

# Temposonics®

Absolute, Non-Contact Position Sensors

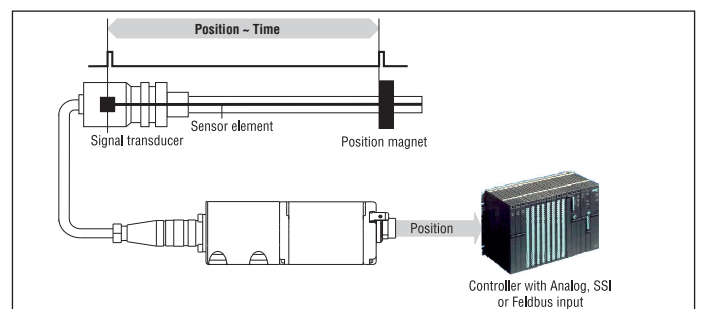
## Data Sheet R-Series Rod Model RD4

**Temposonics® RD4**  
Stroke length 25...5000 mm



**Compact sensor for  
hydraulic cylinders  
and machine manufacturing**

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



**Temposonics® RD4** the extremely robust sensor, ideal for continuous operation under harshest industrial conditions is completely modular in mechanic and electronic design. A rod-shaped sensor housing protects the sensing element. The sensor head accommodates the complete 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 conditioning. The sensor electronics is connected to the basic-sensor via side or bottom cable entry.

## Technical data

| Input                            |                                                                                                                                                                                                                                         |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measured variables               | <ul style="list-style-type: none"> <li>- Position</li> <li>- Velocity</li> <li>- Multi-position measurement max. 20 positions (CANbus, Profibus, EtherCAT, Ethernet/IP™, Powerlink, Profinet)</li> </ul>                                |
| Stroke length                    | 25...5000 mm                                                                                                                                                                                                                            |
| Output                           |                                                                                                                                                                                                                                         |
| Interfaces                       | Analog, SSI, CANbus, Profibus-DP, EtherCAT, Ethernet/IP™, Powerlink, Profinet                                                                                                                                                           |
| Accuracy                         |                                                                                                                                                                                                                                         |
| Resolution                       | Output dependent                                                                                                                                                                                                                        |
| Linearity                        | $< \pm 0.02 \% \text{ F.S. (Minimum } \pm 50 \mu\text{m)}^1 < \pm$                                                                                                                                                                      |
| Repeatability                    | $0.001 \% \text{ F.S. (Minimum } \pm 2.5 \mu\text{m)} < 4 \mu\text{m}$                                                                                                                                                                  |
| Hysteresis                       | Analog: $0.01 \% \text{ F.S. / Digital: } < \pm 10 \mu\text{m}$                                                                                                                                                                         |
| Ripple/Jitter                    |                                                                                                                                                                                                                                         |
| Operating conditions             |                                                                                                                                                                                                                                         |
| Magnet speed                     | Any                                                                                                                                                                                                                                     |
| Operating temperature            | $-40^\circ\text{C} \dots +75^\circ\text{C}$                                                                                                                                                                                             |
| Dew point, humidity              | 90% rel. humidity, no condensation                                                                                                                                                                                                      |
| Ingress 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 IP30 100 g |
| Shock test                       | (single shock IEC-Standard 60068-2-27)                                                                                                                                                                                                  |
| Vibration test                   | 10 g / 10 - 2000 Hz IEC-Standard 60068-2-6                                                                                                                                                                                              |
| Standards, EMC test <sup>2</sup> | Electromagnetic emission EN 61000-6-4<br>Electromagnetic immunity EN 61000-6-2<br>EN 61000-4-2/3/4/6, Level 3/4, criterium A                                                                                                            |
| Design, material                 |                                                                                                                                                                                                                                         |
| Diagnostic display               | LED beside connector                                                                                                                                                                                                                    |
| Sensor electronics               | Aluminum                                                                                                                                                                                                                                |
| Measuring rod with flange        | Stainless steel 1.4301 / AISI 304                                                                                                                                                                                                       |
| Operating pressure               | 350 bar, (700 bar peak) for hydraulic rod Ring                                                                                                                                                                                          |
| Position magnet                  | magnets                                                                                                                                                                                                                                 |
| Electrical connection            |                                                                                                                                                                                                                                         |
| Connection type                  | Connector or cable outlet (output dependent) 24                                                                                                                                                                                         |
| Supply voltage                   | VDC (-15 / +20 %)                                                                                                                                                                                                                       |
| - Polarity protection            | up to -30 VDC                                                                                                                                                                                                                           |
| - Overvoltage protection         | up to 36 VDC                                                                                                                                                                                                                            |
| Current drain                    | 100 mA typical                                                                                                                                                                                                                          |
| Ripple                           | $\leq 0.28 \text{ Vpp}$                                                                                                                                                                                                                 |
| Electric strength                | 500 VDC (DC ground to machine ground)                                                                                                                                                                                                   |

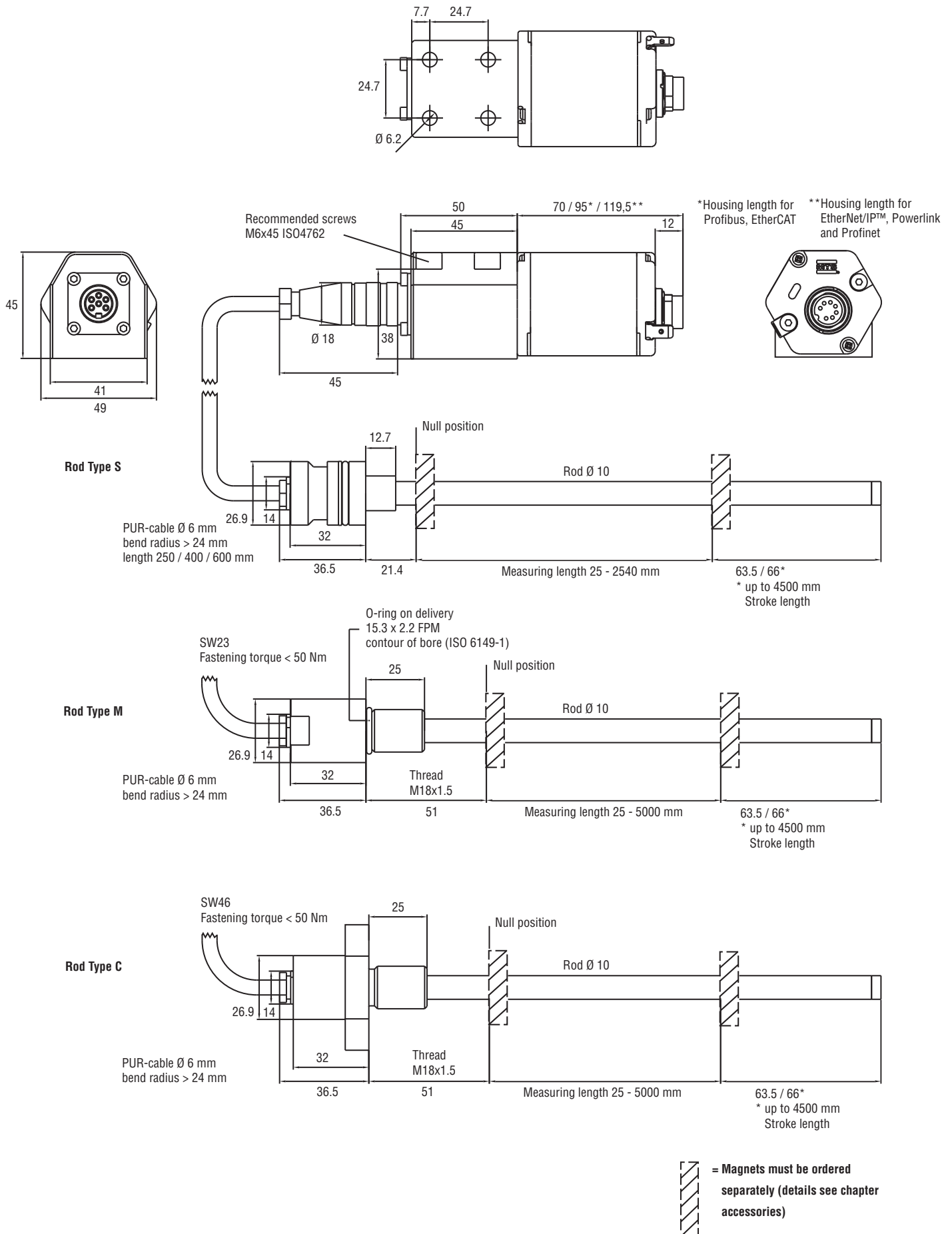
<sup>1</sup> For rod style "S" the linearity deviation can be higher in the first 30 mm (1.2 in.) of stroke length

<sup>2</sup> Measuring rod and connecting cable mounted inside metal housing

### Info:

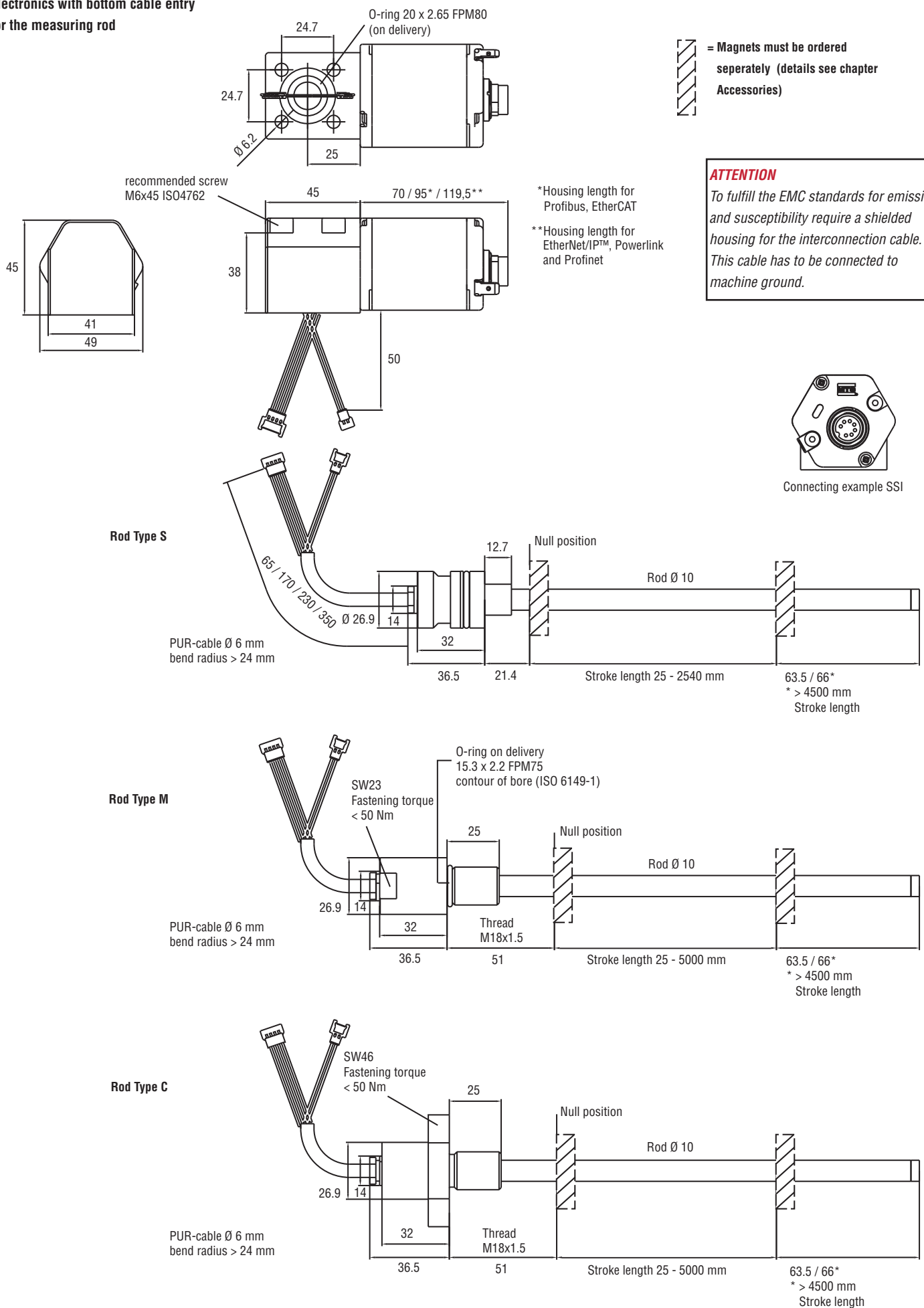
For detailed technical data and electrical connection for the outputs please see data sheets: R-Series Analog, SSI, CANbus, Profibus, EtherCAT, Ethernet/IP™, Powerlink, Profinet

## Electronics with side cable entry for the measuring rod



All dimensions in mm

## Electronics with bottom cable entry for the measuring rod



All dimensions in mm

## Sensor installation with fitting flange »S«

### Cylinder mounting

For installation in hydraulic cylinders, we recommend the sensor system consisting of the rod and the mounting flange, and the B type electronics.

Install the rod using the fit and seal it off by means of the O-ring and the supporting ring. Block the rod using a shoulder screw.

The adaptor plate of the separate electronics housing facilitates mounting on the outside of small cylinders. Advantage of this version: Connection to the measuring rod is via the bottom of the housing. Thus the sensor system is fully encapsulated and protected against external disturbances.

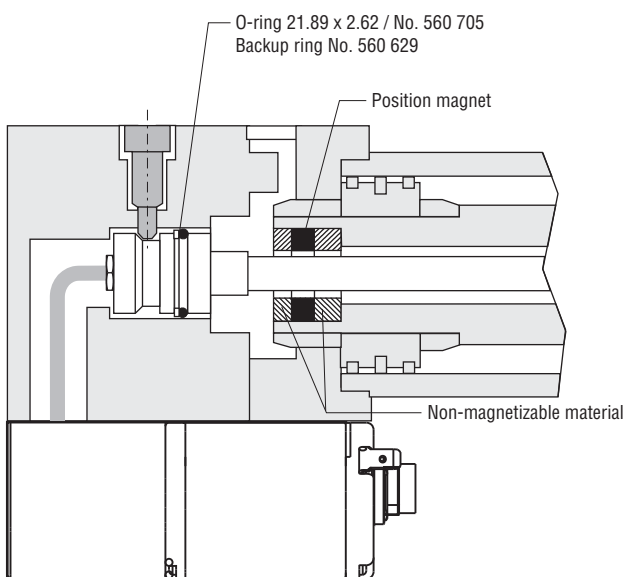
When installing the cylinder, please note:

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

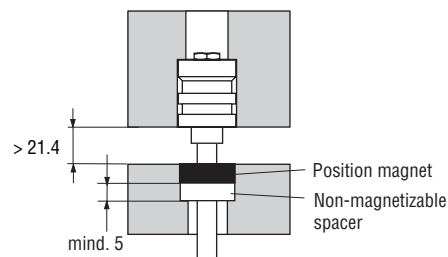
### Mounting ring magnet

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

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

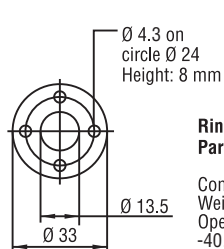


### Minimum installation dimensions for magnetizable material



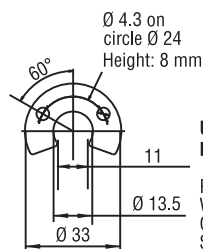
Bore in cylinder  $\varnothing$  13...17 mm to push single wires with flat connector through.

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



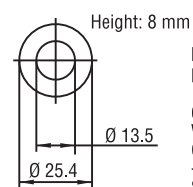
#### Ring magnet OD33 Part No. 201 542-2

Composite PA-Ferrite-GF20  
Weight ca. 14 g  
Operating temperature: -40...+100 °C  
Surface pressure max. 40 N/mm<sup>2</sup>  
Fastening Torque for M4 screws max. 1 Nm



#### U-magnet OD33 Part No. 251 416-2

PA-Ferrit-GF20  
Weight ca. 11 g  
Operating temperature: -40...+100 °C  
Surface pressure max. 40 N/mm<sup>2</sup>  
Fastening torque for M4 screws max. 1 Nm



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

Composite: PA-Ferrite  
Weight ca. 10 g  
Operating temperature: -40...+100 °C  
Surface pressure max. 40 N/mm<sup>2</sup>

All dimensions in mm

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

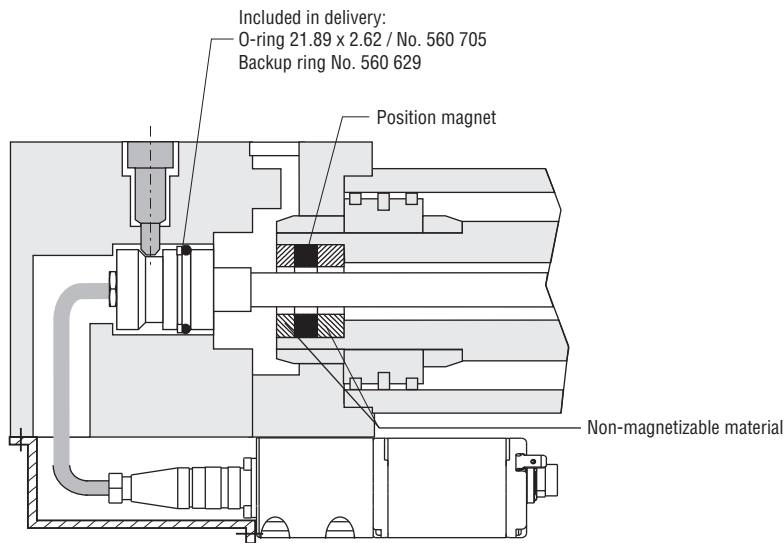
#### Position magnets

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

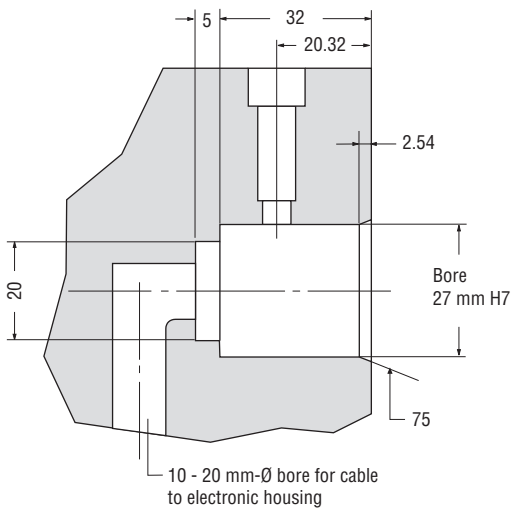
#### Connection types

Connector or cable outlet output dependent

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



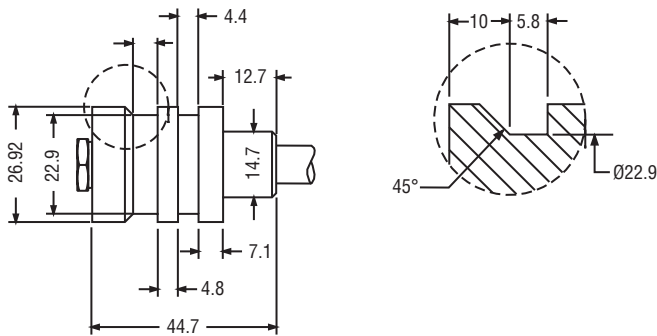
Mounting detail: Setscrew 8 M6 - ISO 7379 with internal hexagon



ATTENTION

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

Detail: Fitting flange



## Sensor installation with fitting flange »M« and »C«

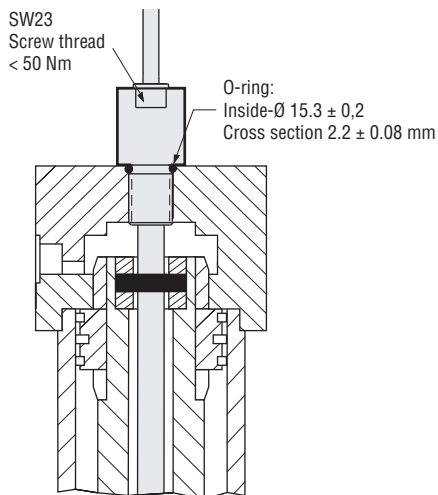
### Rod

The sensor's pipe will be fixed via the threaded flange M18 x 1.5.

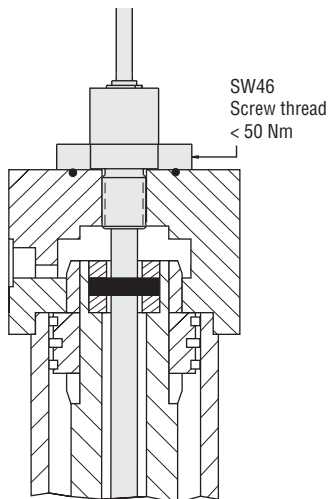
Mounting should be with non-magnetizable material. If using magnetizable material please necessarily follow the displayed installation dimensions.

### Mounting example fitting flange »M«

Sealing results from the provided O-ring 15.3x2.2 mounted in the undercut.



### Mounting example fitting flange »C«



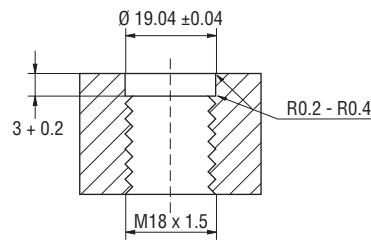
### Hydraulic sealing

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

### Cylinder mounting

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

### Detail screwing bore

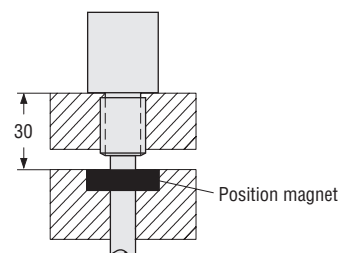


Alternative screwing bore:  
See ISO 6149-1

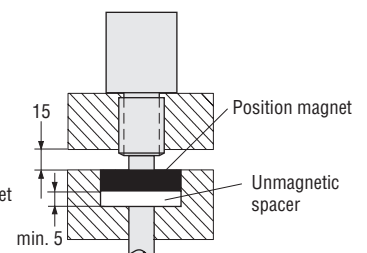
### Position magnet

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

### Non-magnetizable material



### Magnetizable material



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:  
R2 - Single wires with flat connector, length 65 mm  
R4 - Single wires with flat connector, length 170 mm  
R5 - Single wires with flat connector, length 230 mm  
R6 - Single wires with flat connector, length 350 mm

Sensor electronics

S - Side cable entry  
B - Bottom cable entry

Stroke length

Flange M, C: 0025...5000 mm  
Flange S: 0025...2540 mm  
Standard: See chart

Further parameter

See data sheets R-Series according to the required output Analog / SSI / CANbus / Profibus / EtherCAT / EtherNet/IP™ / Powerlink / Profinet

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                        | 401 032   |
| 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   |

| Stroke Length Standard RD4 |                |
|----------------------------|----------------|
| Stroke length              | Ordering steps |
| < 500 mm                   | 5 mm           |
| 500...750 mm               | 10 mm          |
| 750...1000 mm              | 25 mm          |
| 1000...2500 mm             | 50 mm          |
| > 2500 mm                  | 100 mm         |



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