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 magnetostriction, even for the most unusual applications. Over the decades, we have built up a wealth of experience which we put into practice in the form of intelligent sensors and software for our customers in a wide variety of industrial sectors. And our quality requirements extend to our comprehensive after-sales service.
QUALITY ASSURANCE

The quality of our 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 den Schafträ 9
58513 Lüdenscheid

has implemented and maintains a Quality Management System.

Scope

Development and manufacturing of linear position transducers and liquid level measuring systems based on the magnetic-tore 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. 002256 GM008
Date of certification: 2010-02-25
Valid until: 2016-02-24

DGS GmbH

G. Blabechwout

Managing Director

Accredited Body: DGS GmbH, August-Ehrentrau-Strasse 24, 60489 Frankfurt am Main
Asynchronous mode
Asynchronous communication occurs when data is sent from one device to another device with a separate clock. When the Temposonics® R-Series SSI position sensor is operated in the asynchronous mode, the sensor takes measurements at its fastest internal interrogation rate (length dependent) and provides the information upon request.

N 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 sensor varies from the actual physical position. In magnetostrictive sensors, this variability is caused by minute differences in the propagation rate of the return signal through the waveguide medium. Non-linearity is expressed in absolute units 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.

Temperature drift is:
\[(TC \times \text{full scale output} \times \text{Ø temperature})\]

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

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.

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

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.
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

100% field adjustable Null and Span
Sensor diagnostic display
Integrated LEDs (green/red) provide basic visual feedback for normal sensor operation and troubleshooting.

<table>
<thead>
<tr>
<th>Green</th>
<th>Red</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td>Normal function</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Magnet not detected,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wrong quantity of magnets</td>
</tr>
<tr>
<td>ON</td>
<td>Flashing</td>
<td>Magnet out of setup range</td>
</tr>
<tr>
<td>Flashing</td>
<td>ON</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 23 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.

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.

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)

Windows sensor programming
(MTS Analog Communicator)
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 / +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 protection\(^1\): 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, 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 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.

Wiring Pin Cable Function

1 grey Output 1: Position #1
   0...10/10...0/-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 V
   4...20/20...4 mA
4 green DC Ground
5 brown +24 VDC (-15/+20 %)
6 white DC Ground (0 V)

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
- 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.

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**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

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All dimensions in mm
TEMPOSONICS®

Sensor model
RP - Profile
RH - Hydraulic rod

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

Rod Temposonics® RH:
M - Flange M18 x 1.5 (Standard)
V - Flange M18 x 1.5 (Fluorelastomer housing-seal)
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) + Output 2 (position magnet 2)

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 0…10 VDC
V11 xxx.x = 10…0 VDC 10…0 VDC
V21 xxx.x = -10…-10 VDC -10…-10 VDC
V31 xxx.x = +10…-10 VDC +10…-10 VDC
A01 xxx.x = 4…20 mA 4…20 mA
A11 xxx.x = 20…4 mA 20…4 mA

2 Outputs with 2 magnets
Output 1 (position magnet 1) + Output 2 (position magnet 2)

Stroke Length Standard RP

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

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.

Ordering steps
< 500 mm 25 mm
500…2500 mm 50 mm
750…1000 mm 25 mm
1000…2500 mm 50 mm
2500…5000 mm 100 mm
> 5000 mm 250 mm

Accessories page 67 and following.
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

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

<table>
<thead>
<tr>
<th>LED</th>
<th>Green</th>
<th>Red</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>Normal function</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>Magnet not detected 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></td>
<td>Power out of range (high or low)</td>
</tr>
</tbody>
</table>

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.

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.
## 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

<table>
<thead>
<tr>
<th>Interface</th>
<th>CAN-Fieldbus System ISO-DIS 11898</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data protocol</td>
<td>CANopen: CIA Standard DS 301 V3.0 / Encoder Profile DS 406 V3.1, CANbasic: CAN 2.0 A</td>
</tr>
<tr>
<td>Baud rate, kBit/s</td>
<td>1000 800 500 250 125 50 20</td>
</tr>
<tr>
<td>Cable length, m</td>
<td>&lt; 25 &lt; 50 &lt; 100 &lt; 250 &lt; 500 &lt; 1000 &lt; 2500</td>
</tr>
</tbody>
</table>

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

### Accuracy

<table>
<thead>
<tr>
<th>Resolution</th>
<th>CANopen CANbasic</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Position</td>
<td>5 μm 2 μm 5 μm 2 μm</td>
</tr>
<tr>
<td>- Speed</td>
<td>0.5 mm/s 0.2 mm/s 1.0 mm/s 0.1 mm/s</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>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; ± 0.01 % F.S. (Minimum ± 45 μm)</td>
</tr>
<tr>
<td>Linearity tolerance</td>
<td>Option internal linearization</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>
</tr>
<tr>
<td>RP</td>
<td>&gt; 600…1200 mm: typ. ± 30 μm, max. ± 50 μm</td>
</tr>
</tbody>
</table>

| Repeatability      | < ± 0.001 % F.S. (Minimum ± 2.5 μm) |
| Temperature coefficient | < 15 ppm/°C |
| Hysteresis         | < 4 μm |

### Operating conditions

| Magnet speed       | any |
| Operating temperature | -40 °C…+75 °C |
| Dew point, humidity| 90% rel. humidity, no condensation |
| Ingress protection | 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 |
| 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 ½”-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

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

All dimensions in mm
High pressure rod design

Temposonics® RH with a pressure resistant stainless steel flange and sensing rod is suitable for use in hydraulic cylinders and externally in all applications where space is a problem. Position measurement is via ring or U-magnets travelling along the sensing rod without any mechanical contact.

Advantage…
the completely operable sensor cartridge can be replaced for servicing easily without opening the fluid circuit.

Standard position magnets (not included in, please order separately)

<table>
<thead>
<tr>
<th>Standard position magnet not included in delivery (see chapter accessories)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Position magnets</strong></td>
</tr>
<tr>
<td>Ring magnet OD33 (part no. 201 542-2)</td>
</tr>
<tr>
<td>Ring magnet OD25.4 (part no. 400 533)</td>
</tr>
<tr>
<td>U-magnet OD33 (part no. 251 416-2)</td>
</tr>
<tr>
<td><strong>Connection types</strong></td>
</tr>
<tr>
<td>6 pin female connector (part no. 370 623)</td>
</tr>
<tr>
<td>6 pin female connector M16, 90° (part no. 560 778)</td>
</tr>
</tbody>
</table>

All dimensions in mm
### Design

**Profile Temposonics® 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 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

- 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)

### Stroke Length Standard RP

<table>
<thead>
<tr>
<th>Stroke Length</th>
<th>Ordering Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 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 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>

---

**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

*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)

---

**Characteristics of the EtherCAT® sensor**

**Sensor’s 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 fulfils the requirements of the EtherCAT field-bus and can be connected as a slave to this bus system. EtherCAT is an open field-bus system which is based on the EtherNet technology (IEEE 802.3) with a high data rate, short response time and a good real-time performance, it is standardized in the IEC/PAS 62407 and it is part of the ISO 15745-4. The integration in the IEC 61158, IEC 61784 and IEC 61800-7 is in the way.

It is very easy to implement the Temposonics® sensor with the EtherCAT interface into an EtherCAT field-bus system. The System-Manager (e.g. TwinCAT from 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>Linearity tolerance:</td>
<td>RP &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>RP 1200…3000 mm: typ. ± 45 μm, max. ± 90 μm, 3,…5 m: typ. ± 85 μm, max. ± 150 μm</td>
</tr>
<tr>
<td>Repeatability</td>
<td>&lt; ± 0.001 % F.S. (Minimum ± 2.5 μm)</td>
</tr>
<tr>
<td>Cycle time</td>
<td>Stroke length dependent</td>
</tr>
<tr>
<td>Data transmission rate</td>
<td>≤ 10 kHz (oversampling is active while the scanning cycle is shorter than the measuring cycle.)</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

| 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                                                           |
| 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 4 pin connector M12-D                                                       |
| 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         | 80 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.

Electronics

Sensor head

![Diagram of Magnet slider S](image)

Connection

<table>
<thead>
<tr>
<th>BUS In / Out</th>
<th>Pin</th>
<th>Cable</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>View</td>
<td>1</td>
<td>yellow</td>
<td>Tx-</td>
</tr>
<tr>
<td>Connector side</td>
<td>2</td>
<td>white</td>
<td>Rx+</td>
</tr>
<tr>
<td>Sensor</td>
<td>3</td>
<td>orange</td>
<td>Tx-</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>blue</td>
<td>Rx-</td>
</tr>
</tbody>
</table>

Input voltage

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>brown</td>
<td>+24 VDC (-15 / +20 %)</td>
</tr>
<tr>
<td>2</td>
<td>white</td>
<td>do not connect</td>
</tr>
<tr>
<td>3</td>
<td>blue</td>
<td>0 V (GND)</td>
</tr>
<tr>
<td>4</td>
<td>black</td>
<td>do not connect</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

- Cable connector (part no. 530 066)
- Cable connector (part no. 530 064)
- 4 pin Bus cable connector (part no. 370 523)
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 OD33</td>
<td>201 542-2</td>
<td>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</td>
</tr>
<tr>
<td>U-magnet OD33</td>
<td>251 416-2</td>
<td>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</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** - 0.025…5000 mm
- **Rod** - 0.025…7600 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** - +24VDC
- **A** - +24VDC, 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.

---

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

---

**Stroke Length Standard RP**

<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...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 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>

---

**Accessories page 67 and following.**
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

---

**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 |
| Linearity  | < ± 0.01 % F.S. (Minimum ± 50 μm) |

#### Operating conditions

| Magnet speed         | any |
| Operating temperature| -40 °C…+75 °C |
| Dew point, humidity  | 90% rel. humidity, no condensation |

#### 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

| 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 ¼”-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 |
| 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.

Wiring D63

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>green</td>
<td>RxO/TxO-N (Bus)</td>
</tr>
<tr>
<td>2</td>
<td>red</td>
<td>RxO/TxO-P (Bus)</td>
</tr>
<tr>
<td>3-4</td>
<td>black</td>
<td>+24 VDC (-15 / +20 %)</td>
</tr>
<tr>
<td>5</td>
<td>blue</td>
<td>DC Ground (0V)</td>
</tr>
</tbody>
</table>

Wiring D53

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>green</td>
<td>RxO/TxO-N (Bus)</td>
</tr>
<tr>
<td>2</td>
<td>red</td>
<td>RxO/TxO-P (Bus)</td>
</tr>
<tr>
<td>3-4</td>
<td>yellow</td>
<td>do not connect</td>
</tr>
</tbody>
</table>

Input voltage

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>brown</td>
<td>+24 VDC (-15 / +20 %)</td>
</tr>
<tr>
<td>2</td>
<td>white</td>
<td>do not connect</td>
</tr>
<tr>
<td>3</td>
<td>blue</td>
<td>0 V (GND)</td>
</tr>
<tr>
<td>4</td>
<td>black</td>
<td>do not connect</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-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)

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

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

All dimensions in mm
Tempsonics®
Sensor model
RP - Profile
RH - Rod

Design
Profile Tempsonics® 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 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
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
1 - +24 VDC
A - +24 VDC, high vibration resistant (stroke length 25…2000 mm)

Output
P = Profibus-DP
101 - Profibus-DP, Multi-position measurement, 1 - 2 0 positions (Standard)
102 - Profibus-DP, Single-position measurement (Standard)
105 - Profibus-DP, Single- and multi-position measurement, 1 - 1 5 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

Operation Manual & Software available at: www.mtssensors.com
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
Measured value  position or velocity, option: 1…19 multi-position measurement
Measuring length profile: 25…5000 mm / rod: 25…7600 mm

Output
Interface/Data protocol Profinet IO RT
Data transmission rate 100 MBit/s max.

Accuracy
Resolution
- Position 1…100 μm selectable
- Velocity 1 mm/s
Linearity 1 < ± 0.01 % F.S. (minimum ± 50 μm)
Repeatability < ± 0.001 % F.S. (minimum ± 2.5 μm)
Update time dependent on stroke length
Process data maximum 1 kHz
Temperature coefficient < 15 ppm/°C
Ripple < 5 μm
Hysteresis < 4 μm

Operating conditions
Magnet speed any
Operating temperature 0…+75 °C
Dew point, humidity 90% rel. humidity, no condensation
Ingress protection 2 profile: IP65, rod: IP67 if appropriate mating cable connector is correctly fitted
Shock test 100 g (single shock) IEC-Standard 60068-2-27
Vibration test 15 g / 10…2000 Hz, IEC-Standard 60068-2-6 (resonance frequencies excluded)
EMC test Electromagnetic emission EN 61000-4-6 (for industrial environments)
Electromagnetic immunity EN 61000-4-3
the sensor meets the requirements of the EC directives and is marked with CE

Design, material
Diagnostic display LED beside connector
Profile model:
Sensor head aluminum
Rod aluminum
Position magnet magnet slider or removable U-magnet
Rod model:
Sensor head aluminum
Rod stainless steel 1.4301 / AISI 304
Pressure rating 350 bar, 700 bar peak
Position magnet Ring- or U-magnets

Installation
Mounting position any
Profile adjustable mounting feet or T-Slot nut in bottom groove
U-magnet, removable mounting plate and screws from antimagnetical material
Rod threaded flange M18x1.5 or ¾”-16 UNF-3A
Position magnet mounting plate and screws from antimagnetical material

Electrical connection
Connection type 2 x 4 pin M12 (d-coded); 1 x 4 pin M12 (a-coded)
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 consumption typ. 110 mA
Ripple ≤ 0.28 Vpp
Electric strength 500 VDC (DC ground to machine ground)

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 taking 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>1 BN</td>
<td>YE</td>
<td>Tx+</td>
<td></td>
</tr>
<tr>
<td>2 WH</td>
<td>WH</td>
<td>Rx+</td>
<td></td>
</tr>
<tr>
<td>3 BU</td>
<td>BU</td>
<td>Rx-</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supply</th>
<th>Pin</th>
<th>Cable</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 BN</td>
<td>YE</td>
<td>Tx+</td>
<td></td>
</tr>
<tr>
<td>2 WH</td>
<td>WH</td>
<td>Rx+</td>
<td></td>
</tr>
<tr>
<td>3 BU</td>
<td>BU</td>
<td>Rx-</td>
<td></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. 530 085)
### Specification

**Profile Temposonics® RP:**
- S - Magnet slider, joint at top
- V - Magnet slider, joint at front
- G - Magnet slider, joint 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**
- ≤ 500 mm: 25 mm
- 500…2500 mm: 50 mm
- 2500…5000 mm: 100 mm

**Rod**
- ≤ 500 mm: 5 mm
- 500…750 mm: 10 mm
- 750…1000 mm: 25 mm
- 1000…2500 mm: 50 mm
- 2500…5000 mm: 100 mm
- > 5000 mm: 250 mm

### Connection type

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

### Supply voltage

T - +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

---

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>Green</th>
<th>Red</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td>Normal function</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Magnet not detected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrong quantity of magnets</td>
</tr>
<tr>
<td>ON</td>
<td>Flashing</td>
<td>Sensor not synchronous*</td>
</tr>
<tr>
<td>Flashing</td>
<td>ON</td>
<td>Programming mode</td>
</tr>
</tbody>
</table>

*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.

Sensor input

<table>
<thead>
<tr>
<th>Optocoupler</th>
<th>Clock (+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>91 ohms</td>
<td>7 mA</td>
</tr>
<tr>
<td>100 ohms</td>
<td>0</td>
</tr>
<tr>
<td>100 ohms</td>
<td>0 Clock (+)</td>
</tr>
<tr>
<td>91 ohms</td>
<td>0 Clock (-)</td>
</tr>
</tbody>
</table>

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.

Timing diagram

Logic diagram

Windows sensor programming

<table>
<thead>
<tr>
<th>Sensor Function</th>
<th>Optocoupler</th>
<th>Data (+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24 VDC</td>
<td></td>
<td>Data (-)</td>
</tr>
<tr>
<td>0 V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Windows sensor programming)
## 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) |
| 8…32 bit          | Binary or Gray, optional Parity and Errorbit and internal temperature |
| Update time Stroke length | Stroke length 300 750 1000 2000 5000 mm |
|                   | Measurement rate: 3.7 3.0 2.3 1.2 0.5 kHz |
| Data speed         | 70 kBAud*…1 MBD, depending on cable length: |
|                   | Length < 3 < 50 < 100 < 200 < 400 m |
|                   | Baud rate 1 MBD < 400 kBD < 300 kBD < 200 kBD < 100 kBd |

### 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) |
| Linearity RP/RH     | < ± 0.01 % F.S. (minimum ± 40 μm) |
| Option internal linearization | Linearity tolerance: |
| RP/RH               | < 300 mm: typ. ± 15 μm, max. ± 25 μm, > 300…600 mm: typ. ± 20 μm, max. ± 30 μm |
| Sed 600 mm: typ. ± 30 μm, max. ± 50 μm |
|                        | 1200…3000 mm: typ. ± 45 μm, max. ± 90 μm, 3…5 m: typ. ± 85 μm, max. ± 150 μm |
| Repeatability         | < ± 0.001 % F.S. (minimum ± 2.5 μm) |
| Temperature coefficient | < 15 ppm/°C |
| Hysteresis           | < 4 μm typical 2 μm |

### Operating conditions

| Magnet speed        | any |
| Dew point, humidity | -40 °C…+75 °C 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, 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 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 ¾"-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) |

¹The 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)**

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:
- 7 pin female connector M16 (part no. 370 624)
- 7 pin female connector M16, 90° (part no. 560 779)
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: 14 g
  - Operating temperature: -40…+100 °C
  - Surface pressure max. 40 N/mm²
  - Fastening Torque for M4 screws max. 1 Nm

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

---

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
- 7 pin female connector M16 (part no. 370 624)
- 7 pin female connector M16, 90° (part no. 560 779)
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
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
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] - Synchronous Serial Interface

[1] Data length: 1 - 25 bit • 2 - 24 bit • 3 - 26 bit
[2] Output format: B - Binary • D - 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

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 / ProfiBus-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, Proflbus, EtherCAT, Ethernet/IP™, Powerlink, Profinet) |
| Stroke length                       | 100…20,000 mm |

## Output

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

## Accuracy

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Output dependent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>&lt; ±0.02 % F.S. (Minimum ±100 μm)</td>
</tr>
<tr>
<td>Repeatability</td>
<td>&lt; ±0.001 % F.S. (Minimum ±2.5 μm)</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>&lt; 4 μm</td>
</tr>
</tbody>
</table>

## Operating conditions

<table>
<thead>
<tr>
<th>Magnet movement velocity</th>
<th>Any</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-40…+75 °C</td>
</tr>
<tr>
<td>Dew point, humidity</td>
<td>90% rel. humidity, no condensation</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>IP30 (IP65 rating only for professional mounted guide pipe IP65 and if mating connectors are correctly fitted)</td>
</tr>
<tr>
<td>Shock test</td>
<td>100 g (single shock IEC-Standard 60068-2-27)</td>
</tr>
<tr>
<td>Vibration test</td>
<td>5 g / 10…150 Hz IEC-Standard 60068-2-6</td>
</tr>
<tr>
<td>Standards, EMC test</td>
<td>Electromagnetic emission EN 61000-6-4</td>
</tr>
<tr>
<td></td>
<td>Electromagnetic immunity EN 61000-6-2</td>
</tr>
<tr>
<td></td>
<td>EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE qualified1</td>
</tr>
</tbody>
</table>

## Design, Material

<table>
<thead>
<tr>
<th>Diagnostic display</th>
<th>LEDs beside connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor electronics housing</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Sensor stroke</td>
<td>Stainless steel conduct with Teflon® coating</td>
</tr>
<tr>
<td>Position magnet</td>
<td>Ring- or U-magnet</td>
</tr>
</tbody>
</table>

## Electrical connection

<table>
<thead>
<tr>
<th>Connection type</th>
<th>Connector or cable outlet (output dependent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>24 VDC (-15 / +20 %)</td>
</tr>
<tr>
<td>- Polarity protection</td>
<td>Up to -30 VDC</td>
</tr>
<tr>
<td>- Overvoltage protection</td>
<td>Up to 36 VDC</td>
</tr>
<tr>
<td>Current drain</td>
<td>100 mA typical</td>
</tr>
<tr>
<td>Ripple</td>
<td>&lt; 0.28 Vpp</td>
</tr>
<tr>
<td>Electric strength</td>
<td>500 VDC (DC ground to machine ground)</td>
</tr>
</tbody>
</table>

---

**Info:**
For detailed technical data and electrical connection for the outputs please see data sheets: R-Series Analog, SSI, CANbus, Proflbus, 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.
Flexible R-series Flexible

Sensor electronics housing

2 Screws
M4x59 hexagon socket
2.5 mm

* Housing length for Profibus and EtherCAT

** Housing length for Profinet, EtherCAT™ and Powerlink

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)

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

Ring magnet OD33
Part No. 201 542-2
PA-Ferrite-GF0
Weight ca. 14 g
Operating temperature: -40...+100 °C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm

U-Magnet OD33
Part No. 251 416-2
PA-Ferrite-GF0
Weight ca. 11 g
Operating temperature: -40...+100 °C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm

Ring magnet OD66
Part No. 0162
AEC-Mg²b
Magnets compound-filled
Weight ca. 30 g
Operating temperature: -40...+75 °C

U-Magnet OD66.5
Part No. 251 964
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Block magnet
Part no. 403 448
Magnet support: plastic
Magnet: hard ferrite
Weight: ca. 20 g
Operating temperature: -40...+75 °C

Note: Tolerance of total length has no influence on the stroke length.

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

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

Connection types
Connector or cable outlet output dependent

Note: All dimensions in mm

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>Tolerance of total length</th>
<th>Dead zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 2000 mm</td>
<td>+8 mm / −5 mm</td>
<td>94 mm (3.70 in.)</td>
</tr>
<tr>
<td>10.000 mm</td>
<td>+15 mm / −15 mm</td>
<td>100 mm (3.94 in.)</td>
</tr>
<tr>
<td>15.000 mm (150.50 in.)</td>
<td>+15 mm / −30 mm</td>
<td>120 mm (4.72 in.)</td>
</tr>
<tr>
<td>20.000 mm (187.00 in.)</td>
<td>+15 mm / −45 mm</td>
<td>140 mm (5.51 in.)</td>
</tr>
</tbody>
</table>

Null zone
Measuring length
max 7500 mm

Position magnet

Height: 8

Ring magnet OD30.5
Part No. 402 316
PA Ferrite Verbund
Weight ca. 15 g
Operating temperature: -40...+100 °C
Surface pressure max. 40 N/mm²

U-Magnet OD66.5
Part No. 291 553
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Null zone
Measuring length
max 7500 mm

Position magnet
Height: 8

Ring magnet OD30.5
Part No. 402 316
PA Ferrite Verbund
Weight ca. 15 g
Operating temperature: -40...+100 °C
Surface pressure max. 40 N/mm²

U-Magnet OD66.5
Part No. 291 553
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Null zone
Measuring length
max 7500 mm

Position magnet
Height: 8

Ring magnet OD30.5
Part No. 402 316
PA Ferrite Verbund
Weight ca. 15 g
Operating temperature: -40...+100 °C
Surface pressure max. 40 N/mm²

U-Magnet OD66.5
Part No. 291 553
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Null zone
Measuring length
max 7500 mm

Position magnet
Height: 8

Ring magnet OD30.5
Part No. 402 316
PA Ferrite Verbund
Weight ca. 15 g
Operating temperature: -40...+100 °C
Surface pressure max. 40 N/mm²

U-Magnet OD66.5
Part No. 291 553
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Null zone
Measuring length
max 7500 mm

Position magnet
Height: 8

Ring magnet OD30.5
Part No. 402 316
PA Ferrite Verbund
Weight ca. 15 g
Operating temperature: -40...+100 °C
Surface pressure max. 40 N/mm²

U-Magnet OD66.5
Part No. 291 553
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Null zone
Measuring length
max 7500 mm

Position magnet
Height: 8

Ring magnet OD30.5
Part No. 402 316
PA Ferrite Verbund
Weight ca. 15 g
Operating temperature: -40...+100 °C
Surface pressure max. 40 N/mm²

U-Magnet OD66.5
Part No. 291 553
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Null zone
Measuring length
max 7500 mm

Position magnet
Height: 8

Ring magnet OD30.5
Part No. 402 316
PA Ferrite Verbund
Weight ca. 15 g
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Surface pressure max. 40 N/mm²

U-Magnet OD66.5
Part No. 291 553
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Null zone
Measuring length
max 7500 mm

Position magnet
Height: 8

Ring magnet OD30.5
Part No. 402 316
PA Ferrite Verbund
Weight ca. 15 g
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Surface pressure max. 40 N/mm²

U-Magnet OD66.5
Part No. 291 553
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Null zone
Measuring length
max 7500 mm

Position magnet
Height: 8

Ring magnet OD30.5
Part No. 402 316
PA Ferrite Verbund
Weight ca. 15 g
Operating temperature: -40...+100 °C
Surface pressure max. 40 N/mm²

U-Magnet OD66.5
Part No. 291 553
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Null zone
Measuring length
max 7500 mm

Position magnet
Height: 8

Ring magnet OD30.5
Part No. 402 316
PA Ferrite Verbund
Weight ca. 15 g
Operating temperature: -40...+100 °C
Surface pressure max. 40 N/mm²

U-Magnet OD66.5
Part No. 291 553
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Null zone
Measuring length
max 7500 mm

Position magnet
Height: 8

Ring magnet OD30.5
Part No. 402 316
PA Ferrite Verbund
Weight ca. 15 g
Operating temperature: -40...+100 °C
Surface pressure max. 40 N/mm²

U-Magnet OD66.5
Part No. 291 553
PA 66-GF 30
Magnets compound-filled
Weight ca. 25 g
Operating temperature: -40...+75 °C

Null zone
Measuring length
max 7500 mm

Position magnet
Height: 8
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.

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®**

**Model**
\[ RF = \text{Flexible sensor stroke} \]

**Design**
- C - Basic sensor
- M - Flange M18×1.5
- S - Flange \( \frac{3}{4}’’ – 16 \text{ UNF – 3A} \)

**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 OD60</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 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)**

**Temposonics®**

**Model**
\[ HD = \text{Pressure housing pipe 12.7 mm with flange for Temposonics® RF M18×1.5} \]

**Stroke length**
255...7500 mm
Standard: See chart

---

**Stroke Length Standard RF**

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>Ordering steps</th>
</tr>
</thead>
<tbody>
<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 Tempsonics® sensor detects even smallest ground movements and can predict land slipping. In other words: it is able to prevent catastrophies.
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

| Measured variables | - Position  
| - Velocity | - Multi-position measurement max. 20 positions (CANbus, Profindus, EtherCAT, Ethernet/IP™, Powerlink, Profinet) |
| Stroke length | 25…5000 mm |

#### Output

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

#### Accuracy

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

#### 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 Ring |
| 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, Profindus, EtherCAT, Ethernet/IP™, Powerlink, Profinet
Electronics with side cable entry for the measuring rod

- **Recommended screws**: M6x45 ISO4762
- **PUR-cable Ø 6 mm**: bend radius > 24 mm, length 250 / 400 / 600 mm
- **Rod Ø 10**
- **Thread M18x1.5**
- **Measuring length 25 - 2540 mm**
- **Stroke length**
- **O-ring on delivery**
- **Contour of bore (ISO 6149-1)**
- **Fastening torque < 50 Nm**
- **Housing length for Profibus, EtherCAT**
- **Housing length for EtherNet/IP™, Powerlink and Profinet**

All dimensions in mm

*Magnets must be ordered separately (details see chapter accessories)
**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.

---

**Electronics with bottom cable entry for the measuring rod**

- **Rod Type S**
  - PUR-cable Ø 6 mm bend radius > 24 mm
  - Stroke length 25 - 2540 mm
  - 0-ring on delivery 15.3 x 2.2 FPM75 contour of bore (ISO 6149-1)

- **Rod Type M**
  - PUR-cable Ø 6 mm bend radius > 24 mm
  - Stroke length 25 - 5000 mm
  - SW23 Fastening torque < 50 Nm

- **Rod Type C**
  - PUR-cable Ø 6 mm bend radius > 24 mm
  - Stroke length 25 - 5000 mm
  - SW46 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.

When installing the cylinder, please note:
- The position magnet should not grind over the measuring rod.
- The bore in the piston rod is dependent on the hydraulic pressure and the piston's velocity. The minimum drilling should be 13 mm. Do not exceed the peak pressure.
- The measuring rod should be protected against wear.

Mounting ring magnet

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

Mounting example fitting flange »S« and sensor electronics with bottom cable entry

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

Minimum installation dimensions for magnetizable material

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

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

Position magnets

<table>
<thead>
<tr>
<th>Magnetic Material</th>
<th>Part No.</th>
<th>Description</th>
<th>Dimensions</th>
<th>Weight</th>
<th>Operating Temperature</th>
<th>Surface Pressure</th>
<th>Fastening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring magnet OD33</td>
<td>201 542-2</td>
<td>Composite PA-Ferrite-GF20</td>
<td>Ø 4.3 x 33</td>
<td>14 g</td>
<td>-40...+100 °C</td>
<td>40 N/mm²</td>
<td>1 Nm</td>
</tr>
<tr>
<td>U-magnet OD33</td>
<td>251 416-2</td>
<td>PA-Ferrite-GF20</td>
<td>Ø 4.3 x 33</td>
<td>11 g</td>
<td>-40...+100 °C</td>
<td>40 N/mm²</td>
<td>1 Nm</td>
</tr>
</tbody>
</table>

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

Detail: Fitting flange

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

Non-magnetizable material

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«

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
See ISO 6149-1

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

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.

Non-magnetizable material

Magnetizable material

All dimensions in mm
Temposonics® RD4

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

Integral cable of sensor rod
For side cable entry:
- D1 - PUR-cable, length 250 mm
- D2 - PUR-cable, length 400 mm
- D3 - PUR-cable, length 600 mm
For bottom cable entry:
- 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 / EtherNet/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>
</tbody>
</table>

Connectors and cables see data sheet R-Series

Spare parts
- O-ring 15.3 x 2.2 FPM 75  | 401 133 |
- O-ring 21.89 x 2.62 FPM 75 | 560 705 |
- Backup ring               | 560 629 |
- O-ring 20 x 2.65 FPM 80    | 561 435 |

<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

---

**Position sensor with IP69K super shield housing**

- Rugged industrial sensor
- Linear and absolute measurement
- Contactless sensing with highest durability
- Analog / SSI / CANbus / DeviceNet / Proflbus / EtherCAT
- Sealed IP68 / IP69K

---

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, Proflbus, 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, Probus, 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</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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, Probus, EtherCAT.
Type 1 Cable outlet
Housing type 1 = 150

Type 2 Housing short
Housing type 2 = 170

Type 3 Housing long
Housing type 3 = 190

Lids according to the outputs.

Please use a standard strap wrench to mount the sensor.

All dimensions in mm
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 / Profibus / 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>

<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>
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 Height: 8 mm&lt;br&gt;Ø 33</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 Height: 8 mm&lt;br&gt;Ø 33</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 Height: 9.5&lt;br&gt;12.5 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 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;2 Ø 30.5</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 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>Ø 4.5 on circle Ø 48 Height: 15 mm&lt;br&gt;Ø 60 Ø 30</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</td>
<td><img src="image" alt="U-magnet 70" /></td>
<td>All Mg4.5Mn, black anodised Magnets compound-filled Weight ca. 75 g</td>
<td>RH, RF, RP Resolution min. 10 μm</td>
</tr>
<tr>
<td>Part No. 252 185</td>
<td></td>
<td>Operating temperature: -40…+75°C</td>
<td></td>
</tr>
<tr>
<td>Magnet slider V</td>
<td><img src="image" alt="Magnet slider V" /></td>
<td>GFK, Magnet hard ferrite Weight ca. 30 g</td>
<td>RP</td>
</tr>
<tr>
<td>Part No. 252 184</td>
<td></td>
<td>Operating temperature: -40…+75°C</td>
<td></td>
</tr>
<tr>
<td>Magnet slider S</td>
<td><img src="image" alt="Magnet slider S" /></td>
<td>GFK, Magnet hard ferrite Weight ca. 30 g</td>
<td>RP</td>
</tr>
<tr>
<td>Magnet slider G</td>
<td><img src="image" alt="Magnet slider G" /></td>
<td>GFK, Magnet hard ferrite Weight ca. 30 g</td>
<td>RP</td>
</tr>
<tr>
<td>Magnet slider S</td>
<td><img src="image" alt="Magnet slider S" /></td>
<td>Magnet slider S: Ball joint CuZn 39Pb3 nickel plated</td>
<td></td>
</tr>
<tr>
<td>Magnet slider G</td>
<td><img src="image" alt="Magnet slider G" /></td>
<td>Magnet slider G - free from float: Socket joint, high-strength plastics Ball joint CuZn 39Pb3 nickel-plated</td>
<td></td>
</tr>
<tr>
<td>Magnet slider P</td>
<td><img src="image" alt="Magnet slider P" /></td>
<td>GFK, Magnet hard ferrite Weight ca. 30 g</td>
<td>RP</td>
</tr>
<tr>
<td>Part No. 253 673</td>
<td></td>
<td>Operating temperature: -40…+75°C</td>
<td></td>
</tr>
<tr>
<td>Block magnet</td>
<td><img src="image" alt="Block magnet" /></td>
<td>GFK, Magnet hard ferrite Weight ca. 30 g</td>
<td>RP</td>
</tr>
<tr>
<td>Part No. 403 448</td>
<td></td>
<td>Operating temperature: -40…+75°C with additional end plates</td>
<td></td>
</tr>
<tr>
<td>Float 50 mm</td>
<td><img src="image" alt="Float 50 mm" /></td>
<td>1.4571 Stainless steel Density: 720 kg/m³ Max. pressure: &lt; 40 bar Weight: 42 ± 3 g</td>
<td>RH, RF</td>
</tr>
<tr>
<td>Part No. 251 447</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Float 41 mm</td>
<td><img src="image" alt="Float 41 mm" /></td>
<td>1.4404 Stainless steel Density: 740 kg/m³ Max. pressure: = &lt; 8 bar Weight: 20 ± 2 g</td>
<td>RH, RF</td>
</tr>
<tr>
<td>Part No. 200 938-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collar</td>
<td><img src="image" alt="Collar" /></td>
<td>1.4301 Stainless steel</td>
<td>RH</td>
</tr>
<tr>
<td>Part No. 560 777</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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## 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 | Ø18 54 | 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) | Ø18 54 | 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 -52  6 - 8 mm  
PG9, cable | 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 -35  6 - 8 mm  
PG9, cable | 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 54 | 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 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 54 | Housing: Zinc nickel-plated  
Termination: Solder  
Contact insert: Silver plated  
Max. cable-Ø 8 mm | Profibus (D63) |

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## ACCESSORIES R-SERIES

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

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<tr>
<th>Product</th>
<th>Dimension</th>
<th>Material</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 pin Bus endplug M16, male</td>
<td>Ø18 48</td>
<td>Housing: Zinc nickel plated Contact insert: Silver plated</td>
<td>Profibus (D63)</td>
</tr>
<tr>
<td>Part No. 370 620</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 pin connector M12-B</td>
<td>Ø19.5 -52</td>
<td>Housing: Zinc nickel plated Termination: IDC (insulation position contact) Contact insert: Silver plated Cable-Ø: 6 - 8 mm</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 560 885 (female)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 pin 90° connector M12-B</td>
<td>Ø19</td>
<td>Housing: Zinc nickel plated Termination: spring-type terminal Contact insert: Silver plated Cable-Ø: 6.5 - 8.5 mm</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 370 514 (female)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 pin connector M12-B</td>
<td>Ø19.5 -52</td>
<td>Housing: Zinc nickel plated Termination: IDC (insulation position contact) Contact insert: Silver plated Cable-Ø: 6 - 8 mm</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 560 884 (male)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 pin 90° connector M12-B</td>
<td>Ø19</td>
<td>Housing: Zinc nickel plated Termination: Spring-type terminal Contact insert: Silver plated Cable-Ø: 6 - 8 mm</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 370 515 (male)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 pin Bus T-connector M12</td>
<td>Ø19</td>
<td>Housing: PA 66 Contact insert: Silver plated</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 560 887</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 pin Bus endplug M12</td>
<td>Ø16.4 43</td>
<td>Housing: PA 66 Contact insert: Silver plated</td>
<td>Profibus (D53)</td>
</tr>
<tr>
<td>Part No. 560 888</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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><img src="image" alt="4 pin cable connector M8" /></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><img src="image" alt="4 pin cable connector M8, 90°" /></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><img src="image" alt="Cable connector" /></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><img src="image" alt="Cable connector" /></td>
<td>5 m industrial ethernet cable (Cat 5e CS)&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>Cable connector</td>
<td><img src="image" alt="Cable connector" /></td>
<td>5 m industrial ethernet cable (Cat 5e ES)&lt;br&gt;RJ45 connector and M12-connector (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><img src="image" alt="4 pin Bus cable connector" /></td>
<td>IDC technology</td>
<td>EtherCAT&lt;br&gt;Profinet</td>
</tr>
<tr>
<td>End cap</td>
<td><img src="image" alt="End cap" /></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</td>
<td></td>
<td>Stainless steel</td>
<td>RP</td>
</tr>
<tr>
<td>Part No. 400 802</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-Nut</td>
<td></td>
<td>Stainless steel</td>
<td>RP</td>
</tr>
<tr>
<td>Part No. 401 602</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spacer</td>
<td>Ø 31.75</td>
<td>Aluminum</td>
<td>RH</td>
</tr>
<tr>
<td>Part No. 400 633</td>
<td>Height: 3.17mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixing clip</td>
<td>Ø10</td>
<td>Brass, non-magnetic</td>
<td>RH</td>
</tr>
<tr>
<td>Part No. MT 0200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal protection cap for connector M16</td>
<td>M16x0.75</td>
<td>Brass, nickel plated</td>
<td>Analog, CAN, SSI, Profibus</td>
</tr>
<tr>
<td>Part No. 403 290</td>
<td>ca. 60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hex nut</td>
<td>Ø15.3</td>
<td>Stainless steel</td>
<td>RH-M</td>
</tr>
<tr>
<td>Part No. 500 018</td>
<td>M18x1.5 - 6H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O-ring</td>
<td>Ø 15.3</td>
<td>Fluorelastomer FPM 75</td>
<td>RH-M</td>
</tr>
<tr>
<td>Part No. 481 133</td>
<td>2.2</td>
<td>Operating temperature: -10...+125°C</td>
<td></td>
</tr>
<tr>
<td>Cable</td>
<td>3 x 2 x 0,14 mm²</td>
<td>PVC</td>
<td>Standard</td>
</tr>
<tr>
<td>Part No. 530 032</td>
<td>Ø 6 mm</td>
<td></td>
<td></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>
| Cable  | 3 x 2 x 0.25 mm  
Ø 6.8 mm | Pelon PUR  
-40…+80°C | Halogen free  
Oil-resistant  
High flexible |
| Part No. 530 052 | | | |
| Cable  | 4 x 2 x 0.25 mm² | PUR (-30…+90°C) | Water proof wires |
| Part No. 530 116 | | | |
| Cable  | 4 x 2 x 0.25 mm² | Teflon (-90…+180°C) | Temperature |
| Part No. 530 112 | | | |
| Cable  | 7 x 0.14 mm²  
EMC protected  
Ø 7 mm | PUR  
-20…+70°C | SSI  
CAN |
| Part No. 530 029 | | | |
| Cable  | BUS + feed-in  
Ø 8 mm | PVC  
-30…+80°C | Profibus-DP D63 |
| Part No. 530 040 | | | |
| Cable  | BUS conductor, high flexible cable  
Ø 8 mm | PUR  
-30…+70°C | Profibus-DP D53 |
| Part No. 530 109 | | | |

### Hand-Programmer R-Analog for 1-magnet sensor

Is for easy teach-in-setups of measuring length and direction on desired zero/span positions.

**Hand-Programmer R-Analog**  
Part No. 253 124

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 R-Analog](image1) | **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.  
**Part No. 253 408** |
| ![USB-Programmer R-Analog](image2) | **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)  
**Part No. 253 134-1** |
| ![USB-Programmer R-SSI](image3) | **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  
**Part No. 253 135-1** |
| ![PROFIBUS Address Programmer](image4) | **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.  
**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><img src="image1.jpg" alt="CANopen Address-Programmer D62" /></td>
<td>CANopen Address Programmer 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. <strong>CANopen Address-Programmer D62</strong>&lt;br&gt;6 pin. female connector M 16&lt;br&gt;Part No. 252 382-D62&lt;br&gt;6 pin female 90°-connector M16&lt;br&gt;Part No. 252 382-D62A</td>
</tr>
<tr>
<td><img src="image2.jpg" alt="PROFIBUS Master Simulator" /></td>
<td>PROFIBUS Master Simulator&lt;br&gt;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. <strong>Cable D53</strong>&lt;br&gt;Part No. 252 383&lt;br&gt;<strong>Cable D63</strong>&lt;br&gt;Part No. 401 726</td>
</tr>
<tr>
<td><img src="image3.jpg" alt="Display and control unit with SSI input" /></td>
<td>Housing: 96 x 48 x 141 m&lt;br&gt;Cutout: 91 x 44 mm&lt;br&gt;6-segment LED&lt;br&gt;Display for SSI <strong>Display and control unit with SSI input</strong>&lt;br&gt;Part No. IX 345</td>
</tr>
<tr>
<td><img src="image4.jpg" alt="Profibus Filter box" /></td>
<td>Housing: 80 x 75 x 58 mm&lt;br&gt;The box is used for EMC-conformal feeding of 24 VDC supply voltage into the Profibus-DP hybrid cable. <strong>Profibus Filter box</strong>&lt;br&gt;Part No. 252 916</td>
</tr>
<tr>
<td><img src="image5.jpg" alt="Linearity diagram" /></td>
<td>DIN A4 printout with sensor data and graphic with the linearity gradient&lt;br&gt;Printout with linearity gradient from the sensor. This gradient can be used to choose a special linear segment also for linearity correctue in sections. <strong>Linearity diagram</strong>&lt;br&gt;Part No. 625 096</td>
</tr>
</tbody>
</table>

Notice: Product pictures may vary from original.
ACCESSORIES R-SERIES
ATEX (Atmosphères Explosibles)

Ordering Code

Temposonics®

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

Note: 1. All products are available as profile and rod version.
2. Cable has to fulfill EN 60079-14.

ATEX Conformity: Marking on MTS Approved Sensor

II 3G Ex nA IIC T4 Gc
II 3D Ex tc IIB 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 80079-0, 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>
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.
**Top mounted cable gland**

- Ø85 mm
- Ø64 mm
- Ø64 mm
- 25 mm
- Ø69 mm

**Side mounted cable gland**

- Ø85 mm
- Ø64 mm
- Ø64 mm
- 25 mm
- Ø69 mm

**HPH 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-¾” UNF-2 fits for the ¾” UNF threadhousing and has a 1 1/16 - 12 UNF mounting thread.

The adapter 253961 fits for the ¾” UNF-threadhousing and has a 1 ¼ - 12 mounting thread.
## ACCESSORIES R-SERIES

**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>M 20</td>
<td>M 20</td>
<td>0100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0900</td>
<td>1000 ATEX</td>
<td>1000 UL/cUL</td>
<td>1300</td>
<td></td>
</tr>
<tr>
<td>M 20</td>
<td></td>
<td></td>
<td></td>
<td>0300*</td>
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</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>4 – 8.5 mm cable diameter, stainless steel</td>
<td>CG-816679</td>
</tr>
<tr>
<td>M20×1.5 cable gland, ATEX/IECEx</td>
<td>8.5 – 16 mm cable diameter, stainless steel</td>
<td>CG-816609</td>
</tr>
<tr>
<td>½” NPT cable gland ATEX/IECEx/CSA, 180 °C</td>
<td>4.0 – 8.4 mm cable diameter, brass nickeld</td>
<td>403 042</td>
</tr>
<tr>
<td>Hook key (please order two per piece)</td>
<td>DIN 1018A AMF 80-90 mm</td>
<td>201 542-2</td>
</tr>
<tr>
<td>Ring magnet 0033</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

- 6 pin plug M16 | 370 423 |
- 6 pin plug M16 with 10 m PUR-cable (Type 530052) | MTS-x-370423-1000-530052 with x = A: Analog, R: Start/Stop, C: CAN |

**Sensors with SSI-output:**

- 7 pin plug M16 | 370 624 |
- 7 pin plug M16 with 10 m PUR-cable (Type 530052) | MTS-S-370624-1000-530052 |
- HPH mount adapter (rotation adapter) for M18, M30x1.5 | RTA-M18 |
- HPH mount adapter (rotation adapter) for ¼” UNF; 1 1/16 - 12 UNF | RTA-¼” UNF-2 |
- HPH mount adapter (rotation adapter) for ¼” UNF; 1 ¾ - 12 UNF | 253 961 |
Ordering Information:

Part-No. 

Choose a design combination from the chart 

Measuring length 50…7600 mm 

Approved or Non-approved version 

Only for version 1000: Please add type of approval:
- ATEX / IECEx
- UL/cUL

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.

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