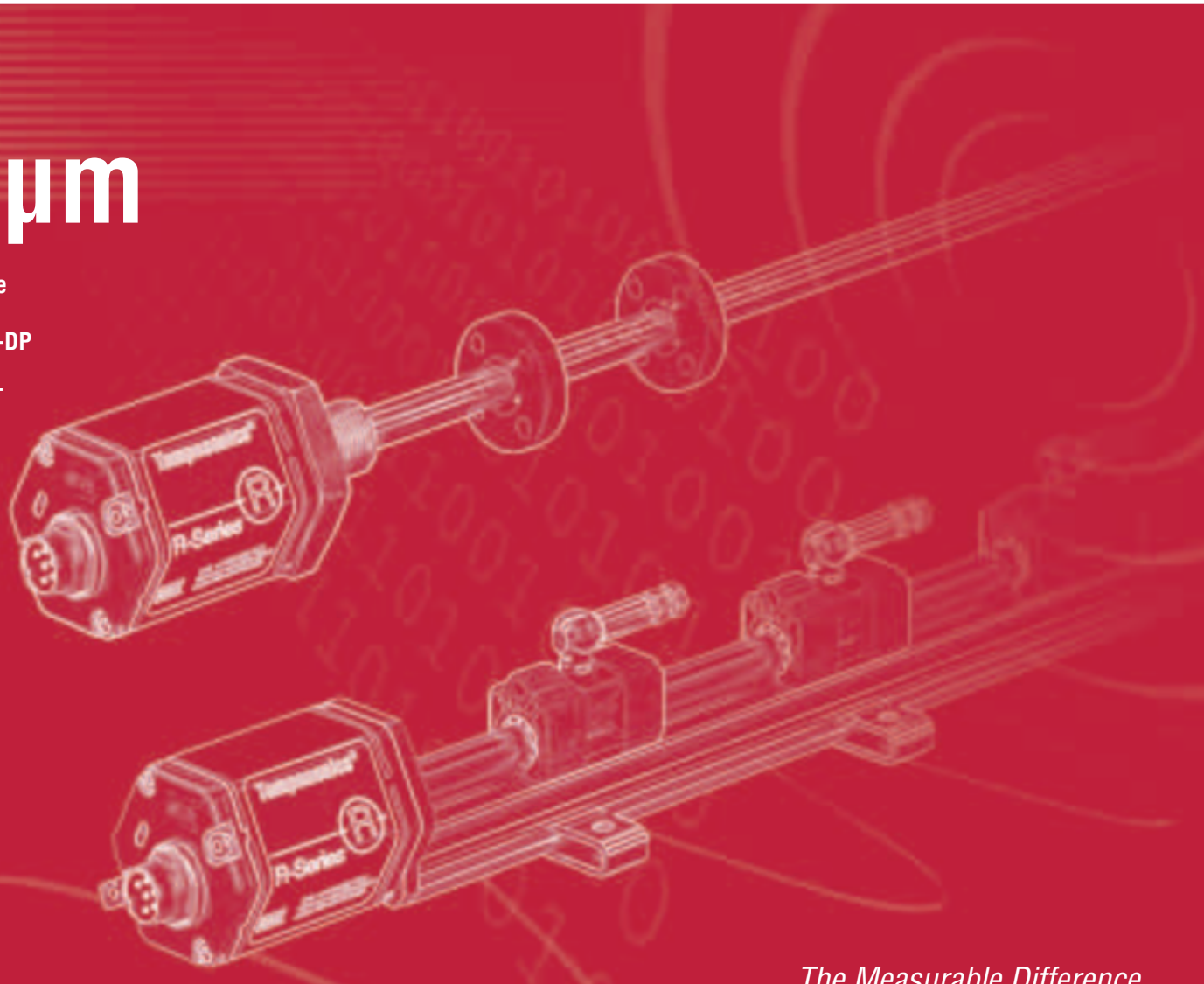
# Temposonics®

Absolute, Non-Contact Position Sensors

## R-Series Catalogue

# 1 µm

Analogue
CANbus
Profibus-DP
SSI
EtherCAT




*The Measurable Difference*

## CONTENTS

## THE COMPANY

**The World of MTS**

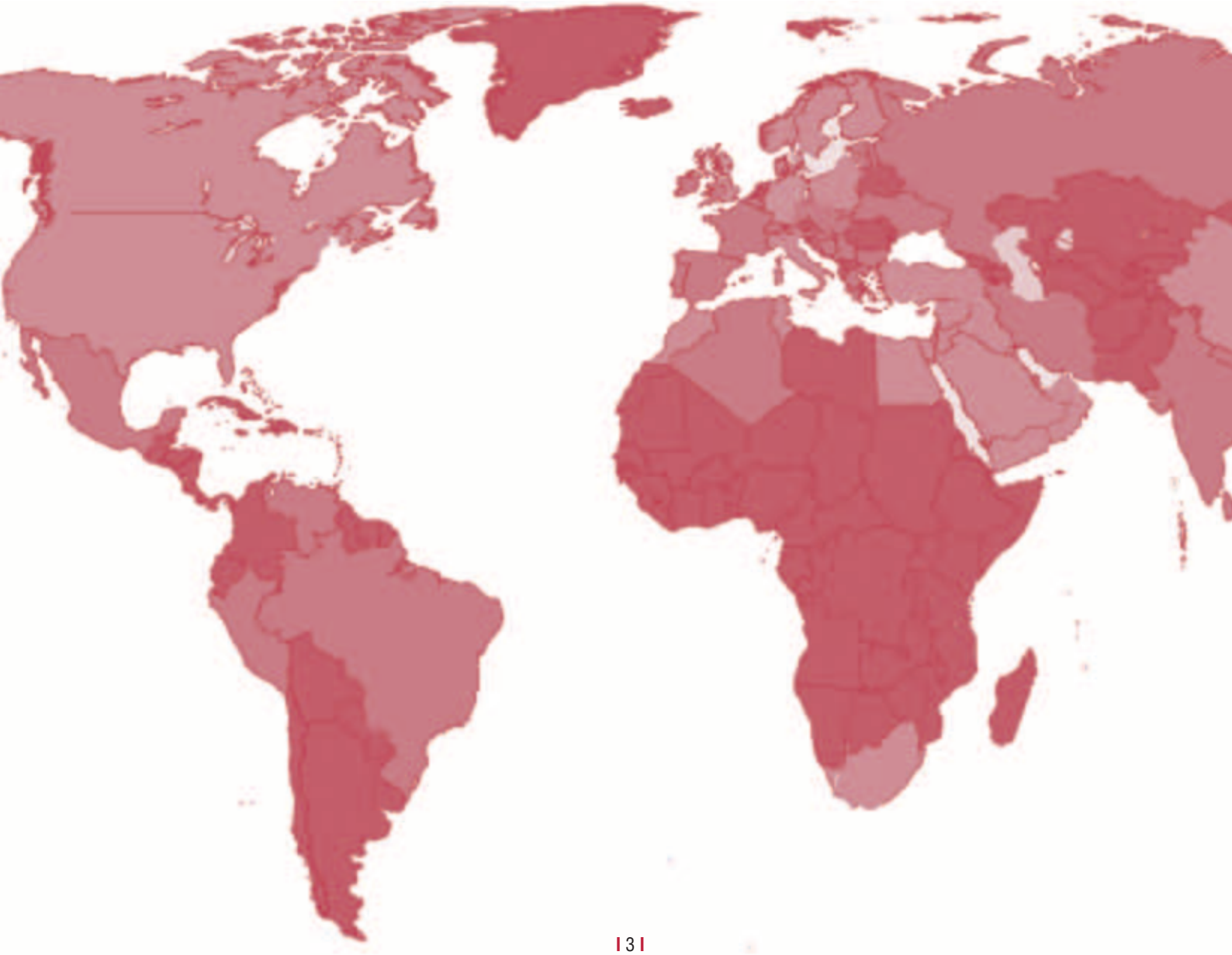
Following the founding of **MTS Systems Corporation** in 1951, the company rapidly developed into a leading supplier of intelligent hardware and software products in the fields of test and simulation systems and in measuring and automation technology. Today MTS Systems Corporation has over 2.335 employees worldwide – 355 of whom are employed by **MTS Sensors** at three sites in the **USA (Cary, N.C.), Germany (Lüdenscheid)** and **Japan (Tokyo).** At MTS, intensive basic research is efficiently merged with a consistent focus on practical requirements. The results are innovative solutions for a wide range of potential industrial and non-industrial applications.

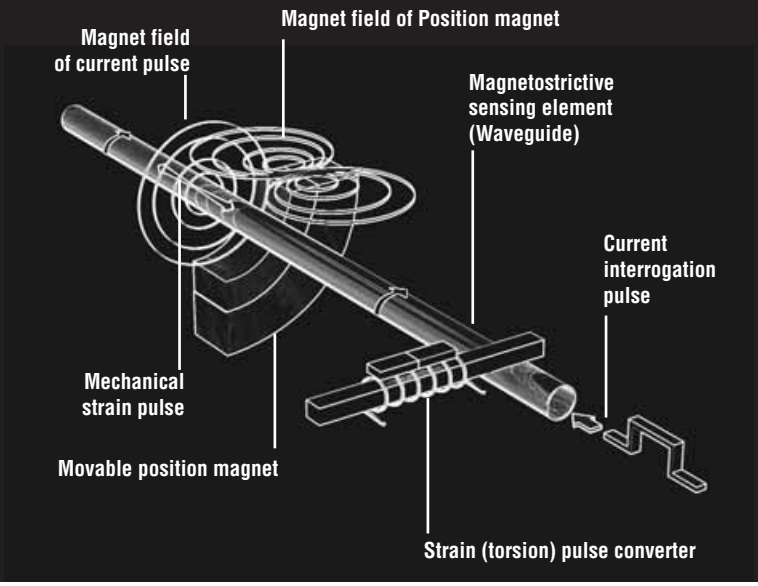
**Headquarters**
MTS Systems Corporation, Minneapolis, USA

**MTS Sensor Technologie**
Lüdenscheid, Germany

**MTS Sensors Division**
Cary (North Carolina), USA

**MTS Sensors Technology Corp.**
Tokyo, Japan





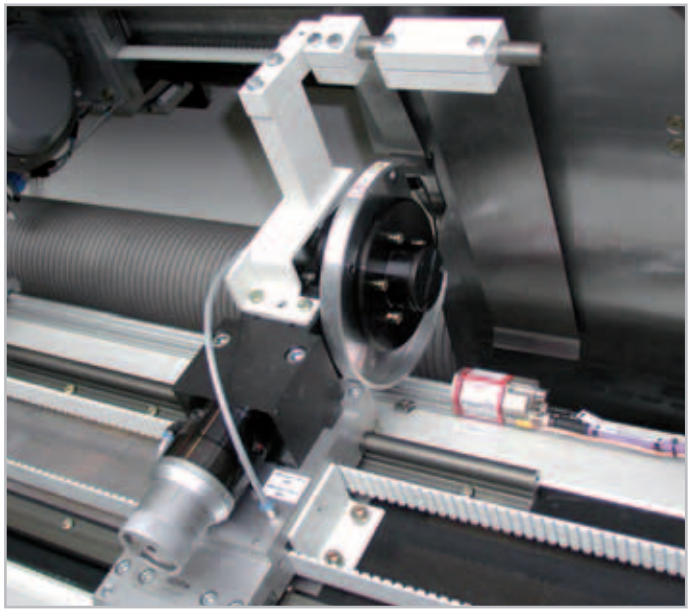

## MAGNETOSTRICTIVE PRINCIPLE

**Technology at its best**

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

**Magnetostriction - how it works**

The heart of MTS sensors is the ferromagnetic measuring element, also known as the waveguide, and a movable position magnet that generates a direct-axis magnetic field in the waveguide.
When a current or interrogation pulse passes through the waveguide, a second magnetic field is created radially around the waveguide. The interaction between the magnetic field in the waveguide and the magnetic field produced by the position magnet generates a strain pulse which travels at a constant ultrasonic speed from its point of generation, the measurement point, to the end of the waveguide where it is transformed into an electric pulse in the sensor element.
The resulting signal is processed by the specialized electronics of the Temposonics® sensor.
With our extensive know-how of ferromagnetic materials, magnetic effects and ultrasonic processes, MTS remains unrivalled in performance standards for non-contacting position measurement of the highest precision.



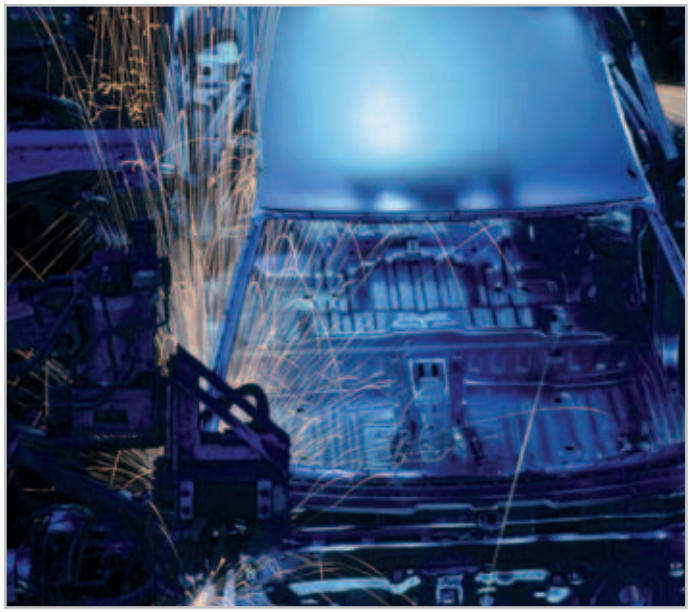
## APPLICATIONS

**Magnetostriction: The best choice for your application**

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

**Increased productivity through innovation**

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

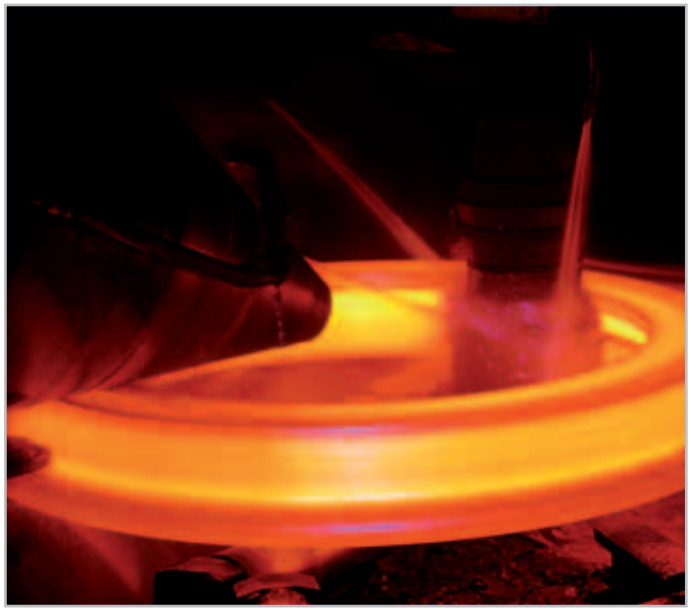


**Small sensor - great effect**

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

**Amazing, where Temposonics® can be found….**

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

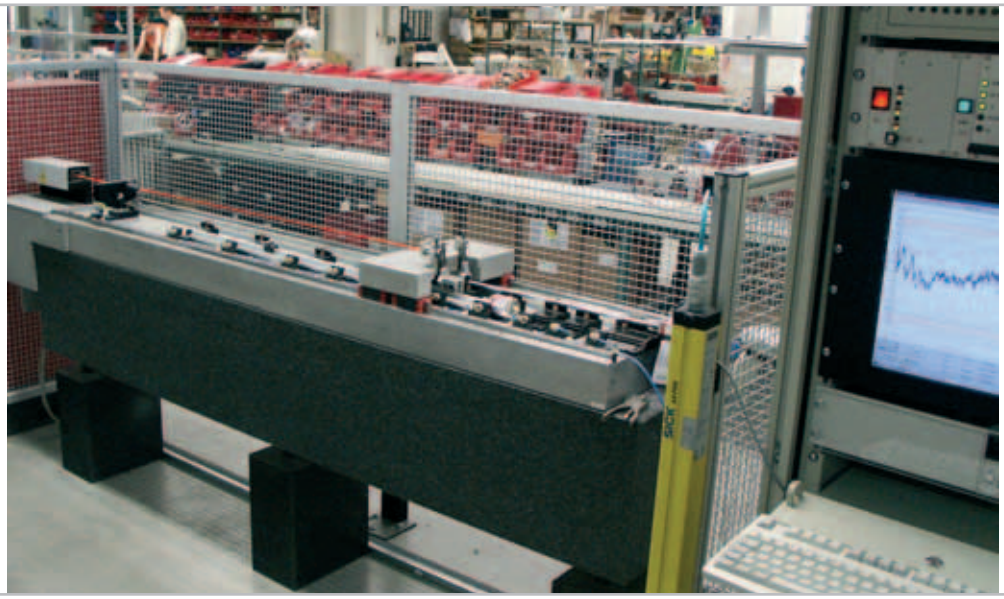


**Temposonics® rod-in-cylinder: Thinking ahead**

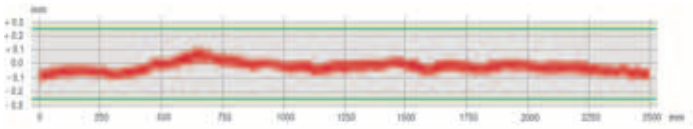
In order to enable user-friendly use of superior Temposonics® sensor technology in cylinders, MTS has further enhanced the rod-style version. An innovative modular design eliminates the need to break the high-pressure hydraulic seal of the fluid system when installing or replacing the sensor cartridge. 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.).



## Laser controlled quality:
## Up to 1000 measuring points per mm!



## *QUALITY*

**Precision is our strength**

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

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

## QUALITY ASSURANCE

The quality of our transducers is our mission and it is black on white certified. The high quality of MTS position sensors and liquid level meters proves itself in countless applications world-wide every day.

Certificate

PROFIBUS Nutzerorganisation e.V. grants to

**MTS Sensor Technologie GmbH**
**Auf dem Schüffel 9; 58513 Lüdenscheid, Germany**

the Certificate No.: **Z01255** for the PROFIBUS Slave:

**Product Name:** **MTS R-Series**
**Revision:** **22Sep06; SW/FW: SW05; HW: HW04**
**GSD:** **MTSR04C3.gsg; File Version: 22.Sep.06**

This certificate confirms that the product has successfully passed the certification tests with the following scope:

| | | |
|---|---|---|
| ☑ | DP-V0 | MS0, Sync, Freeze, Set_Slave_Add |
| ☐ | DP-V1 | |
| ☐ | DP-V2 | |
| ☐ | Profile | |
| ☑ | Physical Layer | RS485 |

Test Report Number: **481-1**
Authorized Test Laboratory: **Siemens AG, Fürth, Germany**
Expiry date of Certificate: **March 14, 2010**

The tests were executed in accordance with the following documents:
"Test Specifications for PROFIBUS DP Slaves, Version 3.0 from November 2005"
This certificate is granted according to the document "Framework for testing and certification of PROFIBUS products".

Karlsruhe, May 16, 2007

(Official in Charge)

Board of PROFIBUS Nutzerorganisation e. V.

(E. Küster) (Prof. K. Bender)

CERTIFICATE

**DQS GmbH**
Deutsche Gesellschaft zur Zertifizierung von Managementsystemen

hereby certifies that the company

**MTS Sensor Technologie GmbH & Co. KG**

Auf dem Schüffel 9
D-58513 Lüdenscheid

for the scope

Development and manufacturing of linear position transducers and liquid level measuring systems based on the magnetostrictive principle

has implemented and maintains a

**Quality Management System.**

An audit, documented in a report, has verified that this quality management system fulfills the requirements of the following standard

**DIN EN ISO 9001 : 2000**
December 2000 edition

This certificate is valid until 2009-12-06
Certificate Registration No. 003095 QM
Frankfurt am Main 2006-12-07

MANAGING DIRECTORS

D-60433 Frankfurt am Main, August-Schanz-Straße 21

# GLOSSARY

## A

**Absolute position**
The sensor's output indicates the position relative to an absolute (fixed) reference point. Immediately after power is applied, there is no need to 'rehome' the sensor as you would with one that provides an incremental position output.

**Asynchronous Mode**
Asynchronous data communication occurs when data is sent from one device with its own clock to another device with a separate clock. When the Temposonics® R-Series SSI position sensor is used in the asynchronous mode, the sensor takes measurements at its fastest internal interrogation rate (length dependent) and provides the information upon request.

## D

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

## F

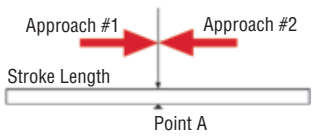
**Full Scale (F.S.)**
(see range)

## G

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

## H

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




*Note: The hysteresis specification for Temposonics® position sensors is minimal and can, in most applications, be ignored.*

## L

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

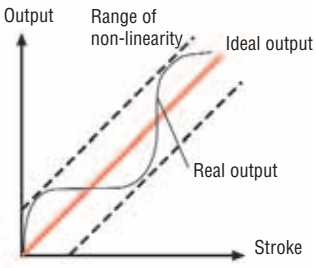
## M

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

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




## O

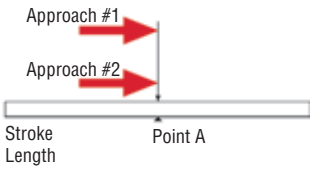
**Outputs**
1. Digitally-derived analogue output: The Temposonics® R-Series product line offers a digitally-derived analogue output. A digital position count of 16 bits is converted to an analogue signal (voltage or current) via a digital/analo gue converter.

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

## R

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

**Repeatability**
The deviation in indicated position when a point along a stroke length is approached repeatedly from the same direction. For an example, see the illustration below.
If you leave point "A" and then return to it from the same direction as before, the change in indicated position between the two readings is described by the repeatability specification. For magnetostrictive sensors, repeatability is usually equal to resolution.




**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:
a) temperature: 25 °C (± 10)
b) relative humidity: 90 % or less.
Tolerance closer than shown are frequently specified for transducer caibration and test environments.

## T

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

Temperature drift is:

$$\frac{(\text{TC} \times \text{Full Scale Output} \times \text{Ø temperature})}{10^6}$$

or

$$\frac{(25\ \text{ppm} \times 10\ \text{VDC} \times 5\ °\text{C}) = 1{,}25\ \text{mV}}{10^6}$$

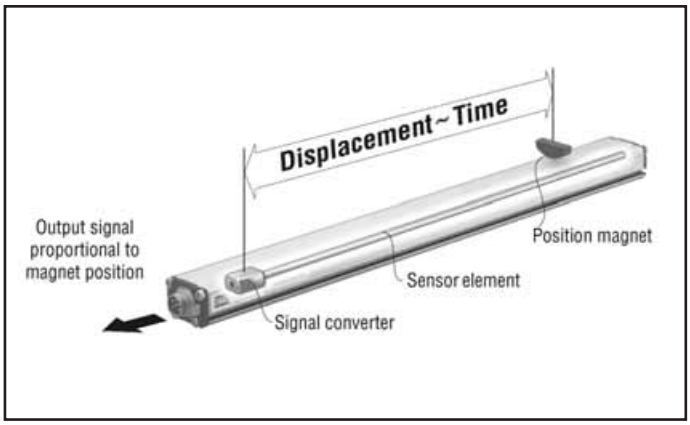
**Example (Sensor with analogue output):**
- Output: 0 to 10 VDC
- Stroke length: 200 mm
- Temperature change: 5 °C
- TC= 25 ppm/°C

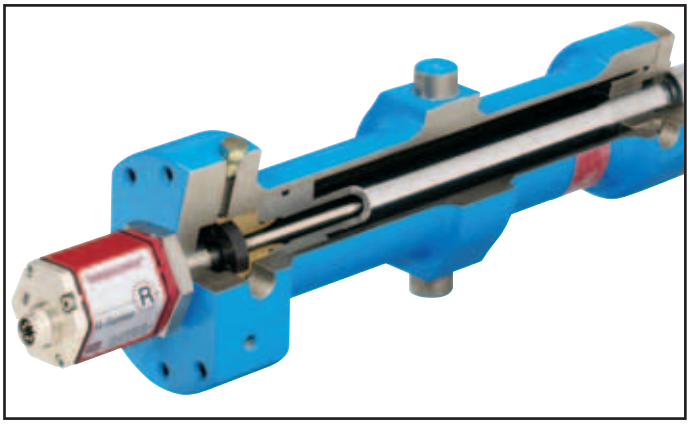
If the indicated output at 200 mm is 10 VDC, the potential change in indicated output per degree in Celsius. Temperature change is 1,25 mV or 0,025 mm for a 5 °C rise.

## W

**Warm-up Period**
The time required for the output to stabilize following power-up of the sensor. This error is characterized by a parallel displacement of the entire calibration curve.

## GENERAL DATA R-Series Profile and Rod



**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
Analogue

**Temposonics® RP and RH**
Measuring length 50 - 7600 mm

**100% field adjustable Null and Span**

- Rugged Industrial Sensor
- Linear and Absolute Measurement
- LEDs for Sensor Diagnostics
- Contactless Sensing with Highest Durability
- Superior Accuracy: Linearity better 0,01 %
- Repeatability 0,001 %
- Direct Analogue Output, Displacement + Speed
- Dual Magnet Position Measurement

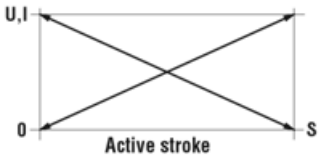
### Sensor Diagnostic Display

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


| Green | Red | Description |
|---|---|---|
| ON | OFF | Normal function |
| ON | ON | Magnet no not detected, Wrong quantity of magnets |
| ON | Flashing | Magnet out of setup range |
| Flashing | ON | Programming mode |

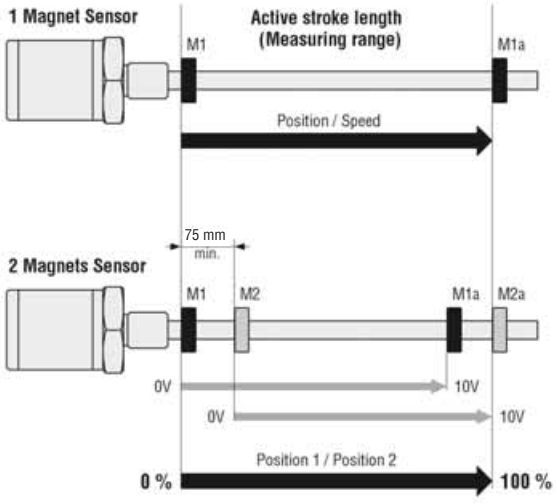
### Output

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




### Availability

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




### Sensor Field Programming

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

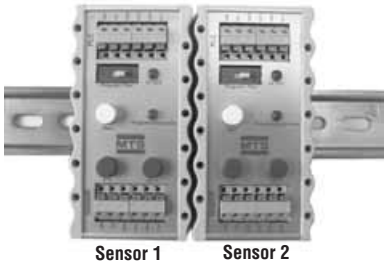
### 1. Hand-Programmer R-Analogue for 1 Magnet Sensor

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


**Hand-Programmer R-Analogue, Part No. 253 124**

### 2. Cabinet-Programmer R-Analogue

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



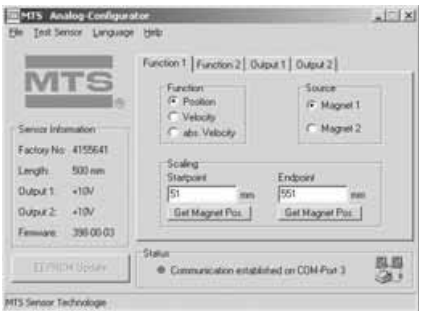

**Cabinet-Programmer R-Analogue, Part Nr. 253 408**
10 x 55 x 31 mm

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

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


**Programming Kit, Part No. 253 134-1**
(PC-Programmer, Power supply, USB-Cable, Sensor-Cable, Software)

### Windows Sensor Programming



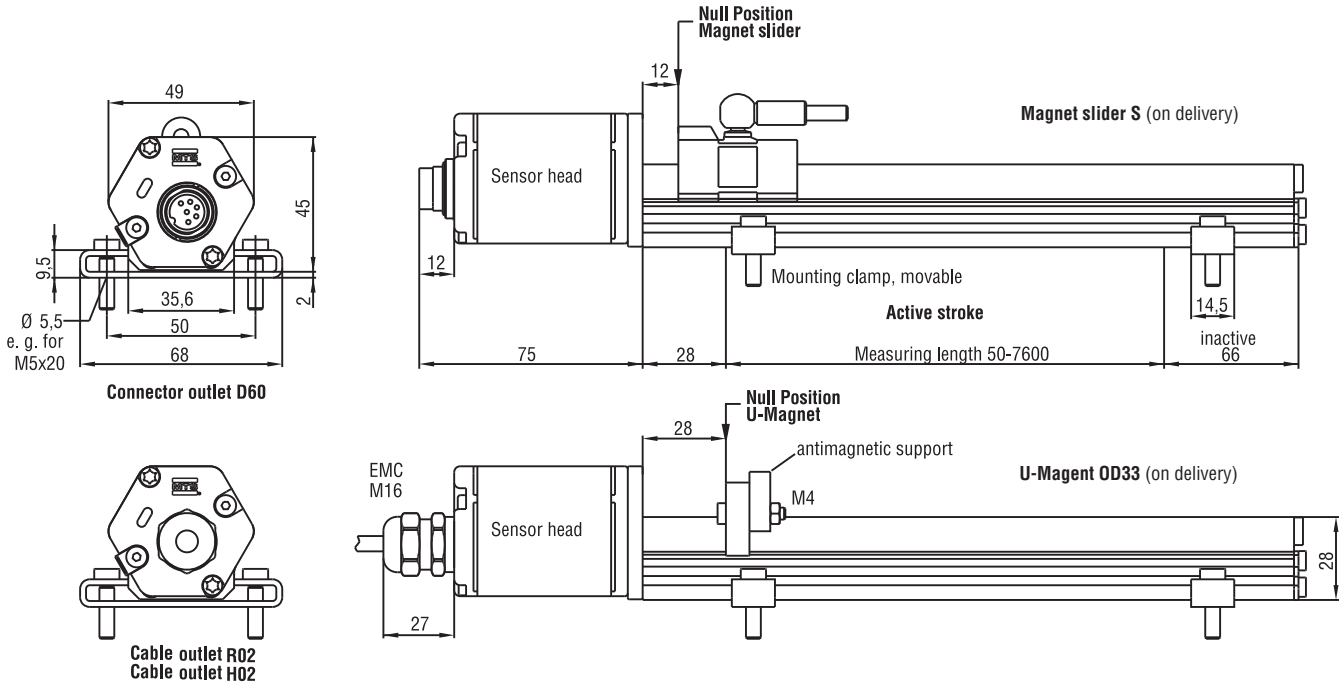
**Technical Data**

| | |
|---|---|
| **Input** | |
| Measured variables | Position, Speed / Dual magnets position measurements |
| Measuring range | 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) |
| Overvoltage protection | up to 36 VDC |
| **Accuracy** | |
| Position measurement: | |
| - Null/Span adjustment | 100 % of electrical stroke (Min. range 25 mm) |
| - Resolution | 16 bit; 0,0015 % (Minimum 1 µm) |
| - Linearity | < ± 0,01 % F.S. (Minimum ± 50 µm) |
| - Repeatability | < ± 0,001 % F.S. (Minimum ± 1 µm) |
| - Hysteresis | < 4 µm |
| - Update time | 0,5 ms up to 1200 mm / 1,0 ms up to 2400 mm / 2,0 ms up to 4800 mm / 5,0 ms up to 7600 mm stroke length |
| - Ripple | < 0,01 % F.S. |
| Speed measurement: | |
| - Range | 0,025 - 10 m/s |
| - Deviation | < 0,5 % |
| - Resolution | 0,1 mm/s Option 0,01 mm/s |
| - Update time (ms) | see position measurement |
| Temperature coefficient | < 30 ppm/°C |
| **Operating conditions** | |
| Magnet speed | any |
| Operating temperature | -40 °C ... +75 °C |
| Dew point, humidity | 90% rel. humidity, no condensation |
| Protection | Profile: IP 65, Rod: IP 67, IP 68 for cable outlet |
| Shock test | 100 g single hit, IEC-Standard 68-2-27 |
| Vibration test | 15 g / 10 - 2000 Hz, IEC-Standard 68-2-6 |
| Standards, EMC test | Electromagnetic emission EN 50081-1 |
| | Electromagnetic immunity EN 50082-2 |
| | EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified |
| **Form factor, material** | |
| Diagnostic display | LEDs beside connector |
| Profile model: | |
| Sensor head | Aluminum |
| Sensor stroke | Aluminum |
| Position magnet | Magnet slider or removable U-magnet |
| Rod model: | |
| Sensor head | Aluminum |
| Rod with flange | Stainless steel 1.4301 / AISI 304 |
| Pressure rating | 350 bar, 700 bar peak |
| Position magnet | Ring magnets, U-magnets |
| **Installation** | |
| Mounting position | any orientation |
| Profile | Movable mounting clamps fixed with M5 x 20 screws or T-slot nuts M5 in base channel |
| U-Magnet, removable | Mounting plate and screws from antimagnetical material |
| Rod | Threaded flange M18 x 1,5 or 3/4" -16 UNF-3A, Hex nut M18 |
| Position magnet | Mounting plate and screws from antimagnetical material |
| **Electrical connection** | |
| Connection type | 6 pin connector M16 or cable outlet |
| Input voltage | 24 VDC (-15 / +20 %) |
| - Polarity protection | up to -30 VDC |
| - Overvoltage protection | up to 36 VDC |
| Current drain | 100 mA typical |
| Ripple | < 1 % S-S |
| Electric strength | 500 VDC (DC ground to machine ground) |

**Stable Profile Design**

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

- A sliding magnet running in profile housing rails. Connection with the mobile machine part is via a ball jointed arm to taking up axial forces.
- A floating magnet, mounted directly on the moving machine part, travels over the profile at a low distance. Its air-gap allows the correction of small misalignments at installation.




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

Male insert sensor plug
rear of cable connector

All dimensions in mm

**Standard position magnet upon delivery (see chapter Accessories)**

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

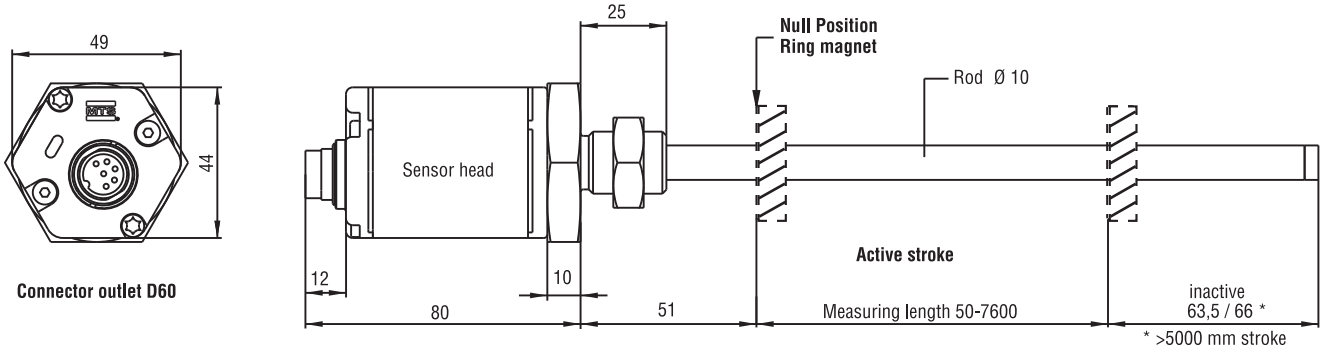
**Connection types**
6 pin female connector (Part No. STC 09131D)
6 pin female connector M16, 90° (Part No. STC 09131-6)

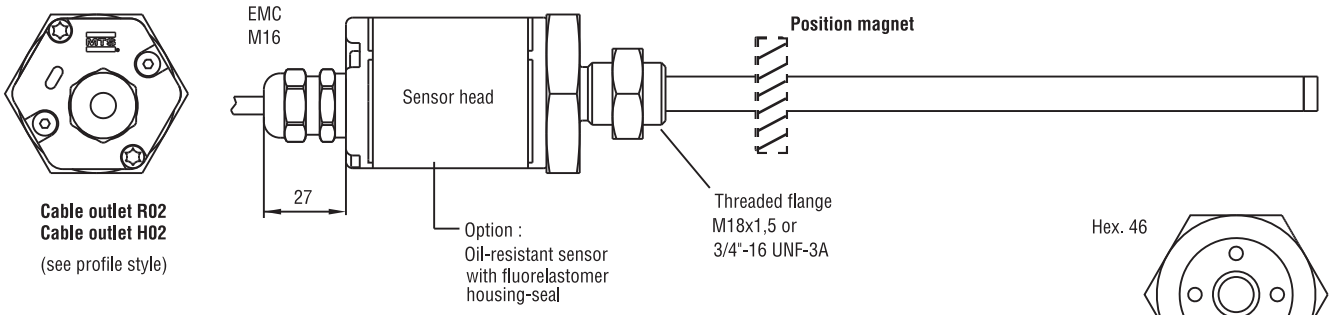
**High Pressure Rod Design**

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

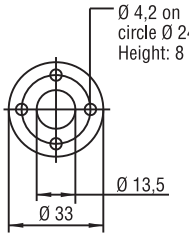
**Advantage…**

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



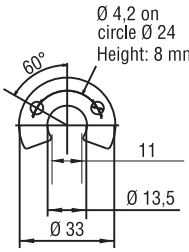




**Standard Position Magnets** (not on delivery, please order seperatly)




**Ring magnet OD33**
**Part No. 201 542-2**

Composite PA-Ferrite-GF20
Weigth 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
Weigth ca. 11 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm

All dimensions in mm

**Standard position magnet not on delivery (see chapter Accessories)**

**Position magnets**
Ring magnet OD33 (Part No. 201 542-2)
Ring magnet OD25,4 (Part No. 400 533)
U-Magnet OD33 (Part No. 251 416-2)

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

**Temposonics®** [ ][ ] [ ] [ ][ ][ ][ ][ ] **M** [ ][ ][ ] [ ] [ ][ ][ ][ ][ ][ ][ ]

3 / 7 digits

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

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

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

**Form factor**
**Profile Temposonics®-RP:**
**S** - Magnet slider, joint at top
**V** - Magnet slider, joint at front
**M** - U-magnet, OD33
**Rod Temposonics®-RH:**
**M** - Flange M18 x 1,5 (Standard)
**V** - Flange M18 x 1,5 (Fluorelastomer housing-seal)
**S** - Flage 3/4" - 16 UNF - 3A

**Measuring length**
**Profile** - 0050...5000 mm
**Rod** - 0050...7600 mm
Standard: up to 1000 in 50 mm, greater 1000 in 250 mm steps
Other length upon request.

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

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

**Output**

**1 Output with 1 Magnet**

Output 1 (Position Magnet 1)

| | |
|---|---|
| **V01** = 0...10 V | **A01** = 4...20 mA |
| **V11** = 10...0 V | **A11** = 20...4 mA |
| **V21** = -10...+10 V | **A21** = 0...20 mA |
| **V31** = +10...-10 V | **A31** = 20...0 mA |

**2 Outputs with 2 Magnets**

| Output 1 (Position Magnet 1) | + Output 2 (Position Magnet 2) |
|---|---|
| **V02** = 0...10 V | 0 .. 10 V |
| **V12** = 10...0 V | 10...0 V |
| **V22** = -10...+10 V | -10...+10 V |
| **V32** = +10...-10 V | +10...-10 V |
| **A02** = 4...20 mA | 4...20 mA |
| **A12** = 20...4 mA | 20...4 mA |

**2 Outputs with 1 Magnet**

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

| Magnet direction >>>>> | Head Null Tip |
|---|---|
| **V01** xxx.x = 0...10 V | +10.....0.....+10 V |
| **V11** xxx.x = 10...0 V | +10.....0.....+10 V |
| **A01** xxx.x = 4...20 mA | 20.....4..... 20 mA |
| **A11** xxx.x = 20...4 mA | 20.....4..... 20 mA |

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

| Magnet direction >>>>> | Head Null Tip |
|---|---|
| **V61** xxx.x = 0...10 V | -10.....0.....+10 V |
| **V71** xxx.x = 10...0 V | +10.....0.....-10 V |
| **A41** xxx.x = 4...20 mA | 4.....12..... 20 mA |

Fill in blanks (xxx.x) with desired max. speed (see above):
**- Speed range 1: 0,1…10 m/s (0001 … 0100)**
Sample: (-5,5...0...5,5 m/s = 10...0...10 V) = V01 0055
**- Speed range 2: 25…90 mm/s (1025 … 1090)**
Sample: (-50...0...50 mm/s = 4...12...20 mA) = A41 1050

Output 1 (Position Magnet 1) + Output 2 (Position Magnet 1)
**V03** = 0...10 V 10 ... 0 V

Outout 1 (Position Magnet 1) + Output 2 (electronics temperature)
**A04** = 4...20 mA 4...20 mA (-40°C...+100°C)

**Accessories page 57 and following.**

# Temposonics®

Absolute, Non-Contact Position Sensors

## R-Series
CANopen • CANbasic

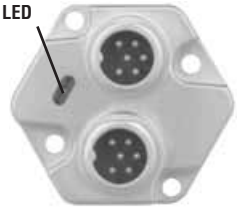
**Temposonics® RP and RH**
Measuring length 25 - 7600 mm

More than just a sensor
**Multi-Position Measurement**

- Rugged Industrial Sensor
- Linear and Absolute Measurement
- LEDs for Sensor Diagnostic
- Contactless Sensing with Highest Durability
- Superior Accuracy: Resolution up to 2 µm
- Linearity better 0,01 %
- Repeatability 0,001 %
- Sensor-based intelligence
- Direct CAN Output, Displacement + Speed
- Multi-Position Measurement (1 Sensor for 20 Positions)
- Selectable Bus Termination (CANopen)
- CANopen with Heartbeat-Function

### Sensor Diagnostic Display

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




| Green | Red | Description |
|---|---|---|
| ON | OFF | Normal function |
| ON | ON | Magnet not detected or wrong quantity of magnets |
| OFF | ON | Initialization error |
| Flashing | Flashing | Power out of range (high or low) |

### CAN Bus Interface

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

### Operation modes

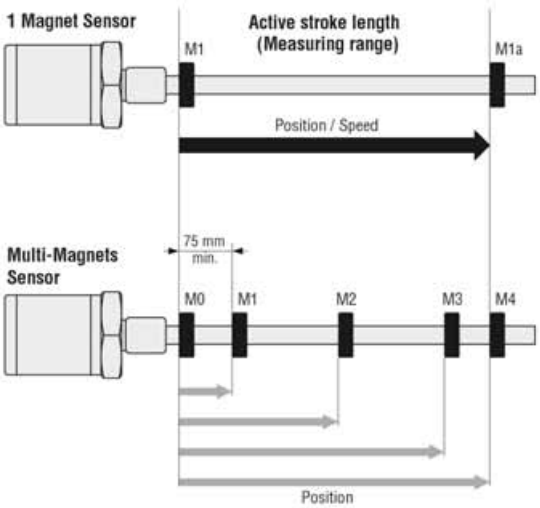
CAN sensors provide following measurings with **one** or **multiple** magnets:

**1. Standard measurement:**

- **CANbasic:** Displacement + speed with 1 magnet
- **CANopen:** Displacement + speed with 1 - 4 magnets and electronic temperature

**2. Multi-Magnet measurement:**

- **CANbasic:** Positions for each of 2-20 magnets *simultaneously*




### Temposonics® CANbus Variations

**1. CANopen**

is corresponding to encoder profile DS-406 V3.1 (CiA Standard DS-301 V4.02). CANopen functionality describes communication objects (below), which are set via configuration tool.

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

**2. CANbasic (MTS)**

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

**3. CANbasic Multi-Magnet Measurement**

provides the position measurement with **maximum 20 magnets on one sensor.** Set-ups and operation are via the on-site control system according to MTS instruction manual.

Data protocols of above CAN options are factory set in the sensor processor, so all versions can be connected directly to the fieldbus.

Conformance Test Certificate No. CiA199902-301V30/I-004 is given by the CAN-bus 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 normally is done by the **LMT/LSS-Service** of the bus. Since some master systems do not support this standard, or customer controller system can not handle, this tool - connected to the sensor - can be used for direct setup.

**Technical Data**

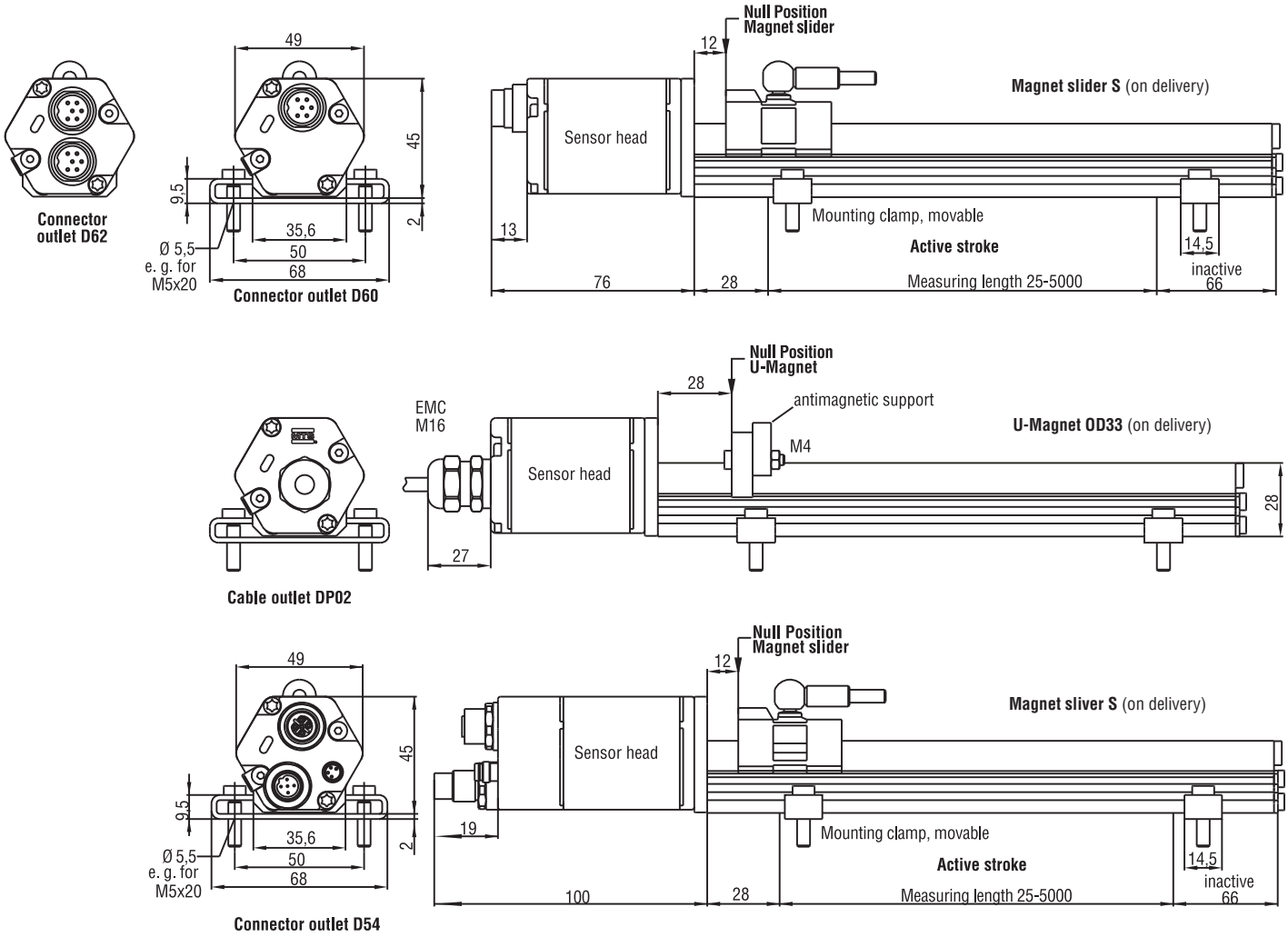
| | |
|---|---|
| **Input** | |
| Measured variables | Displacement, speed / Option: Multi-Magnet measurement (max. 20 positions simultaneous) |
| Measuring range | Profile 25 - 5000 mm / Rod 25 - 7600 mm |
| **Output** | |
| Interface | CAN-Fieldbus System ISO-DIS 11898 |
| Data protocol | CANopen: CIA Standard DS 301 V3.0 / Encoder Profile DS 406 V3.1, CANbasic: CAN 2.0 A |
| Baud rate, kBit/s | 1000 800 500 250 125 50 20 |
| Cable length, m | < 25 < 50 < 100 < 250 < 500 < 1000 < 250 |
| | The sensor will be supplied with ordered baud rate, which is changeable by customer |
| Overvoltage protection | up to 36 VDC |
| **Accuracy** | |
| Resolution | CANopen CANbasic |
| - Displacement | 5 µm 2 µm 5 µm 2 µm |
| - Speed | 0,5 mm/s 0,2 mm/s 1,0 mm/s 0,1 mm/s |
| Update time | 1,0 ms up to 2400 / 2,0 ms up to 4800 / 4,0 ms up to 7600 mm stroke length |
| | 0,5 ms up to 1200 mm extra for CANbasic |
| Linearity | < ± 0,01 % F.S. (Minimum ± 40 µm) |
| Repeatability | < ± 0,001 % F.S. (Minimum ± 2,5 µm) |
| Temperature coefficient | < 15 ppm/°C |
| Hysteresis | < 4 µm |
| **Operating conditions** | |
| Magnet speed | Any |
| Operating temperature | -40 °C ... +75 °C |
| Dew point, humidity | 90% rel. humidity, no condensation |
| Protection | Profile style: IP65 / Rod style: IP67, IP68 for cable outlet |
| Shock test | 100 g, single hit, IEC-Standard 68-2-27 |
| Vibration test | 15 g / 10 - 2000 Hz, IEC-Standard 68-2-6 |
| Standards, EMC test | Electromagnetic emission EN 50081-1 |
| | Electromagnetic immunity EN 50082-2 |
| | EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified |
| **Form factor, material** | |
| Diagnostic display | LEDs beside connector |
| Profile model: | |
| Sensor head | Aluminum |
| Sensor stroke | Aluminum |
| Position magnet | Magnet slider or removable U-magnet |
| Rod model: | |
| Sensor head | Aluminum |
| Rod with flange | Stainless steel 1.4301 / AISI 304 |
| Pressure rating | 350 bar, 700 bar peak |
| Position magnet | Ring magnets, U-magnets |
| **Installation** | |
| Mounting position | Any orientation |
| Profile | Movable mounting clamps or T-slot nuts M5 in base channel |
| U-Magnet, removable | Mounting plate and screws from antimagnetical material |
| Rod | Threaded flange M18 x 1,5 or 3/4" -16 UNF-3A, Hex nut M18 |
| 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 |
| Input voltage | 24 VDC (-15 / +20 %) |
| - Polarity protection | up to -30 VDC |
| - Overvoltage protection | up to 36 VDC |
| Current drain | 90 mA typical |
| Ripple | < 1 % S-S |
| Electric strength | 500 VDC (DC ground to machine ground) |

**Stable Profile Design**

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

• A sliding magnet running in profile housing rails. Connection with the mobile machine part is via a ball jointed arm to taking up axial forces.

• A floating magnet, mounted directly on the moving machine part, travels over the profile at a low distance. Its air-gap allows the correction of small misalignments at installation.

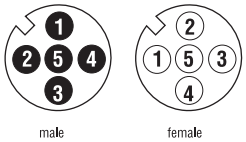



**Connector outlet D60/D62**

| Wiring | Pin | Cable | Function |
|---|---|---|---|
|  | 1 | grey | CAN (-) |
| | 2 | pink | CAN (+) |
| | 3 | do not connect | --- |
| | 4 | do not connect | --- |
| | 5 | brown | +24 VDC (-15/+20%) |
| | 6 | white | 0 V |

Male insert sensor plug
rear of cable connector

**Connector outlet D54**

| Wiring | Pin | Function |
|---|---|---|
|  | 1 | shield |
| | 2 | do not connect |
| | 3 | do not connect |
| | 4 | CAN (+) |
| | 5 | CAN (-) |

male female

View:
Front of sensor connector
Back of mating connector

| Input voltage | Pin | Cable | Function |
|---|---|---|---|
|  | 1 | brown | +24 VDC (-15/+20 %) |
| | 2 | white | do not connect |
| | 3 | blue | 0 V (GND) |
| | 4 | black | |

Male insert sensor plug
rear of cable connector

All dimensions in mm

**Standard position magnet upon delivery (see chapter Accessories)**

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

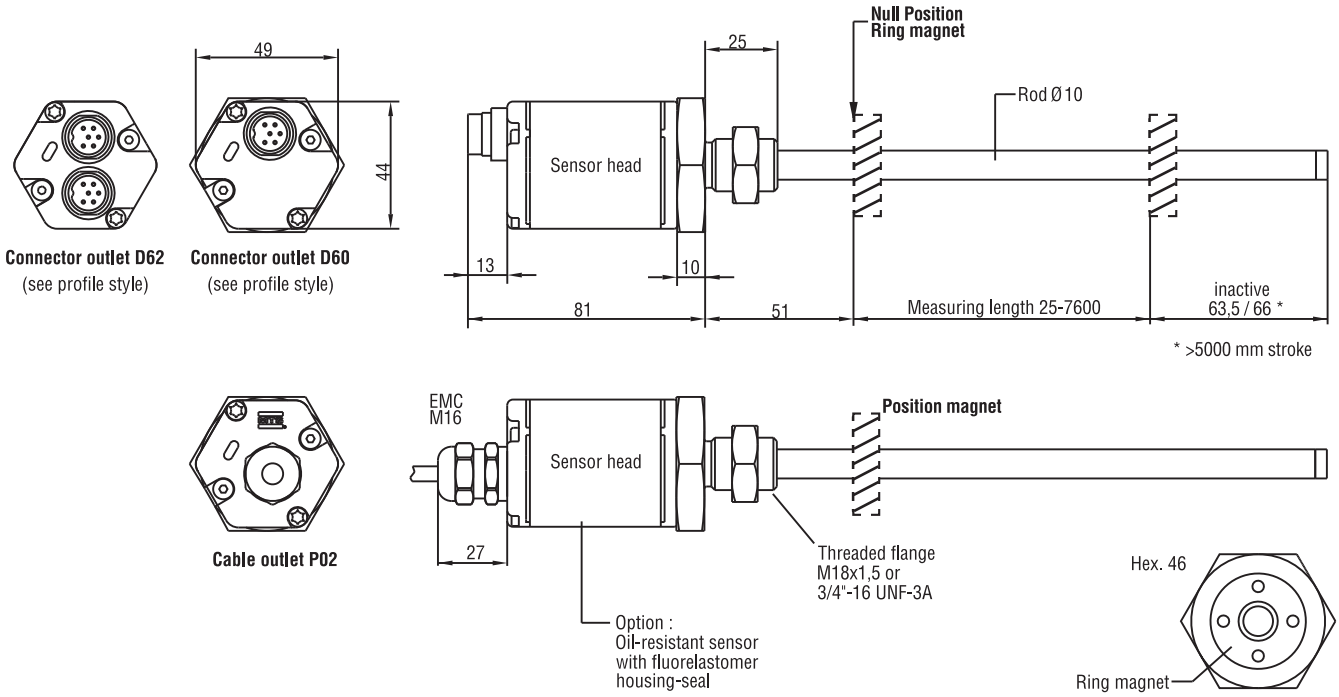
**Connection types**
6 pin female connector (Part No. STC 09131D)
6 pin female connector M16, 90° (Part No. STC 09131-6)

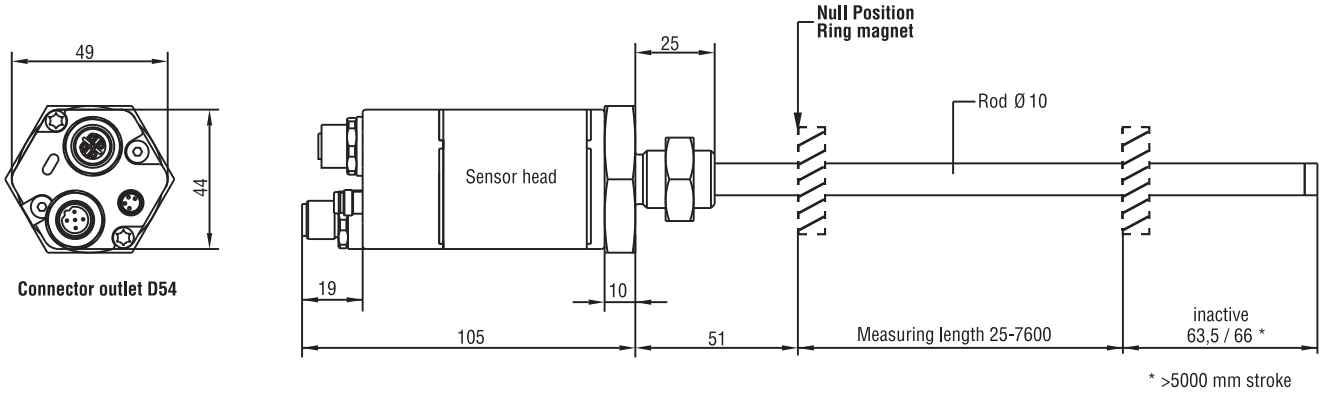
**High Pressure Rod Design**

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

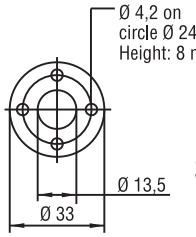
**Advantage…**

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



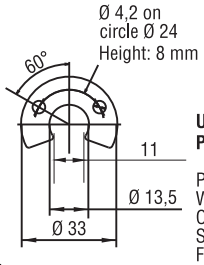




**Standard Position Magnets** (not on delivery, please order seperatly)




**Ring magnet OD33**
**Part No. 201 542-2**

Composite PA-Ferrite-GF20
Weigth 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
Weigth ca. 11 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm

**= Magnet must be ordered seperately (details see chapter Accessories)**

All dimensions in mm

**Standard position magnet not on delivery (see chapter Accessories)**

**Position magnets**
Ring magnet OD33 (Part No. 201 542-2)
Ring magnet OD25,4 (Part No. 400 533)
U-Magnet OD33 (Part No. 251 416-2)

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

**Temposonics®** M C Z

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

**Form factor**
**Profile Temposonics®-RP:**
**S** - Magnet slider, joint to top
**V** - Magnet slider, joint at front
**M** - U-Magnet, OD33
**Rod Temposonics®-RH:**
**M** - Flange M18 x 1,5 (Standard)
**V** - Flange M18 x 1,5
(Fluorelastomer housing-seal)
**S** - Flange 3/4" - 16 UNF - 3A

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

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

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

**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*

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

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

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

**Accessories page 57 and following.**

# Temposonics®

Absolute, Non-Contact Position Sensors

## R-Series
EtherCAT

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

**Advanced Communication**
**… offers Multi-Position Measurement**

- Rugged Industrial Sensor
- Linear and Absolute Measurement
- LEDs for Sensor Diagnostics
- Contactless Sensing with Highest Durability
- Superior Accuracy: Linearity better 0,01 %
- Resolution 1 µm
- Repeatability 0,001 %
- Direct EtherCAT Output
- Displacement + Velocity with 5 Magnets
- Displacement with up to 20 Magnets

**Sensor Diagnostic display**

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


| Green | Red | Description |
|---|---|---|
| Flashing | OFF | Normal function |
| Flashing | ON | Magnet not detected or Wrong quantity of magnets |

Further diagnostic features programmble.

**Characteristics of the EtherCAT sensor**

**Sensor's output**

- Position as an absolute value
- Velocity and direction of the drive
- Diagnostics (Status information)

**The EtherCAT Interface**

The sensor 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 to 5 magnets only).

**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:

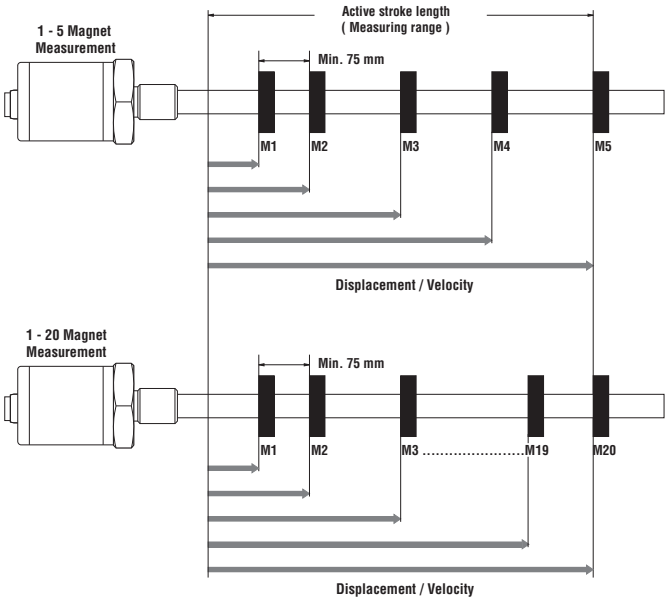
- Position (32 bit)
- Velocity (32 bit)
- Long status information (16 bit)

**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)



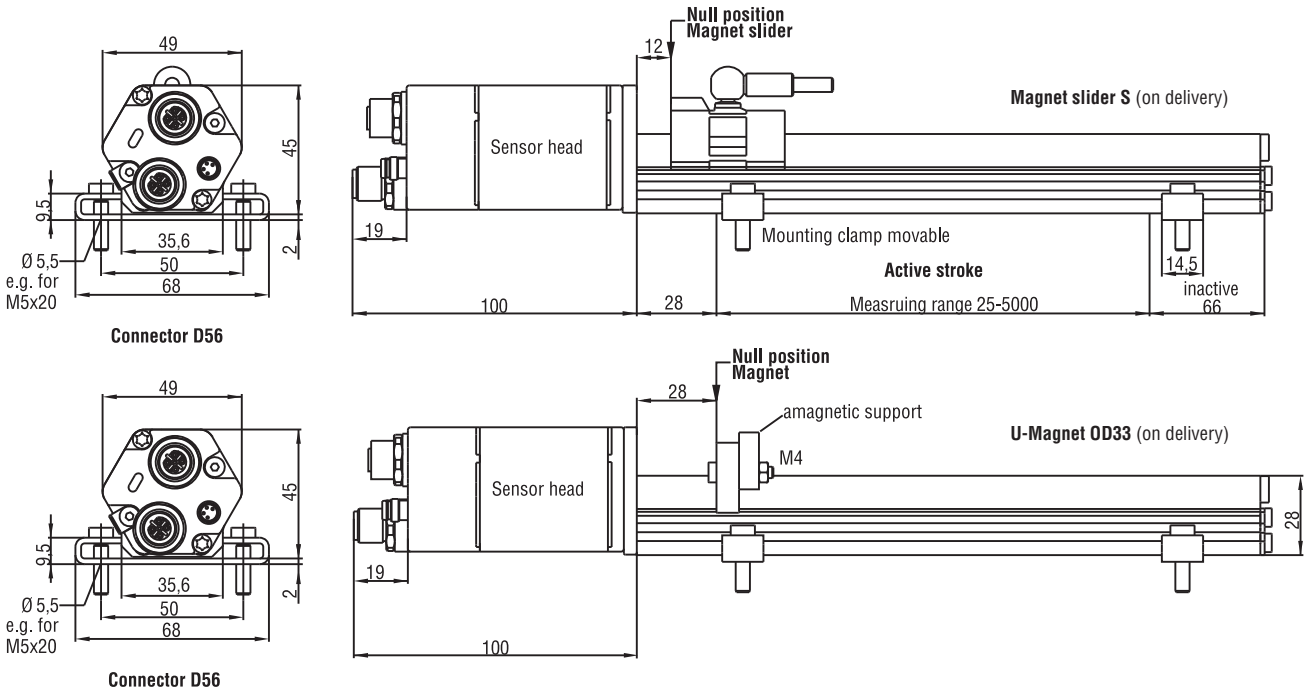
**Technical Data**

| | |
|---|---|
| **Input** | |
| Measured variable | Displacement / Velocity 1-5 magnet measurement option 1-20 magnet measurement |
| Measuring length | Profile 25 - 5000 mm / Rod 25 - 7600 mm |
| **Output** | |
| Output signal | EtherCAT Ethernet Control Automation Technology |
| Data format | EtherCAT 100 Base-Tx, fast Ethernet |
| Data transmission rate | 100 MBit/s |
| **Accuracy** | |
| Resolution | |
| - Displacement | 1 ... 1000 µm selectable |
| - Speed | 1 µm/s (Quality rating) adjustable according to velocity and measuring length |
| Linearity | < ± 0,01 % F.S. (Minimum ± 50 µm) |
| Repeatability | < ± 0,001 % F.S. (Minimum ± 2,5 µm) |
| Cycle time | Measuring length dependent |
| Data transmission rate | ≤ 10 KHz (Oversampling is active while the scanning cycle is shorter than the measuring cycle.) |
| Temperature coefficient | < 15 ppm/°C |
| Ripple | < 5 µm |
| Hysteresis | < 4 µm |
| **Operating conditions** | |
| Magnet speed | any |
| Operating temperature | -40 °C ... +75 °C |
| Dew point, humidity | 90 % rel. humidity, no condensation |
| Protection | Profile: IP65, Rod: IP67, if mating connector is correctly fitted |
| Shock test | 100 g single hit, IEC-Standard 68-2-27 |
| Vibration test | 15 g / 10 - 2000 Hz, IEC-Standard 68-2-6 |
| Standards, EMC test | Electromagnetic emission EN 50081-1 |
| | Electromagnetic immunity EN 50082-2 |
| | EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified |
| **Form factor, Material** | |
| Diagnostic display | LEDs beside connector |
| Profile model: | |
| Sensor head | Aluminum |
| Sensor stroke | Aluminum |
| Position magnet | Magnet slider or removable U-magnet |
| Rod model: | |
| Sensor head | Aluminum |
| Rod with flange | Stainless steel 1.4301 / AISI 304 |
| Pressure rating | 350 bar, 700 bar peak |
| Position magnet | Ring magnets, U-magnets |
| **Installation** | |
| Mounting position | any orientation |
| Profile | Movable mounting clamps or T-slot nuts M5 in base channel |
| U-Magnet, removable | Mounting plate and screws from antimagnetical material |
| Rod | Threaded flange M18 x 1,5 or 3/4" -16 UNF-3A, Hex nut M18 |
| Position magnet | Mounting plate and screws from antimagnetical material |
| **Electrical connection** | |
| Connection type | 2 x 4 pin connector M12-D |
| Input voltage | 24 VDC (-15 / +20 %) |
| - Polarity protection | up to -30 VDC |
| - Overvoltage protection | up to 36 VDC |
| Current drain | 80 mA typical |
| Ripple | < 1 % S-S |
| Electric strength | 500 VDC (DC ground to machine ground) |

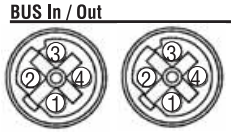
**Stable Profile Design**

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

- A sliding magnet running in profile housing rails. Connection with the mobile machine part is via a ball jointed arm to taking up axial forces.
- A floating magnet, mounted directly on the moving machine part, travels over the profile at a low distance. Its air-gap allows the correction of small misalignments at installation.

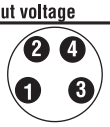



Connection View Connector side Sensor




| BUS In / Out | Pin | Cable | Function |
|---|---|---|---|
| | 1 | yellow | Tx+ |
| | 2 | white | Rx+ |
| | 3 | orange | Tx- |
| | 4 | blue | Rx- |

| Input voltage | Pin | Cable | Function |
|---|---|---|---|
| | 1 | brown | +24 VDC (-15/+20%) |
| | 2 | white | do not connect |
| | 3 | blue | 0 V (GND) |
| | 4 | black | do not connect |




All dimensions in mm

**Standard position magnet upon delivery (see chapter Accessories)**

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

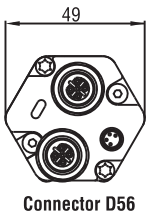
**Connection types**
Cable connector (Part No. 530 066)
Cable connector (Part No. 530 064)
4 pin Bus cable connector (Part No. 370 523)

**High Pressure Rod Design**

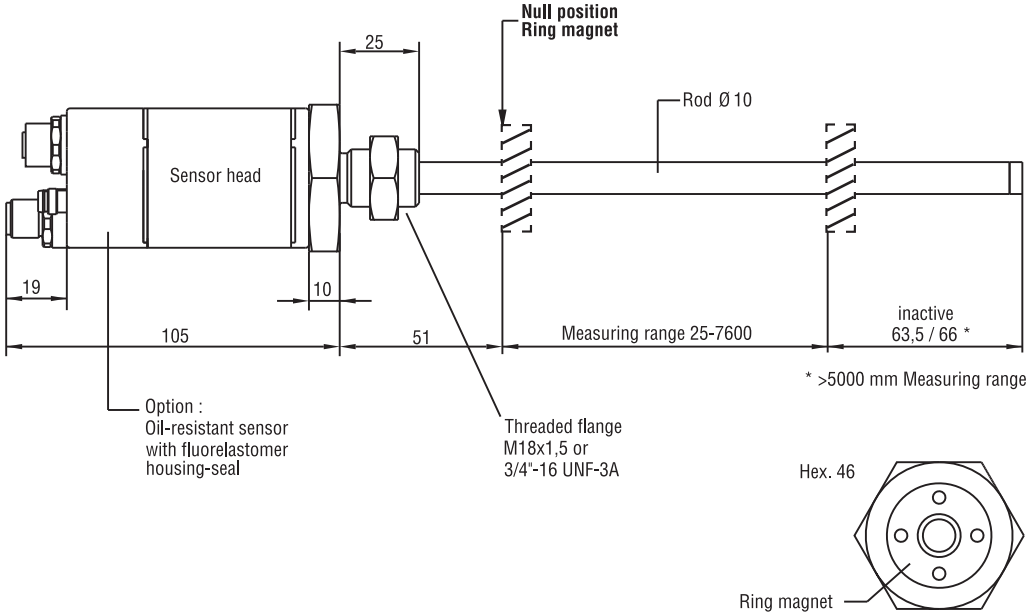
**Temposonics®-RH** with a pressureresistant stainless steel flange and sensing rod is suitable for use in hydraulic cylinders and externally in all applications where space is a problem. Position measurement is via ring or U-magnets travelling along the sensing rod without any mechanical contact.

**Advantage…**

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



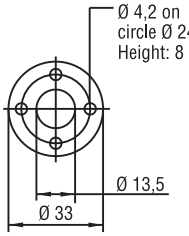

**Connector D56**





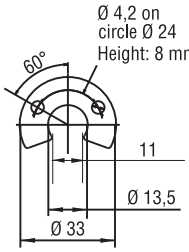


**Standard Position Magnets** (not on delivery, please order seperatly)




**Ring magnet OD33**
**Part No. 201 542-2**

Composite PA-Ferrite-GF20
Weigth 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
Weigth ca. 11 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm

**= Magnet must be ordered seperately (details see chapter Accessories)**

All dimensions in mm

**Standard position magnet not on delivery (see chapter Accessories)**

**Position magnets**
Ring magnet OD33 (Part No. 201 542-2)
Ring magnet OD25,4 (Part No. 400 533)
U-Magnet OD33 (Part No. 251 416-2)

**Connection types**
Cable connector (Part No. 530 066)
Cable connector (Part No. 530 064)
4 pin Bus cable connector (Part No. 370 523)

**Temposonics®** [ ][ ][ ][ ][ ][ ][ ][M][ ][ ][ ][ ][E][ ][ ][ ][Z][ ][ ]

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

**Form factor**
**Profile Temposonics®-RP:**
**S** - Magnet slider, joint at top
**V** - Magnet slider, joint at front
**M** - U-Magnet, OD33
**Rod Temposonics®-RH:**
**M** - Flange M18 x 1,5 (Standard)
**V** - Flange M18 x 1,5
(Fluorelastomer housing-seal)
**S** - Flange 3/4" - 16 UNF - 3A

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

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

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

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

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

**On delivery Profile Model:**
Sensor, magnet slider or U-magnet, 2 mounting clamps up to 1250 mm stroke + 1 clamp for every additional 500 mm.
Installation guide + CD-ROM (XML-File).

**On delivery Rod Model:**
Sensor and hex nut. Installation guide + CD-ROM (XML-File).
Magnets must be ordered separately.

**Accessories page 57 and following.**

# Temposonics®

Absolute, Non-Contact Position Sensors

## R-Series
Profibus

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

**Advanced Communication**
**… offers Multi-Position Measurement**

- **Rugged Industrial Sensor**
- **Linear and Absolute Measurement**
- **LEDs for Sensor Diagnostics**
- **Contactless Sensing with Highest Durability**
- **Superior Accuracy: Linearity better 0,01 %**
- **Resolution up to 2 µm**
- **Repeatability 0,001 %**
- **Direct Profibus-DP Output, Displacement + Speed**
- **Multi-Position Measurement: 1 Sensor for max. 20 Positions**

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


| Green | Red | Description |
|---|---|---|
| ON | OFF | Normal function |
| ON | ON | Magnet not detected or Wrong quantity of magnets |
| Flashing | OFF | Waiting for Master parameters |
| Flashing | ON | Programming mode |

**Profibus Interface**
Temposonics® sensors fulfill all requirements of PROFIBUS-DP (EN 50170). The sensor realizes the absolute position measuring with direct transmission of serial, bitsynchronous data in RS485 standard to control units in a baud rate of 12 Mbit/s maximum. PROFIBUS interface is built-up with
Siemens buscontroller SPC3. In addition to applications data transmission, PROFIBUS provides powerful functions for diagnostics and configuration, loaded into the bus via the GSD (Electronic Device Data Sheet).
Profibus sensors - corresponding DP-slave Class 2 - featuring

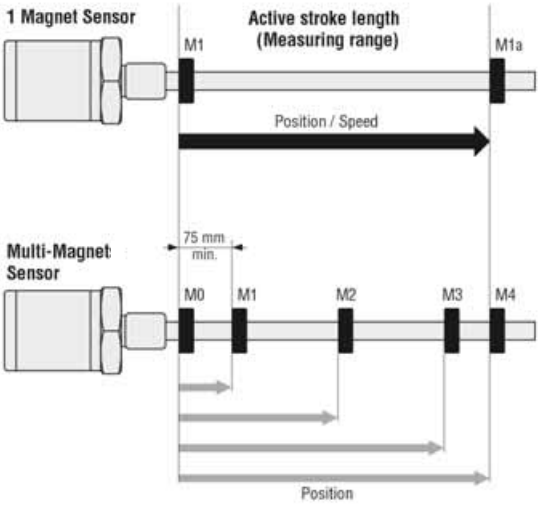
**Sensor Outputs:**
- Absolute position measurement
- Speed measurement
- Sensor status
- Error detection (e.g. magnet status)

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

**Operation Mode:**
**P101 1-20 Multi-Magnet measurement**
Position measurement of max. 20 magnets simultaneously

**P102 1 Magnet measurement (Standard)**
Positions measurement 1 magnet

**P103 1-5 Multi-Magnet measurement**
Position and speed measurement of max. 5 magnets simultaneously




**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 transfered 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.

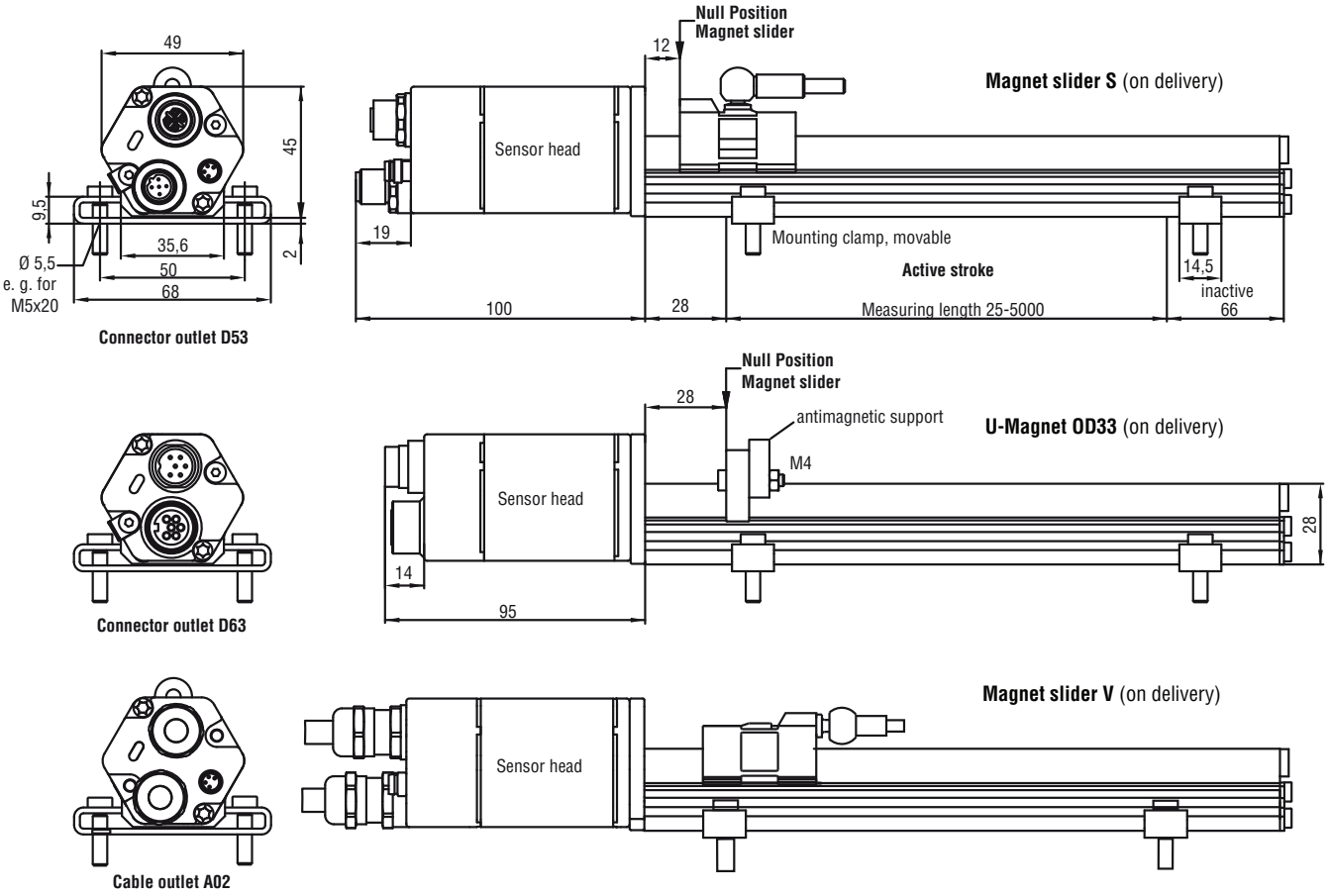
**Technical Data**

| | |
|---|---|
| **Input** | |
| Measured variable | Displacement / Option: Multi-Magnet measurement (max. 20 positions or 5 positions + 5 velocities) |
| Measuring length | Profile 25 - 5000 mm / Rod 25 - 7600 mm |
| **Output** | |
| Output signal | PROFIBUS-DP System according ISO 74498 |
| Data format | PROFIBUS-DP (EN 50 170) |
| Data transmission rate | Max. 12 Mbit/s |
| **Accuracy** | |
| Resolution | |
| - Displacement | 1 µm / other values selectable via GSD-File |
| - Speed | 5 µm displacement resolution: 0,64 mm/s up to 500 mm; 0,43 mm/s up to 2000 mm; 0,21 mm/s up to 4500 mm; 0,14 mm/s up to 7600 mm stroke length |
| Linearity | < ± 0,01 % F.S. (Minimum ± 50 µm) |
| Option Internal Linearization | Linearity ± 20 µm ... ± 70 µm = 100 mm ... 5000 mm ML |
| Repeatability | < ± 0,001 % F.S. (Minimum ± 2,5 µm) |
| Cycle time, standard (1 magnet) | 0,5 ms at 500 mm / 1 ms at 2000 mm / 2 ms at 4500 mm / 3,1 ms at 7600 mm stroke length<br>each additional magnet + 0,05 ms; for speed measurement ca. + 0,03 ms |
| Temperature coefficient | < 15 ppm/°C |
| Ripple | < 5 µm |
| Hysteresis | < 4 µm |
| **Operating conditions** | |
| Magnet speed | any |
| Operating temperature | -40 °C ... +75 °C |
| Dew point, humidity | 90% rel. humidity, no condensation |
| Protection | Profile: IP65, Rod: IP67, if mating connector is correctly fitted |
| Shock test | 100 g single hit, IEC-Standard 68-2-27 |
| Vibration test | 15 g / 10 - 2000 Hz, IEC-Standard 68-2-6 |
| Standards, EMC test | Electromagnetic emission EN 50081-1<br>Electromagnetic immunity EN 50082-2<br>EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified |
| **Form factor, material** | |
| Diagnostic display | LEDs beside connector |
| Profile model: | |
| Sensor head | Aluminum |
| Sensor stroke | Aluminum |
| Position magnet | Magnet slider or removable U-magnet |
| Rod model: | |
| Sensor head | Aluminum |
| Rod with flange | Stainless steel 1.4301 / AISI 304 |
| Pressure rating | 350 bar, 700 bar peak |
| Position magnet | Ring magnets, U-magnets |
| **Installation** | |
| Mounting position | any orientation |
| Profile | Movable mounting clamps or T-slot nuts M5 in base channel |
| U-Magnet, removable | Mounting plate and screws from antimagnetical material |
| Rod | Threaded flange M18 x 1,5 or 3/4" -16 UNF-3A, Hex nut M18 |
| 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<br>Cable outlet 2 x 0 - 10 m PUR-cable + 4 pin. connector M8 |
| Input voltage | 24 VDC (-15 / +20 %) |
| - Polarity protection | up to -30 VDC |
| - Overvoltage protection | up to 36 VDC |
| Current drain | 90 mA typical |
| Ripple | < 1 % S-S |
| Electric strength | 500 VDC (DC ground to machine ground) |

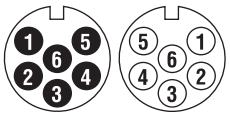
## Stable Profile Design

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

- A sliding magnet running in profile housing rails. Connection with the mobile machine part is via a ball jointed arm to taking up axial forces.
- A floating magnet, mounted directly on the moving machine part, travels over the profile at a low distance. Its air-gap allows the correction of small misalignments at installation.




**Wiring D63**

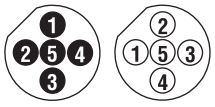



Male insert sensor plug
rear of cable connector

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

*female only

**Wiring D53**
**Bus connector**




Inserts sensor plug
rear of cable connector

| Pin | Cable | Function |
|---|---|---|
| 1 | ---- | VP+5 (Bus termination)* |
| 2 | green | RxD/TxD-N (Bus) |
| 3 | ---- | DGND (Bus termination)* |
| 4 | red | RxD/TxD-P (Bus) |
| 5 | shield | shield |

*female only

| Input voltage | Pin | Cable | Function |
|---|---|---|---|
| | 1 | brown | +24 VDC (-15/+20 %) |
| | 2 | white | do not connect |
| | 3 | blue | 0 V (GND) |
| | 4 | black | do not connect |

Male insert sensor plug
rear of cable connector

All dimensions in mm

**Standard position magnet upon delivery (see chapter Accessories)**

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

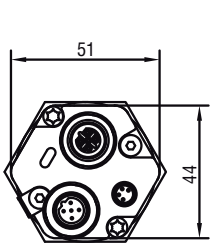
**Connection types**
5 pin female connector M12-B (Part No. 560 885)
5 pin male connector M12-B (Part No. 560 884)
4 pin cable connector M8, 90°(Part No. 560 886)

## High Pressure Rod Design

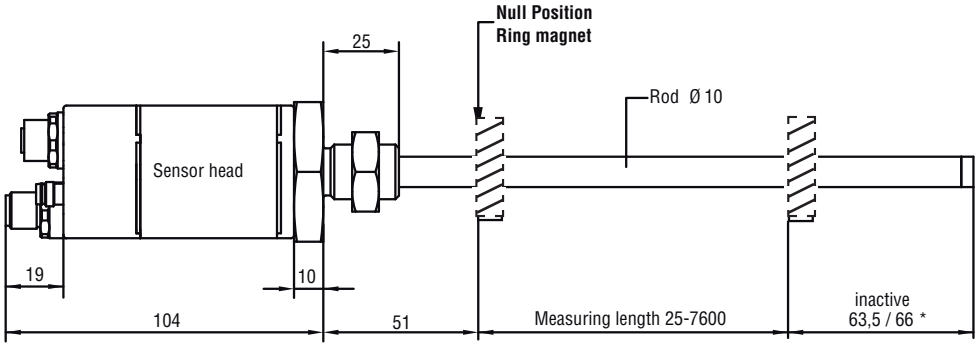
**Temposonics®-RH** with a pressure-resistant stainless steel flange and sensing rod is suitable for use in hydraulic cylinders and externally in all applications where space is a problem. Position measurement is via ring or U-magnets travelling along the sensing rod without any mechanical contact.

**Advantage…**

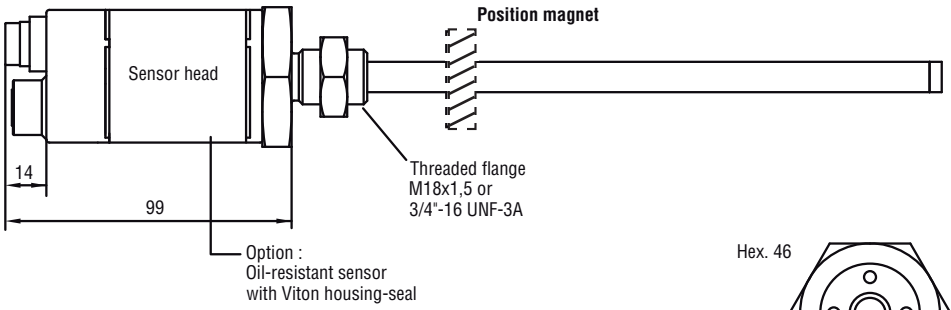
the completely operable sensor cartridge can be replaced for servicing easily without opening the fluid circuit.



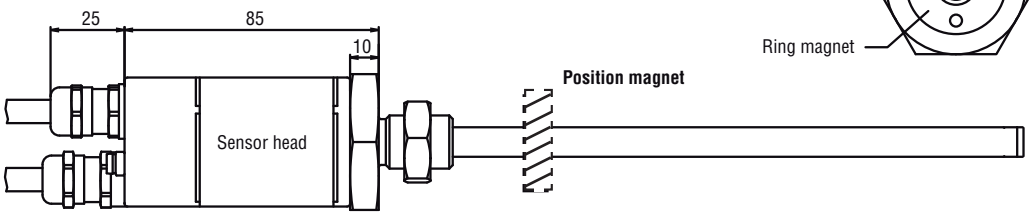

**Connector outlet D53**

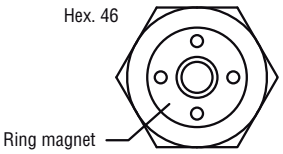



**Connector outlet D63**



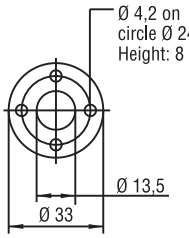

**Cable outlet A02**



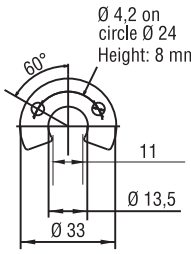

**= Magnet must be ordered seperately (details see chapter Accessories)**

**Standard Position Magnets** (not on delivery, please order seperatly)




**Ring magnet OD33**
**Part No. 201 542-2**

Composite PA-Ferrite-GF20
Weigth 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
Weigth ca. 11 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm

All dimensions in mm

**Standard position magnet not on delivery (see chapter Accessories)**

**Position magnets**
Ring magnet OD33 (Part No. 201 542-2)
Ring magnet OD25,4 (Part No. 400 533)
U-Magnet OD33 (Part No. 251 416-2)

**Connection types**
5 pin female connector M12-B (Part No. 560 885)
5 pin male connector M12-B (Part No. 560 884)
4 pin cable connector M8, 90°(Part No. 560 886)

**Temposonics®** [ ][ ][ ][ ][ ][ ][ ]**M**[ ][ ][ ][ ]**P**[ ][ ][ ]**Z**[ ][ ]

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

**Form factor**
**Profile Temposonics®-RP:**
**S** - Magnet slider, joint at top
**V** - Magnet slider, joint at front
**M** - U-Magnet, OD33
**Rod Temposonics®-RH:**
**M** - Flange M18 x 1,5 (Standard)
**V** - Flange M18 x 1,5
(Fluorelastomer housing-seal)
**S** - Flange 3/4" - 16 UNF - 3A

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

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

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

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

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

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

**On delivery Profile Model:**
Sensor, magnet slider or U-magnet, 2 mounting clamps up to 1250 mm stroke + 1 clamp for every additional 500 mm. Installation guide + CD-ROM (Electronic Data Sheet with standardized Device Data Base File)

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

**Accessories page 57 and following.**

# Temposonics®

Absolute, Non-Contact Position Sensors

## R-Series
SSI

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

**Perfect data processing**
**1 µm**

- Rugged Industrial Sensor
- Linear and Absolute Measurement
- LEDs for Sensor Diagnostics
- Contactless Sensing with Highest Durability
- Superior Accuracy: Resolution up to 1 µm
- Linearity better 0,01 %
- Repeatability 0,001 %
- Direct 24/25/26 Bit SSI Output, Gray/Binary
- Synchronous Measurement for Real-time Sensing

### Sensor Diagnostic Display

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

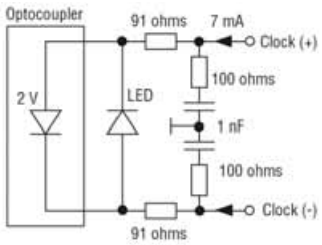

| Green | Red | Description |
|---|---|---|
| ON | OFF | Normal function |
| ON | ON | Magnet not detected |
| | | Wrong quantity of Magnets |
| ON | Flashing | Sensor not synchronous* |
| Flashing | ON | Programming mode |

*for synchronous measurement only

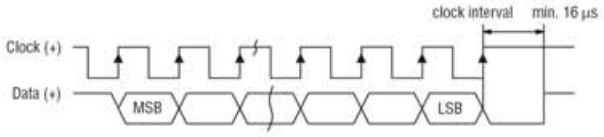
### SSI (Synchronous Serial Interface)

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

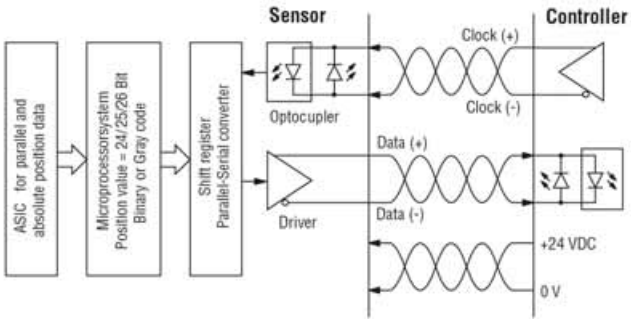
### Sensor Input




### Timing Diagram




### Logic Diagram




### Sensor Fiel Programming

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

### USB-Programmer R-SSI

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

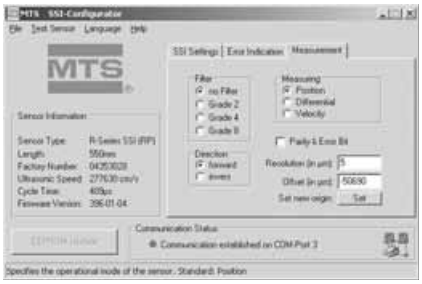
- *Data length*
- *Data format*
- *Resolution*
- *Measuring direction*
- *Synchronous / asynchronous measurement*
- *Offset, begin of the measurement range*
- *Alarm value (Magnet outside)*
- *Measurement filter*
- *Differential measurement: Distance between two magnets*
- *Speed measurement instead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

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


**Programming-Kit, Part No. 253 135-1**

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

### Windows Sensor Programming



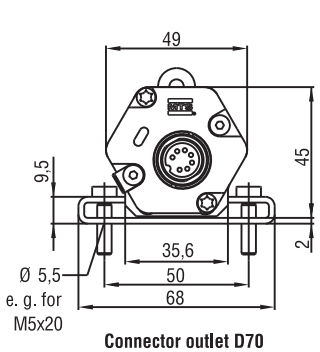
**Technical Data**

| | |
|---|---|
| **Input** | |
| Measured variable | Displacement, Displacement difference between 2 magnets, Velocity |
| Measuring range | Profile 25 - 5000 mm / Rod 25 - 7600 mm |
| **Output** | |
| Interface | SSI (Synchronous Serial Interface) - Differential signal in SSI standard |
| Data format | Binary or Gray, optional Parity and Errorbit |
| Data length | 8 ... 32 bit |
| Update time | Measuring length 300 750 1000 2000 5000 mm<br>Measurements/sec. 3,7 3,0 2,3 1,2 0,5 kHz |
| Data speed | 70 kBaud ... 1 MBaud, depending on cable length:<br>Length < 3 < 50 < 100 < 200 < 400 m<br>Baud rate 1,0 MBd < 400 kBd < 300 kBd < 200 kBd < 100 kBd |
| Overvoltage protection | up to 36 VDC |
| **Accuracy** | |
| Resolution | Displacement: 1 µm, 2 µm, 5 µm, 10 µm i.a. / Velocity over 10 measured values: 1 µm/s, 2 µm/s, 5 µm\|s... |
| Linearity | < ± 0,01 % F.S. (minimum ± 40 µm)<br>Option internal linearisation<br>Linearity tolerance:<br>Model RP-G ±6 … ±40 µm = 100 mm … 5000 mm ML<br>RH ±10 … ±70 µm = 100 mm … 5000 mm ML |
| Repeatability | < ± 0,001 % F.S. (minimum ± 2,5 µm) |
| Temperature coefficient | < 15 ppm/°C |
| Hysteresis | < 4 µm typical 2 µm |
| **Operating conditions** | |
| Magnet speed | Any |
| Operating temperature | -40 °C ... +75 °C |
| Dew point, humidity | 90% rel. humidity, no condensation |
| Protection | Profile: IP65, Rod: IP67, IP68 for cable outlet |
| Shock test | 100 g, single hit, IEC-Standard 68-2-27 |
| Vibration test | 15 g / 10 - 2000 Hz, IEC-Standard 68-2-6<br>Option: Vibration resistant 30 g (av) |
| Standards, EMC test | Electromagnetic emission EN 50081-1<br>Electromagnetic immunity EN 50082-2<br>EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified |
| **Form factor, material** | |
| Diagnostic display | LEDs beside connector |
| Profile model: | |
| Sensor head | Aluminum |
| Sensor stroke | Aluminum |
| Position magnet | Magnet slider or removable U-magnet |
| Rod model: | |
| Sensor head | Aluminum |
| Rod with flange | Stainless steel 1.4301 / AISI 304 |
| Pressure rating | 350 bar, 700 bar peak option: 800 bar, 1200 bar peak |
| Position magnet | Ring magnets, U-magnets |
| - Differentiation measurement | Min. magnet distance 50 mm (in the range of 50 - 75 mm double linearity) |
| **Installation** | |
| Mounting position | Any orientation |
| Profile | Movable mounting clamps or T-slot nuts M5 in base channel |
| U-Magnet, removable | Mounting plate and screws from antimagnetical material |
| Rod | Threaded flange M18 x 1,5 or 3/4" -16 UNF-3A |
| Position magnet | Mounting plate and screws from antimagnetical material |
| **Electrical connection** | |
| Connection type | 7 pin connector M16 or cable outlet |
| Input voltage | 24 VDC (-15 / +20 %) |
| - Polarity protection | up to -30 VDC |
| - Overvoltage protection | up to 36 VDC |
| Current drain | 100 mA typical |
| Ripple | < 1 % S-S |
| Electric strength | 500 VDC (DC ground to machine ground) |

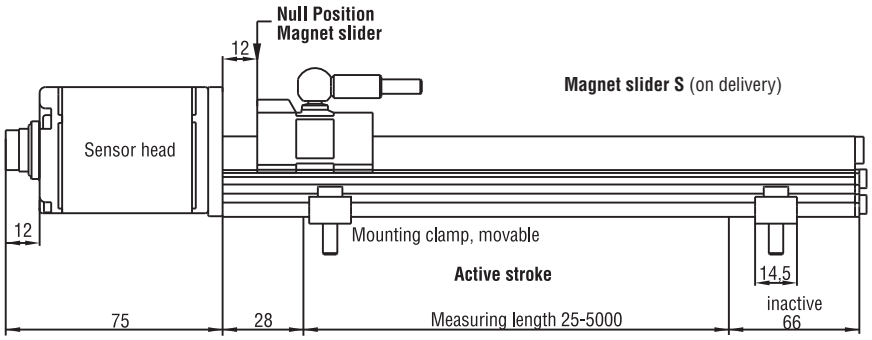
**Stable Profile Design**

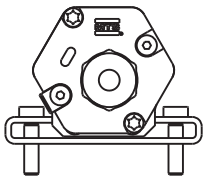
**Temposonics®-RP** offers modular construction, flexible mounting configurations and easy installation. Position measurement is contactless via two versions of permanent magnets.

- A sliding magnet running in profile housing rails. Connection with the mobile machine part is via a ball jointed arm to taking up axial forces.
- A floating magnet, mounted directly on the moving machine part, travels over the profile at a low distance. Its air-gap allows the correction of small misalignments at installation.

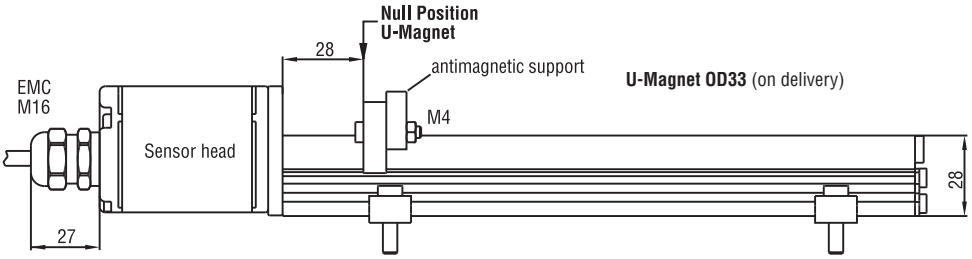


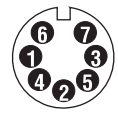

**Connector outlet D70**



**Cable outlet P02**




| Wiring | Pin | Cable | Function |
|---|---|---|---|
|  | 1 | grey | Data (-) |
| | 2 | pink | Data (+) |
| | 3 | yellow | Clock (+) |
| | 4 | green | Clock (-) |
| | 5 | brown | +24 VDC |
| | 6 | white | 0 V (GND) |
| | 7 | do not connect | |

Male insert sensor plug
rear of cable connector

All dimensions in mm

**Standard position magnet upon delivery (see chapter Accessories)**

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

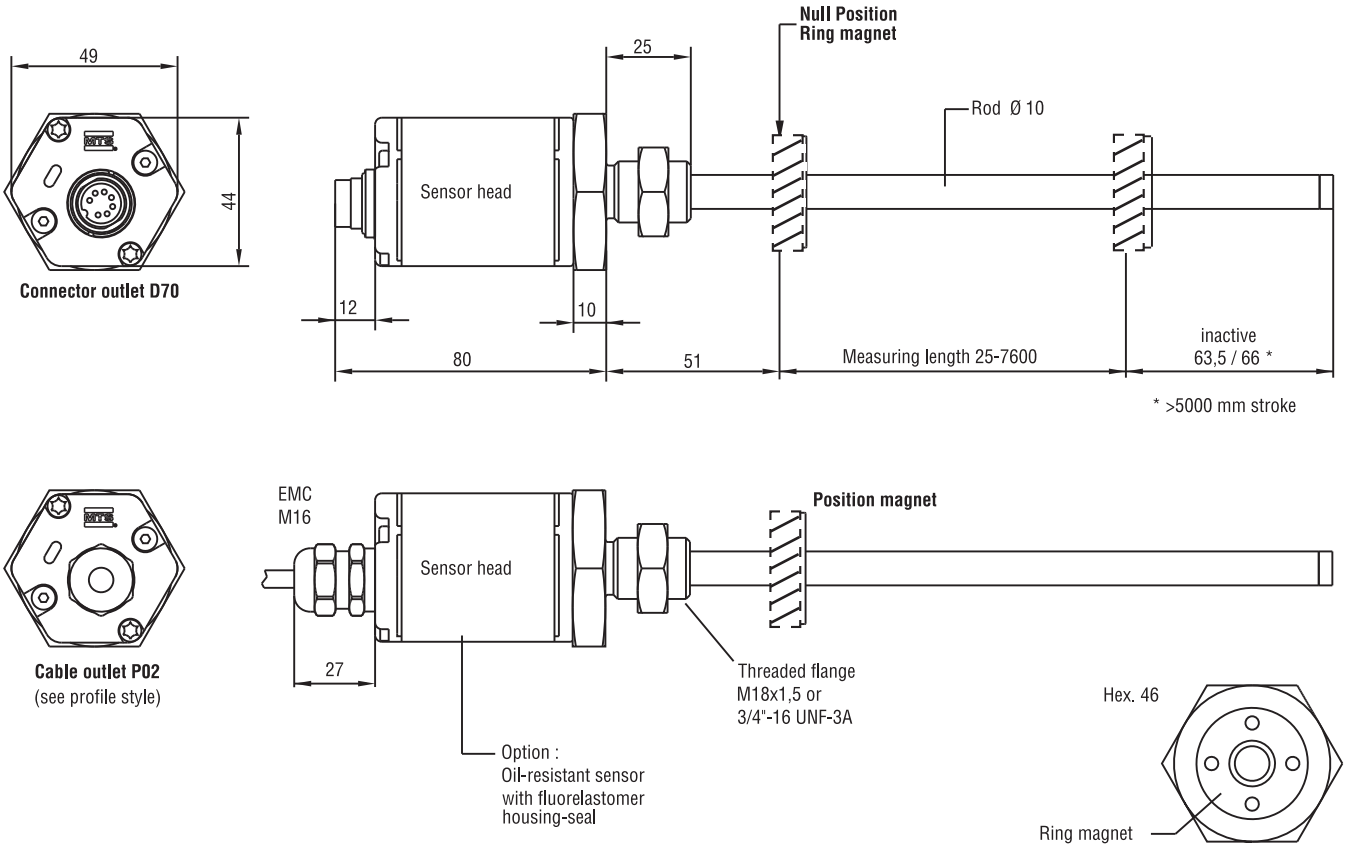
**Connection types**
7 pin female connector M16 (Part No. STC 09131D07PG9)
7 pin female connector M16, 90° (Part No. STC 09131-7)

## High Pressure Rod Design

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

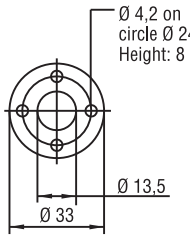
**Advantage…**

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



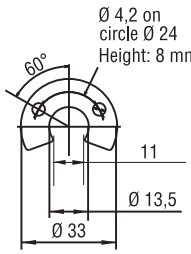

**Standard Position Magnets** (not on delivery, please order seperatly)

= **Magnet must be ordered seperately (details see chapter Accessories)**




**Ring magnet OD33**
**Part No. 201 542-2**

Composite PA-Ferrite-GF20
Weigth 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
Weigth ca. 11 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm

All dimensions in mm

**Standard position magnet not on delivery (see chapter Accessories)**

**Position magnets**
Ring magnet OD33 (Part No. 201 542-2)
Ring magnet OD25,4 (Part No. 400 533)
U-Magnet OD33 (Part No. 251 416-2)

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

**Temposonics®** [ ][ ] [ ] [ ][ ][ ][ ] **M** [ ][ ][ ] **1** **S** [ ][ ][ ][ ][ ][ ]

**Sensor model**

**RP** - Profile
**RH** - Rod

**Form factor**

**Profile Temposonics®-RP:**
**S** - Magnet slider, joint at top
**V** - Magnet slider, joint at front
**G** - Magnet slider, join at top, blackslash free
**M** - U-Magnet, OD33
**Rod Temposonics®-RH:**
**M** - Flange M18 x 1,5 (Standard)
**V** - Flange M18 x 1,5 (Fluorelastomer housing-seal)
**S** - Flange 3/4" - 16 UNF - 3A
**J** - Flange M22 x 1,5, rod Ø 12,7 mm, 800 bar

**Measuring length**

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

**Connection type**

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

**Input voltage / Conditions of use**

**1** - +24 VDC
**A** - +24 VDC / vibation resistant (measuring length 25 … 2000 mm)

**Output**

**S [1][2][3][4][5][6]** = Synchronous Serial Interface

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

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

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

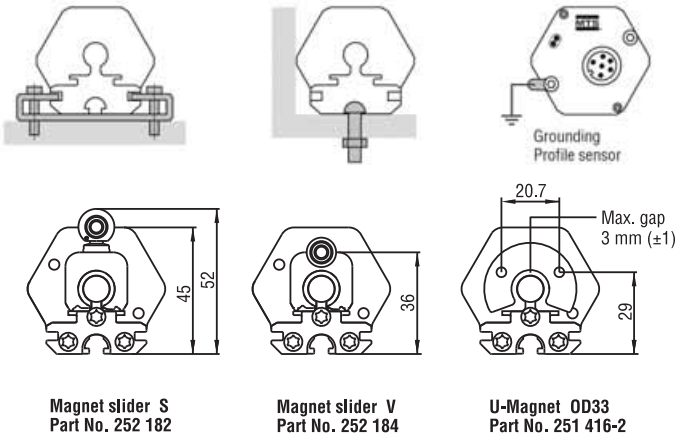
**Accessories page 57 and following.**

# MOUNTING / INSTALLATION

**Flexible Installation in any Position**

**Profile Model**

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




**Magnet slider S**
**Part No. 252 182**

**Magnet slider V**
**Part No. 252 184**

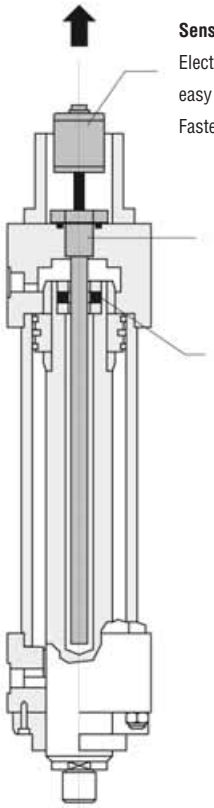
**U-Magnet OD33**
**Part No. 251 416-2**

**Rod Model**

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

**Hydraulic Sealing**

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



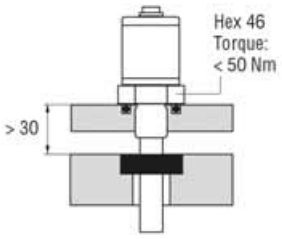
**Sensor Cartridge**
Electronic head + sensor element
easy to replace with 2 screws M4
Fastening torque ≤ 1,3 Nm

**Sensor Hydraulic Housing**
lange with tube becomes a permanent part of the cylinder

**Ring Magnet**

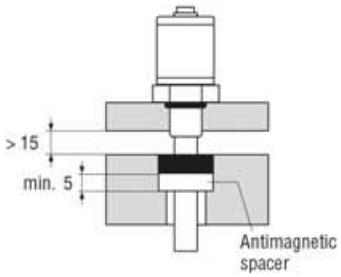
**Minimum assembly distance**

**1. Non-magnetisable material**




**Recommended hydraulic sealing**

**2. Magnetisable material**




**Alternative sealing O-Ring 15,3 x 2,2**

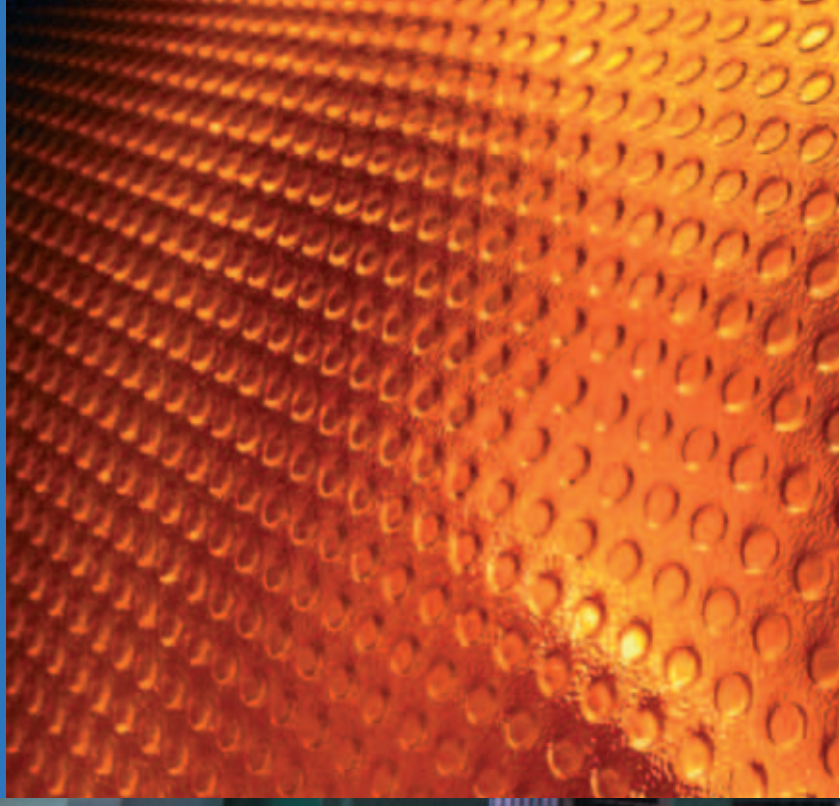
**See ISO 6149-1**

**Cylinder Installation**

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

The sensor cartridge can be removed from the flange and rod housing while still installed in the cylinder. This procedure allows quick and easy sensor cartridge replacement, without the loss of hydraulic pressure.

**CAN YOU IMAGINE…a sensor used in the plastics industry, which increases product quality and productivity and, at the same time, extends the useful life of the machine, by high-accuracy measurement of the mould movement.**



# Temposonics®

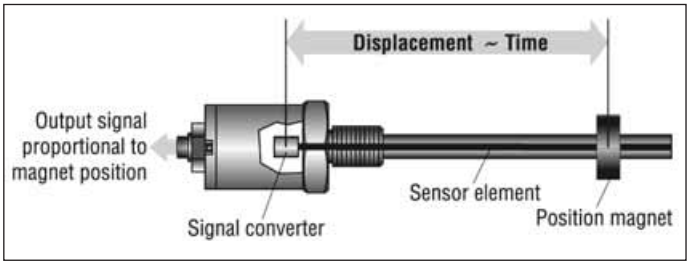
Absolute, Non-Contact Position Sensors

## R-Series
Rod Model RF

**Temposonics®-RF**
Measuring range 100 - 20.000 mm

**A very flexible Sensor**

- **Rugged Industrial Sensor**
- **Linear and Absolute Measurement**
- **LEDs for Sensor Diagnostics**
- **Contactless Sensing with Highest Durability**
- **Superior Accuracy: Linearity better 0,02 %**
- **Repeatability 0,001 %**
- **Direct Analogue Output for Displacement:**
- **Analogue / SSI / CANbus / Profibus-DP / EtherCAT**
- **Multi-Position Measurement: max. 20 Positions**
- **with 1 Sensor**
- **Cost-effective shippment for long measuring length**

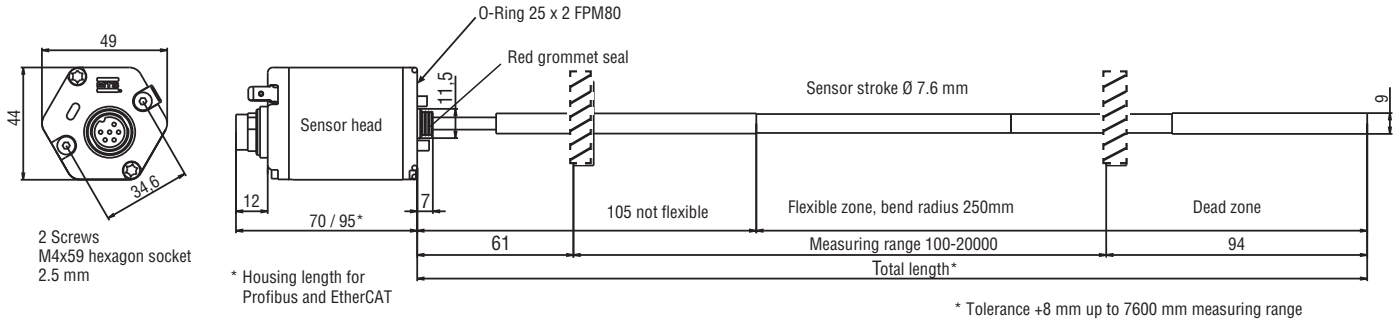



**Temposonics® RF** the extremely robust sensor, ideal for continuous operation under harshest industrial conditions is completely modular in mechanic and electronic design. A rod-shaped sensor housing protects the sensing element in which gives rise to the measurement signal. The sensor head accommodates the complete modular electronic interface with active signal conditioning. Double encapsulation ensures high operating safety and optimum EMC protection. The position transmitter, a permanent magnet - fixed at the mobile machine part - drives contactlessly over the sensor's stroke and starts measuring through the housing wall. The RF sensors are housed in a teflon coated stainless steel housing that is flexible and that can be bent in an arc to an 250 mm min. bend radius arc. Specifications are measured with flexible sensor element at a 0° degree bend radius. Most operating parameters are identical to its rigid cousin.

**Technical Data**

| | |
|---|---|
| **Input** | |
| Measured variables | - Displacement |
| | - Velocity |
| | - Multi-Position measurement max. 20 positions (CANbus, Profibus, EtherCAT) |
| Measuring range | 100 - 20.000 mm |
| **Output** | |
| Interfaces | Analogue, SSI, CANbus, Profibus-DP, EtherCAT |
| **Accuracy** | |
| Resolution | output dependent |
| Linearity | < ± 0,02 % F.S. (Min ± 100 µm) |
| Repeatability | < ± 0,001 % F.S. (Minimum ± 2,5 µm) |
| Hysteresis | < 4 µm |
| **Operating conditions** | |
| Magnet speed | any |
| Operating temperature | -40 °C ... +75 °C |
| Dew point, humidity | 90% rel. humidity, no condensation |
| Protection | IP30 (IP65 rating only for professional mounted guide pipe IP65 and if mating connectors are correctly fitted) |
| Shock test | 100 g (single shock IEC-Standard 68-2-27) |
| Vibration test | 5 g / 10 - 150 Hz IEC-Standard 68-2-C |
| Standards EMC test | Electromagnetic emission EN 50081-1 |
| | Electromagnetic immunity EN 50082-2 |
| | EN 61000-4-2/3/4/6, Level 3/4, Criterium A, CE-qualified |
| **Form factor, Material** | |
| Diagnostic display | LEDs beside connector |
| Sensor head | Aluminum-diecasting housing |
| Sensor stroke | Flexible stainless steel pipe (teflon coated), min. bend radius 250 mm, radius for shipping 400 mm |
| Position magnet | Permament magnet |
| **Electrical connection** | |
| Connection type | Connector or cable outlet (output dependent) |
| Input voltage | 24 VDC (-15 / +20 %) |
| - Polarity protection | up to -30 VDC |
| - Overvoltage protection | up to 36 VDC |
| Current drain | 100 mA typical |
| Ripple | < 1 % S-S |
| Electric strength | 500 VDC (DC ground to machine ground) |

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

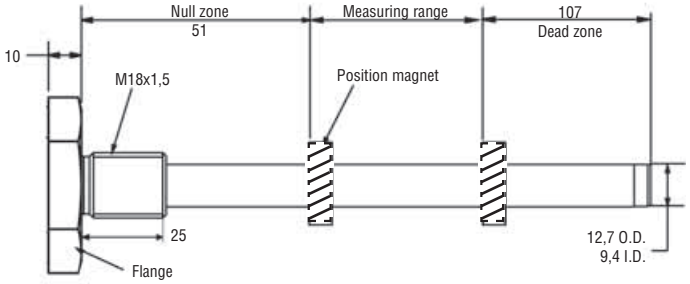



* Tolerance +8 mm up to 7600 mm measuring range
Tolerance +15 mm -5 mm > 7600 mm measuring range
Tolerance of total length has no influence to the measuring range

**Option:**

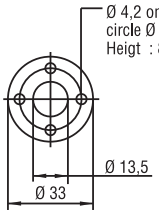
**Pressure Housing Pipe OD 12,7 and Flange**

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



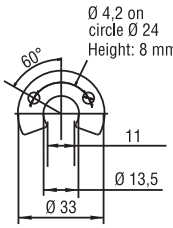

**= Magnet must be ordered seperately (details see chapter accessories)**

**Position Magnets** (not on delivery, please order seperatly)



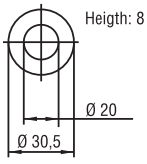

**Ring magnet OD33**
**Part No. 201 542-2**

PA-Ferrit-GF20
Weigth ca. 14 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm



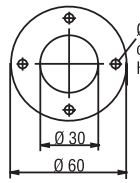

**U-Magnet OD33**
**Part No. 251 416-2**

PA-Ferrit-GF20
Weigth ca. 11 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm



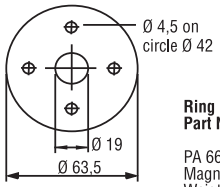

**Ring magnet OD30,5**
**Part No. 402 316**

PA-Ferrit Verbund
Weigth ca. 15 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²



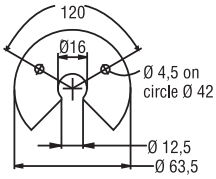

**Ring magnet OD60**
**Part No. MT 0162**

AlCuMgPb
Magnets compound-filled
Weigth ca. 90 g
Operating temperature: -40 ... +75°C



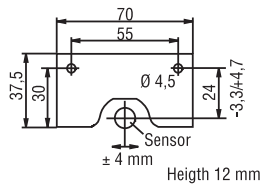

**Ring magnet OD63,5**
**Part No. 201 554**

PA 66-GF 30
Magnets compound-filled
Weigth ca. 25g
Operating temperature: -40 ... +75°C



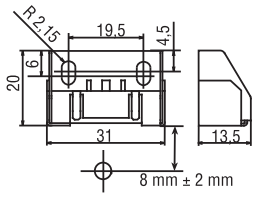

**U-Magnet OD63,5**
**Part No. 201 553**

PA 66-GF 30
Magnets compound-filled
Weigth ca. 25 g
Operating temperature: -40 ... +75°C




**Position magnet 70x37,5**
**Part No. 252 185**

AlMg4.5Mn, black anodized
Magnets compound-filled
Weigth ca. 75 g
Operating temperature: -40 ... +75°C




**Block magnet L**
**Part No. 252 887**

Magnet ground: CuSN6 zinc-plated
Magnet: Hartferrit
Weigth ca. 20 g
Operating temperature: -40 ... +75°C

All dimensions in mm

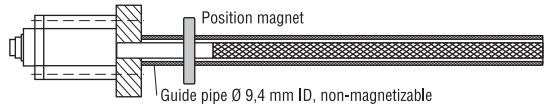
**Standard position magnet not on delivery (see chapter Accessories)**

**Position magnets**
Ring magnet OD33 (Part No. 201 542-2)
Ring magnet OD25,4 (Part No. 400 533)
U-Magnet OD33 (Part No. 251 416-2)

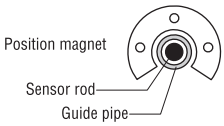
**Connection types**
Connector or cable outlet output dependent

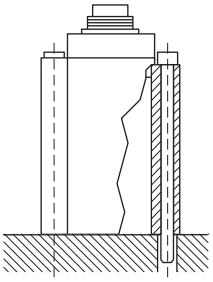
**Sensor Installation**

Mounting of sensor head requires the use of 2 non-ferrous screws M4x59. Long sensors require a guide pipe support (inside diameter of 9,4 mm) of non-magnetisable material, straight or bent to the desired shape.
For easy installation the sensor can be supplied with a hex 46 flange (accessorie) bored for above mounting screws.
Optional you can order a pressure housing pipe OD 12,7 mm with flange up to max 7500 mm measuring length.

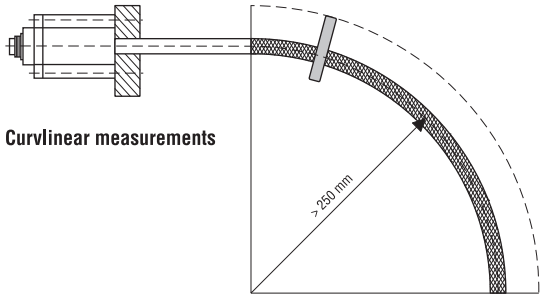



**Straight measurements**

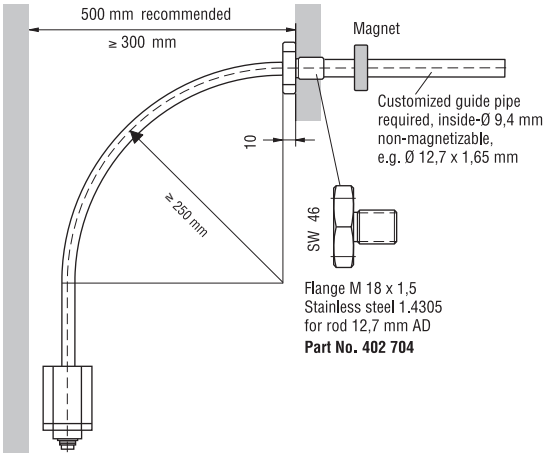


Note
A flexible sensor requires supports or anchoring to maintain proper alignment between sensor rod and the magnet, otherwise the sensor output signal can be interfered or lost.




**Curvlinear measurements**




Required for substitute sensors mounted on flange Part No. 401 035:
Use 2 Screws 8-32 x 2,35 Part No. 402 617 which supplied as attachemend with each sensor. The red rubber seal between sensor head and sensor stroke slit carefully and remove.

All dimensions in mm

**Temposonics®** R F _ _ _ _ _ _ _ M _ _ _ 1 _ _ _

**Model**
**RF** - Flexible sensor stroke

**Form factor**
**C** - Basic sensor

**Measuring range**
00100...20.000 mm
Up to 1000 in 50 mm steps, up 1000 in 250 mm steps

**Connection type**
Connector or cable outlet output dependent

**Input voltage**
**1** - +24 VDC

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

**Magnets and Accessories must be ordered separately.**

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

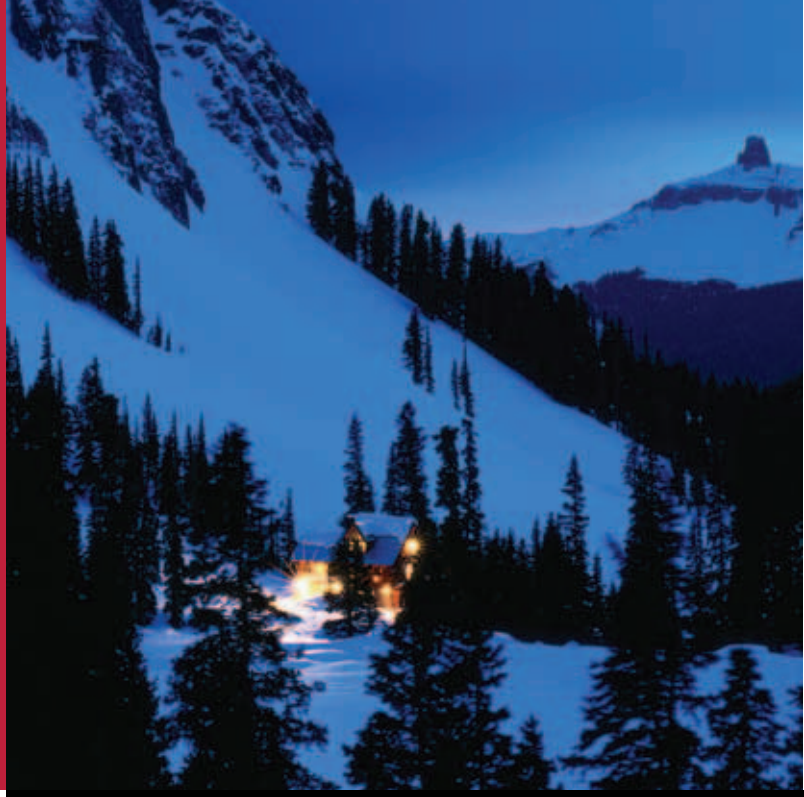
**Pressure Housing Pipe (Please order separately)**

**Temposonics®** H D _ _ _ _ M

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

**Measuring range**
0100...7500 mm
Up to 1000 in 50 mm steps, up 1000 in 250 mm steps

**CAN YOU IMAGINE…a hillside threatened by land slipping. An 18 m long MTS Temposonics® sensor detects even smallest ground movements and can predict land slipping. In other words: it is able to prevent catastrophies.**



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

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

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

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

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

# Temposonics®

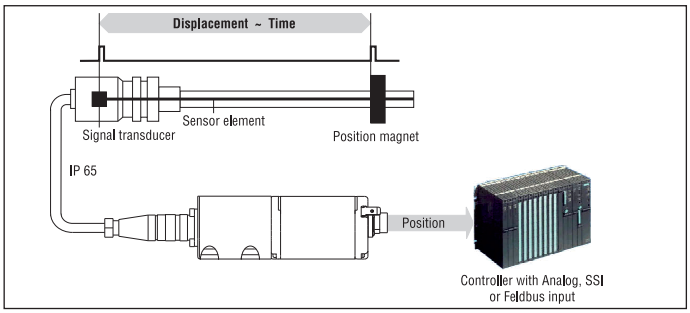
Absolute, Non-Contact Position Sensors

## R-Series
Rod Model RD4

**Temposonics®-RD4**
Measuring range 25 - 5000 mm

**Compact Sensor for Hydraulic Cylinders and Machine Manufacturing**

- **Rugged Industrial Sensor**
- **Linear and Absolute Measurement**
- **LEDs for Sensor Diagnostics**
- **Contacless Sensing with Highest Durability**
- **Superior Accuracy: Linearity better 0.02 %**
- **Repeatability 0.001 %**
- **Direct Output for Displacement + Velocity Analogue / SSI / CANbus / Profibus-DP / EtherCAT**
- **Multi-Position Measurement: max. 20 Positions with 1 Sensor**




**Temposonics® RD4** the extremely robust sensor, ideal for continuous operation under harshest industrial conditions is completely modular in mechanic and electronic design. A rod-shaped sensor housing protects the sensing element in which the measurement signal arises. The sensor head accommodates the complete modulare 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:

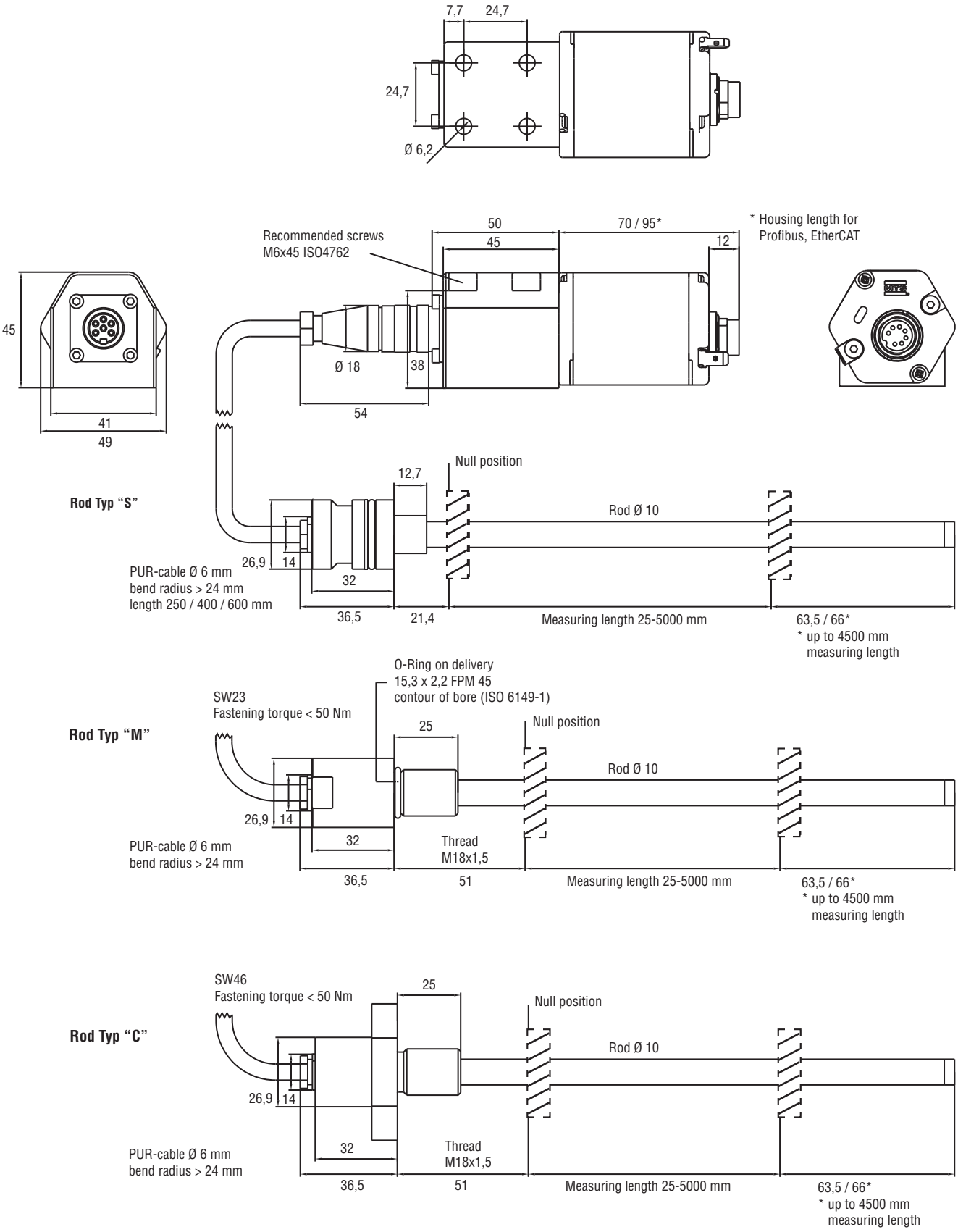
- The pressure proof stainless steel sensor rod with fitting or threaded flange, which protects the sensing element in which the measurement signal arises. It fits into the bored piston rod.
- The external industrial housing (IP67) which accommodates the modular electronic interface with active signal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

**Technical Data**

| | |
|---|---|
| **Input** | |
| Measured variables | - Displacement<br>- Velocity<br>- Multi-Position measurement max. 20 positions (CANbus, Profibus, EtherCAT) |
| Measuring range | 25...5000 mm |
| **Output** | |
| Interfaces | Analogue, SSI, CANbus, Profibus-DP, EtherCAT |
| **Accuracy** | |
| Resolution | Output dependent |
| Linearity | < ± 0,02 % F.S. (Min ± 50 µm) |
| Repeatabilty | < ± 0,001 % F.S. (Minimum ± 2,5 µm) |
| Hysteresis | < 4 µm |
| Ripple/Jitter | Analogue: 0,01 % F.S. / Digital: < ± 10 µm |
| **Operating conditions** | |
| Manget speed | Any |
| Operating temperature | -40 °C ... +75 °C |
| Dew point, humidity | 90% rel. humidity, no condensation |
| Protection | Sensor electronics IP67<br>(with professional mounted housing and connectors)<br>Measuring rod with connecting cable for side cable entry IP65<br>Measuring rod with single wires and flat connector with bottom cable entry IP 30 |
| Shock test | 100 g (single shock IEC-Standard 68-2-27) |
| Vibration test | 10 g / 10 - 2000 Hz IEC-Standard 68-2-6 |
| Standards, EMC test* | Electromagnetic emission EN 50081-1<br>Electromagnetic immunity EN 50082-2<br>EN 61000-4-2/3/4/6, Level 3/4, criterion A, CE-qualified |
| *Measuring rod and connecting cable mounted inside metal housing | |
| **Form factor, Material** | |
| Diagnostic display | LED besides connector |
| Sensor electronics | Aluminum-diecasting housing |
| Measuring rod with flange | Stainless steel 1.4301 / AISI 304 |
| Operating pressure | 350 bar, 700 bar peak |
| Position magnet | Ring magnets |
| **Electrical connection** | |
| Connection type | Connector or cable outlet (output dependent) |
| Input voltage | 24 VDC (-15 / +20 %) |
| - Polarity protection | up to -30 VDC |
| - Overvoltage protection | up to 36 VDC |
| Current drain | 100 mA typical |
| Ripple | < 1 % S-S |
| Electric strength | 500 VDC (DC ground to machine ground) |

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

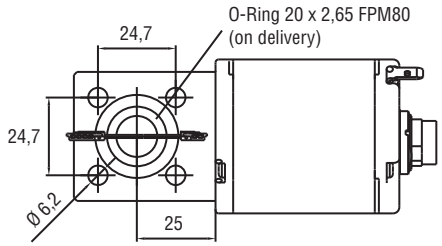
**Electronics with Side Cable Entry for the Measuring Rod**



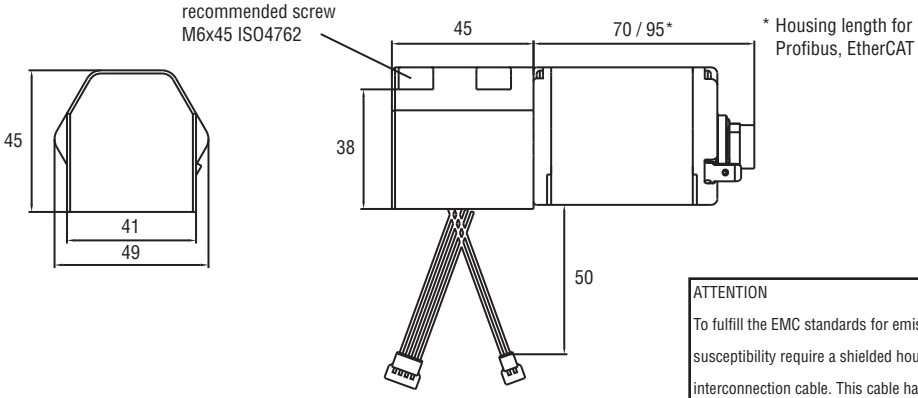

**= Magnet must be ordered seperately (details see chapter Accessories)**

All dimensions in mm

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



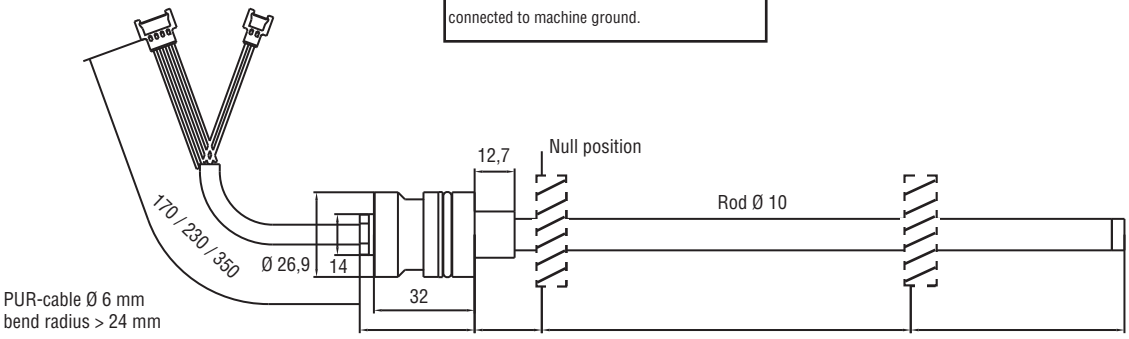

= **Magnet must be ordered seperately (details see chapter Accessories)**



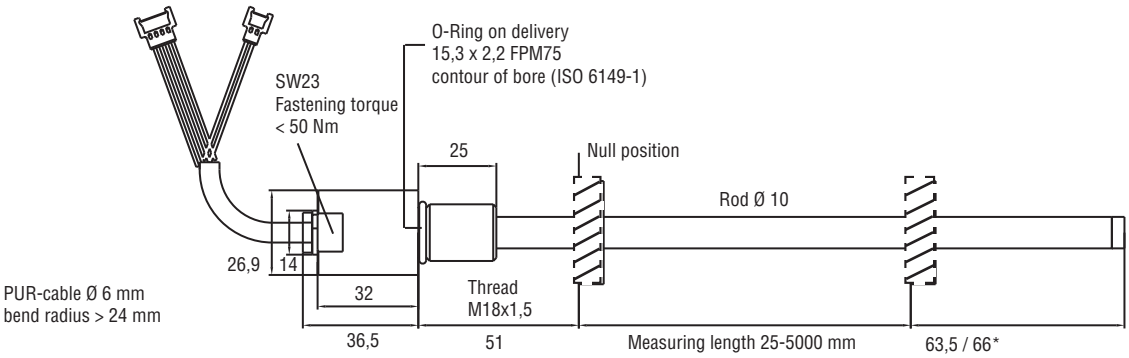

Connecting example SSI

ATTENTION
To fulfill the EMC standards for emission and susceptibility require a shielded housing for the interconnection cable. This cable has to be connected to machine ground.

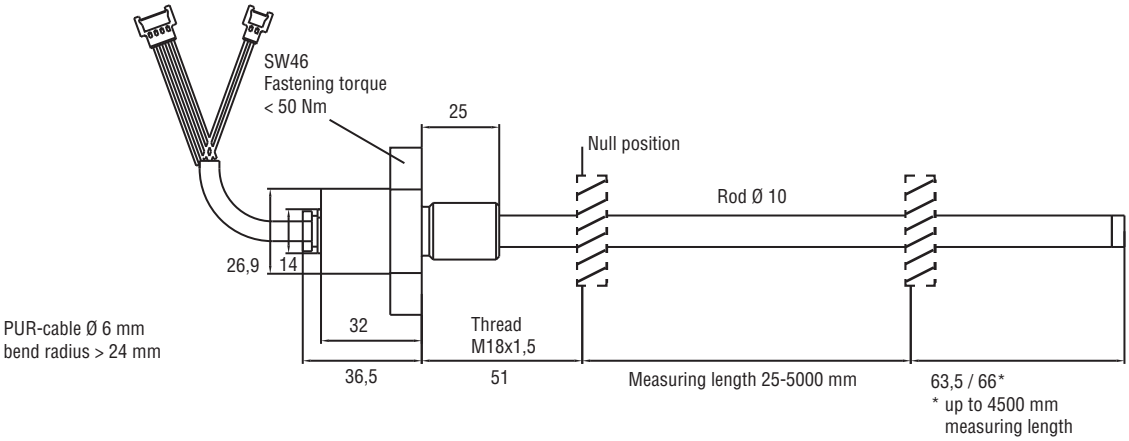
**Rod Typ "S"**




**Rod Typ "M"**




**Rod Typ "C"**




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.

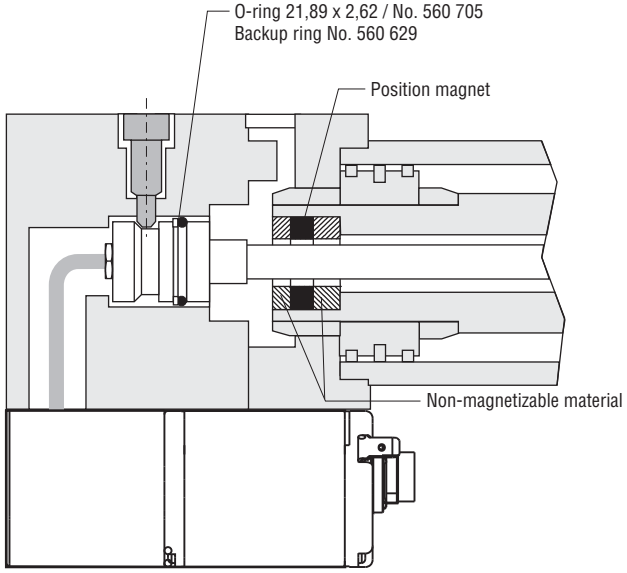
When installing the cylinder, please note:

- The position magnet should not grind over the measuring rod.
- The bore in the piston rod is dependent on the hydraulic pressure and the pistons velocity. The minimum drilling should be 13 mm. Do not exceed the peak pressure.
- The measuring rod should be protected against wear.

**Mounting Ring Manget**

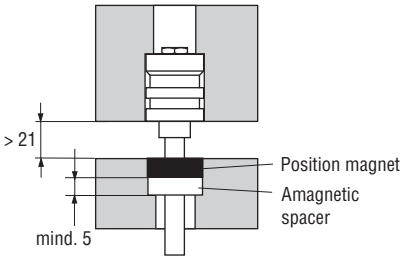
Mount the magnetic with the non-magnetic material for entrainment, screws, spacers, etc.

**Mounting Example Fitting Flange »S« and Sensor Electronics with Bottom Cable Entry**

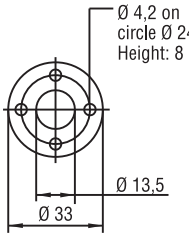



Bore in cylinder Ø 13-17 mm to push single wires with flat connector through.

**Minimum Installation Dimensions for Magnetisable Material**

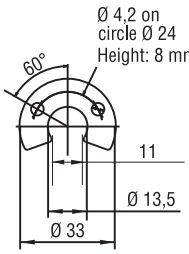



**Selection of Position Mangets** (not on delivery, please order seperatly)



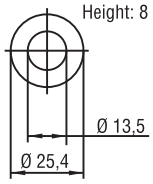

**Ring magnet OD33**
**Part No. 201 542-2**

Composite PA-Ferrite-GF20
Weigth 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
Weigth ca. 11 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm




**Ring magnet OD25,4**
**Part No. 400 533**

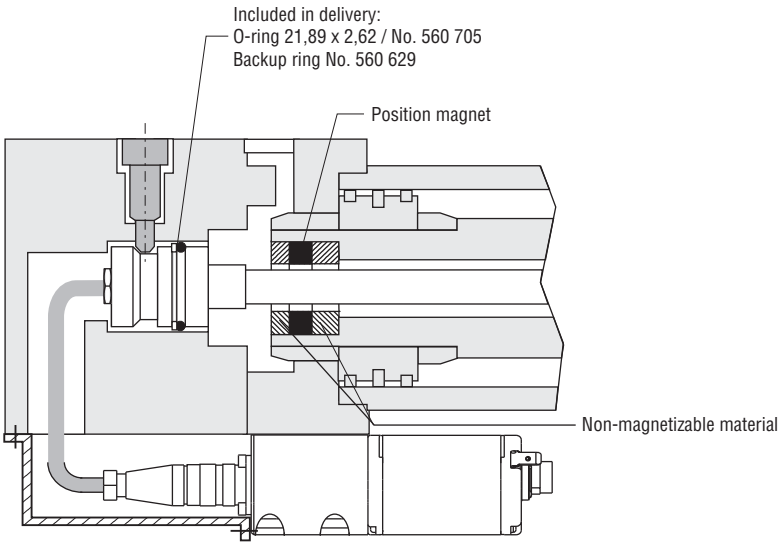
Composite: PA-Ferrite
Weigth ca. 10 g
Operating temperature:
-40 ... +100°C
Surface pressure max.
40 N/mm²

**Standard position magnet not on delivery (see chapter Accessories)**

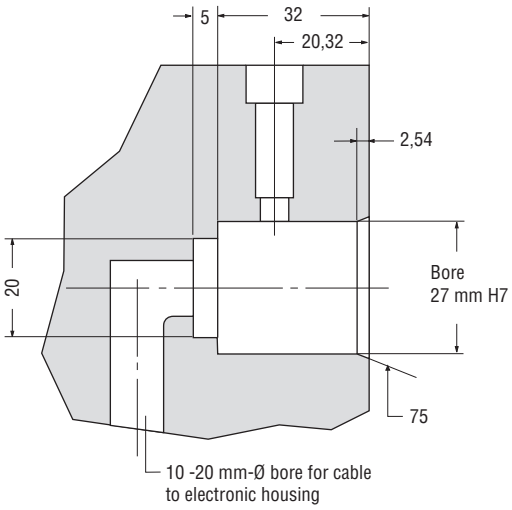
**Position magnets**
Ring magnet OD33 (Part No. 201 542-2)
Ring magnet OD25,4 (Part No. 400 533)
U-Magnet OD33 (Part No. 251 416-2)

**Connection types**
Connector or cable outlet output dependent

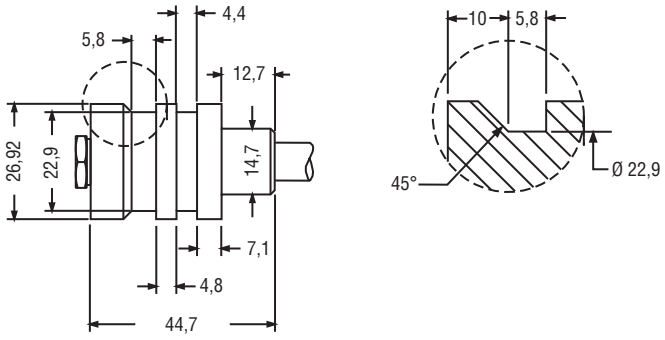
**Mounting Example Fitting Flange »S« and Sensor Electronics with Side Cable Entry**




**Mounting Detail: Setscrew 8 M6 - ISO7379 with internal Hexagon**




**Detail: Fitting Flange**




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

All dimensions in mm

**Sensor Installation with Fitting Flange »M« and »C«**

**Rod**

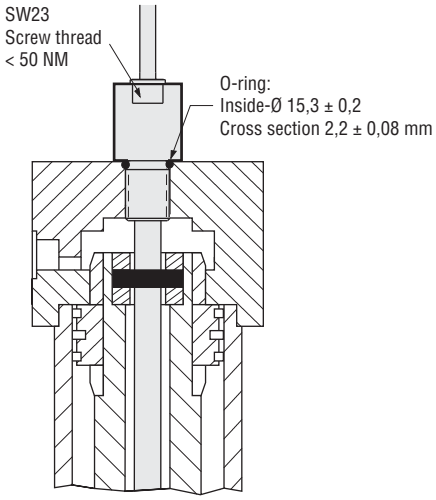
The sensor's pipe will be fixed via the threaded flange M18 x 1.5. Mounting should be with non-magnetisable material. If using magnetisable material please necessarily follow the displayed installation dimensions.

**Cylinder mounting**

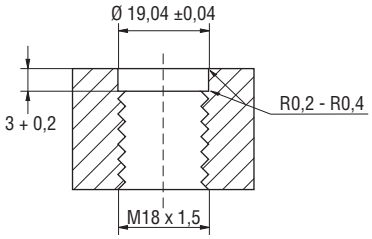
- The position magnet should not grind over the measuring rod.
- The bore in the piston rod is dependent on the hydraulic pressure and the pistons velocity. The minimum drilling should be 10 mm. Do not exceed the peak pressure.
- The measuring rod should be protected against wear.
- Pressure sealing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

**Mounting Example Fitting Flange »M«**

Sealing results from the provided O-Ring 15.3 x 2.2 mounted in the undercut.

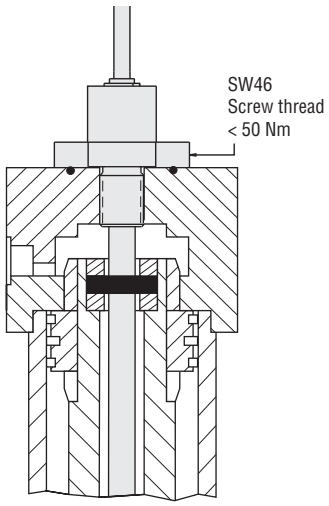



**Detail screwing bore**




Alternative screwing bore:
See ISO 6149-1

**Mounting Example Fitting Flange »C«**



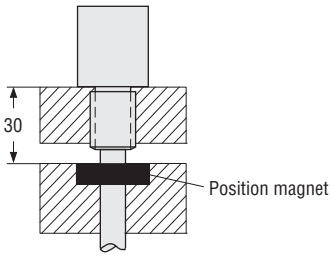

**Hydraulic sealing**

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

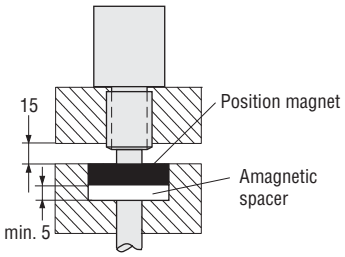
**Position Magnet**

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

**Non-magnetisable material**




**Magnetisable material**




All dimensions in mm

**Temposonics® RD4** R D 4 _ _ _ _ _ _ _ _ M _ _ _ _ _ _

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

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

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

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

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

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

**Magnets and Accessories must be ordered separately.**

| **Description** | **Part No.** |
|---|---|
| Ring magnet OD33, standard | 201 542-2 |
| U-Magnet OD33 | 251 416-2 |
| Ring magnet OD 25.4 mm | 400 533 |
| Ring magnet OD 17.4 mm | 253 572 |
| Connectors and cables see data sheet R-Series | |
| **Spare Parts** | |
| O-Ring 15.3 x 2.2 FPM 75 | 401 133 |
| O-Ring 21.89 x 2.62 PFPM 75 | 560 705 |
| Backup ring | 560 629 |
| O-Ring 20 x 2.65 FPM 80 | 561 435 |

# Temposonics®

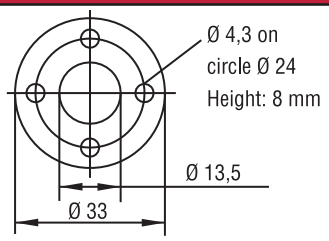
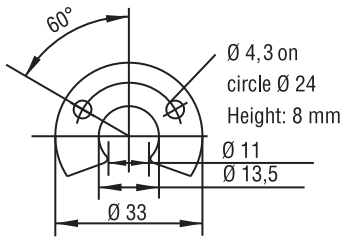
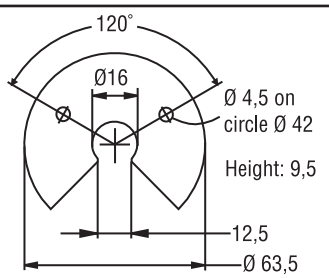
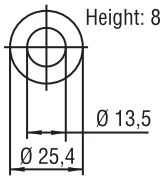
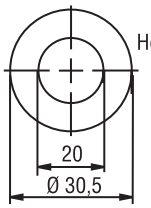
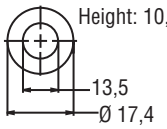
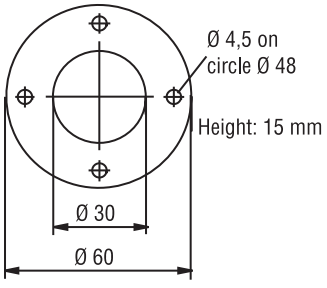
Absolute, Non-Contact Position Sensors

## Accessories

- Position Magnets
- Floats
- Connectors
- Clamps
- Cables
- Programming Tools
- High Pressure Housing, ...

## ACCESSORIES R-SERIES

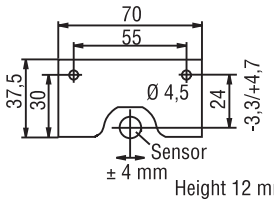
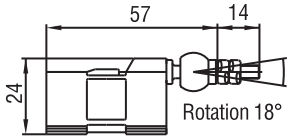
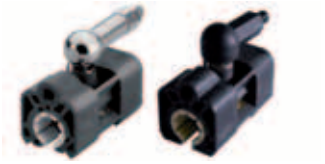
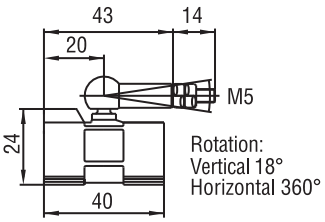
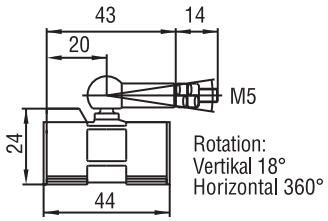
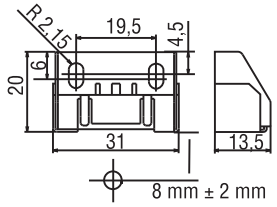
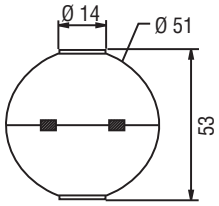
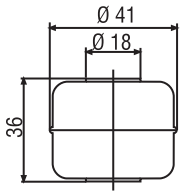
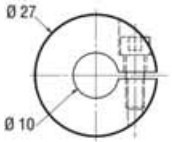
**Position Magnets, Floats, Connectors, Clamps, Cables and Programming Tools**

| Product | Dimension | Material | Application |
|---|---|---|---|
|  <br>**Standard magnet**<br>Ring magnet OD33<br>**Part No. 201 542-2** |  | Composite PA-Ferrite-GF20<br>Weight ca. 14 g<br>Operating temperature:<br>-40 ... +100°C<br>Surface pressure max. 40 N/mm²<br>Fastening Torque for M4<br>screws max. 1 Nm | RH, RF, RD4 |
|  <br>**Standard magnet**<br>U-magnet OD33<br>**Part No. 251 416-2** |  | Composite PA-Ferrite-GF20<br>Weight ca. 11 g<br>Operating temperature:<br>-40 ... +100°C<br>Surface pressure max. 40 N/mm² | RH, RF, RP |
|  <br>U-magnet OD63,5<br>**Part No. 201 553** |  | PA 66-GF30<br>Magnets compound-filled<br>Weight ca. 26 g<br>Operating temperature:<br>-40 ... +75°C | RH, RF, RP |
|  <br>Ring magnet OD25,4<br>**Part No. 400 533** |  | Composite: PA-Ferrite<br>Weight ca. 10 g<br>Operating temperature:<br>-40 ... +100°C<br>Surface pressure max. 40 N/mm² | RH, RF, RD4 |
|  <br>Ring magnet OD30,5<br>**Part No. 402 316** |  | Composite: PA-Ferrite<br>Weight ca. 15 g<br>Operating temperature:<br>-40 ... +100°C<br>Surface pressure max. 40 N/mm² | RH, RF, RD4 |
|  <br>Ring magnet<br>**Part No. 401 032** |  | PA-Neonbond compound<br>Weight ca. 5 g<br>Operating temperature: -40 ... +100<br>Surface Pressure max. 20 N/mm² | RH, RD4<br>(not for multi-position measure-ment) |
|  <br>Ring magnet OD60<br>**Part No. MT 0162** |  | Al CuMgPb<br>Magnets compound-filled<br>Weight ca. 90 g<br>Operating temperature:<br>-40 ... +75°C | RH, RF, RD4 |

Notice: More magnets available on request.

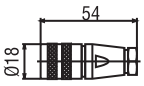
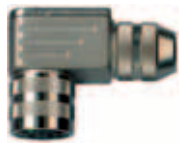
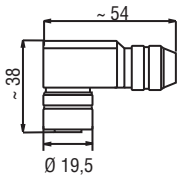
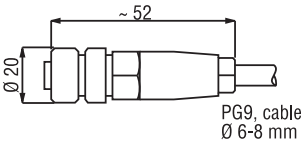
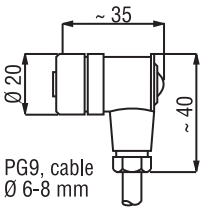
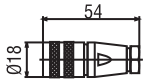
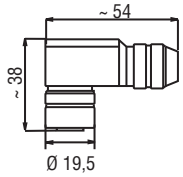
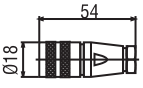
## *ACCESSORIES R-SERIES*

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

| Product | Dimension | Material | Application |
|---|---|---|---|
|  <br>U-magnet 70<br>**Part No. 252 185** |  | AlMg4.5Mn, black anodised<br>Magnets compound-filled<br>Weight ca. 75 g<br>Operating temperature:<br>-40...+75°C | RH, RF, RP<br>not for Multi-Position<br>measurement<br>Resolution min. 10 µm |
|  <br>Magnet slider V<br>**Part No. 252 184** |  | GFK, Magnet Hardferrite<br>Weight ca. 30 g<br>Operating temperature:<br>-40 ... +75°C | RP |
|  <br>Magnet slider S **Part No. 252 182**<br>Magnet slider G **Part No. 253 421** |  | GFK, Magnet Hardferrite<br>Weight ca. 30 g<br>Operating temperature: -40 ... +75°C<br>**Magnet slider S:**<br>Ball joint CuZn 39Pb3 nickel plated<br>**Magnet slider G - free from float:**<br>Socket joint, high-strength plastics<br>Ball joint CuZn39Pb3 nickel plated | RP |
|  <br>Magnet slider P<br>**Part No. 253 673** |  | GFK, Magnet Hardferrite<br>Weight ca. 30 g<br>Operating temperature: -40 ... +75°C<br>with additional end plates | RP |
|  <br>Block magnet L<br>**Part No. 252 887** |  | CuSn6 zinc coated,<br>Magnet Hardferrite<br>Weight: ca. 20 g<br>Operating temperature:<br>-40...+75°C | RH, RF, RP<br>not for Multi-Position measurement<br>Resolution min. 10 µm |
|  <br>Float 50 mm<br>**Part No. SW0107** |  | 1.4571 Stainless steel<br>Density: 720 kg/m³<br>Max. Pressure: < 40 bar<br>Weight: 42 ± 3 g | RH, RF |
|  <br>Float 41 mm<br>**Part No. 200 938-2** |  | 1.4404 Stainless steel<br>Density: 740 kg/m³<br>Max. Pressure: =< 8 bar<br>Weight: 20 ± 2 g | RH, RF |
|  <br>Collar<br>**Part No. 560 777** |  | 1.4301 Stainless steel | RH |

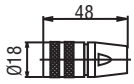
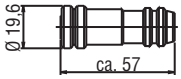
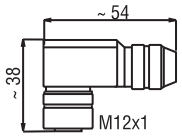
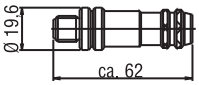
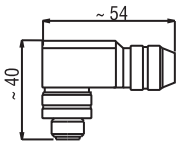
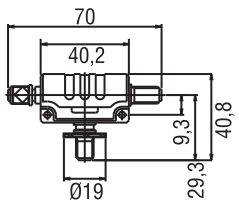
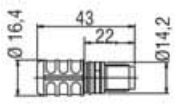
## ACCESSORIES R-SERIES

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

| Product | Dimension | Material | Application |
|---|---|---|---|
|  <br>6 pin Connector (for cable Ø 6 mm)<br>**Part No. STC 09131D (female)**<br>For cable Ø 6-8 mm<br>**Part No. STC 09131D06PG9** |  | Housing: Zinc nickel plated<br>Termination: Solder<br>Contact insert: Silver plated<br>Cable clamp: PG7<br>Max. Cable-Ø 6 mm<br>Cable clamp: PG9, M16<br>Max. Cable-Ø 8 mm | Analogue<br>CAN |
|  <br>6 pin Connector M16, 90°<br>**Part No. STC 09131-6 (female)** |  | Housing: Zinc nickel plated<br>Termination: Solder<br>Contact insert: Silver plated<br>Cable clamp: M16<br>Max. Cable-Ø 8 mm | Analogue<br>CAN |
|  <br>5 pin connector, M12x1<br>**Part No. ST 933 171-100 (female)** |  | Housing: PA<br>Termination: Solder<br>Contact insert: (CuZn/Sn)<br>Max. Cable-Ø 6-8 mm | CAN |
|  <br>5 pin connector, M12x1, 90°<br>**Part No. ST 933 176-100 (female)** |  | Housing: PA<br>Termination: Solder<br>Contact insert: (CuZn/Sn)<br>Max. Cable-Ø 6-8 mm | CAN |
|  <br>7 pin Connector, M16<br>**Part No. STC 09131D07PG9 (female)** |  | Housing: Zinc nickel plated<br>Termination: Solder<br>Contact insert: Silver plated<br>Cable clamp: PG9<br>Max. Cable-Ø 8 mm | SSI |
|  <br>7 pin Connector, M16, 90°<br>**Part No. STC 09131-7 (female)** |  | Housing: Zinc nickel plated<br>Termination: Solder<br>Contact insert: Silver plated<br>Cable clamp: M16<br>Max. Cable-Ø 8 mm | SSI |
|  <br>6 pin Connector, M16<br>**Part No. STC 09131D06PG9 (female)**<br>**Part No. STC 09131H06PG9 (male)** |  | Housing: Zinc nickel plated<br>Termination: Solder<br>Contact insert: Silver plated<br>Cable clamp: PG9<br>Max. Cable-Ø 8 mm<br>Cable type (e.g.) K53 | Profibus (D63) |

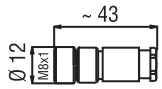
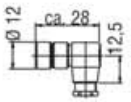
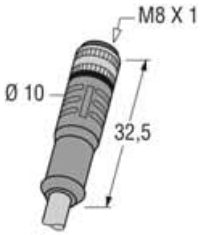
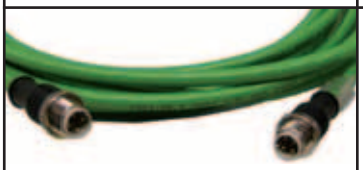
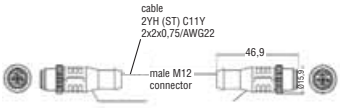
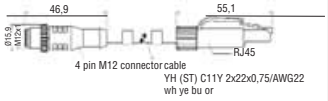
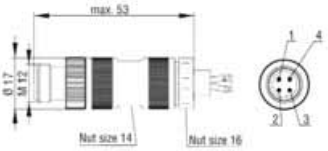
## ACCESSORIES R-SERIES

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

| Product | Dimension | Material | Application |
|---|---|---|---|
|  <br>6 pin Bus endplug M16, male<br>**Part No. STA 09131H06** |  | Housing: Zinc nickel plated<br>Contact insert: Silver plated | Profibus (D63) |
|  <br>5 pin connector M12-B<br>**Part No. 560 885 (female)** |  | Housing: Zinc nickel plated<br>Termination: Srews clamp<br>Contact insert: Silver plated<br>Cable clamp: M16<br>Cable-Ø: 6,5 - 8,5 mm<br>Cable type e.g.: K25 | Profibus (D53) |
|  <br>5 pin 90° connector M12-B<br>**Part No. 370 514 (female)** |  | Housing: Zinc nickel plated<br>Termination: Srews clamp<br>Contact insert: Silver plated<br>Cable clamp: M16<br>Cable-Ø: 6,5 - 8,5 mm<br>Cable type e.g.: K58 | Profibus (D53) |
|  <br>5 pin connector M12-B<br>**Part No. 560 884 (male)** |  | Housing: Zinc nickel plated<br>Termination: Srews clamp<br>Contact insert: Silver plated<br>Cable clamp: M16<br>Cable-Ø: 6,5 - 8,5 mm<br>Cable type e.g.: K58 | Profibus (D53) |
|  <br>5 pin 90° connector M12-B<br>**Part No. 370 515 (male)** |  | Housing: Zinc nickel plated<br>Termination: Srews clamp<br>Contact insert: Silver plated<br>Cable clamp: M16<br>Cable-Ø: 6,5 - 8,5 mm<br>Cable type e.g.: K58 | Profibus (D53) |
|  <br>5 pin Bus T-connector M12<br>**Part No. 560 887** |  | Housing: PA 66<br>Contact insert: Silver plated | Profibus (D53) |
|  <br>5 pin Bus endplug M12<br>**Part No. 560 888** |  | Housing: PA 66<br>Contact insert: Silver plated | Profibus (D53) |

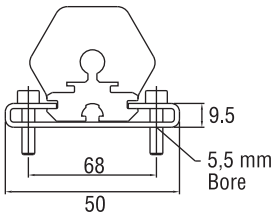
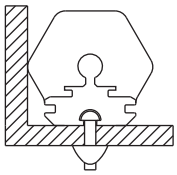
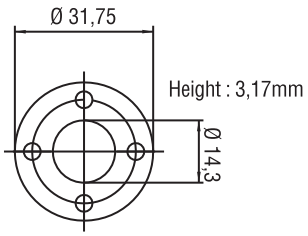
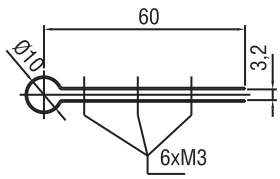
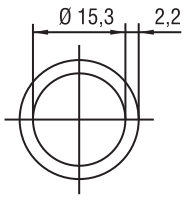
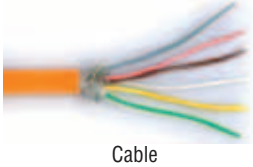
## ACCESSORIES R-SERIES

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

| Product | Dimension | Material | Application |
|---|---|---|---|
|  <br>4 pin cable connector M8<br>**Part No. 370 504** |  | Housing: Brass nickel plated<br>Termination: Solder<br>Contact insert: Au<br>Max. Cable-Ø 5 mm | Profibus (D53)<br>EtherCAT<br>CAN (D54) |
|  <br>4 pin cable connector M8, 90°<br>**Part No. 560 886** |  | Housing: PA 66<br>Termination: Solder<br>Contact insert: Au<br>Max. Cable-Ø 5 mm | Profibus (D53)<br>EtherCAT<br>CAN (D54) |
|  <br>Cable connector<br>**Part No. 530 066**<br>**Part No. 530 096**<br>**Part No. 530 093** |  | PUR-cable with 4 pin. female connector<br>5 m length free end<br>4 x 0,25 mm², shielded<br>for 24 V power supply<br><br>**Part No. 530 066** = 5 m length<br>**Part No. 530 096** = 10 m lengt<br>**Part No. 530 093** = 15 m length | Profibus (D53)<br>EtherCAT<br>CAN (D54) |
|  <br>Cable connector<br>**Part No. 530 064** |  | 5 m industrial Ethernet cable<br>(Cat 5e ES)<br>w/2x4 pin M12-connectors (D-coded)<br>PUR-jacket, green | EtherCAT |
|  <br>Cable connector<br>**Part No. 530 065** |  | 5 m industrial Ethernet cable<br>(Cat 5e ES)<br>RJ45 connector and<br>M12-connector (D-coded)<br>PUR-jacket, green | EtherCAT |
|  <br>4 pin Bus cable connector<br>**Part No. 370 523** |  | IDC technology | EtherCAT |
|  <br>End cap<br>**Part No. 370 537** | | Aluminium | EtherCAT |

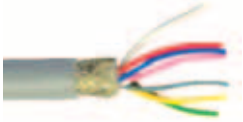
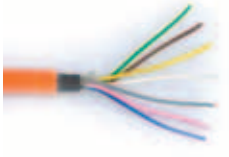
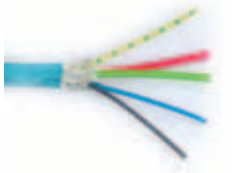
## ACCESSORIES R-SERIES

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

| Product | Dimension | Material | Application |
|---|---|---|---|
|  <br>Clamp<br>**Part No. 400 802** |  | Stainless steel | RP |
|  <br>Groove stone<br>**Part No. 401 602** |  | Stainless steel | RP |
|  <br>Spacer<br>**Part No. 400 633** |  | Aluminum | RH |
|  <br>Fixing clip<br>**Part No. MT 0200** |  | Brass<br>Flat section and fastening screws:<br>non-magnetic material | RH |
|  <br>Metal protection cap for connector M16<br>**Part No. GZ0611** | | | Analogue, CAN, SSI, Profibus |
|  <br>O-ring<br>**Part No. 401 133** |  | Fluorelastomer FPM 75 | RH-M |
|  <br>Cable<br>**Part No. K 27** | 3 x 2 x 0,14 mm²<br>Ø 6 mm | PVC<br>-10 ... +80°C | Standard |
|  <br>Cable<br>**Part No. K 59** | 3 x 2 x 0,25 mm<br>Ø 6,8 mm | Pelon PUR<br>-40 ... +80°C | Halogen free<br>Oil-resistant<br>High flexible |

## ACCESSORIES R-SERIES

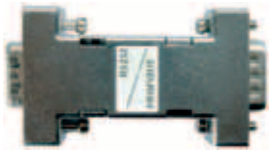
**Position Magnets, Floats, Connectors, Clamps, Cables and Programming Tools**

| Product | Dimension | Material | Application |
|---|---|---|---|
|  Cable **Part No. K 61** | 4 x 2 x 0,25 mm² | PUR (-30 ... +90°C) | Water proof wires |
|  Cable **Part No. K 34** | 4 x 2 x 0,25 mm² | Teflon (-90 ... +180°C) | Temperature |
|  Cable **Part No. K 26** | 7 x 0,14 mm²<br>EMC protected<br>Ø 7 mm | PUR<br>-20 ...+70°C | SSI, CAN |
|  Cable **Part No. K 53** | BUS + feed-in<br>Ø 8 mm | PVC<br>-30 ... +80°C | Profibus-DP D63 |
|  Cable **Part No. K 25** | BUS conductor, high flexible cable<br>Ø 8 mm | PUR<br>-30 ... +70°C | Profibus-DP D53 |

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

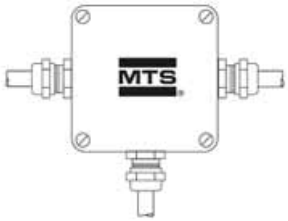
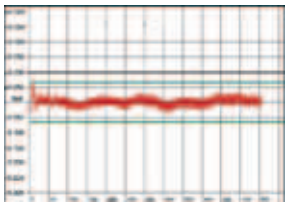
## ACCESSORIES R-SERIES

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

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

## ACCESSORIES R-SERIES

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

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

**RP+RH Analogue…**
**…programming outside!**

# ACCESSORIES R-SERIES

**ATEX [ATmosphere EXplosive]**

**Approved Sensors: R-Series**

- Analogue Output
- CAN Bus [All Versions]
- SSI Output

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

**ATEX Conformity: Marking on MTS Approved Sensor**

Ex II 3G Ex nA II T4
and / or
Ex II 3D tD A22 IP65 T100°C
TFR: 07 ATEX 027
-20 °C ≤ Ta ≤ 75 °C
Pmax = 4 Watt
Derated 6,5 K/W ≥ 49°C

**Applicable ATEX Regulations / Directives**

**Directive 94/9/EG** ('Manufacturers Directive')
Sets out directives for equipment manufacturers that are used in potentially explosive atmospheres.
**Related Norms:**
EN 60079-0:2006, EN 60079-15:2005
EN 61241-0:2006, EN 61241 - 1:2004

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

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

**Ordering Code**

**Temposonics®** R _ _ _ _ _ _ M _ _ _ 1 _ _ _ E X

**Model**
**RP-** Profile
**RH** - Rod

**Measuring Length in mm**
Profile - 0050...5000 mm
Rod - 0050...7600 mm
Standard: up to 1000 in 50 mm steps, greater 1000 in 250 mm steps
Other length upon request.

**Connection type:**
**R02 -** 2 m PVC cable w/o connector, Option: R01-R10 (1-10 m)
**P02 -** 2 m PUR cable w/o connector, Option: P01-P10 (1-10 m)
**T02 -** 2 m Teflon cable w/o connector, Option: T01-T10 (1-10 m)
Note: This options are output signal dependent.
For details refer individual catalog section.

**Output**
Analogue / CANbus / SSI

**EX-ATEX Approved Versions**

## ACCESSORIES R-SERIES

**Precision Position Measurement High Pressure Housing**

This **H**igh **P**ressure **H**ousing is **ATEX EEx approved** and **UL and cUL** approved for use in **hazardous locations** with Temposonics® position sensors.

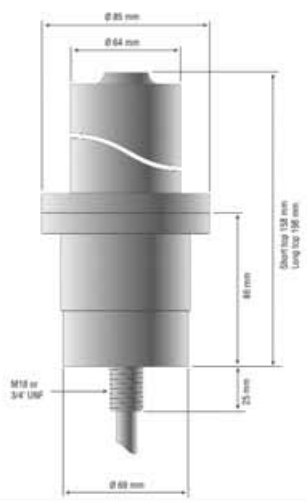
The ATEX, UL and cUL approvals cover flammable gases, vapors and liquids.

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

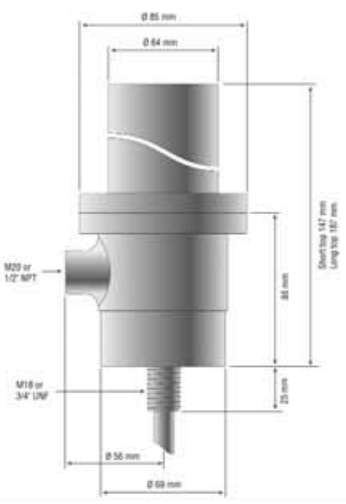
All parts are made of 316L Stainless steel. The housing is also available in non-approved versions ensuring an outstanding protection to the sensor when used in rugged applications with high humidity and aggressive gases.

| | |
|---|---|
| **Protection Type:** | |
| **ATEX:** | 0539 II 2GD |
| | Ex d IIC T5 T100°C |
| | Demko 07 ATEX 142619X |
| | In accordance with EN 60079-0:2006 |
| | EN 60079-1:2004, EN 50281-1-1:1998 |
| | incl. A1:2002 |
| | Class 1, Devision 1, Groups A, B, C and D |
| | hazardous locations, temperature code T5 |
| | As to fire, electrical shock and explosion |
| | hazards only UL certificate no. 2PD0. |
| | In accordance with UL 1203 standard. |
| | Only with UL approved cable glands |
| **Material:** | Stainless Steel AISI 316L (1.4404) |
| **Cable Gland Threads:** | M20 x 1,5 or 1/2" NPT |
| **Ingress protection code:** | IP68 (only with IP68 approved cable gland) |
| **Approved sensors:** | G-Series Analogue + Digital |
| | L-Series Start / Stop |
| | R-Series Analogue |
| | R-Series Profibus |
| | R-Series CANBUS |
| | R-Series SSI |
| | R-Series DeviceNet |
| **Mounting Flange:** | M18 x 1,5 or 3/4" - 16UNF - 3A |
| **Pressure rating:** | 350 Bar continuous |
| **Peak pressure:** | 530 Bar |
| **Magnet type:** | Ring magnets see page 58 |
| **Level Measurement:** | Float on request |

**Top mounted cable gland**



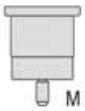
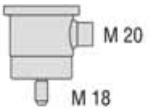
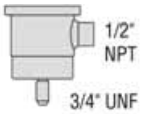
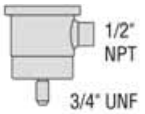
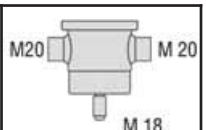
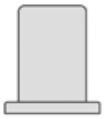
**Side mounted cable gland**



## ACCESSORIES R-SERIES

**Precision Position Measurement High Pressure Housing**

**Combination Chart:**

| Bottom / Top |  M 18 |  M 20 M 18 |  1/2" NPT 3/4" UNF |  1/2" NPT 3/4" UNF |  M20 M 20 M 18 |
|---|---|---|---|---|---|
| **Approval** | **ATEX** | **ATEX** | **ATEX** | **UL and cUL** | **ATEX** |
|  M 20 | **0100** | | | | |
|  | | **0900** | **1000 ATEX** | **1000 UL/cUL** | **1300** |
|  M 20 | **0300** | | | | |
|  | | **1700** | | | **2100** |

The long top is needed for Profibus sensors

**Ordering Information:**

Part-No. HPH -XXXX-XXXX-X-XXXXXX

Choose a design combination from the chart

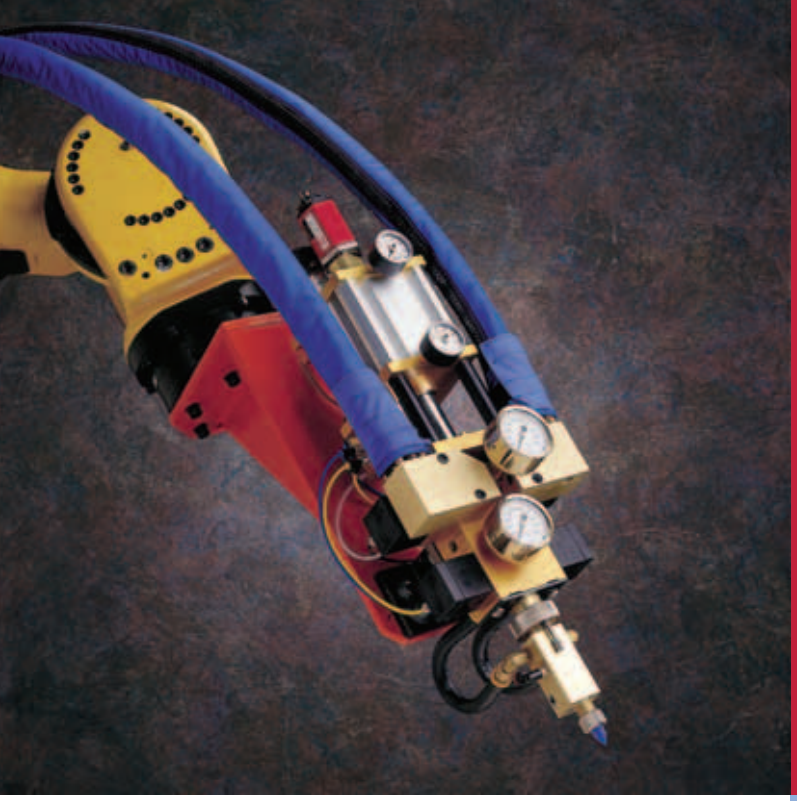
Measuring length (see drawing)

**A**pproved or **N**on-approved version

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

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

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



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

## OUR TARGET? YOUR SATISFACTION!

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

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

# MTS Temposonics® Sales Organisation

## MTS SENSORS

### Germany
**MTS Sensor Technologie GmbH & Co. KG**
Auf dem Schüffel 9
D - 58513 Lüdenscheid
Tel.: +49 23 51 95 87 0
Fax: +49 23 51 56 49 1
eMail: info@mtssensor.de
http://www.mtssensor.de

### USA
**MTS Systems Corporation**
Sensors Division
3001 Sheldon Drive
Cary, NC 27513, USA
Tel: +1 919 677 0100
Fax: +1 919 677 0200
eMail: sensorsinfo@mts.com
http://www.mtssensors.com

### Japan
**MTS Sensors Technology Corp.**
737 Aihara-cho,
Machida-shi
Tokyo 194-0211, Japan
Tel.: +81 42 775 3838
Fax: +81 42 775 5516
eMail: info@mtssensor.co.jp
http://www.mtssensor.co.jp

## BRANCH OFFICES

### France
**MTS Systems**
58, Rue Auguste Perret - Europarc
F - 94043 Creteil Cedex
Tel.: +33 1 58 43 90 28
Fax: +33 1 58 43 90 03
eMail: Fernando.Prates@mts.com
Contact: Mr. Fernando Prates

### Italy
**MTS Systems Srl.**
**Sensor Division**
Via Diaz,4
I - 25050 Provaglio d' Iseo (Bs)
Tel.: +39 030 988 38 19
Fax: +39 030 982 33 59
eMail: mtssenstechitalia@tin.it
Contact: Mr. I. Bertazzi, Mr. G. Pellegrini

### China
**MTS Sensors**
No. 481, Guiping Road, Building #23
Shanghai, 200233, P.R.China
Tel: +86 21 6485 5800
Fax: +86 21 6495 6329
eMail: info@mtssensors.cn
http://www.mtssensors.cn
Contact: Ms. Vivian Wu

## DISTRIBUTORS

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

### Balkan Region
**(Albania, Macedonia, Serbia and Montenegro)**
**Neel Komerc DOOEL**
Antigona 25
MK - 1440 Negotino
Tel.: +389 43 365510
Fax: +389 43 365510
eMail: vjovanov@mt.net.mk
Contact: Mr. Vladimir Jovanov

### Belgium
**Multiprox N.V.**
Lion d`Orweg 12
B - 9300 Aalst
Tel.: +32 53 766 587
Fax: +32 53 783 977
eMail: mail@multiprox.be
http://www.multiprox.be
Contact: Mr. Freddy Verloove

### Czech Republic
**Alpha International spol.s.r.o.**
Fantova 342
CZ-38241 Kaplice
Tel: +420 380 311 203
Fax: +420 380 311 018
eMail: info@alphaint.cz
http://www.alphaint.cz
Contact: Mrs. Machackova

### Denmark
**Summit Electronics ApS**
Roskildevej 8-10
DK - 2620 Albertslund
Tel.: +45 48 47 59 19
Fax: +45 48 48 48 81
eMail: ch@summit.dk
http://www.summit.dk
Contact: Mr. Carsten Holme

### Finland
**Sensorola Oy**
Vanha Porvoontie 229
FIN - 01380 Vantaa
Tel.: +358 207 289900
Fax: +358 207 289919
eMail: myynti@sensorola.fi
http://www.sensorola.fi
Contact: Mr. Kimmo Ikonen

### Great Britain
**R.D.P. Electronics Ltd.**
Grove Street, Heath Town
GB - Wolverhampton W V10 OPY
Tel.: +44 1902 45 75 12
Fax: +44 1902 45 20 00
eMail: sales@rdpe.com
http://www.rdpe.com
Contact: Mr. Peter Purdy

### Hungary
**Kvalix Automatika Kft.**
IV. Kiss Ernö u. 3.
H-1046 Budapest
Tel.: +36 (1) 272 2242
Fax: +36 (1) 272 2244
eMail: info@kvalix.hu
http://www.kvalix.hu
Contact: Mr. Péter Forró

### India
**Servocontrols & Hydraulics India Pvt Ltd**
Servey No. 683, Industrial Estate
Udyamabag, Belgaum
IND - Karnataka 590008
Tel: +91 831-2407501, -2407502,
-2407503, -2481734, -4201132

### India
**Servocontrols & Hydraulics India Pvt Ltd**
Fax: +91 831 2484496
eMail: sales@servocontrolsindia.com
http://www.servocontrolsindia.com
Contact: Mr. Deepak Dhadoti

### Ireland
**R.D.P. Electronics Ltd.**
Grove Street, Heath Town
GB - Wolverhampton W V10 OPY
Tel.: +44 1902 45 75 12
Fax: +44 1902 45 20 00
eMail: sales@rdpe.com
http://www.rdpe.com
Contact: Mr. Peter Purdy

### Netherlands
**tsb-bescom b.v.**
Spoorallee 8
NL - 6921 HZ Duiven
Tel.: +31 316 250 800
Fax: +31 316 250 819
eMail: john.post@tsb-bescom.nl
http://www.tsb-bescom.nl
Contact: Mr. John Post

### Norway
**Semitronic AS**
Grorudveien 55 D
N - 0976 Oslo
Tel.: +47 21 37 87 20
Fax: +47 22 91 75 01
eMail: firmapost@rh-semitronic.no
http://www.semitronic.no
Contact: Mr. Erik Nordby

### Poland
**Newtech Engineering Sp. z.o.o.**
ul. Sowinskiego 3
PL - 44-100 Gliwice
Tel.: +48 032 2376198
Fax: +48 032 2376197
eMail: witold.nantka@newtech.com.pl
http://www.newtech.com.pl
Contact: Mr. Witold Nantka

### Portugal
**F. Fonseca, S.A.**
Rua Joao Francisco do Casal 87/89
Esgueira
P - 3801-997 Aveiro
Tel.: +351 234 303 900
Fax: +351 234 303 910
eMail: hlemos@ffonseca.com
http://www.ffonseca.com
Contact: Mr. Helder Lemos

### Romania
**ROMSENZOR SRL.**
Ritmului 4
Bl. 438 Sc. 2 Ap. 55
RO - 021677 Bucharest
Tel.: +40 21 2502719
Fax: +40 21 2504769
eMail: c.petcu@romsenzor.ro
http://www.romsenzor.ro
Contact: Mr. Constantin Petcu

### Slovakia
**Alpha International spol.s.r.o.**
Fantova 342
CZ-38241 Kaplice
Tel: +420 380 311 203
Fax: +420 380 311 018
eMail: info@alphaint.cz
http://www.alphaint.cz
Contact: Mrs. Machackova

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

### South Africa
**ATI Systems (Pty) Ltd.**
159 Galjoen Road
ZA - Wadeville 1428
Tel: +27 11 383 8300
Fax: +27 11 824 1353
eMail: sales@atisystems.co.za
http://www.atisystems.co.za
Contact: Mr. Wim Annandale

### Spain
**Iberfluid Instruments S.A.**
Cardenal Reig, 12
E - 08028 Barcelona
Tel.: +34 93 333 36 00
Fax: +34 93 334 05 24
eMail: myct@iberfluid.com
http://www.iberfluid.com
Contact: Mr. Angel Jané

### Sweden
**Sensor Control Nordic AB**
Sollentunavägen 49
S - 19140 Sollentuna
Tel.: +46 8 668 2100
Fax: +46 8 669 0110
eMail: anders.olofsson@scn.se
http://www.scn.se
Contact: Mr. Anders Olofsson

### Switzerland
**SMT-Keller AG**
Sensor u. Magnet-Technik
Landstr. 35
CH - 8450 Andelfingen
Tel.: +41 52 317 33 60
Fax: +41 52 317 35 51
eMail: info@smt-keller.ch
http://www.smt-keller.ch
Contact: Mr. Hans Keller

### Turkey
**OTKON MÜHENDiSLiK ve ELEKTRiK SAN. TiC. LTD. STi.**
Perpa Ticaret Merkezi
A Blok Kat: 5 No: 305
TR - 34 384 Okmeydani-Istanbul
Tel.: +90 212 320 23 60
Fax: +90 212 320 23 62
eMail: bayrama@otkon.com.tr
http://www.otkon.com.tr
Contact: Mr. Bayram Akkaya

### Ukraine / Belarus
**MegaSensor GmbH**
Windmühlenstr. 159
D - 51063 Köln
Tel.: +49 221 989 45 95
Fax: +49 221 989 45 96
eMail: info@megasensor.com
http://www.megasensor.com
Contact: Mr. Pavel Bazanov

**www.mtssensor.com**
**www.temposonics-shop.de**



**Germany**
MTS Sensor Technologie
GmbH & Co. KG
Auf dem Schüffel 9
58513 Lüdenscheid, Germany
Tel.: +49-2351-9587-0
Fax: +49-2351-56491
info@mtssensor.de
www.mtssensor.de

**USA**
MTS Systems Corporation
Sensors Division
3001 Sheldon Drive
Cary, NC 27513, USA
Tel.: +1-919-677-0100
Fax: +1-919-677-0200
sensorsinfo@mts.com
www.mtssensors.com

**Japan**
MTS Sensors Technology Corp.
737 Aihara-cho,
Machida-shi
Tokyo 194-0211, Japan
Tel.: +81-42-775-3838
Fax: +81-42-775-5516
info@mtssensor.co.jp
www.mtssensor.co.jp