Temposonics®
Absolute, Non-Contact Position Sensors

R-Series Catalog

0.5 μm
Analog
CANbus
Profibus-DP
SSI
EtherCAT
Profinet

The Measurable Difference
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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 2,200 employees worldwide — 360 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 more than 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 to 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 Veltins-Arena 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.).
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 up to 0.5 μm steps.

Our engineers enthusiastically take up every challenge and develop position measuring solutions of exemplary precision based on magnetostriiction, 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 position sensors and liquid level transducers is our mission and it is black on white certified. It proves itself in countless applications world-wide every day. MTS co-operates with research institutes, professional associations from the range of the sensor technology and user organizations, in order to offer the customers sensors with a maximum of innovative quality.

CERTIFICATE

This is to certify that

MTS Sensor Technologie GmbH & Co. KG
Auf dem Schiöfe 9
85713 Lüdenscheid

has implemented and maintains a Quality Management System.

Spheres of application: Development and manufacturing of linear position transducers and liquid level measuring systems based on the magnetostricive principle.

Through an audit, documented in a report, it was verified that the management system fulfills the requirements of the following standard:

ISO 9001 : 2008

Certificate registration no. 60295 GM016
Date of certification 2010-03-08
Valid until 2016-03-19

DGS GmbH
G. Blaschke-Rehut
Chief Executive Officer
Managing Director

Accredited Body: DGS GmbH, August-Ehrenzeller-Straße 21, 60594 Frankfurt am Main

R-Series Catalog
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 SSI 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.

Load impedance
The impedance presented to the output terminals of a transducer by the associated external circuitry.

Load impedance
The impedance presented to the output terminals of a transducer by the associated external circuitry.

Multi-position measurement
Multiple magnets located at several positions along the stroke can be used to measure multiple positions simultaneously. MTS Temposonics® R-Series products can measure 20 positions on a single sensor.

Non-contact
MTS Temposonics® sensors utilize a non-contact sensing technology that results in longer-lasting sensors with greater reliability and no mechanical wear.

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.

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.

Resolution
The term resolution describes the smallest incremental change in position along the stroke length that can be detected and indicated in an output. For digital systems, such as the R-Series, resolution is a discrete value corresponding to one binary bit out of the total number of bits used in the output.

Ambient condition
Environmental conditions, under which transducers must commonly operate, which have been established as follows:

- Temperature: 25 °C (± 10 K)
- Relative humidity: < 90 %
- Tolerance closer than shown are frequently specified for transducer calibration and test environments.

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.

Example (Sensor with analog 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.

Warm-up period
The time required for the output to stabilize following power-up of the sensor. This error is characterized by a parallel position 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.
**Temposonics®**

Absolute, Non-Contact Position Sensors

**R-Series**

Analog

**Temposonics® RP and RH**

Stroke length 50…7600 mm

- Rugged industrial sensor
- Linear and absolute measurement
- LEDs for sensor diagnostics
- Non-contact sensing with highest durability
- Superior accuracy: Linearity better 0.01 % F.S.
- Repeatability 0.001 % F.S.
- Direct analog output, position + 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>OFF</td>
<td></td>
<td>Normal function</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td></td>
<td>Magnet not detected,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wrong quantity of magnets</td>
</tr>
<tr>
<td>ON</td>
<td>Flashing</td>
<td></td>
<td>Magnet out of setup range</td>
</tr>
<tr>
<td>Flashing</td>
<td>ON</td>
<td></td>
<td>Programming mode</td>
</tr>
</tbody>
</table>

Output
Smart analog sensors provide direct analog 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 position output over the entire active stroke length and one velocity output with 1 magnet.
- Dual magnets sensor provides two identical positions outputs; a separate output is provided for each of two magnets positioned along sensor length.

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:

1. Hand-Programmer R-Analog for 1 magnet sensor
   for easy teach-in setups of stroke length and direction by moving the magnet on desired Null/Span positions and pushing the 0/100% buttons.

   ![Hand-Programmer R-Analog](image)

2. Cabinet-Programmer R-Analog
   Cabinet-Programmer R-Analog 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.

   ![Cabinet-Programmer R-Analog](image)

3. USB-Programmer R-Analog 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)

   ![Programming kit, part no. 253 134-1](image)

   ![Windows sensor programming](image)
## Technical Data

### Input
- **Measured value**: Position, velocity / dual magnet position measurements
- **Stroke length**: Profile: 50…5000 mm, Rod: 50…7600 mm

### Output
- **Voltage**: 0…10 / 10…0 / -10…-10 VDC (min. load controller: > 5 kOhms)
- **Current**: 4(0)…20 mA / 20…4(0) mA (min/max. load: 0/500 Ohms)

### 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.

- **Velocity 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
- **Dew point, humidity**: 90% rel. humidity, no condensation
- **Ingress protection¹**: Profile: IP65, Rod: IP67, IP68 for cable outlet, RS: IP69K
- **Shock test**: 100 g single hit, IEC-Standard 60068-2-27
- **Vibration test**: 15g / 10 - 2000 Hz, IEC-Standard 60068-2-6
- **Standards, EMC test**: Electromagnetic emission EN 61000-6-4
  - Electromagnetic immunity EN 61000-6-2
  - EN 61000-4-2/3/4/6, Level ¾, Criterium A, CE-qualified

### Design, 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) for hydraulic rod
  - 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 ¾“ -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
- **Supply voltage**: 24 VDC (-15 / +20 %); UL Recognition requires an approved power supply with energy limitation (UL 61010-1), or Class 2 rating according to the National Electrical Code (USA) / Canadian Electrical Code.
  - Polarity protection: up to -30 VDC
  - Overvoltage protection: up to 36 VDC
- **Current drain**: 100 mA typical
- **Ripple**: ≤ 0.28 Vpp
- **Electric strength**: 500 VDC (DC ground to machine ground)

¹ The IP rating is not part of the UL recognition
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.

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### Wiring

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

Male insert sensor plug rear of cable connector

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All dimensions in mm

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### Standard position magnet included in 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. 251 416-2)

- **Connection types**
  - 6 pin female connector (part no. 370 623)
  - 6 pin female connector M16, 30° (part no. 370 460)
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 included in delivery, please order separately)

- **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
Tempsonics®

Sensor model
RP - Profile
RH - Hydraulic rod

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

Rod Tempsonics® RH:
M - Flange M18 x 1.5 (Standard)
V - Flange M18 x 1.5 (Fluor elastomer housing-seal)
D - Flange M18 x 1.5 with bushing on rod end
R - Flange M18 x 1.5 with thread M4 at rod end
J - Flange M22 x 1.5, rod Ø 12.7 mm, 800 bar
S - Flange ¾” - 16 UNF - 3A

Stroke length
Profile - 0050…5000 mm
Rod - 0050…7600 mm
Standard: See chart
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)

Supply voltage
1 - +24 VDC
A - +24 VDC, high vibration resistant (stroke length 25…2000 mm)

Output
1 Output with 1 magnet
Output 1 (position magnet 1)
V01 = 0…10 VDC A01 = 4…20 mA
V11 = 10…0 VDC A11 = 20…4 mA
V21 = -10…+10 VDC A21 = 0…20 mA
V31 = +10…-10 VDC A31 = 20…0 mA

2 Outputs with 2 magnets
Output 1 (position magnet 1) + Output 2 (position magnet 2)
V02 = 0…10 VDC 0…10 VDC
V12 = 10…0 VDC 10…0 VDC
V22 = -10…+10 VDC -10…+10 VDC
V32 = +10…-10 VDC +10…-10 VDC
A02 = 4…20 mA 4…20 mA

2 Outputs with 1 magnet
Output 1 (position magnet 1) + Output 2 (absolute speed magnet 1)
Magnet direction >>>>> Head Null Tip
V01 xxx.x = 0…10 VDC +10…….0……+10 VDC
V11 xxx.x = 10…0 VDC +10…….0……+10 VDC
A01 xxx.x = 4…20 mA 20…….4…….20 mA
A11 xxx.x = 20…4 mA 20…….4…….20 mA

Output 1 (position magnet 1) + Output 2 (speed magnet 1)
Magnet direction >>>>> Head Null Tip
V61 xxx.x = 0…10 VDC -10…….0……-10 VDC
V71 xxx.x = 10…0 VDC +10…….0……+10 VDC
A41 xxx.x = 4…20 mA 4…….12…….20 mA

Output 1 (position magnet 1) + Output 2 (position magnet 1)
V03 = 0…10 VDC 10…0 VDC

Output 1 (position magnet 1) + Output 2 (electronics temperature)
A04 = 4…20 mA 4…20 mA (-40ºC…+100ºC)

3 / 7 digits

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

Included in delivery rod model:
Sensor and O-ring.
Magnets must be ordered separately.

Accessories page 67 and following.

R-Series Analog
Temposonics®

Absolute, Non-Contact Position Sensors

R-Series
CANopen • CANbasic

Temposonics® RP and RH
Stroke length 25…7600 mm

• Rugged industrial sensor
• Linear and absolute measurement
• LEDs for sensor diagnostic
• Non-contact sensing with highest durability
• Superior accuracy: Resolution up to 2 μm
• Linearity better 0.01 % F.S.
• Repeatability 0.001 % F.S.
• Sensor-based intelligence
• Direct CAN output, position + velocity
• Multi-position measurement (1 sensor for 20 positions)
• Selectable bus termination (CANopen)
• CANopen with heartbeat-function

More than just a sensor
Multi-position measurement
CAN Bus Interface
Temposonics® position sensors fulfill - as slave devices - all requirements of the CAN-Bus (ISO 11898). The sensors electronics convert the position 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: Position + velocity with 1 magnet
   - CANopen: Position + velocity with 1 - 4 magnets and electronic temperature

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

3. CANopen 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/I-004 is given by the CANbus user organisation CiA (CAN in Automation) for MTS CANopen sensors.

Accessory: MTS Servicetool
CANopen address programmer is used for setup the node-address to sensors with CANopen interface. This setup is normally 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.

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, velocity, 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/I-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>LED</th>
<th>Green</th>
<th>Red</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td></td>
<td>Normal function</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td></td>
<td>Magnet not detected or wrong quantity of magnets</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td></td>
<td>Initialization error</td>
</tr>
<tr>
<td>Flashing</td>
<td>Flashing</td>
<td>Power out of range (high or low)</td>
<td></td>
</tr>
</tbody>
</table>

CANbus
## Technical Data

### Input

| Measured value | Position, velocity / Option: Multi-magnet measurement (max. 20 positions simultaneous) |
| Stroke length | 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 < 2500 |

The sensor will be supplied with ordered baud rate, which is changeable by customer

### Accuracy

<table>
<thead>
<tr>
<th>Resolution</th>
<th>CANopen</th>
<th>CANbasic</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Position</td>
<td>5 μm 2 μm 5 μm 2 μm</td>
<td></td>
</tr>
<tr>
<td>- Speed</td>
<td>0.5 mm/s 0.2 mm/s 1.0 mm/s 0.1 mm/s</td>
<td></td>
</tr>
<tr>
<td>Update time</td>
<td>1.0 ms up to 2400 / 2.0 ms up to 4800 / 4.0 ms up to 7600 mm stroke length</td>
<td></td>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; ± 0.01 % F.S. (Minimum ± 45 μm)</td>
<td></td>
</tr>
<tr>
<td>Linearity tolerance:</td>
<td>Option internal linearization</td>
<td></td>
</tr>
<tr>
<td>RP/RH</td>
<td>&lt; 300 mm: typ. ± 15 μm, max. ± 25 μm, &gt; 300…600 mm: typ. ± 20 μm, max. ± 30 μm</td>
<td></td>
</tr>
<tr>
<td>RP</td>
<td>&gt; 600…1200 mm: typ. ± 30 μm, max. ± 50 μm</td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>1200…3000 mm: typ. ± 45 μm, max. ± 90 μm, 3…5 m: typ. ± 85 μm, max. ± 150 μm</td>
<td></td>
</tr>
<tr>
<td>Temperature coefficient</td>
<td>&lt; ± 0.001 % F.S. (Minimum ± 2.5 μm)</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>&lt; 4 μm</td>
<td></td>
</tr>
</tbody>
</table>

### Operating conditions

| Magnet speed | any |
| Operating temperature | -40 °C…+75 °C |
| Dew point, humidity | 90% rel. humidity, no condensation |
| Ingress protection¹ | Profile style: IP65 / Rod style: IP67, IP68 for cable outlet, RS: IP69K |
| Shock test | 100 g, single hit, IEC-Standard 60068-2-27 |
| Vibration test | 15 g / 10 - 2000 Hz, IEC-Standard 60068-2-6 |
| Standards, EMC test | Electromagnetic emission EN 61000-6-4 |
| | Electromagnetic immunity EN 61000-6-2 |
| | EN 61000-4-2/3/4/6, Level 3/4, Criterion A, CE-qualified |

### Design, 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) for hydraulic rod |
| 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 ¾”-16 UNF-3A, Hex nut M18 |
| Position magnet | 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 |
| Supply voltage | 24 VDC (-15 / +20 %); UL Recognition requires an approved power supply with energy limitation (UL 61010-1), or Class 2 rating according to the National Electrical Code (USA) / Canadian Electrical Code. |
| - Polarity protection | up to -30 VDC |
| - Overvoltage protection | up to 36 VDC |
| Current drain | 90 mA typical |
| Ripple | ≤ 0.28 Vpp |
| Electric strength | 500 VDC (DC ground to machine ground) |

¹ The IP rating is not part of the UL recognition
Stable profile design

Tempsonics® 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.

Electronics housing

Electronics housing

Electronics housing

Electronics housing

Stable profile design

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Electronics housing

Electronics housing

Electronics housing

Electronics housing

Stable profile design

Tempsonics® 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.
High pressure rod design

Tempsonics® 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 included in, please order separately)

Position magnets

| Ring magnet OD33 (part no. 201 542-2) |
| U-magnet OD33 (part no. 251 416-2) |

Connection types

6 pin female connector (part no. 370 623)
6 pin female connector M16, 90° (part no. 560 778)
Tempsonics®

Sensor model
RP - Profile
RH - Rod

Design
Profile Tempsonics® RP:
S - Magnet slider, joint to top
V - Magnet slider, joint at front
G - Magnet slider, joint at top, backlash free
M - U-magnet, OD33

Rod Tempsonics® RH:
M - Flange M18 x 1.5 (Standard)
V - Flange M18 x 1.5 (Fluorelastomer housing-seal)
D - Flange M18 x 1.5 with bushing on rod end
R - Flange M18 x 1.5 with thread M4 at rod end
J - Flange M22 x 1.5, rod Ø 12.7 mm, 800 bar
S - Flange ¾" - 16 UNF - 3A

Stroke length
Profile - 0025…5000 mm
Rod - 0025…7600 mm
Standard: See chart
Other length upon request.

Connection type
D60 - 6 pin male receptacle M16
D62 - 2 x 6 pin male receptacle M16
D54 - 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)

Supply voltage
1 - +24 VDC
A - +24 VDC, high vibration resistant (stroke length 25…2000 mm)

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

[1][2][3] Protocol: 101 = CANbasic (MTS) • 207 = Multi-position measurement • 304 = CANopen • 504 = CANopen internal linearization
[4] Baud rate: 1 = 1000 kBit/s • 2 = 500 kBit/s • 3 = 250 kBit/s • 4 = 125 kBit/s
[5] Resolution: 1 = 5 μm • 2 = 2 μm
[6] Type: 1 = Standard

Magnet number for multi-position measurement*
Z02 - Z20 = 2 - 20 pcs.
*Note: Please specify magnet numbers for your sensing application and order separately

Included in delivery profile model:
Sensor, 1 position magnet, 2 mounting clamps up to 1250 mm + 1 clamp for every additional 500 mm.

Included in delivery rod model:
Sensor and O-ring. Magnets must be ordered separately. Use signed magnets for sensors w/LCO

CANopen only:
Installation guide + CD-ROM (Electronic Data Sheet)

<table>
<thead>
<tr>
<th>Stroke Length Standard RP</th>
<th>Stroke Length Standard RH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke Length</td>
<td>Ordering Steps</td>
</tr>
<tr>
<td>≤ 500 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>500…2500 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>2500…5000 mm</td>
<td>100 mm</td>
</tr>
<tr>
<td>&gt; 5000 mm</td>
<td>250 mm</td>
</tr>
<tr>
<td>2500…5000 mm</td>
<td>100 mm</td>
</tr>
<tr>
<td>&gt; 5000 mm</td>
<td>250 mm</td>
</tr>
</tbody>
</table>

Accessories page 67 and following.
Temposonics®
Absolute, Non-Contact Position Sensors

R-Series
EtherCAT®

Temposonics® RP and RH
Stroke length 25…7600 mm

- Rugged industrial sensor
- Linear and absolute measurement
- LEDs for sensor diagnostics
- Non-contact sensing with highest durability
- Superior accuracy: Linearity better 0.01 % F. S.
- Resolution 1 µm
- Repeatability 0.001 % F.S.
- Direct EtherCAT output
- Position + velocity with 5 magnets
- Positions with up to 20 magnets

Advanced communication
...offers multi-position measurement

EtherCAT® is a registered trademark and patented technology licensed by Beckhoff Automation GmbH, Germany.
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)

---

**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>Flashing OFF</td>
<td>Normal function</td>
<td></td>
</tr>
<tr>
<td>Flashing ON</td>
<td>Magnet not detected or Wrong quantity of magnets</td>
<td></td>
</tr>
</tbody>
</table>

Further diagnostic features programmable.

---

**Characteristics of the EtherCAT® sensor**

**Sensor output**
- Position as an absolute value
- Velocity and direction of the drive
- Diagnostics (Status information)
- Error status (e.g. of magnet)

**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 Tempsonics® sensor with the EtherCAT interface into an EtherCAT field-bus system. The System-Manager (e.g. TwinCAT from Beckoff) 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 - 5 magnets only).
## Technical Data

### Input

<table>
<thead>
<tr>
<th>Measured value</th>
<th>Position / Velocity 1 - 5 magnet measurement option 1 - 20 magnet measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke length</td>
<td>Profile 25…5000 mm / Rod 25…7600 mm</td>
</tr>
</tbody>
</table>

### Output

<table>
<thead>
<tr>
<th>Output signal</th>
<th>EtherCAT Ethernet Control Automation Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data format</td>
<td>EtherCAT 100 Base-Tx, Fast Ethernet</td>
</tr>
<tr>
<td>Data transmission rate</td>
<td>100 MBit/s max.</td>
</tr>
</tbody>
</table>

### Accuracy

<table>
<thead>
<tr>
<th>Resolution</th>
<th>1…1000 μm selectable</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Speed</td>
<td>1 μm/s (Quality rating) adjustable according to velocity and 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></td>
</tr>
<tr>
<td>Linearity tolerance:</td>
<td>RP/RH &lt; 300 mm: typ. ± 15 μm, max. ± 25 μm, &gt; 300…600 mm: typ. ± 20 μm, max. ± 30 μm</td>
</tr>
<tr>
<td></td>
<td>&gt; 600…1200 mm: typ. ± 30 μm, max. ± 50 μm</td>
</tr>
<tr>
<td></td>
<td>1200…3000 mm: typ. ± 45 μm, max. ± 90 μm, 3…5 m: typ. ± 85 μm, max. ± 150 μm</td>
</tr>
</tbody>
</table>

| Repeatability        | < ± 0.001 % F.S. (Minimum ± 2.5 μm)                                         |
| Cycle time           | Stroke 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                                          |
| Ingress protection   | Profile: IP65, Rod: IP67, if mating connector is correctly fitted, RS: IP69K |
| Shock test           | 100 g single hit, IEC-Standard 60068-2-27                                     |
| Vibration test       | 15 g / 10 - 2000 Hz, IEC-Standard 60068-2-6                                   |
| Standards, EMC test  | Electromagnetic emission EN 61000-6-4                                         |
|                      | Electromagnetic immunity EN 61000-6-2                                         |
|                      | EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified                     |

### Design, Material

<table>
<thead>
<tr>
<th>Diagnostic display</th>
<th>LEDs beside connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile model:</td>
<td></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) for hydraulic rod</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 ¾”-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 4 pin connector M12-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>24 VDC (-15 / +20 %); UL Recognition requires an approved power supply with energy limitation</td>
</tr>
<tr>
<td></td>
<td>(UL 61010-1), or Class 2 rating according to the National Electrical Code (USA) / Canadian Electrical Code.</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>80 mA typical</td>
</tr>
<tr>
<td>Ripple</td>
<td>≤ 0.28 Vpp</td>
</tr>
<tr>
<td>Electric strength</td>
<td>500 VDC (DC ground to machine ground)</td>
</tr>
</tbody>
</table>

1 The IP rating is not part of the UL recognition
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. 251 416-2)

Connection types

- Cable connector (part no. 530 066)
- Cable connector (part no. 530 064)
- 4 pin Bus cable connector (part no. 370 523)

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 included in delivery, please order separately)

<table>
<thead>
<tr>
<th>Magnet Type</th>
<th>Code</th>
<th>Description</th>
<th>Dimensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring magnet OD33</td>
<td>Part. 201 542-2</td>
<td>Composite PA-Ferrite-GF20</td>
<td>Ø 13.5, Height 6 mm</td>
<td>Weight ca. 14 g</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating temperature: -40...+100 °C</td>
<td></td>
<td>Surface pressure max. 40 N/mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fastening Torque for M4 screws max. 1 Nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U-magnet OD33</td>
<td>Part. 251 416-2</td>
<td>PA-Ferrite-GF20</td>
<td>Ø 13.5, Height 6 mm</td>
<td>Weight ca. 11 g</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating temperature: -40...+100 °C</td>
<td></td>
<td>Surface pressure max. 40 N/mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fastening Torque for M4 screws max. 1 Nm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All dimensions in mm
**Temposonics®**

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

**Design**

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

**Rod Temposonics® RH:**
- M - Flange M18 x 1.5 (Standard)
- V - Flange M18 x 1.5 (Fluorelastomer housing-seal)
- D - Flange M18 x 1.5 with bushing on rod end
- R - Flange M18 x 1.5 with thread M4 at rod end
- J - Flange M22 x 1.5, rod Ø 12.7 mm, 800 bar
- S - Flange ¾” - 16 UNF - 3A

**Stroke length**

**Profile**
- ≤ 500 mm: 25 mm
- 500…2500 mm: 50 mm
- 2500…5000 mm: 100 mm

**Rod**
- ≤ 500 mm: 25 mm
- 500…7600 mm: 100 mm

**Standard: See chart**

**Other length upon request.**

**Connection type**

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

**Supply voltage**

T - +24V DC

A - +24 VDC, high vibration resistant (stroke length 25…2000 mm)

**Output**

E 101 - EtherCAT, Single- and multi-position measurement, 1 - 5 positions and velocity distributed clock mode selectable

E 102 - EtherCAT, Single- and multi-position measurement, 1 - 20 positions and velocity

E 103 - EtherCAT, Single-position measurement, 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

---

Included in 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).

Included in delivery **rod model:**


Magnets must be ordered separately. Use signed magnets for sensors w/LCO.
Temposonics®
Absolute, Non-Contact Position Sensors

R-Series
Profibus

Temposonics® RP and RH
Stroke length 25…7600 mm

Advanced Communication
…offers Multi-Position Measurement

- Rugged industrial sensor
- Linear and absolute measurement
- LEDs for sensor diagnostics
- Non-contact sensing with highest durability
- Superior accuracy: Linearity better 0.01 %
- Resolution up to 1 μm
- Repeatability 0.001 %
- Direct Profibus-DP output, position
- Multi-position measurement: 1 sensor for max. 20 positions
Operation mode:

P101 1-20 multi-magnet measurement
Position measurement of max. 20 magnets simultaneously

P102 1 magnet measurement (Standard)
Positions measurement 1 magnet

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>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>

Profiler 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
- 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
Measured value
Position / Option: Multi-magnet measurement (max. 20 positions)
Stroke length
Profile 25…5000 mm / Rod 25…7600 mm

Output
Output signal
IEC 61158 CPF3 PROFIBUS
Data format
PROFIBUS-DP slave
Data transmission rate
Max. 12 Mbit/s

Accuracy
Resolution
1 µm / other values selectable via GSD-file
< ± 0.01 % F.S. (Minimum ± 50 µm)
Linearity
Option internal linearization
Linearity tolerance:
RP/RH < 300 mm: typ. ± 15 µm, max. ± 25 µm, > 300…600 mm: typ. ± 20 µm, max. ± 30 µm
> 600…1200 mm: typ. ± 30 µm, max. ± 50 µm
RP 1200…3000 mm: typ. ± 45 µm, max. ± 90 µm, 3…5 m: typ. ± 85 µm, max. ± 150 µm
Option internal linearization
Linearity ± 20 µm…± 70 µm = 100 mm…5000 mm ML
Repeatability
< ± 0.001 % F.S. (Minimum ± 2.5 µm)
Cycle time, standard (1 magnet)
0.5 ms at 500 mm / 1 ms at 2000 mm / 2 ms at 4500 mm / 3.1 ms at 7600 mm stroke length
each additional magnet + 0.05 ms
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
Ingress protection¹
Profile: IP65, Rod: IP67, if mating connector is correctly fitted, RS: IP69K
Shock test
100 g single hit, IEC-Standard 60068-2-27
Vibration test
15 g / 10 - 2000 Hz, IEC-Standard 60068-2-6
Standards, EMC test
Electromagnetic emission EN 61000-6-4
Electromagnetic immunity EN 61000-6-2
EN 61000-4-2/3/4/6, Level 3/4,Criterion A, CE-qualified

Design, 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) for hydraulic rod
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 ¾" -16 UNF-3A, Hex nut M18
Position magnet
Mounting plate and screws from antimagnetical material

Electrical connection
Connection type
2 x 6 pin connector M16 or 2 x 5 pin connector M12 + 4 pin, connector M8
Cable outlet 2 x 0 - 1 0 m PUR-cable + 4 pin, connector M8
Supply voltage
24 VDC (-15 / +20 %); UL Recognition requires an approved power supply with energy limitation
(UL 61010-1), or Class 2 rating according to the National Electrical Code (USA) / Canadian Electrical Code.
- Polarity protection
up to -30 VDC
- Overvoltage protection
up to 36 VDC
Current drain
90 mA typical
Ripple
≤ 0.28 Vpp
Electric strength
500 VDC (DC ground to machine ground)

¹ The IP rating is not part of the UL recognition
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.

### Wiring D63

**Pin** | **Cable** | **Function**
---|---|---
1 | green | RxO/TxD-N (Bus)
2 | red | RxO/TxD-P (Bus)
3 | ---- | DGND (for Bus termination)*
4 | ---- | VP (for Bus termination)*
5 | black | +24 VDC (-15 / +20 %)
6 | blue | DC Ground (0V)
7 | yellow/green | do not connect
8 | - | *female only

### Wiring D53

**Pin** | **Cable** | **Function**
---|---|---
1 | ---- | VP-S (for Bus termination)*
2 | green | RxO/TxD-N (Bus)
3 | ---- | DGND (for Bus termination)*
4 | red | RxO/TxD-P (Bus)
5 | shield | shield
6 | shield | *female only

### Standard position magnet included in 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. 251 416-2)

**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. 560 686)
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 included in delivery, please order separately)

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)

All dimensions in mm
### Temposonics®

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

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

**Rod Temposonics® RH:**
- **M** - Flange M18 x 1.5 (Standard)
- **V** - Flange M18 x 1.5 (Fluorelastomer housing-seal)
- **D** - Flange M18 x 1.5 with bushing on rod end
- **R** - Flange M18 x 1.5 with thread M4 at rod end
- **J** - Flange M22 x 1.5, rod Ø 12.7 mm, 800 bar
- **S** - Flange ¾" - 16 UNF - 3A

#### Stroke length
**Profile** - 0025…5000 mm
**Rod** - 0025…7600 mm
Standard: See chart
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)

#### Supply voltage
- **T** - +24 VDC
- **A** - +24 VDC, high vibration resistant (stroke length 25…2000 mm)

#### Output
- **P** = Profibus-DP
- **101** - Profibus-DP, Multi-position measurement, 1 - 20 positions (Standard)
- **102** - Profibus-DP, Single-position measurement (Standard)
- **105** - Profibus-DP, Single- and multi-position measurement, 1 - 15 positions, internal linearization
  (Specified tolerances valid for single-position measurement)

**Magnet number** for multi-position measurement*
**Z02 - Z20** = 2 - 20 pcs
* Note: Please specify magnet numbers for your sensing application and order separately

---

#### Included in delivery profile model:
Sensor, magnet slider or U-magnet, 2 mounting clamps up to 1250 mm stroke + 1 clamp for every additional 500 mm.

#### Included in delivery rod model:
Sensor and O-ring.
Magnets must be ordered separately. Use signed magnets for sensors w/LCO

---

### Profibus

#### Operation Manual & Software available at: www.mtssensors.com

---

**Accessories page 67 and following.**
Temposonics®
Absolute, Non-Contact Position Sensors

R-Series
Profinet

Temposonics® RP and RH
Stroke length 25…7600 mm

• Rugged industrial sensor
• Linear and absolute measurement
• LEDs for sensor diagnostics
• Non-contact sensing with highest durability
• Superior accuracy: linearity less than 0.01 %
• Repeatability less than 0.001 %
• Resolution up to 1 μm
• Direct Profinet output with:
  - Multi-position measurement with up to 19 magnets
  - Speed
  - Integrated IRT switch
Sensor diagnostic display
Integrated LED (green/red) provides 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>No master contact</td>
</tr>
<tr>
<td>ON</td>
<td>Flashing</td>
<td>Parametrization failed</td>
</tr>
</tbody>
</table>

See manual for more diagnostic functions

The most important characteristics of Profinet are:
- absolute position measurement
- speed measurement
- status announcement
- error message (e.g. of magnet)

Profinet interface
The sensor meets the requirements of the Profinet IO industrial Ethernet standards and can be directly operating in a network with decentralized peripherals. Profinet is characterized by a high data transfer and high real-time capability. It’s officially certified by the PNO (Profinet user organization).

Profinet versions
The sensor can be ordered in following versions:

a) Encoder Profile 4.1: PNO standardized profile

b) MTS Communication Profile: It allows a simultaneous position measurement up to 19 positions. The configuration is similar to the sequence of Temposonics® Profibus sensors

1…19 multi-position measurement
### Technical data

#### Input
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured value</td>
<td>position or velocity, option: 1…19 multi-position measurement</td>
</tr>
<tr>
<td>Measuring length</td>
<td>profile: 25…5000 mm / rod: 25…7600 mm</td>
</tr>
</tbody>
</table>

#### Output
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface/Data protocol</td>
<td>Profinet IO RT</td>
</tr>
<tr>
<td>Data transmission rate</td>
<td>100 MBit/s max.</td>
</tr>
</tbody>
</table>

#### Accuracy
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>- Position 1…100 μm selectable</td>
</tr>
<tr>
<td></td>
<td>- Velocity 1 mm/s</td>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; ± 0.01 % F.S. (minimum ± 50 μm)</td>
</tr>
<tr>
<td>Repeatability</td>
<td>&lt; ± 0.001 % F.S. (minimum ± 2.5 μm)</td>
</tr>
<tr>
<td>Update time</td>
<td>dependent on stroke length</td>
</tr>
<tr>
<td>Process data</td>
<td>maximum 1 kHz</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>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet speed</td>
<td>any</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0…+75 °C</td>
</tr>
<tr>
<td>Dew point, humidity</td>
<td>90% rel. humidity, no condensation</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>profile: IP65, rod: IP67 if appropriate mating cable connector is correctly fitted</td>
</tr>
<tr>
<td>Shock test</td>
<td>profile: IP65, rod: IP67 if appropriate mating cable connector is correctly fitted</td>
</tr>
<tr>
<td>Vibration test</td>
<td>15 g/10…2000 Hz, IEC-Standard 60068-2-6 (resonance frequencies excluded)</td>
</tr>
<tr>
<td>EMC test</td>
<td>Electromagnetic emission EN 61000-4-6 (for industrial environments)</td>
</tr>
<tr>
<td></td>
<td>Electromagnetic immunity EN 61000-4-3</td>
</tr>
<tr>
<td></td>
<td>the sensor meets the requirements of the EC directives and is marked with CE</td>
</tr>
</tbody>
</table>

#### Design, material
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic display</td>
<td>LED beside connector</td>
</tr>
<tr>
<td>Profile model</td>
<td>Sensor head aluminum</td>
</tr>
<tr>
<td></td>
<td>Rod aluminum</td>
</tr>
<tr>
<td></td>
<td>Position magnet magnet slider or removable U-magnet</td>
</tr>
<tr>
<td>Rod model</td>
<td>Sensor head aluminum</td>
</tr>
<tr>
<td></td>
<td>Rod stainless steel 1.4301 / AISI 304</td>
</tr>
<tr>
<td></td>
<td>Pressure rating 350 bar, 700 bar peak</td>
</tr>
<tr>
<td></td>
<td>Position magnet Ring- or U-magnets</td>
</tr>
</tbody>
</table>

#### Installation
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting position</td>
<td>any</td>
</tr>
<tr>
<td>Profile</td>
<td>adjustable mounting feet or T-Slot nut in bottom groove</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 M18x1.5 or ¾&quot; -16 UNF-3A</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>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection type</td>
<td>2 x 4 pin M12 (d-coded); 1 x 4 pin M12 (a-coded)</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>24 VDC (-15 / +20 %); UL Recognition requires an approved power supply with energy limitation (UL 61010-1), or Class 2 rating according to the National Electrical Code (USA) / Canadian Electrical Code.</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 consumption</td>
<td>typ. 110 mA</td>
</tr>
<tr>
<td>Ripple</td>
<td>≤ 0.28 Vpp</td>
</tr>
<tr>
<td>Electric strength</td>
<td>500 VDC (DC ground to machine ground)</td>
</tr>
</tbody>
</table>

---

1. with position magnet # 251 416-2.
2. The IP rating is not part of the UL recognition
**Temposonics® RP – Profile design**

Temposonics® RP offers modular construction, flexible mounting configurations and easy installation. Position measurement is contactless via two versions of position magnets.

- A sliding position 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 part, travels over the profile at low distance. Its air-gap allows the correction of misalignments at installation.

### Connector wiring (connector view, sensor)

<table>
<thead>
<tr>
<th>BUS On/Off</th>
<th>Pin</th>
<th>Cable</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>YE</td>
<td>Tx+</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>WH</td>
<td>Rx+</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>OG</td>
<td>Tx-</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>BU</td>
<td>Rx-</td>
</tr>
</tbody>
</table>

### Supply

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BN</td>
<td>+24 VDC (-15/+20 %)</td>
</tr>
<tr>
<td>2</td>
<td>WH</td>
<td>n.c.</td>
</tr>
<tr>
<td>3</td>
<td>BU</td>
<td>0 V (GND)</td>
</tr>
<tr>
<td>4</td>
<td>BK</td>
<td>n.c.</td>
</tr>
</tbody>
</table>

All dimensions in mm

---

**Standard position magnet included in 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. 251 416-2)

**Connection types**
- 5 pin female connector M12, power supply (Part No. 370 677)
- 4 pin bus cable connector (Part No. 370 523)
- Cable connector 5 m M12-M12 (Part no. 530 064)
- Cable connector 5 m M12-RJ45 (Part no. 530 065)
**Temposonics® RH – High pressure design**

Temposonics® RH with a pressure 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.

---

**Position magnets** (not included in delivery, please order separately)

**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

Composite 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

**Other position magnets on request.**

---

All dimensions in mm

---

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

**Position magnets**

- Ring magnet OD33 (Part No. 201 542-2)
- Ring magnet OD25.4 (Part No. 400 533)
- U-magnet OD33 (Part No. 251 416-2)

**Connection types**

- 5 pin female connector M12, power supply (Part No. 370 677)
- 4 pin bus cable connector (Part No. 370 523)
- Cable connector 5 m M12-M12 (Part no. 530 064)
- Cable connector 5 m M12- RJ45 (Part no. 530 065)
**TempoSonics® ordering information**

<table>
<thead>
<tr>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP - Profile</td>
</tr>
<tr>
<td>RH - Rod</td>
</tr>
</tbody>
</table>

**Design**

**Profile TempoSonics® RP:**
- S - Magnet slider, joint at top
- V - Magnet slider, joint at front
- G - Magnet slider, join at top, blackslash free
- M - U-Magnet, 0033

**Rod TempoSonics® RH:**
- M - Flange M18x1.5 (standard)
- V - Flange M18x1.5 (Fluorelastomer housing-seal)
- D - Flange M18x1.5 with bushing on rod end
- R - Flange M18x1.5 with thread M4 at rod end
- J - Flange M22x1.5, rod Ø 12.7 mm, 800 bar
- S - Flange ¾" -16 UNF - 3A

**Stroke length**

**Profile**
- 0025…5000 mm

**Rod**
- 0025…7600 mm

Standard: see chart

Other length upon request.

**Connection type**

**D58** - 2 x 4 pin M12 d-coded, 1 x 4 pin M12 a-coded

**Supply voltage**

1 - +24 VDC

**Output**

**U401** - Profinet RT, Encoder Profile, 1 magnet

**U402** - Profinet RT, MTS Profile, 1…19 magnets

**Magnet number for multi-position measurement**

Z02…Z19 = 2…19 pcs

**Profile**

Delivery includes:

Sensor, position magnet, 2 mounting clamps
up to 1250 mm + 1 clamp for each 500 mm.

GDSML file on CD

**Rod**

Delivery includes:

Sensor and O-ring, GDSML file on CD

Please order separately: Magnets, connectors

---

**Stroke length standard RP**

<table>
<thead>
<tr>
<th>Stroke</th>
<th>Ordering steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 500 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>500…2500 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>2500…5000 mm</td>
<td>100 mm</td>
</tr>
</tbody>
</table>

**Stroke length standard RH**

<table>
<thead>
<tr>
<th>Stroke</th>
<th>Ordering steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 500 mm</td>
<td>5 mm</td>
</tr>
<tr>
<td>500…750 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>750…1000 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>1000…2500 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>2500…5000 mm</td>
<td>100 mm</td>
</tr>
<tr>
<td>&gt; 5000 mm</td>
<td>250 mm</td>
</tr>
</tbody>
</table>

---

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

**Absolute, Non-Contact Position Sensors**

**R-Series**

**SSI**

**Temposonics® RP and RH**

Stroke length 25…7600 mm

- Rugged industrial sensor
- Linear and absolute measurement
- LEDs for sensor diagnostics
- Non-contact sensing with highest durability
- Superior accuracy: Resolution up to 0.5 μm
- Linearity better 0.01 % F.S.
- Repeatability 0.001 % F.S.
- Direct SSI output, Gray/binary
- Synchronous measurement for real-time sensing

**Perfect data processing**

0.5 μm
**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>OFF</td>
<td>Normal function</td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Magnet not detected</td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>Flashing</td>
<td>wrong quantity of magnets</td>
<td></td>
</tr>
<tr>
<td>Flashing</td>
<td>ON</td>
<td>Sensor not synchronous*</td>
<td></td>
</tr>
</tbody>
</table>

*for synchronous measurement only

**SSI (Synchronous Serial Interface)**
The sensors fulfill all requirements of the SSI standard for absolute encoders. Its position value is encoded in a binary format and transmitted at high speed to the control device.

MTS offers the ideal solution for high dynamic applications by using different synchronisation modes. Corresponding to the application you can choose the following modes:

**Async**
In asynchronous mode the Temposonics® SSI sensor support the PLC with position values as fast as possible. The sensor works independently (free running mode).

**Syn1**
In synchronous mode 1 the output of the Temposonics® SSI sensor is matched to the data request cycle of the controller. The contouring error is as small as possible, the delay is equal to the cycle time of the sensor’s stroke.

**Syn2**
The synchronous mode 2 is most suitable for applications where the polling cycle of the controller can be faster than the measurement cycle time of the Temposonics® SSI sensor. The values for the PLC will be oversampled up to 10 kHz. The delay is similar to the asynchronous mode.

**Syn3**
The function of the synchronous mode 3 is similar to Syn2 but here any delay will be compensated.

**Timing diagram**

```
Clock (+) Data (+)
MSB           LSB
```

**Logic diagram**

**Sensor input**

```
Optocoupler
91 ohms
100 ohms
1 nF
100 ohms
91 ohms
```

**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 missing)
- 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.

**Windows sensor programming**

```
Sensor Information
Sensor Type  R-Series
Factory Reset  27A35I
Minimum Speed  400 RPM
Maximum Speed  4500 RPM
ID Time  0.1s
Data Filter  1st
Communication Status  Communication established via COM Port
```

MTS offers the ideal solution for high dynamic applications by using different synchronisation modes. Corresponding to the application you can choose the following modes:

- **Async**
  - In asynchronous mode the Temposonics® SSI sensor support the PLC with position values as fast as possible. The sensor works independently (free running mode).

- **Syn1**
  - In synchronous mode 1 the output of the Temposonics® SSI sensor is matched to the data request cycle of the controller. The contouring error is as small as possible, the delay is equal to the cycle time of the sensor’s stroke.

- **Syn2**
  - The synchronous mode 2 is most suitable for applications where the polling cycle of the controller can be faster than the measurement cycle time of the Temposonics® SSI sensor. The values for the PLC will be oversampled up to 10 kHz. The delay is similar to the asynchronous mode.

- **Syn3**
  - The function of the synchronous mode 3 is similar to Syn2 but here any delay will be compensated.

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

**SSI (Synchronous Serial Interface)**
The sensors fulfill all requirements of the SSI standard for absolute encoders. Its position value is encoded in a binary format and transmitted at high speed to the control device.

MTS offers the ideal solution for high dynamic applications by using different synchronisation modes. Corresponding to the application you can choose the following modes:

- **Async**
  - In asynchronous mode the Temposonics® SSI sensor support the PLC with position values as fast as possible. The sensor works independently (free running mode).

- **Syn1**
  - In synchronous mode 1 the output of the Temposonics® SSI sensor is matched to the data request cycle of the controller. The contouring error is as small as possible, the delay is equal to the cycle time of the sensor’s stroke.

- **Syn2**
  - The synchronous mode 2 is most suitable for applications where the polling cycle of the controller can be faster than the measurement cycle time of the Temposonics® SSI sensor. The values for the PLC will be oversampled up to 10 kHz. The delay is similar to the asynchronous mode.

- **Syn3**
  - The function of the synchronous mode 3 is similar to Syn2 but here any delay will be compensated.

```
**Timing diagram**

```
Clock (+) Data (+)
MSB           LSB
```

**Logic diagram**

```
Sensor
Clock (+)
3-wire
+24 Vdc
Optocoupler
Data (+)
Driver
```

**Sensor input**

```
Optocoupler
91 ohms
100 ohms
1 nF
100 ohms
91 ohms
```

**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.

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- Resolution
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- Offset, begin of the measurement range
- Alarm value (Magnet missing)
- 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.

**Windows sensor programming**

```
Sensor Information
Sensor Type  R-Series
Factory Reset  27A35I
Minimum Speed  400 RPM
Maximum Speed  4500 RPM
ID Time  0.1s
Data Filter  1st
Communication Status  Communication established via COM Port
```
**Technical Data**

### Input

**Measured value**
Position, position difference between 2 magnets, velocity, internal temperature

**Stroke length**
Profile 25…5000 mm / Rod 25…7600 mm

### Output

**Interface**
SSI (Synchronous Serial Interface) - differential signal in SSI standard (RS 422)

**Data format**
Binary or Gray, optional Parity and Errorbit and internal temperature

**Data length**
8…32 bit

**Update time**
Stroke length

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>300</th>
<th>750</th>
<th>1000</th>
<th>2000</th>
<th>5000 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement rate</td>
<td>3.7</td>
<td>3.0</td>
<td>2.3</td>
<td>1.2</td>
<td>0.5 kHz</td>
</tr>
</tbody>
</table>

**Data speed**
70 kBaud* … 1 MBaud, depending on cable length:

<table>
<thead>
<tr>
<th>Length</th>
<th>&lt; 3</th>
<th>&lt; 50</th>
<th>&lt; 100</th>
<th>&lt; 200</th>
<th>&lt; 400 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>1 MBd</td>
<td>&lt; 400 kbd</td>
<td>&lt; 300 kbd</td>
<td>&lt; 200 kbd</td>
<td>&lt; 100 kbd</td>
</tr>
</tbody>
</table>

### Accuracy

**Resolution**
Position: 0.5 μm, 2 μm, 5 μm, 10 μm i.a. / velocity over 10 measured values: 0.1 mm/s (at 1 ms cycle time)

**Linearization**
Option internal linearization

**Linearity tolerance:**

- RP/RH
  - 300 mm: typ. ± 15 μm, max. ± 25 μm, > 300…600 mm: typ. ± 20 μm, max. ± 30 μm
  - > 600…1200 mm: typ. ± 30 μm, max. ± 50 μm
- RP
  - 1200…3000 mm: typ. ± 45 μm, max. ± 90 μm, 3…5 m: typ. ± 85 μm, max. ± 150 μm

**Temperature coefficient**
< 0.001 % F.S. (minimum ± 2.5 μm)

**Repeatability**
< 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

**Ingress protection¹**
Profile: IP65, Rod: IP67, IP68 for cable outlet, RS: IP69K

**Shock test**
100 g single hit, IEC-Standard 60068-2-27

**Vibration test**
15 g / 10 - 2000 Hz, IEC-Standard 60068-2-6

**Option:** Vibration resistant 30 g (av)

**Standards, EMC test**
Electromagnetic emission EN 61000-6-4

**Electromagnetic immunity** EN 61000-6-2

**EN 61000-4-2/3/4/6, Level 3/4, Criterion A, CE-qualified**

### Design, 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 hydraulic rod

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 ⅜” - 16 UNF-3A

**Position magnet**
mounting plate and screws from antimagnetical material

### Electrical connection

**Connection type**
7 pin connector M16 or cable outlet

**Supply voltage**
24 VDC (-15 / +20 %); UL Recognition requires an approved power supply with energy limitation (UL 61010-1), or Class 2 rating according to the National Electrical Code (USA) / Canadian Electrical Code.

- **Polarity protection**
  up to -30 VDC

- **Overvoltage protection**
  up to 36 VDC

- **Current drain**
  100 mA typical

- **Ripple (LF)**
  ≤ 0.28 Vpp

- **Electric strength**
  500 VDC (DC ground to machine ground)

¹ The IP rating is not part of the UL recognition

* with standard monoflop of 16 μs
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.

<table>
<thead>
<tr>
<th>Wiring</th>
<th>Pin</th>
<th>Cable</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>grey</td>
<td>Data (-)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>pink</td>
<td>Data (+)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>yellow</td>
<td>Clock (+)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>green</td>
<td>Clock (-)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>brown</td>
<td>+24 VDC</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>white</td>
<td>0 V (GND)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>do not connect</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All dimensions in mm

Standard position magnet included in delivery (see chapter accessories)

<table>
<thead>
<tr>
<th>Connection types</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 pin female connector M16 (part no. 370 624)</td>
</tr>
<tr>
<td>7 pin female connector M16, 90° (part no. 560 779)</td>
</tr>
</tbody>
</table>

Position magnets

- Magnet slider S (part no. 252 182)
- Magnet slider V (part no. 252 184)
- U-magnet OD33 (part no. 251 416-2)
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 included in delivery, please order separately)

<table>
<thead>
<tr>
<th>Magnet Type</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring magnet 0D33</td>
<td>201 542-2</td>
<td>Ø 4.3 on circle Ø 24 Height: 8 mm</td>
</tr>
<tr>
<td>U-magnet 0D33</td>
<td>251 416-2</td>
<td>Ø 4.3 on circle Ø 24 Height: 8 mm</td>
</tr>
</tbody>
</table>

All dimensions in mm

Position magnets

Ring magnet 0D33 (part no. 201 542-2)
Ring magnet 0D25.4 (part no. 400 533)
U-magnet 0D33 (part no. 251 416-2)

Connection types

7 pin female connector M16 (part no. 370 624)
7 pin female connector M16, 90° (part no. 560 779)
**Tempososics®**

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

**Design**

**Profile Tempososics® RP:**
- S - Magnet slider, joint at top
- V - Magnet slider, joint at front
- G - Magnet slider, joint at top, backlash free
- M - U-magnet, OD33

**Rod Tempososics® RH:**
- M - Flange M18 x 1.5 (Standard)
- V - Flange M18 x 1.5 (Fluorelastomer housing-seal)
- D - Flange M18 x 1.5 with bushing on rod end
- R - Flange M18 x 1.5 with thread M4 at rod end
- J - Flange M22 x 1.5, rod Ø 12.7 mm, 800 bar
- S - Flange ¾" - 16 UNF - 3A

**Stroke length**

**Profile**
- Stroke length: 0025…5000 mm

**Rod**
- Stroke length: 0025…7600 mm

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

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

**Output**
- S [1][2][3][4][5][6][7][8][9] = Synchronous Serial Interface

**[1]** Data length:
- 1 - 25 bit • 2 - 24 bit • 3 - 26 bit

**[2]** Output format:
- 8 - Binary • G - Gray

**[3]** Resolution (mm):
- 1 - 0.005 • 2 - 0.01 • 3 - 0.05 • 4 - 0.1 • 5 - 0.02 • 6 - 0.002 • 8 - 0.001 • 9 - 0.0005

**[4]** Performance:
- 1 - Standard • 8 - Noise reduction filter (8 values) • D - No filter + error delay 10 cycles
- G - Noise reduction filter (8 values) + error delay 10 cycles • K - Peak reduction filter (8 values)
- N - Peak reduction filter (8 values) + error delay 10 cycles

**[5][6] Signal options:**
- 00 - Measuring direction forward
- 01 - Measuring direction reverse
- 02 - Measuring direction forward, synchronised measurement
- 05 - Measuring direction forward, Bit 25 = Alarm, Bit 26 = Parity even
- 16 - Measuring direction forward, internal linearization
- 99 - for optional further combinations (use next fields [7][8][9])

**[7]** Measurement contents
- 1 - Position • 2 - Differential • 3 - Velocity • 4 - Position + temperature (only with data length = 24 bit)
- 5 - Differential + temperature (only with data length = 24 bit) • 6 - Velocity + temperature (only with data length = 24 bit)

**[8]** Direction and sync. mode
- 1 - Forward async • 2 - Forward sync1 • 3 - Forward sync2 • 4 - Forward sync3 • 5 - Reverse async • 6 - Reverse sync1
- 7 - Reverse sync2 • 8 - Reverse sync3

**[9]** Internal linearization & communication diagnostics
- 0 - No further option • 1 - Linearity Correction Option • 2 - Additional alarm bit + parity even bit (not available for temperature output, only data length 26 bit)
- 4 - Additional alarm bit + parity even bit and Linearity Correction Option (not available for temperature output, only data length 26 bit)

Included in delivery profile model: Sensor, position magnet, 2 mounting clamps up to 1250 mm + 1 clamp for every additional 500 mm.

Included in delivery rod model: Sensor and O-ring. Magnets must be ordered separately. Use signed magnets for sensors w/LCO

---

**Accessories page 67 and following.**
**MOUNTING / INSTALLATION RP + RH**

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-magnetizable 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-magnetizable material  
2. Magnetizable material

*Sensor cartridge*

- Electronic head + sensor element easy to replace with 2 screws M4
- Fastening torque ≤ 1.3 Nm

*Sensor hydraulic housing*

- Flange with tube becomes a permanent part of the cylinder

*Ring magnet*

*Recommended hydraulic sealing*

*Included in delivery:*

- O-ring 15.3 x 2.2
- See ISO 6149-1

---

*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.
Temposonics®
Absolute, Non-Contact Position Sensors

R-Series
Rod Model RF

Temposonics® RF
Stroke length 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 % F.S.
- Repeatability 0.001 % F.S.
- Direct output for position and velocity
- Analog / SSI / CANbus / Proflbus-DP / EtherCAT / Ethernet/IP™ / Powerlink / Profinet
- Multi-position measurement: max. 20 positions with 1 sensor
- Cost-effective shipment for long measuring length

Temposonics® RF with compact housing and broad range of stroke length are user-friendly, modular sensors ideal for harshest continuous operations in the automation industry. The sensor head accommodates the complete electronic interface with active signal conditioning. Double encapsulation ensures high operating safety and optimum EMC protection. The passiv position transmitter, a permanent magnet, drives contactlessly over the sensors stroke and starts measuring through the housing wall.

Optimized on high accuracy, engaged the sensor linear measuring displacements up to 20 meters and can be also used for linear measurements on selected radiuses.
## Technical data

### Input

| Measured variables | - Position  
| - Velocity  
| Multi-position measurement max. 20 positions (CANbus, Profibus, EtherCAT, Ethernet/IP™, Powerlink, Profinet) |
| Stroke length | 100…20,000 mm |

### Output

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

### Accuracy

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

### Operating conditions

| Magnet movement velocity | Any |
| Operating temperature | −40…+75 °C |
| Dew point, humidity | 90% rel. humidity, no condensation |
| Ingress 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 60068-2-27) |
| Vibration test | 5 g / 10…150 Hz IEC-Standard 60068-2-6 |
| Standards, EMC test | Electromagnetic emission EN 61000-6-4  
| | Electromagnetic immunity EN 61000-6-2  
| | EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE qualified¹ |

### Design, Material

| Diagnostic display | LEDs beside connector |
| Sensor electronics housing | Aluminum |
| Sensor stroke | Stainless steel conduct with Teflon® coating |
| Position magnet | Ring- or U-magnet |

### Electrical connection

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

**Info:**
For detailed technical data and electrical connection for the outputs please see data sheets: R-Series Analog, SSI, CANbus, Profibus, EtherCAT, Ethernet/IP™, Powerlink, Profinet

¹The conformity is fulfilled, assumed the wave guide of the sensor is embedded in an EMC-sealed and grounded housing.
Option and more accessories:

1. 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 peak. Typically, a bore 18 mm is used to match the large ring magnet.

2. Flexible RF profile HFP
See “Product Flash RF Profile” (Document Part No.: 551 442) for further information

3. Flange M18×1,5
Part No. 402 704

Position magnets (not included in delivery, please order separately)

<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>PA-Ferrit-5920</td>
<td></td>
</tr>
<tr>
<td>Weight ca. 14 g</td>
<td></td>
</tr>
<tr>
<td>Operating temperature: -40...+100 °C</td>
<td></td>
</tr>
<tr>
<td>Pressure housing pipe with flange</td>
<td></td>
</tr>
<tr>
<td>OD 12.7 and flange</td>
<td></td>
</tr>
<tr>
<td>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 peak. Typically, a bore 18 mm is used to match the large ring magnet.</td>
<td></td>
</tr>
<tr>
<td>Flexible RF profile HFP</td>
<td></td>
</tr>
<tr>
<td>See “Product Flash RF Profile” (Document Part No.: 551 442) for further information</td>
<td></td>
</tr>
<tr>
<td>Flange M18×1.5 Part No. 402 704</td>
<td></td>
</tr>
<tr>
<td>PA-Ferrit-5920</td>
<td></td>
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<tr>
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<td></td>
</tr>
<tr>
<td>Flexible RF profile HFP</td>
<td></td>
</tr>
<tr>
<td>See “Product Flash RF Profile” (Document Part No.: 551 442) for further information</td>
<td></td>
</tr>
</tbody>
</table>
Sensor Installation
Mounting of sensor electronics housing requires the use of 2 non-ferrous screws M4×59. 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 (accessory) bored for above mounting screws.
Optional you can order a pressure housing pipe OD 12.7 mm with flange up to max 7500 mm stroke 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.

Curvilinear measurements

Note
Bend radius 250 mm, radius for shipping 400 mm

Required for substitute sensors mounted on flange Part No. 401 035:
Use 2 Screws 8-32 × 2.35 Part No. 402 617 which supplied as attachment with each sensor.
The red rubber seal between sensor head and sensor stroke slit carefully and remove.
**Temposonics®**

<table>
<thead>
<tr>
<th>Model</th>
<th>RF = Flexible sensor stroke</th>
</tr>
</thead>
</table>
| Design | C - Basic sensor  
M - Flange M18×1.5  
S - Flange ¾“ – 16 UNF – 3A |
| **Messlänge** | 00100...20.000 mm  
Up to 1000 in 50 mm steps, up 1000 in 250 mm steps |
| Further parameter | See data sheets R-Series according to the required output  
Analog / SSI / CANbus / Profibus / EtherCAT / Ethernet/IP™ / Powerlink / Profinet |

**Magnets and accessories (Please order separately)**

<table>
<thead>
<tr>
<th>Accessories</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 251</td>
<td>416-2</td>
</tr>
<tr>
<td>Ring magnet OD30.5</td>
<td>402 316</td>
</tr>
<tr>
<td>Ring magnet OD63</td>
<td>MT 0162</td>
</tr>
<tr>
<td>Ring magnet OD63.5</td>
<td>201 554</td>
</tr>
<tr>
<td>U-magnet OD63.5</td>
<td>201 553</td>
</tr>
<tr>
<td>U-magnet 70</td>
<td>252 185</td>
</tr>
<tr>
<td>Block magnet</td>
<td>403 448</td>
</tr>
<tr>
<td>Flange M18×1.5 for pressure housing pipe 12.7 mm</td>
<td>402 704</td>
</tr>
</tbody>
</table>

**Flexible RF Profile HFP**

See “Product Flash RF Profile”  
(Document Part No.: 551 442) for further information

**Pressure housing pipe (Please order separately)**

<table>
<thead>
<tr>
<th>Temposonics®</th>
<th>H</th>
<th>D</th>
<th>M</th>
</tr>
</thead>
</table>
| **Model** | HD = Pressure housing pipe 12.7 mm  
with flange for Temposonics® RF M18×1.5 |
| **Stroke length** | 255...7500 mm  
Standard: See chart |

<table>
<thead>
<tr>
<th>Stroke Length Standard RF</th>
<th>Ordering steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke length</td>
<td>Ordering steps</td>
</tr>
<tr>
<td>&lt; 1000 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>1000 - 5000 mm</td>
<td>100 mm</td>
</tr>
<tr>
<td>5000 - 10000 mm</td>
<td>250 mm</td>
</tr>
<tr>
<td>10000 - 15000 mm</td>
<td>500 mm</td>
</tr>
<tr>
<td>&gt; 15000 mm</td>
<td>1000 mm</td>
</tr>
</tbody>
</table>
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 is 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.

**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 catastrophes.
Temposonics®

Absolute, Non-Contact Position Sensors

R-Series
Rod Model RD4

Temposonics® RD4
Stroke length 25…5000 mm

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

Temposonics® RD4 the extremely robust sensor, ideal for continuous operation under harshest industrial conditions is completely modular in mechanic and electronic design. A rod-shaped sensor housing protects the sensing element. The sensor head accommodates the complete modular electronic interface with active signal conditioning. Double encapsulation ensures high operation safety and optimum EMC protection.

The position transmitter, a permanent magnet fixed at the mobile machine part, drives contactlessly over the sensor’s stroke and starts measuring through the housing wall.
Temposonics® RD4 sensors were designed for installation into hydraulic cylinders, specifically for use in standard clevis head cylinders or any space limited cylinder application. They consist of:

- The pressure proof stainless steel sensor rod with fitting or threaded flange, which protects the sensing element in which the measurement signal arises. It fits into the bored piston rod.
- The external industrial housing (IP67) which accommodates the modular electronic interface with active signal conditioning. The sensor electronics is connected to the basic-sensor via side or bottom cable entry.

**Technical data**

**Input**

<table>
<thead>
<tr>
<th>Measured variables</th>
<th>Position</th>
<th>Velocity</th>
<th>Multi-position measurement max. 20 positions (CANbus, Profibus, EtherCAT, Ethernet/IP™, Powerlink, Profinet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke length</td>
<td>25…5000 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Output**

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

**Accuracy**

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

**Operating conditions**

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

**Design, material**

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

**Electrical connection**

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

1 For rod style “S” the linearity deviation can be higher in the first 30 mm (1.2 in.) of stroke length

2 Measuring rod and connecting cable mounted inside metal housing

**Info:**

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

- Recommended screws: M6x45 ISO4762
- Null position
- PUR-cable Ø 6 mm
  - Bend radius > 24 mm
  - Length 250 / 400 / 600 mm
- Rod Ø 10
- Measuring length 25 - 2540 mm
- *Housing length for Profinbus, EtherCAT
- **Housing length for EtherNet/IP™, Powerlink and Profinet
- Fastening torque < 50 Nm
- Thread M18x1.5
- Measuring length 25 - 5000 mm
- 63.5 / 66 * up to 4500 mm
- Stroke length

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

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

**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.

---

**Rod Type S**

- Recommended screw: M6 x 45 ISO 4762
- O-ring 20 x 2.65 FPM 80 (on delivery)
- Stroke length: 25 - 5000 mm

**Rod Type M**

- SW 23: Fastening torque < 50 Nm
- Fastening torque: < 50 Nm
- Contour of bore (ISO 6149-1)

**Rod Type C**

- SW 46: Fastening torque < 50 Nm
- Fastening torque: < 50 Nm

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

Position magnet
Non-magnetizable material

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

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

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

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

Position magnets

- Ring magnet OD33 (part no. 201 542-2)
- Ring magnet OD25.4 (part no. 400 533)
- U-magnet OD33 (part no. 251 416-2)

Connection types

Connector or cable outlet output dependent
Mounting example fitting flange «S» and sensor electronics with side cable entry

Included in delivery:
O-ring 21.89 x 2.62 / No. 560 705
Backup ring No. 560 629

Position magnet

Non-magnetizable material

Mounting detail: Setscrew 8 M6 - ISO 7379 with internal hexagon

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-magnetizable material. If using magnetizable material please necessarily follow the displayed installation dimensions.

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

Mounting example fitting flange »C«

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

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

Detail screwing bore

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

Non-magnetizable material
Magnetizable material

All dimensions in mm
Tempsonics® RD4

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

Integral cable of sensor rod
For side cable entry:
D1 - PUR-cable, length 250 mm
D2 - PUR-cable, length 400 mm
D3 - PUR-cable, length 600 mm
For bottom cable entry:
R2 - Single wires with flat connector, length 65 mm
R4 - Single wires with flat connector, length 170 mm
R5 - Single wires with flat connector, length 230 mm
R6 - Single wires with flat connector, length 350 mm

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

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

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

Magnets and Accessories must be ordered separately.

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

Spare parts

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-ring 15.3 x 2.2 FPM 75</td>
<td>401 133</td>
</tr>
<tr>
<td>O-ring 21.89 x 2.62 PFPM 75</td>
<td>560 705</td>
</tr>
<tr>
<td>Backup ring</td>
<td>560 629</td>
</tr>
<tr>
<td>O-ring 20 x 2.65 FPM 80</td>
<td>561 435</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stroke Length Standard RD4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke length</td>
</tr>
<tr>
<td>&lt; 500 mm</td>
</tr>
<tr>
<td>500…750 mm</td>
</tr>
<tr>
<td>750…1000 mm</td>
</tr>
<tr>
<td>1000…2500 mm</td>
</tr>
<tr>
<td>&gt; 2500 mm</td>
</tr>
</tbody>
</table>
**Temposonics®**

Absolute, Non-Contact Position Sensors

**R-Series**

Rod Model RS

**Temposonics® RS**

Stroke length 50…7600 mm

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The extremely robust Temposonics® RS sensor with super shield housing ensures long-term linear position measurement in the harshest environments. Hermetically sealed with a housing completely made of stainless steel, it meets the requirements of protection modes IP68 and IP69K and is reliably shielded against corrosion and penetration of dirt and water.

Due to non-contact measuring technology, sensor integration into a hermetically sealed housing is possible. A position magnet moves along the outside of the pressure-resistant sensor pipe and marks the position without mechanical contact. For level measurement, an optional float can be used. The modular sensor cartridge design enables the customer to choose the specific sensor output configurations to be installed within the super shield housing to best fit their application requirements. The measuring accuracy and all technical data correspond to the features of the sensor selected inside the housing. A wide choice of interfaces (Analog, Profinet, SSI, CANbus, EtherCAT) is available. Moreover, integration of ATEX-certified and intrinsically safe sensors is possible with the protective housing.
Temposonics® RS sensors are made to fit Temposonics® R-Series with analog and digital outputs. Fixed cable and connector versions can be used on the sensor side. When using standard sensors in this housing, you get a cost efficient solution for use in rugged applications. Several design combinations are available to fit your application: M18 or ¾”UNF mounting flange thread, various housing length, and single, dual or triple cable glands.

### Technical Data (depending on selected interface)

<table>
<thead>
<tr>
<th>Input</th>
<th>Stroke length</th>
<th>50…7600 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>Interfaces</td>
<td>Analog, SSI, CANbus, Profibus, EtherCAT</td>
</tr>
<tr>
<td>Operating conditions</td>
<td>Dew point, humidity</td>
<td>100% rel. humidity</td>
</tr>
<tr>
<td></td>
<td>Ingress protection</td>
<td>IP68 / IP69K</td>
</tr>
<tr>
<td>Design, material</td>
<td>Sensor head</td>
<td>303/304 Stainless steel 316L (1.4404) on request</td>
</tr>
<tr>
<td></td>
<td>Sensor stroke</td>
<td>303/304 (1.4305) Stainless steel 316L on request</td>
</tr>
<tr>
<td></td>
<td>Pressure rating</td>
<td>350 bar, 700 bar peak</td>
</tr>
<tr>
<td></td>
<td>Position magnet</td>
<td>Ring magnet or magnet float</td>
</tr>
<tr>
<td>Installation</td>
<td>Mounting position</td>
<td>Any orientation</td>
</tr>
<tr>
<td></td>
<td>Torque moment</td>
<td>&lt; 50 Nm</td>
</tr>
<tr>
<td></td>
<td>Rod</td>
<td>Threaded flange M18 x 1.5 or ¾”-16 UNF-3A, Hex nut M18</td>
</tr>
<tr>
<td>Electrical connection</td>
<td>Connection type</td>
<td>Integral cable pigtail termination</td>
</tr>
</tbody>
</table>

**Info:**
For detailed technical data and electrical connection for the outputs please see data sheets:
R-Series Analog, SSI, CANbus, Profibus, EtherCAT.
Lids according to the outputs.

Please use a standard strap wrench to mount the sensor.
Temposonics®

Model
RS - Super shield sensor

Design
M - Flange M18x1.5
S - Flange ¾” – 16 UNF – 3A

Stroke length
0050…7600 mm
Standard: See chart

Further parameter
See data sheets R-Series according to the required output
Analog / SSI / CANbus / Profinet / EtherCAT

Magnets and accessories must be ordered separately.

<table>
<thead>
<tr>
<th>Accessories</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 OD30.5</td>
<td>402 316</td>
</tr>
<tr>
<td>Position magnet 70x37.5</td>
<td>252 185</td>
</tr>
<tr>
<td>Block magnet</td>
<td>403 448</td>
</tr>
</tbody>
</table>

**Stroke Length**

<table>
<thead>
<tr>
<th>Stroke Length</th>
<th>Ordering Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 500 mm</td>
<td>5 mm</td>
</tr>
<tr>
<td>500…750 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>750…1000 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>1000…2500 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>2500…5000 mm</td>
<td>100 mm</td>
</tr>
<tr>
<td>&gt; 5000 mm</td>
<td>250 mm</td>
</tr>
</tbody>
</table>
Temposonics®

Absolute, Non-Contact Position Sensors

Accessories

- Position magnets
- Floats
- Connectors
- Clamps
- Cables
- Programming tools
- High pressure housing, …
## ACCESSORIES R-SERIES

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><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&lt;br&gt;Ø 13.5</td>
<td>Composite PA-Ferrite-GF20&lt;br&gt;Weight 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&lt;br&gt;marked version for sensors with linearity correction option (LCO): Part No. 253 620</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&lt;br&gt;Ø 11&lt;br&gt;Ø 13.5</td>
<td>Composite PA-Ferrite-GF20&lt;br&gt;Weight 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&lt;br&gt;marked version for sensors with linearity correction option (LCO): Part No. 254 226</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&lt;br&gt;12.5&lt;br&gt;Ø 63.5</td>
<td>PA 66-GF30&lt;br&gt;Magnets compound-filled&lt;br&gt;Weight 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>Height: 8 mm&lt;br&gt;Ø 25.4&lt;br&gt;Ø 13.5</td>
<td>Composite: PA-Ferrite&lt;br&gt;Weight 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&lt;br&gt;marked version for sensors with linearity correction option (LCO): Part No. 253 621</td>
</tr>
<tr>
<td><strong>Ring magnet OD30,5</strong>&lt;br&gt;Part No. 402 316</td>
<td>Height: 8 mm&lt;br&gt;Ø 30.5&lt;br&gt;Ø 17.4</td>
<td>Composite: PA-Ferrite&lt;br&gt;Weight 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</strong>&lt;br&gt;Part No. 401 032</td>
<td>Height: 8 mm&lt;br&gt;13.5&lt;br&gt;Ø 17.4</td>
<td>PA-Neonbond compound&lt;br&gt;Weight ca. 5 g&lt;br&gt;Operating temperature: -40…+100&lt;br&gt;Surface pressure max. 20 N/mm²</td>
<td>RH, RD4&lt;br&gt;(not for multi-position measurement)</td>
</tr>
<tr>
<td><strong>Ring magnet OD60</strong>&lt;br&gt;Part No. MT 0162</td>
<td>Ø4.5 on circle Ø48&lt;br&gt;Height: 15 mm&lt;br&gt;Ø 30&lt;br&gt;Ø 60</td>
<td>Al CuMgPb&lt;br&gt;Magnets compound-filled&lt;br&gt;Weight 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. Product pictures may vary from original.
### ACCESSORIES R-SERIES
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>U-magnet 70 Part No. 252 185</td>
<td></td>
<td>AllMg4.5Mn, black anodised Magnets compound-filled Weight ca. 75 g Operating temperature: -40…+75°C</td>
<td>RH, RF, RP Resolution min. 10 μm</td>
</tr>
<tr>
<td>Magnet slider V Part No. 252 184</td>
<td></td>
<td>GFK, Magnet hard ferrite Weight ca. 30 g Operating temperature: -40…+75°C</td>
<td>RP</td>
</tr>
<tr>
<td>Magnet slider S Part No. 252 182 Magnet slider G Part No. 253 421</td>
<td></td>
<td>GFK, Magnet hard ferrite Weight ca. 30 g Operating temperature: -40…+75°C Magnet slider S: Ball joint CuZn 39Pb3 nickel plated Magnet slider G - free from float: Socket joint, high-strength plastics Ball joint CuZn39Pb3 nickel-plated</td>
<td>RP</td>
</tr>
<tr>
<td>Magnet slider P Part No. 253 673</td>
<td></td>
<td>GFK, Magnet hard ferrite Weight ca. 30 g Operating temperature: -40…+75°C with additional end plates</td>
<td>RP</td>
</tr>
<tr>
<td>Block magnet Part No. 403 448</td>
<td></td>
<td>GFK, Magnet hard ferrite Weight ca. 20 g Operating temperature: -40…+75°C</td>
<td>RH, RF, RP Resolution min. 10 μm</td>
</tr>
<tr>
<td>Float 50 mm Part No. 251 447</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>Float 41 mm Part No. 200 938-2</td>
<td></td>
<td>1.4404 Stainless steel Density: 740 kg/m³ Max. pressure: ≈ 8 bar Weight: 20 ± 2 g</td>
<td>RH, RF</td>
</tr>
<tr>
<td>Collar Part No. 560 777</td>
<td></td>
<td>1.4301 Stainless steel</td>
<td>RH</td>
</tr>
</tbody>
</table>

Notice: Product pictures may vary from original.
### ACCESSORIES R-SERIES
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>
</table>
| 6 pin connector (for cable Ø 6 mm)  
Part No. 370 623 (female)  
For cable Ø 6 - 8 mm  
Part No. 370 423 | | Housing: Zinc nickel-plated  
Termination: Solder  
Contact insert: Silver plated  
Max. Cable-Ø 6 mm or Ø 8 mm depending on design | Analog  
CAN |
| 6 pin connector M16, 90°  
Part No. 370 460 (female) | | Housing: Zinc nickel plated  
Termination: Solder  
Contact insert: Silver plated  
Max. Cable-Ø 8 mm | Analog  
CAN |
| 5 pin connector, M12x1  
Part No. 370 618 (female) | Ø20  
PG9, cable Ø6 - 8 mm | Housing: PA  
Termination: Screws clamp  
Contact insert: (CuZn/Sn)  
Max. Cable-Ø 6 - 8 mm | CAN  
Profinet |
| 5 pin connector, M12x1, 90°  
Part No. 370 619 (female) | Ø20  
PG9, cable Ø6 - 8 mm | Housing: PA  
Termination: Screws clamp  
Contact insert: (CuZn)  
Max. Cable-Ø 6 - 8 mm | CAN  
Profinet |
| 7 pin connector, M16  
Part No. 370 624 (female) | Ø18 | Housing: Zinc nickel plated  
Termination: Solder  
Contact insert: Silver plated  
Max. Cable-Ø 8 mm | SSI |
| 7 pin connector, M16, 90°  
Part No. 560 779 (female) | Ø19.5  
Ø 29  
-54 | Housing: Zinc nickel plated  
Termination: Solder  
Contact insert: Silver plated  
Max. Cable-Ø 8 mm | SSI |
| 6 pin connector, M16  
Part No. 370 423 (female)  
Part No. 370 427 (male) | Ø18 | Housing: Zinc nickel plated  
Termination: Solder  
Contact insert: Silver plated  
Max. cable-Ø 8 mm | Profibus (D63) |

Notice: Product pictures may vary from original.
## Accessories R-Series

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>
</table>
| 6 pin Bus endplug M16, male | ø18 | Housing: Zinc nickel plated  
Contact insert: Silver plated | Profibus (D63) |
| Part No. 370 620 | | | |
| 3 pin connector M12-B | ø19.5 M12x1 | Housing: Zinc nickel plated  
Termination: IDC (insulation position contact)  
Contact insert: Silver plated  
Cable-ø: 6 - 8 mm | Profibus (D53) |
| Part No. 560 885 (female) | | | |
| 5 pin 90° connector M12-B | ø19.5 M12x1 | Housing: Zinc nickel plated  
Termination: spring-type terminal  
Contact insert: Silver plated  
Cable-ø: 6.5 - 8.5 mm | Profibus (D53) |
| Part No. 370 514 (female) | | | |
| 3 pin connector M12-B | ø19.5 M12x1 | Housing: Zinc nickel plated  
Termination: IDC (insulation position contact)  
Contact insert: Silver plated  
Cable-ø: 6 - 8 mm | Profibus (D53) |
| Part No. 560 884 (male) | | | |
| 5 pin 90° connector M12-B | ø19.5 M12x1 | Housing: Zinc nickel plated  
Termination: Spring-type terminal  
Contact insert: Silver plated  
Cable-ø: 6 - 8 mm | Profibus (D53) |
| Part No. 370 515 (male) | | | |
| 5 pin Bus T-connector M12 | ø19  
40.2  
20.3  
8.3  
70 | Housing: PA 66  
Contact insert: Silver plated | Profibus (D53) |
| Part No. 560 887 | | | |
| 5 pin Bus endplug M12 | ø16.4  
43  
22  
34.2 | Housing: PA 66  
Contact insert: Silver plated | Profibus (D53) |
| Part No. 560 888 | | | |

Notice: Product pictures may vary from original.
# ACCESSORIES R-SERIES

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&lt;br&gt;Termination: Solder&lt;br&gt;Contact insert: Au&lt;br&gt;Max. cable-Ø 5 mm</td>
<td>Profibus (D53)&lt;br&gt;EtherCAT&lt;br&gt;CAN (D54)</td>
</tr>
<tr>
<td>4 pin cable connector M8, 90°</td>
<td></td>
<td>Housing: PA 66&lt;br&gt;Termination: Solder&lt;br&gt;Contact insert: Au&lt;br&gt;Max. cable-Ø 5 mm</td>
<td>Profibus (D53)&lt;br&gt;EtherCAT&lt;br&gt;CAN (D54)</td>
</tr>
<tr>
<td>Cable connector</td>
<td></td>
<td>PUR-cable with 4 pin. female connector&lt;br&gt;5 m length free end&lt;br&gt;4 x 0.25 mm², shielded for 24 VDC power supply</td>
<td>Profibus (D53)&lt;br&gt;EtherCAT&lt;br&gt;CAN (D54)</td>
</tr>
<tr>
<td>Cable connector</td>
<td></td>
<td>5 m industrial ethernet cable (Cat 5e ES)&lt;br&gt;with 4 pin M12-connectors (D-coded)&lt;br&gt;PUR-jacket, green</td>
<td>EtherCAT&lt;br&gt;Profinet</td>
</tr>
<tr>
<td>4 pin Bus cable connector</td>
<td></td>
<td>IDC technology</td>
<td>EtherCAT&lt;br&gt;Profinet</td>
</tr>
<tr>
<td>End cap</td>
<td></td>
<td>Brass, nickel plated</td>
<td>EtherCAT</td>
</tr>
</tbody>
</table>

Notice: Product pictures may vary from original.
### ACCESSORIES R-SERIES

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>Mounting clamp Part No. 400 802</td>
<td></td>
<td>Stainless steel</td>
<td>RP</td>
</tr>
<tr>
<td>T-Nut Part No. 401 602</td>
<td></td>
<td>Stainless steel</td>
<td>RP</td>
</tr>
<tr>
<td>Spacer Part No. 400 633</td>
<td></td>
<td>Aluminum</td>
<td>RH</td>
</tr>
<tr>
<td>Fixing clip Part No. MT 0200</td>
<td></td>
<td>Brass</td>
<td>RH</td>
</tr>
<tr>
<td>Metal protection cap for connector M16 Part No. 403 290</td>
<td></td>
<td>Brass, nickel plated</td>
<td>Analog, CAN, SSI, Profibus</td>
</tr>
<tr>
<td>Hex nut Part No. 500 018</td>
<td></td>
<td>Stainless steel</td>
<td>RH-M</td>
</tr>
<tr>
<td>O-ring Part No. 401 133</td>
<td></td>
<td>Fluorelastomer FPM 75 Operating temperature: -10...+125°C</td>
<td>RH-M</td>
</tr>
<tr>
<td>Cable Part No. 530 032</td>
<td>3 x 2 x 0.14 mm² Ø 6 mm</td>
<td>PVC -10...+80 °C</td>
<td>Standard</td>
</tr>
</tbody>
</table>

Notice: Product pictures may vary from original.
### ACCESSORIES R-SERIES
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><strong>Cable</strong>&lt;br&gt;Part No. 530 052&lt;br&gt;Hand-Programmer R-Analog</td>
<td>$3 \times 2 \times 0.25 \text{ mm}$&lt;br&gt;$Ø 6.8 \text{ mm}$</td>
<td>Pelon PUR&lt;br&gt;$-40…+80^\circ \text{C}$</td>
<td>Halogen free&lt;br&gt;Oil-resistant&lt;br&gt;High flexible</td>
</tr>
<tr>
<td><strong>Cable</strong>&lt;br&gt;Part No. 530 116&lt;br&gt;Pin-plug</td>
<td>$4 \times 2 \times 0.25 \text{ mm}^2$</td>
<td>PUR&lt;br&gt;$(-30…+90^\circ \text{C})$</td>
<td>Water proof wires</td>
</tr>
<tr>
<td><strong>Cable</strong>&lt;br&gt;Part No. 530 112&lt;br&gt;Pin-plug</td>
<td>$4 \times 2 \times 0.25 \text{ mm}^2$</td>
<td>Teflon&lt;br&gt;$(-90…+180^\circ \text{C})$</td>
<td>Temperature</td>
</tr>
<tr>
<td><strong>Cable</strong>&lt;br&gt;Part No. 530 029&lt;br&gt;Pin-plug</td>
<td>$7 \times 0.14 \text{ mm}^2$&lt;br&gt;EMC protected&lt;br&gt;$Ø 7 \text{ mm}$</td>
<td>PUR&lt;br&gt;$-20…+70^\circ \text{C}$</td>
<td>SSI&lt;br&gt;CAN</td>
</tr>
<tr>
<td><strong>Cable</strong>&lt;br&gt;Part No. 530 040&lt;br&gt;Pin-plug</td>
<td>BUS + feed-in&lt;br&gt;$Ø 8 \text{ mm}$</td>
<td>PVC&lt;br&gt;$-30…+80^\circ \text{C}$</td>
<td>Profibus-DP D63</td>
</tr>
<tr>
<td><strong>Cable</strong>&lt;br&gt;Part No. 530 109&lt;br&gt;Pin-plug</td>
<td>BUS conductor, high flexible cable&lt;br&gt;$Ø 8 \text{ mm}$</td>
<td>PUR&lt;br&gt;$-30…+70^\circ \text{C}$</td>
<td>Profibus-DP D53</td>
</tr>
</tbody>
</table>

### Hand-Programmer R-Analog for 1-magnet sensor
This is for easy teach-in-sets of measuring length and direction on desired zero/span positions.

Notice: Product pictures may vary from original.
# ACCESSORIES R-SERIES

Position magnets, floats, connectors, clamps, cables and programming tools

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Cabinet-Programmer](image1.png)            | Cabinet-programmer R-Analog  
Cabinet-Programmer R-Analog 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. |
| Cabinet-Programmer Part No. 253 408          |                                                                                                                                                                                                             |
| ![USB-Programmer R-Analog for 1 or 2-magnets sensor](image2.png) | USB-Programmer R-Analog 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-Analog Part No. 253 134-1   |                                                                                                                                                                                                             |
| ![USB-Programmer R-SSI](image3.png)          | 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 outside)  
- Measurement filter  
- Differential measurement |
| USB-Programmer R-SSI Part No. 253 135-1       |                                                                                                                                                                                                             |
| ![PROFIBUS Address Programmer](image4.png)   | PROFIBUS Address Programmer is used for setting the slave address to Temposonics® sensors with Profibus-DP Interface. The setup of slave address is normally 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. The programmer and the sensor will be supplied by the included power supply. |
| PROFIBUS Address-Programmer kit for D63, D53 or cable connector Part No. 280 640 |                                                                                                                                                                                                             |

Notice: Product pictures may vary from original.
## ACCESSORIES R-SERIES
Position magnets, floats, connectors, clamps, cables and programming tools

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CANopen Address Programmer</strong></td>
<td>is used for setting the Node-Address to Temposonics® sensors with CANopen Interface. The setup of Node-Address is normally 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.</td>
</tr>
<tr>
<td><strong>PROFIBUS Master Simulator</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>
| **Display and control unit with SSI input** | Housing: 96 x 48 x 141 m  
Cutout: 91 x 44 mm  
6-segment LED  
Display for SSI |
| **Profi bus Filter box** | 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. |
| **DIN A4 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 correctue in sections. |

Notice: Product pictures may vary from original.
ACCESSORIES R-SERIES
ATEX [Atmosphères Exposibles]

Ordering Code

Tempsonics®

Model

- RP - Profile
- RPM - U-magnet, OD33
- RPS - Magnet slider, joint on top
- RPV - Magnet slider, joint in front
- RH - Rod
- RHM - Flange, M18 x 1.5
- RHS - Flange ¼" - 16 UNF - 3A
- RS - Rod, Safety housing
- RSM - Flange, M18 x 1.5

Stroke length in mm
- Profile - 0050…1650 mm
- Rod - 0050…1650 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
- Analog / CANbus / SSI

Approved Versions
- ATEX

Approved Sensors: R-Series
- Analog Output
- CANbus [All Versions]
- SSI Output

ATEX Conformity: Marking on MTS Approved Sensor

- II 3G Ex nA IIC T4 Gc
- II 3D Ex tc IIIB T100°C Dc IP65/67
- -20 °C ≤ Ta ≤ 75 °C
- Pmax = 4 Watt
- Derated 6.5 kW ≥ 49 °C

Applicable ATEX Regulations / Directives


Related Norms:
- EN 60079-0, EN 60079-15
- EN 60079-31, EN 61326-1,
- EN 61326-2-3

MTS is a certified supplier for position 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 in the explosion groups IIIA and IIIB

Stroke Length Standard RP RH

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>Ordering steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 500 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>500…1650 mm</td>
<td>50 mm</td>
</tr>
</tbody>
</table>

I 77 I
ACCESSORIES R-SERIES

Precision Position Measurement High Pressure Housing

This High Pressure Housing is ATEX, IECEx and UL and cUL approved for use in hazardous areas with Temposonics® position sensors.

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

This housing is made to fit Temposonics® R-Series sensors with analog 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 ¾" UNF Mounting flange thread - M20 or ½" 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 stainless steel 316L. 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.

**ATEX/IECEx**

<table>
<thead>
<tr>
<th>ATEX</th>
<th>IECEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex II 2G Ex db IIC T5 Gb</td>
<td>Ex II 2D Ex tb IIIC T100°C Db</td>
</tr>
<tr>
<td>-40°C ≤ T_{	ext{amb}} ≤ +75°C</td>
<td></td>
</tr>
<tr>
<td>ATEX Certificate: ExVeritas 16 ATEX 0192X</td>
<td>IECEx certificate: IECEx EXV 16.0014X</td>
</tr>
<tr>
<td>Compliance with</td>
<td></td>
</tr>
<tr>
<td>EN IEC 60079-0, EN IEC 60079-1</td>
<td>EN IEC 60079-26, EN IEC 60079-31</td>
</tr>
</tbody>
</table>

**UL/cUL**

<table>
<thead>
<tr>
<th>UL/cUL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1, Division 1, Groups A, B, C, D</td>
</tr>
<tr>
<td>UL/cUL-Certificates:</td>
</tr>
<tr>
<td>USA: FTRV.E234045</td>
</tr>
<tr>
<td>Canada: FTRV7.E234045</td>
</tr>
<tr>
<td>In accordance with UL 1203 standard.</td>
</tr>
</tbody>
</table>

**Material**

Stainless steel AISI 316L (1.4404)

**Cable Gland Threads**

- M20×1.5 (only with ATEX and IECEx approved cable glands (Ex db))
- ½" NPT (only with UL and cUL approved cable glands)

**Ingress protection code**

IP68 (only with professionally assembled and IP68 approved cable gland)

**Approved sensors**

- G-Series Analog + Digital
- R-Series Analog
- R-Series Profibus
- R-Series CANbus
- R-Series SSI
- Max. power consumption: U = 24 VDC, I = 150 mA, P = 3.6 W

**Mounting flange**

M18×1.5 or ¾" - 16UNF - 3A

**Pressure rating**

350 bar

**Peak Pressure**

530 bar

**Magnet type**

Ring magnets

**Level measurement**

Float on request

**Operating temperature**

-40...+75 °C

1/°T_{	ext{amb}}+ is limited to max T_{	ext{amb}}+ of used sensor −10 °C
TPH mounting adapter (rotation adapter)

Allows the optimal alignment of the collateral cable gland, when you mount the housing. It’s pressure tested up to 580 bar.

The adapter RTA-M18 fits for the standard M18 thread and has a M30x1.5 mounting thread. The adapter RTA-1/4” UNF-2 fits for the 1/4” UNF thread housing and has a 1 1/16 - 12 UNF mounting thread. The adapter 253961 fits for the 1/4” UNF-thread housing and has a 1 1/4 - 12 mounting thread.
## R-SERIES ACCESSORIES

### Precision Position Measurement High Pressure Housing

#### Combination Chart:

<table>
<thead>
<tr>
<th>Bottom</th>
<th>Top</th>
<th>Approval</th>
<th>ATEX / IECEx</th>
<th>ATEX / IECEx</th>
<th>ATEX / IECEx</th>
<th>UL and cUL</th>
<th>ATEX / IECEx</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>M 20</td>
<td>M 20</td>
<td>M 20</td>
<td>M 20</td>
<td>0100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0900</td>
<td>1000 ATEX</td>
<td>1000 UL/cUL</td>
<td>1300</td>
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<tr>
<td></td>
<td>M 20</td>
<td></td>
<td>0300*</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>1700*</td>
<td></td>
<td></td>
<td></td>
<td>2100*</td>
</tr>
</tbody>
</table>

*The long top is needed for Profibus sensors

* Selected cable should fulfill the requirements of EN IEC 60079-14

### Accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>Part no.</th>
<th>Type no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>M20×1.5 cable gland, ATEX/IECEx</td>
<td>CG-816679</td>
<td>ADE-1F2 no4</td>
</tr>
<tr>
<td>M20×1.5 cable gland, ATEX/IECEx</td>
<td>CG-816609</td>
<td>ADE-1F2 no6</td>
</tr>
<tr>
<td>½” NPT cable gland ATEX/IECEx/CSA, 180 °C</td>
<td>403 042</td>
<td>A3LBF / 16 ½” NPT</td>
</tr>
<tr>
<td>Hook key (please order two per piece)</td>
<td>DIN 1018A AMF 80-90 mm</td>
<td></td>
</tr>
<tr>
<td>Ring magnet 0D33</td>
<td>201 542-2</td>
<td></td>
</tr>
</tbody>
</table>

**Sensors with Analog-, Start/Stop- or CANbus-output:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part no.</th>
<th>Type no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 pin plug M16</td>
<td>370 423</td>
<td></td>
</tr>
<tr>
<td>6 pin plug M16 with 10 m PUR-cable (Type 530052)</td>
<td>MTS-x-370423-1000-530052 with x = A: Analog, R: Start/Stop, C: CAN</td>
<td></td>
</tr>
</tbody>
</table>

**Sensors with SSI-output:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part no.</th>
<th>Type no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 pin plug M16</td>
<td>370 624</td>
<td></td>
</tr>
<tr>
<td>7 pin plug M16 with 10 m PUR-cable (Type 530052)</td>
<td>MTS-S-370624-1000-530052</td>
<td></td>
</tr>
<tr>
<td>HPH mount adapter (rotation adapter) for M18, M30x1.5</td>
<td>RTA-M18</td>
<td></td>
</tr>
<tr>
<td>HPH mount adapter (rotation adapter) for ½” UNF; 1 1/16 - 12 UNF</td>
<td>RTA-½” UNF-2</td>
<td></td>
</tr>
<tr>
<td>HPH mount adapter (rotation adapter) for ¾” UNF; 1 ¼ - 12 UNF</td>
<td>253 961</td>
<td></td>
</tr>
<tr>
<td>Part-No.</td>
<td>HPH -XXXX-XXXX-X-XXXXX</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------</td>
<td></td>
</tr>
<tr>
<td>Choose a design combination from the chart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring length 50…7600 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Approved or Non-approved version</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only for version 100: Please add type of approval:</td>
<td></td>
<td></td>
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<tr>
<td>- ATEX / IECEx</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- UL/cUL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example: Approved short housing with M18 mounting threads and one side mounted cable gland with M20 threads and a stroke 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. At MTS, customer orientation is more than a slogan.

- Always up-to-date with the MTS E-Newsletter
<table>
<thead>
<tr>
<th>Country</th>
<th>Address</th>
<th>Phone</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNITED STATES</strong></td>
<td>MTS Systems Corporation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sensors Division</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3001 Sheldon Drive</td>
<td>+1 919 677-0100</td>
<td><a href="mailto:info.us@mtssensors.com">info.us@mtssensors.com</a></td>
</tr>
<tr>
<td></td>
<td>Cary, N.C. 27513</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GERMANY</strong></td>
<td>MTS Sensor Technologie</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GmbH &amp; Co. KG</td>
<td>+49 2351 9587-0</td>
<td><a href="mailto:info.de@mtssensors.com">info.de@mtssensors.com</a></td>
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<tr>
<td></td>
<td>Auf dem Schüffel 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>58513 Lüdenscheid</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ITALY</strong></td>
<td>Branch Office</td>
<td>+39 030 988 3819</td>
<td><a href="mailto:info.it@mtssensors.com">info.it@mtssensors.com</a></td>
</tr>
<tr>
<td></td>
<td>Phone:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FRANCE</strong></td>
<td>Branch Office</td>
<td>+33 1 58 4390-28</td>
<td><a href="mailto:info.fr@mtssensors.com">info.fr@mtssensors.com</a></td>
</tr>
<tr>
<td></td>
<td>Phone:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UK</strong></td>
<td>Branch Office</td>
<td>+44 79 44 15 03 00</td>
<td><a href="mailto:info.uk@mtssensors.com">info.uk@mtssensors.com</a></td>
</tr>
<tr>
<td><strong>CHINA</strong></td>
<td>Branch Office</td>
<td>+86 21 2415 1000 / 2415 1001</td>
<td><a href="mailto:info.cn@mtssensors.com">info.cn@mtssensors.com</a></td>
</tr>
<tr>
<td><strong>JAPAN</strong></td>
<td>Branch Office</td>
<td>+81 3 6416 1063</td>
<td><a href="mailto:info.jp@mtssensors.com">info.jp@mtssensors.com</a></td>
</tr>
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