tr>
<tr>
<td>Part No. STA 09131H06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 pin connector M12-B</td>
<td></td>
<td>Housing: Zinc nickel plated Contact insert: Silver plated</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 560 885 (female)</td>
<td></td>
<td>Termination: Screws clamp Cable clamp: M16 Cable-Ø: 6,5 - 8,5 mm Cable type e.g.: K25</td>
<td></td>
</tr>
<tr>
<td>5 pin 90° connector M12-B</td>
<td></td>
<td>Housing: Zinc nickel plated Contact insert: Silver plated</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 370 514 (female)</td>
<td></td>
<td>Termination: Screws clamp Cable clamp: M16 Cable-Ø: 6,5 - 8,5 mm Cable type e.g.: K58</td>
<td></td>
</tr>
<tr>
<td>5 pin connector M12-B</td>
<td></td>
<td>Housing: Zinc nickel plated Contact insert: Silver plated</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 560 884 (male)</td>
<td></td>
<td>Termination: Screws clamp Cable clamp: M16 Cable-Ø: 6,5 - 8,5 mm Cable type e.g.: K58</td>
<td></td>
</tr>
<tr>
<td>5 pin 90° connector M12-B</td>
<td></td>
<td>Housing: Zinc nickel plated Contact insert: Silver plated</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 370 515 (male)</td>
<td></td>
<td>Termination: Screws clamp Cable clamp: M16 Cable-Ø: 6,5 - 8,5 mm Cable type e.g.: K58</td>
<td></td>
</tr>
<tr>
<td>5 pin Bus T-connector M12</td>
<td></td>
<td>Housing: PA 66 Contact insert: Silver plated</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 560 887</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 pin Bus endplug M12</td>
<td></td>
<td>Housing: PA 66 Contact insert: Silver plated</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 560 888</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## ACCESSORIES RP + RH MODEL
Position Magnets, Floats, Connectors, Clamps, Cables and Programming Tools

<table>
<thead>
<tr>
<th>Product</th>
<th>Dimension</th>
<th>Material</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 pin cable connector M8</td>
<td></td>
<td>Housing: Brass nickel plated</td>
<td></td>
</tr>
<tr>
<td>Part No. 370 504</td>
<td></td>
<td>Termination: Solder</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contact insert: Au</td>
<td>EtherCAT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max. Cable-Ø 5 mm</td>
<td>CAN (D54)</td>
</tr>
<tr>
<td>4 pin cable connector M8, 90°</td>
<td></td>
<td>Housing: PA 66</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 560 886</td>
<td></td>
<td>Termination: Solder</td>
<td>EtherCAT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contact insert: Au</td>
<td>CAN (D54)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max. Cable-Ø 5 mm</td>
<td></td>
</tr>
<tr>
<td>Cable connector</td>
<td></td>
<td>PUR-cable with 4 pin, female connector</td>
<td></td>
</tr>
<tr>
<td>Part No. 530 066</td>
<td></td>
<td>5 m length free end</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 530 096</td>
<td></td>
<td>4 x 0.25 mm², shielded</td>
<td>EtherCAT</td>
</tr>
<tr>
<td>Part No. 530 093</td>
<td></td>
<td>for 24V power supply</td>
<td>CAN (D54)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable connector</td>
<td></td>
<td>5 m industrial Ethernet cable</td>
<td></td>
</tr>
<tr>
<td>Part No. 530 064</td>
<td></td>
<td>(Cat 5e ES)</td>
<td>EtherCAT</td>
</tr>
<tr>
<td>Part No. 530 066</td>
<td></td>
<td>w/2x4 pin M12-connectors (D-coded)</td>
<td></td>
</tr>
<tr>
<td>Part No. 530 093</td>
<td></td>
<td>PUR-jacket, green</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable connector</td>
<td></td>
<td>5 m industrial Ethernet cable</td>
<td></td>
</tr>
<tr>
<td>Part No. 530 065</td>
<td></td>
<td>(Cat 5e ES)</td>
<td>EtherCAT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RJ45 connector and</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>M12-connector (D-coded)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PUR-jacket, green</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 pin Bus cable connector</td>
<td></td>
<td>IDC technology</td>
<td>EtherCAT</td>
</tr>
<tr>
<td>Part No. 370 523</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End cap</td>
<td></td>
<td>Aluminium</td>
<td>EtherCAT</td>
</tr>
<tr>
<td>Part No. 370 537</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## ACCESSORIES RP + RH MODEL

Position Magnets, Floats, Connectors, Clamps, Cables and Programming Tools

<table>
<thead>
<tr>
<th>Product</th>
<th>Dimension</th>
<th>Material</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clamp</td>
<td><img src="image1" alt="Clamp Image" /></td>
<td>Stainless steel</td>
<td>RP</td>
</tr>
<tr>
<td>Part No. 400 802</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groove stone</td>
<td><img src="image2" alt="Groove Stone Image" /></td>
<td>Stainless steel</td>
<td>RP</td>
</tr>
<tr>
<td>Part No. 401 602</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spacer</td>
<td><img src="image3" alt="Spacer Image" /></td>
<td>Aluminum</td>
<td>RH</td>
</tr>
<tr>
<td>Part No. 400 633</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixing clip</td>
<td><img src="image4" alt="Fixing Clip Image" /></td>
<td>Brass</td>
<td>RH</td>
</tr>
<tr>
<td>Part No. MT 0200</td>
<td></td>
<td>Flat section and fastening screws: non-magnetic material</td>
<td></td>
</tr>
<tr>
<td>Metal protection cap for connector M16</td>
<td><img src="image5" alt="Metal Protection Cap Image" /></td>
<td>Fluorelastomer FPM 75</td>
<td>RH-M</td>
</tr>
<tr>
<td>Part No. GZ0611</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O-ring</td>
<td><img src="image6" alt="O-ring Image" /></td>
<td>Fluorelastomer FPM 75</td>
<td>RH-M</td>
</tr>
<tr>
<td>Part No. 401 133</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable</td>
<td><img src="image7" alt="Cable Image" /></td>
<td>PVC</td>
<td>Standard</td>
</tr>
<tr>
<td>Part No. K 27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable</td>
<td><img src="image8" alt="Cable Image" /></td>
<td>Pelon PUR</td>
<td>Halogen free, Oil-resistant, High flexible</td>
</tr>
<tr>
<td>Part No. K 59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### ACCESSORIES RP + RH MODEL
Position Magnets, Floats, Connectors, Clamps, Cables and Programming Tools

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hand-Programmer R-Analogue for 1-Magnet Sensor</strong>&lt;br&gt;Part No.253 124</td>
<td>is for easy teach-in-sets of measuring length and direction on desired Zero/Span positions.</td>
</tr>
<tr>
<td><strong>Cabinet-Programmer R-Analogue</strong>&lt;br&gt;Part Nr. 253 408</td>
<td>Cabinet-Programmer R-Analogue completes the accessories program of MTS absolute position sensors. The unit can be used for adjusting a connected 1-magnet sensor via the leads, using a simple teach-in procedure in the field.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Dimension</th>
<th>Material</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cable</strong>&lt;br&gt;Part No. K 61</td>
<td>4 x 2 x 0,25 mm²</td>
<td>PUR (-30 ... +90°C)</td>
<td>Water proof wires</td>
</tr>
<tr>
<td><strong>Cable</strong>&lt;br&gt;Part No. K 34</td>
<td>4 x 2 x 0,25 mm²</td>
<td>Teflon (-90 ... +180°C)</td>
<td>Temperature</td>
</tr>
<tr>
<td><strong>Cable</strong>&lt;br&gt;Part No. K 26</td>
<td>7 x 0,14 mm²&lt;br&gt;EMC protected&lt;br&gt;Ø 7 mm</td>
<td>PUR&lt;br&gt;-20 ...+70°C</td>
<td>SSI, CAN</td>
</tr>
<tr>
<td><strong>Cable</strong>&lt;br&gt;Part No. K 53</td>
<td>BUS + feed-in&lt;br&gt;Ø 8 mm</td>
<td>PVC&lt;br&gt;-30 ... +80°C</td>
<td>Profibus-DP D63</td>
</tr>
<tr>
<td><strong>Cable</strong>&lt;br&gt;Part No. K 25</td>
<td>BUS conductor, high flexible cable&lt;br&gt;Ø 8 mm</td>
<td>PUR&lt;br&gt;-30 ... +70°C</td>
<td>Profibus-DP D53</td>
</tr>
</tbody>
</table>
## ACCESSORIES RP + RH MODEL

Position Magnets, Floats, Connectors, Clamps, Cables and Programming Tools

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
</table>
| **USB-Programmer R-Analogue** Part No. 253 134-1 | USB-Programmer R-Analogue for 1 or 2-Magnets Sensor (incl. Power supply, USB-Cable, Sensor-Cable and CD-ROM) for setting and reading of position and output values by using a PC for  
- Zero/Span Magnet 1  
- Zero/Span Magnet 2  
- Velocity range  
- Free assignment of outputs to measured position or velocity  
- Error output value (e.g. magnet out of stroke) |
| **USB-Programmer R-SSI** Part No. 253 135-1 | USB-Programmer R-SSI (incl. Power supply, USB-Cable, Sensor-Cable and CD-ROM) for setting and reading of  
- Data length  
- Data format  
- Resolution  
- Measuring direction  
- Synchronous / asynchronous measurement  
- Offset, begin of the measurement range  
- Alarm value (Magnet outsite)  
- Measurement filter  
- Differential measurement |
| **Profibus Address-Programmer D52/D53** Part No. 252 173-D52 | Profibus Address-Programmer D52/D53  
**Profibus Address-Programmer D63** Part No. 252 173-D63 | PROFIBUS Address Programmer is used for setting the slave address to Temposonics® sensors with Profibus-DP Interface. The setup of slave address normally is done by the profibus standard service SetSlaveAddress. Since some master systems do not support this standard, or the customer controller system can not handle it, this MTS service tool can be used for the direct setup of the sensor.  
All you need for using the programmer is a 24 VDC power supply to the sensor. The programming tool will be supplied from the Temposonics® position sensor. |
| **CANopen Address-Programmer D62** 6 pin. female connector M 16 Part No. 252 382-D62 | CANopen Address-Programmer D62  
**6 pin female 90°-connector M16** Part No. 252 382-D62A | CANopen Address Programmer is used for setting the Node-Address to Temposonics® sensors with CANopen Interface. The setup of Node-Address normally is done by the CAN Bus standard LMT-Service. Since some master systems do not support this standard, or the customer controller system can not handle it, this MTS service tool can be used for the direct setup of the sensor.  
All you need for using the programmer is a 24 VDC power supply to the sensor. The programming tool will be supplied from the Temposonics® position sensor. |
| **PROFIBUS Master Simulator** Part No. 401 727 | PROFIBUS Master Simulator  
The Master Simulator can be used to check the sensors functions and to change the slave address. The magnet positions can be read out and the diagnostic data as well.  
**Cable D 53** Part No. 252 383  
**Cable D63** Part No. 401 726 |
## ACCESSORIES RP + RH MODEL

Position Magnets, Floats, Connectors, Clamps, Cables and Programming Tools

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
</table>
| **IX 345 display and control unit with SSI input** | Housing: 96 x 48 x 141 mm  
Cutout: 91 x 44 mm  
6-segment LED  
Display for SSI |
| **Profibus Filter box**  
Part No. 252 916 | Housing: 80 x 75 x 58 mm  
The box is used for EMC-conformal feeding of 24 VDC supply voltage into the Profibus-DP hybrid cable. |
| **Linearity diagram**  
Part No. 402 463 | DIN A 4 printout with sensor data and graphic with the linearity gradient  
Printout with linearity gradient from the sensor. This gradient can be used to choose a special linear segment also for linearity correcture in sections. |

### RP+RH Analogue...

...programming outside!
Approved Sensors: R-Series
- Analogue Output
- CAN Bus [All Versions]
- SSI Output

Note:
1. All products are available in Profile and Rod Version.
2. Selectable with PUR, PVC or Teflon cable.

ATEX Conformity: Marking on MTS Approved Sensor

### Applicable ATEX Regulations / Directives

**Directive 94/9/EG**

(‘Manufacturers Directive’)  
Sets out directives for equipment manufacturers that are used in potentially explosive atmospheres.

**Related Norms:**
- EN 60079-0:2006
- EN 60079-15:2005
- EN 61241-0:2006
- EN 61241-1:2004

MTS is a certified supplier for displacement sensors intended to be used in hazardous areas of the Category 3 according to the ATEX standard.

- a. In Zone 2 (Gas, Category 3G) in the explosion groups IIA, IIB, IIC.
- b. In Zone 22 (Dust, Category 3D) at dusts with a minimum ignition energy of > 3 mJ.

### Ordering code

**Tempsonics®**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>M</th>
<th>1</th>
<th>E</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP: Profile</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RH: Rod</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Measuring Length in mm**

- **Profile**: 0050...5000 mm
- **Rod**: 0050...7600 mm

Standard: up to 1000 in 50 mm steps, greater 1000 in 250 mm steps. Other length upon request.

**Connection type:**

- **R02**: 2 m PVC cable w/o connector, Option: R01-R10 (1-10 m)
- **P02**: 2 m PUR cable w/o connector, Option: P01-P10 (1-10 m)
- **T02**: 2 m Teflon cable w/o connector, Option: T01-T10 (1-10 m)

Note: This options are output signal dependent.

For details refer individual catalog section.

**Output**

Analogue / CANbus / SSI

**EX-ATEX Approved Versions**
This High Pressure Housing is ATEX EEx approved and UL and cUL approved for use in hazardous locations with Temposonics® position sensors.

The ATEX, UL and cUL approvals cover flammable gases, vapors and liquids.

This housing is made to fit Temposonics® R-Series sensors with analogue and digital outputs. Both fixed cable and connector versions can be used. When using a standard sensor in this housing you get a cost efficient solution for use in hazardous locations which also allows easy sensor replacement. Several design combinations are available to fit your application: M18 or 3/4"UNF Mounting flange thread - M20 or 1/2" NPT Cable gland thread - long or short - top-mounted, side-mounted, or dual side-mounted cable glands. See Combination Chart.

All parts are made of 316L Stainless steel. The housing is also available in non-approved versions ensuring an outstanding protection to the sensor when used in rugged applications with high humidity and aggressive gases.
### Ordering Information:

Part-No.  
HPH -XXXX-XXXX-X-XXXXXX  
Choose a design combination from the chart  
Measuring length (see drawing)  
Approved or Non-approved version  
Only for version 1000: Please add type of approval:  
- ATEX  
- UL/cUL  

Example: Approved short housing with M18 mounting threads and one side mounted cable gland with M20 threads and a measuring length of 650 mm:  
HPH-0900-0650-A

---

**Note!**  
Accessories see data sheet "High Pressure Housing"  
Order separately: Sensor R-Series RH-B...  
B = Basic version without hydraulic rod
OUR TARGET? YOUR SATISFACTION!

A convincing product always requires a brilliant service. For MTS, the customer’s full satisfaction is the uppermost target of our ideas and activities. Excellent technical support is provided by the Application Service Group. Our application engineers expertise, extensive know-how and outstanding knowledge of the branch are available to assist you optimally already during planning. After buying MTS sensors, you can count on the top-class after sales service of the market leader. Whenever necessary, on-site advice by the experienced technicians and engineers is available to you.

Regular courses are held by MTS for optimum training of your operating personnel. Additionally, our hotline is at your disposal to solve your problems even after the normal working hours and on Saturdays. At MTS, customer orientation is more than a slogan.

IMAGINE...minimum size of gluing points, exact mixing ratios, filigree finishing. A sensor ensures high-accuracy dosing due to continuous measurement of the flow quantity and speed.
MTS Temposonics® Sales Organisation

**MTS SENSORS**

**Germany**
MTS Sensor Technologie GmbH & Co. KG
Auf dem Schüttel 9
D - 58513 Lendenfeld
Tel.: +49 23 51 55 87 0
Fax: +49 23 51 56 49 1
email: info@mtsensors.de
http://www.mtsensors.de

**USA**
MTS Systems Corporation
3001 Sheldon Drive
Cary, NC 27513, USA
Tel: +1 919 877 0100
Fax: +1 919 877 0200
email: sales@mtsensors.com
http://www.mtsensors.com

**Japan**
MTS Sensors Technology Corp.
737 Alharga-cho, Machida-shi
Tokyo 194-0211, Japan
Tel.: +86 21 6485 5800
Fax: +86 21 6495 6329
email: info@mtssensortechitalia.it
http://www.mtssensor.de

**DISTRIBUTORS**

**Austria**
Leotec - Sensorik GmbH Co KG
Neubauzeile 101
A - 4030 Linz
Tel.: +43 732 77 48 48 0
Fax: +43 732 77 48 48 9
email: office@leotec.at
http://www.leotec.at
Contact: Ing. Christoph Haginger

**Balkan Region**
(Albania, Macedonia, Serbia and Montenegro)
Neel Komerc DODEL
Antigona 25
MK - 1440 Negotino
Tel.: +389 43 36 5510
Fax: +389 43 36 5510
email: vijovanov@mt.net.mk
Contact: Mr. Vladimir Vojnov

**Belgium**
Multiprox N.V.
Lion d’Orweg 12
B - 9300 Aalst
Tel.: +32 53 766 557
Fax: +32 53 78 977
email: mail@multiprox.be
http://www.multiprox.be
Contact: Mr. Freddy Verloove

**Czech Republic**
Alpha International spol. s.r.o.
Fantova 342
CZ-38241 Kaplice
Tel.: +42 38 201 120
Fax: +42 38 201 120
email: info@alphaint.cz
http://www.alphaint.cz
Contact: Mrs. Machackova

**Denmark**
Summit Electronics ApS
Roksildvej 8-10
DK - 2620 Albertslund
Tel.: +45 48 47 59 19
Fax: +45 48 48 48 18
email: cib@summit.dk
http://www.summit.dk
Contact: Mr. Carsten Holme

**Finland**
Sensorsola Oy
Vanha Porvoonkatu 229
FIN - 01380 Vantaa
Tel.: +358 207 289900
Fax: +358 207 289918
email: myynti@sensorsola.fi
http://www.sensorsola.fi
Contact: Mr. Kimmo Ikonen

**Great Britain**
R.D.P. Electronics Ltd.
Grove Street, Heath Town
GB - Wolverhampton W V10 OPY
Tel.: +40 192 46 55 71
Fax: +40 192 46 55 71
email: sales@rdep.co.uk
http://www.rdep.co.uk
Contact: Mr. Peter Purdy

**Hungary**
Kvály Automatika Kft.
IV. Kiss Ernö u. 3.
H-1046 Budapest
Tel.: +36 (1) 272 2242
Fax: +36 (1) 272 2242
email: info@kvaley.hu
http://www.kvaly.hu
Contact: Mr. Péter Forró

**India**
Servocontrols & Hydraulics India Pvt Ltd
Survey No. 683, Industrial Estate
Udyamnagar, Belgaum, India
IND - Karnataka 590008
Tel.: +91 831-2407501, -2407502, -2407503, -2408174, -4201132
email: sales@alphaint.cz
http://www.alphaint.cz
Contact: Mrs. Machackova

**Indonesia**
Servocontrols & Hydraulics India Pvt Ltd
Survey No. 683, Industrial Estate
Udyamnagar, Belgaum, India
IND - Karnataka 590008
Tel.: +91 831-2407501, -2407502, -2407503, -2408174, -4201132
email: sales@alphaint.cz
http://www.alphaint.cz
Contact: Mrs. Machackova

**Ireland**
R.D.P. Electronics Ltd.
Grove Street, Heath Town
GB - Wolverhampton W V10 OPY
Tel.: +40 192 45 55 71
Fax: +40 192 45 55 71
email: sales@rdep.co.uk
http://www.rdep.co.uk
Contact: Mr. Peter Purdy

**Norway**
Semitronic AS
Grorudeveien 55 D
N - 0976 Oslo
Tel.: +43 1 989 38 19
Fax: +43 1 989 38 19
email: info@alphaint.cz
http://www.alphaint.cz
Contact: Mrs. Machackova

**Switzerland**
SensorControl Nordic AB
Sollentunavägen 49
- 19140 Sollentuna
Tel.: +46 8 669 0110
Fax: +46 8 669 0110
email: anders.olgsson@scn.se
http://www.scn.se
Contact: Mr. Anders Olfgsson

**Turkey**
OTKON MÜHENDISLIK ve ELEKTRIK SAN. TIC. LTD. STI.
Perper Ticaret Merkezi
A Blok Kat: 5 No: 305
TR - 34 384 Okmeydani-Istanbul
Tel.: +90 212 320 23 60
Fax: +90 212 320 23 62
email: baryama@otkon.com.tr
http://www.otkon.com.tr
Contact: Mr. Bayram Akkaya

**UKRAINE / BELARUS**
MegaSensor GmbH
Windmühenstr. 159
D - 51023 Köln
Tel.: +49 221 989 45 95
Fax: +49 221 989 45 96
email: info@megasensor.de
http://www.megasensor.com
Contact: Mr. Pavel Bazanov

**Slovenia**
Leotec - Sensorik GmbH Co KG
Neubauzeile 101
A - 4030 Linz
Tel.: +43 732 77 48 48 0
Fax: +43 732 77 48 48 9
email: office@leotec.at
http://www.leotec.at
Contact: Ing. Christoph Haginger

**South Africa**
ATI Systems (Pty) Ltd.
159 Galjoen Road
ZA - Wedaeville 1428
Tel.: +27 11 383 8300
Fax: +27 11 824 1533
email: sales@atsystems.co.za
http://www.atsystems.co.za
Contact: Mr. Wim Annandale

**Spain**
Iberfluíder Instruments S.A.
Cardenal Reig, 12
E - 08028 Barcelona
Tel.: +34 93 333 36 00
Fax: +34 93 334 55 24
email: myct@iberfluider.com
http://www.iberfluider.com
Contact: Mr. Angel Janela

**Sweden**
Sensor Control Nordic AB
Sollentunavägen 49
- 19140 Sollentuna
Tel.: +46 8 669 0110
Fax: +46 8 669 0110
email: anders.olgsson@scn.se
http://www.scn.se
Contact: Mr. Anders Olfgsson

**Switzerland**
SMT-Keller AG
Sensor u. Magnet-Technik
Landstr. 35
CH - 8450 Andelfingen
Tel.: +41 52 317 35 51
Fax: +41 52 317 35 51
email: info@smt-keller.ch
http://www.smt-keller.ch
Contact: Mr. Hans Keller