The ***Magnetostrictive*** Position Sensors

MTS SENSORS GROUP

Temposonics® R-Series

Profile Models RP & Rod Models RH

- ***Linear, Absolute Measurement***
- ***Contactless Sensing with Highest Durability***
- ***Rugged Industrial Sensor, EMC shielded and CE certified***
- ***Superior Accuracy: Resolution up to 5 µm, Sensor-based intelligence***
- ***Linearity Tolerance better 0,01 %, Repeatability 0,001 %***
- ***Direct INTERBUS-S Output for Position***
- ***Multi-Position Measurement (1 Sensor for 2-16 positions simultaneous)***
- ***Mesuring Range 25 - 7600 mm***

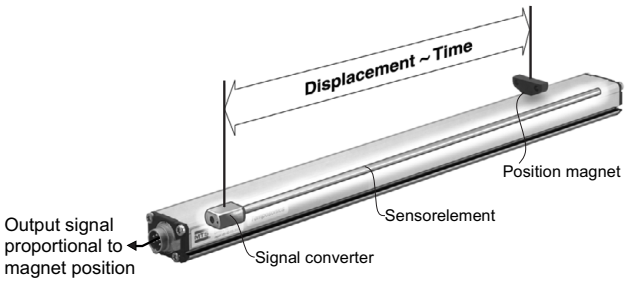
Precision is our Strength !

INTERBUS

CE ISO 9001 CERTIFIED

Interbus-S Interface

...offers Multi-Position Measurement



Operating principle:
Magnetostrictive ultrasonic speed measurement = Position sensing

The **absolute** linear TEMPOSONICS sensors are based on the **MTS**-developed **magnetostrictive measurement** principle, which combines various magnetomechanical effects. Heart of these sensors is the ferromagnetic sensorelement which is subjected to current pulses with a locally changing magnetic field. A mobile permanent magnet providing the position signal surrounds the sensorelement. The interaction of magnetic fields creates a torsional wave, which travels through the sensorelement at constant ultrasonic speed and is detected in a signal converter (MTS know-how). Integrated signal processing converts the wave runtime into a standard analog or digital output signal. Benefit of this operating principle: mechanical contact between position transducer and sensing element is omitted. Therefore, MTS contactless sensors ensure utmost accuracy and wear-free operation during a long lifetime without the need for recalibration.

Input
Measured variables: Displacement, Multi-Position measurement (2-16 positions simultaneous)
Measuring range: Profile 25 - 5000 mm / **Rod** 25 - 7600 mm

Output
Output signal: INTERBUS-S installation remote bus, RS485
Data protocol: INTERBUS-S (EN 50254, DIN E 19258)
Baud rate, kBit/s: 500
Data length: 32 bit (Position: 24 bit, controller and status: 8 bit)

Accuracy
Resolution: 0,005 up to >0,5 mm
Linearity, uncorrected: < ± 0,01 % F.S. (Minimum ± 40 µm)
Repeatabilty: < ± 0,001 % F.S. (Minimum ± 2,5 µm)
Cycle time, ms: 0,5 at 500 mm / 1,0 at 2000 mm / 2,0 at 4500 mm / 3,2 at 7600 mm stroke length
Temperature coefficient: < 15 ppm/° C
Hysteresis: < 4 µm

Operating Conditions
Sensor mounting position: Any orientation
Magnet speed: Any
Operating temperature: -40° C ... +75° C
Dew point, humidity: 90% rel. humidity, no condensation
Pressure rating (rod version): 350 bar (530 bar spike)
Ingress protection: IP 65 (If mating connector is correctly fitted)
Shock rating: 100 g (Single hit) / IEC-Standard 68-2-27
Vibration rating: 5 g / 10 - 150 Hz / IEC-Standard 68-2-6
EMC test: Electromagnetic emission EN 50081-1
Electromagnetic susceptibility EN 50082-2
DIN IEC 801-4 / Type 4
CE qualified

Form Factor, Material
Profile Model
Sensor head: Aluminum diecasting housing
Sensor housing style: Aluminum profile
Magnet type: Captive sliding magnet or open ring magnet (material page 6)
Rod Model
Sensor head: Aluminum diecasting housing
Sensor rod with flange: Stainless steel 1.4301 / AISI 304
Magnet type: Ring magnets (material page 6)

Installation
Profile model: Adjustable mounting feet or T-slot nuts M5 in base channel
Rod model: Threaded flange M18 x 1,5 or 3/4"-16 UNF-3A

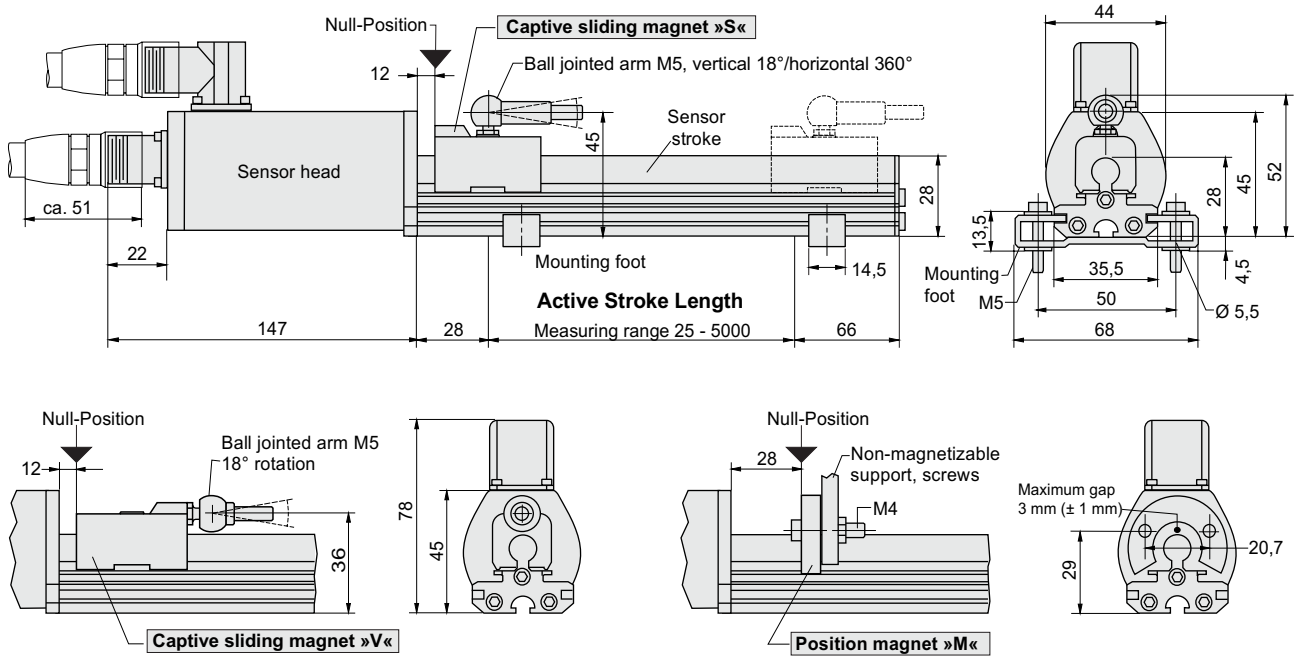
Electrical Connection
Connection Type: Dual 9 pin connector M23 (Interbus norm)
Input voltage: 20 - 30 Vdc (Power consumption < 3W)
Current drain: 70 mA typical
Ripple: < 1 % peak to peak
Electric strength: 500 V (DC ground to machine ground)

TEMPOSONICS are extremely robust sensors, ideal for continuous operation under harshest industrial conditions. The sensor is completely modular in its mechanics and electronics design.
• A profile or rod-shaped **sensor housing** protects the sensor-element in which gives rise to the measurement signal.
• The **sensor head**, a solid diecast aluminum housing, accommodates the complete modular electronic interface with active signal conditioning. Double encapsulation ensures high operating safety and optimum EMC protection.
• The external **position transmitter** is a permanent magnet. It is fitted at the mobile machine part, taken over the sensing element contactlessly without an own energy supply and starts measurement through the sensor's housing wall.
• Electrical connection of the sensors is by dual 9 pin connectors.

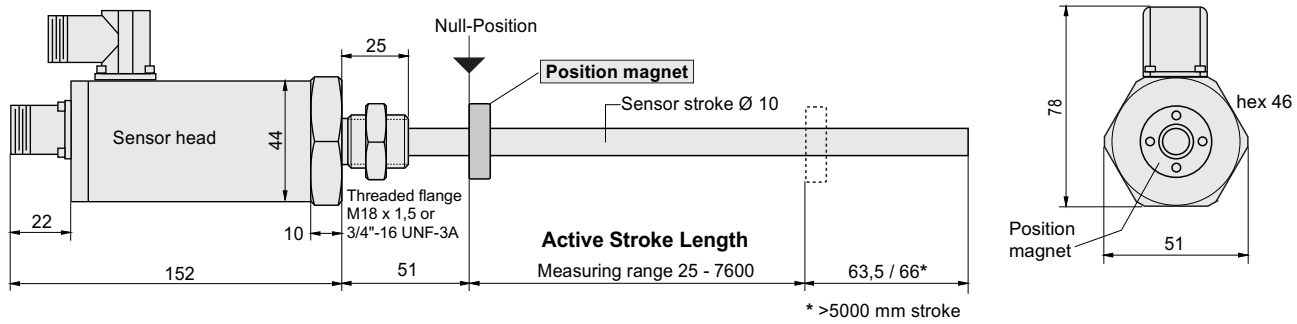
Temposonics-RP, *a stable profile version.*
A robust aluminum profile offers modular construction, flexible mounting configurations, and easy installation. Position measurement is contactless via two versions of permanent magnets.
• A captive sliding magnet running in profile housing rails. Connection 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 permissible misalignment allows a not completely parallel installation.

Temposonics-RH, *a high pressure rod version.*
This sensor with a pressure-resistant stainless steel flange and sensing rod is suitable for use in hydraulic cylinders and in all applications where space is a problem. Position measurement is via ring magnets (open, closed) travelling along the sensing rod without any mechanical contact.
• Advantage: The completely operable sensor cartridge can be replaced easily without opening the fluid circuit.

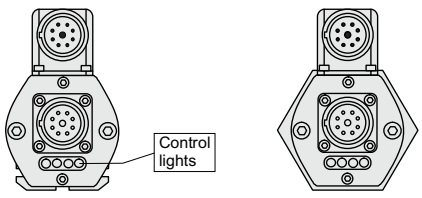
Temposonics-RP, Measuring range 25 - 5000 mm



Temposonics-RH, Measuring range 25 - 7600 mm



Connection typ (Profile / Rod models)



Connector outlet D93
- 9 pin male receptacle M23
- 9 pin female receptacle M23 following Interbus Norm

mm

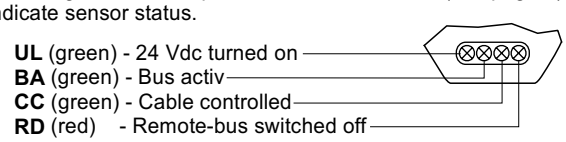
Temposonics position sensors fulfill all requirements of the INTERBUS-S (EN 50254 / DIN E19258). The sensors electronics convert the displacement measurements - proportional to magnet position - into bus oriented outputs and transfer these data directly to the control unit.
The bus interface is appropriate for serial, bit-synchronous data transfer of 500 kBit/s in RS485 standard. The sensor integrated software supports a factory-set customized configuration.
Temposonics sensors provide following features.

Sensor outputs:
- Absolute position measurement
- Sensor status
- Error detection

Data transmission:
- Asynchronous

Selectable parameters:
- Null position: Offset and preset
- Measuring direction: forward / reverse acting
- Resolution
- Filter
- Minimum position numbers (magnets)

Control lights:
Four diagnostic LEDs, placed on connector side (see page 3) indicate sensor status.

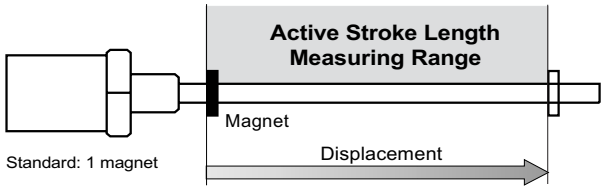


Operation modes

INTERBUS sensors provide measurings with **one** or **multiple** magnets. Following different operation modes are selectable:

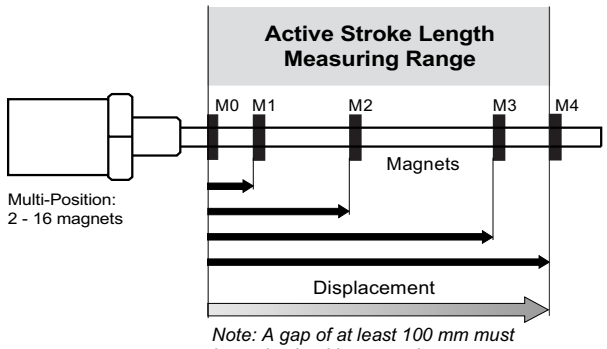
1. Standard measurement

- Displacement with 1 magnet



2. Multi-Positions measurement

- Positions for each of 2 - 16 magnets simultaneous



Note: A gap of at least 100 mm must be maintained between the magnets.

The Multi-Position version of the INTERBUS-S sensors is derived from the standard measurement with one magnet.
For this purpose, the sensor - connected to the remote bus - was extended to 64 bit I/O data with identification code 51 decimal.
During normal measurement operation, the input data determine which magnets shall be output. The numbering starts on sensor head with magnet # 0. The sensor transmits three 16 bit values for the selected magnets.
A minimum number of magnets can be programmed. If a lower number of magnets as specified are detected or in case of other faults, the sensor sets bit 61.

Measurement configuration
With setup bit 63 in the input data, the programming mode compatible to the single magnet version is activated, i.e. only the 32 most significant bits are used.

Data format
80 xx xx xx - reading measurement configuration
C0 aa aa aa - writing measurement configuration a.

Bit definition of Process Data

Bit No.	Name	Function
63	Mode bit	1 = Program / 0 = Measure
62	R/W bit	1 = Write / 0 = Read
61	Error bit	1 = Error / 0 = No error
60	Access bit	1 = Factory access / 0 = Custom access
59-56	Codenibble a	Selected number of position magnet
55-52	Codenibble b	Selected number of position magnet
51-48	Codenibble c	Selected number of position magnet
47-32	Position a	Position values in Codenibble a
31-16	Position b	Position values in Codenibble b
15-0	Position c	Position values in Codenibble c

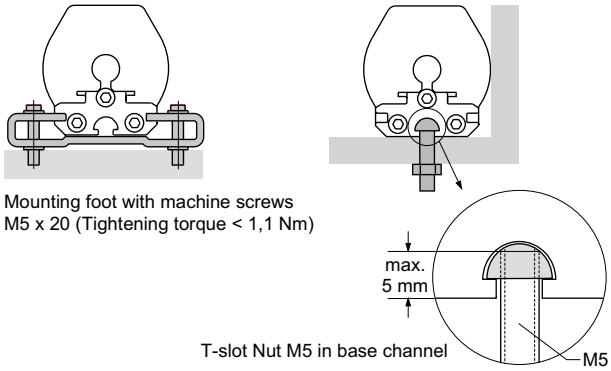
Attention. Ensure the sensor mounting is kept away from strong magnetic and electrical noise-fields.
The sensor may be operated in any position. Normally, the sensor is firmly installed, whilst the magnet head is mounted at the mo-bile machine part and taken over the sensor rod or profile contactlessly.
Note: To avoid damaging of magnet and sensor housing be aware of a careful parallel mounting of the transducer.

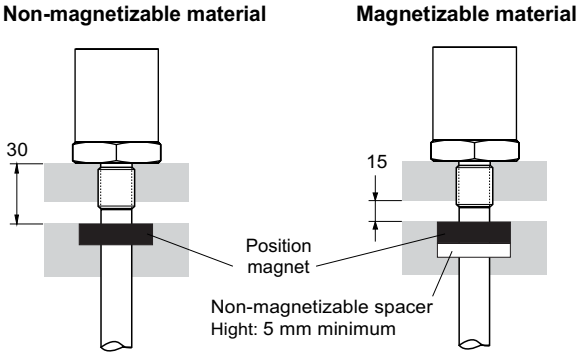
Profile model
The sensor requires at least two mounting feet which simply slide on to the transducer and are held in place with screws M5 x 20 (DIN 6912) or M5 screws in base channel. Mount the floating style magnet using non-magnetizable material and screws.

Rod model
Mount the sensor directly using screws via flange M18 x 1,5 or 3/4"-16-UNF-3A or by means of the nut packed with the sensor. If possible, non-magnetizable material should be used for the sensor mounting component. Taking the mounting dimensions shown right into account is indispensable.

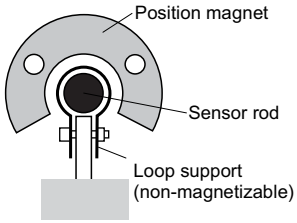
Position magnet
To have a neat magnetic field for measuring, non-magnetizable material must be used for the position magnet mounting components (screws, spacers, etc.).

Horizontal installation
With horizontal mounting, sensors with a measuring length from 1 meter must be provided with mechanical support at the rod end, and with supports distributed regularly over the length if the measuring rod is very long. In this case, open ring magnets must be used as position transmitter.

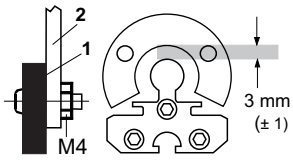




Sample: Sensor support

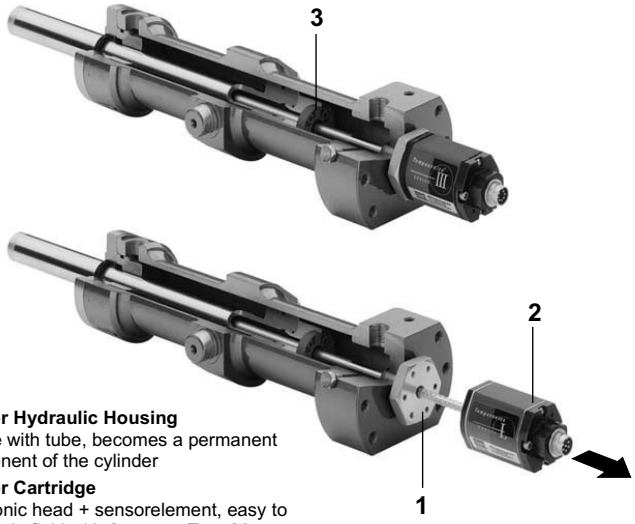


Open Ring magnet



1 Magnet
2 Mounting plate and screws non-magnetizable material

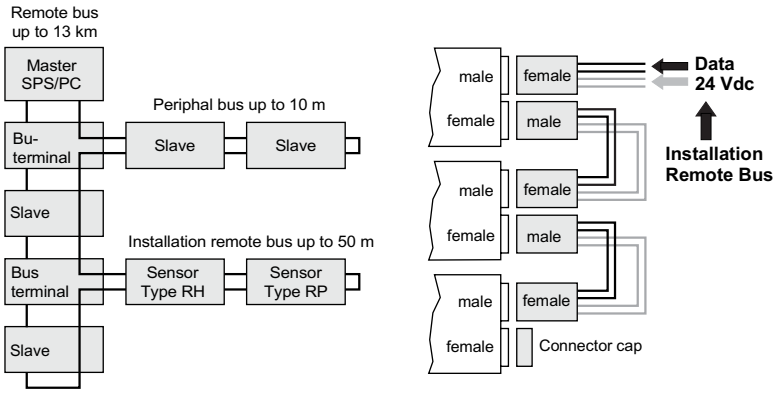
Cylinder installation
Due to its form factor, a Temposonics-RH sensor is excellently suited for direct stroke measurement in a fluid cylinder.
The position magnet, mounted on the piston bottom, drives contactlessly along the measuring stroke and marks exactly the position through the rod wall - independent of the used hydraulic fluid - that guarantees a longlife and trouble-free operation.
Into the pressure-resistant sensor housing (rod with flange), which fits into the bored piston, is the sensor cartridge (electronics head and sensing element) mounted with only two screws. That reduces service costs substantially. If the electronics must be replaced, it is not necessary to open the hydraulic circuit, because the pressure-resistant sensor housing remains in the cylinder and only the sensor cartridge needs to be replaced.



1 Sensor Hydraulic Housing
Flange with tube, becomes a permanent component of the cylinder
2 Sensor Cartridge
Electronic head + sensorelement, easy to replace in field with 2 screws Torx 20
3 Position magnet

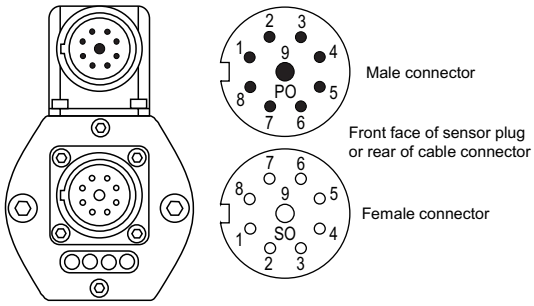
Bus Wiring

The Temposonics sensor with Interbus interface is set as slave, which contents data lines and the 24 Vdc input.
Connectors and cable have to meet the Interbus norm as well as the wiring. The closed-loop-system is shown on the left. A 9 wire go-and-return line connects the different slaves when wiring the installation remote bus. At the forwarding bus cable (connection via the lower female cable connector) Pin 9 has to be connected with Pin 5 on the cable connector. The last slave does not need to be wired at the lower connector (Do not remove the protecting cap). The sensor embedded Interbus-ASIC closes the Interbus-loop at this slave.



Sensor Connections

Connector outlet D93



Dual 9 pin Interbus connectors M23
Male connector (IN), female connector (OUT)

Connector Wiring

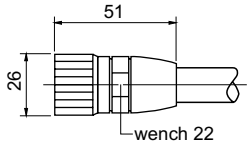
Male connector (IN)

Pin	Function
1	DO
2	$\overline{DO}$
3	DI
4	$\overline{DI}$
5	Gnd
6	PE
7	+24 Vdc
8	0 V
9	n.c.

Female connector (OUT)

Pin	Function
1	DO
2	$\overline{DO}$
3	DI
4	$\overline{DI}$
5	Gnd
6	PE
7	+24 Vdc
8	0 V
9	RBST

Interbus-Cable connector (Pls. order separately)



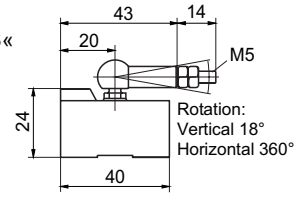
1) 9 pin female connector M23
Part No. ST VRC LBL

2) 9 pin male connector M23
Part No. ST VRC LSR

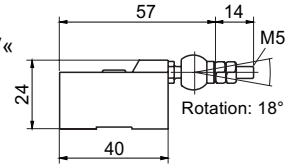
Housing: Zinc diecasting, nickel plated
Termination: Solder
Contact insert: Silver plated
Cable clamp: Pg 9
Cable-Ø: 10 mm max.

Position transmitter

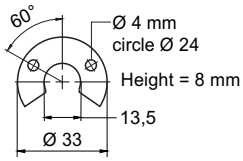
Profile
Captive sliding magnet type »S«
Part No. 252 182



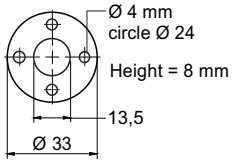
Profile
Captive sliding magnet type »V«
Part No. 252 184



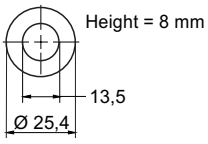
Profile and Rod
Open ring magnet Ø33
Part No. 251 416
Material: PA 66-GF 30, magnets compound-filled, weight ca. 8 g, operating temperature -40...+75° C



Rod
Standard Ring magnet Ø33
Part No. 201 542
Material: PA 66-GF 30, magnets compound-filled, weight ca. 10 g, operating temperature -40...+75° C



Rod
Ring magnet Ø25,4
Part No. 400 533
Material: Composite PA-Ferrit, weight ca. 10 g, operating temperatur -40...+100° C



Pls. order Position magnets for Rod Sensors separately

Position Sensor **Temposonics - xx - x - xxxxM - D93 - 1 - Ixxx - Zxx**

Sensor Model
RP = Profile housing
RH = Hydraulic rod, threaded flange

Style
1. Temposonics-RP (Profile)
S = Captive sliding magnet, joint at top
V = Captive sliding magnet, joint at front
M = Floating magnet, Ø 33 mm (open ring)
2. Temposonics-RH (Rod)
M = Flange, metric thread M18 x 1,5 (Standard)
S = Flange, english thread 3/4" - 16 UNF - 3A

Measuring Range
0025 / 0050 - 5000 mm (Profile models)
0025 / 0050 - 7600 mm (Rod models)

Connection Type
D93 = Dual 9 pin receptacles M23 (male, female)

Input Voltage
1 = +24 Vdc

Output
I101 = Interbus-S, standard measurement
I202 = Interbus-S, Multi-Position measurement

Number of Magnets for Multi-Position measurement I202*
Z02 - Z16 = 2 - 16 pieces

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

Scope of Delivery:
Profile Model
- Sensor
- Captive sliding magnet or floating magnet
- 2 mounting feet up to 1250 mm stroke + 1 mounting foot for 500 mm each

Rod Model
- Sensor
- Hex nut
- Magnets must be ordered separately

Pls. order accessories separately!

Measuring Range:
Profile Model
Standard:
up to 1000 mm in 50 mm steps
up to 5000 mm in 250 mm steps
Option: Other lengths upon request

Rod Model
Standard:
up to 1000 mm in 50 mm steps
up to 7600 mm in 250 mm steps
Option: Other lengths upon request

Acessories	Description	Part No.
	Captive Sliding Magnet Type »S«	252 182
	Captive Sliding Magnet Type »V«	252 184
	Open ring magnet, Ø 33 mm, corresponding magnet type »M«	251 416
	Ring magnet Ø 33 mm, Standard	201 542
	Ring magnet Ø 25,4 mm	400 533
	Mounting foot	400 747
	T-slot Nut M5 for base channel mounting	401 602
	9 pin female cable connector M23	St VRC LBL
	6 pin 90° female cable connector M16	St VRC LSR
	Bus-cable 9 wires	K56

Temposonics-RP & **RH**
Interbus-S

Pioneers,
Innovators,
Leaders in
Magnetostrictive
Position Sensing

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