Temposonics®

Magnetostrictive Position Sensors

MTS SENSORS

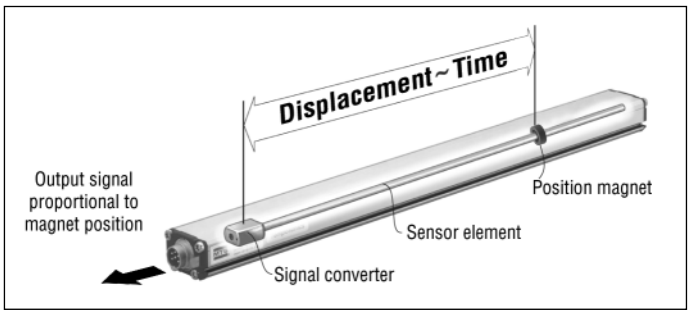
R-Series
Analog

Temposonics RP and RH
Measuring length 50 - 7600 mm

100% field adjustable Null and Span

New: Diagnostic LED

- **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 Analog Output, Displacement + Speed**
- **Dual Magnet Position Measurement**



Magnetostriction	Form factor

The absolute **Temposonics®** linear position sensors are based on the MTS developed magnetostrictive measurement principle. That combines various magneto-mechanical effects and uses the physical hight precise speed-measurement of an ultrasonic wave (torsion pulse in its sensor element) for position detecting. Sensor integrated signal processing transforms the measurements directly into market standard outputs. The contactless principle - an external movable magnet marks the position - eliminates the wear, noise and erroneous signal problems and guarantees the best durability without any recalibration.

The extremely robust sensor, ideal for continuous operation under harshest industrial conditions is completely modular in mechanic and electronic design.

- A profile or 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.

CE ISO 9001 CERTIFIED

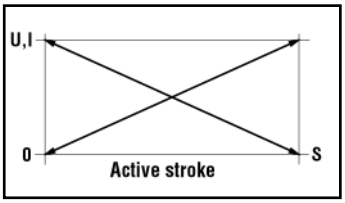
New…a sensor diagnostic display

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

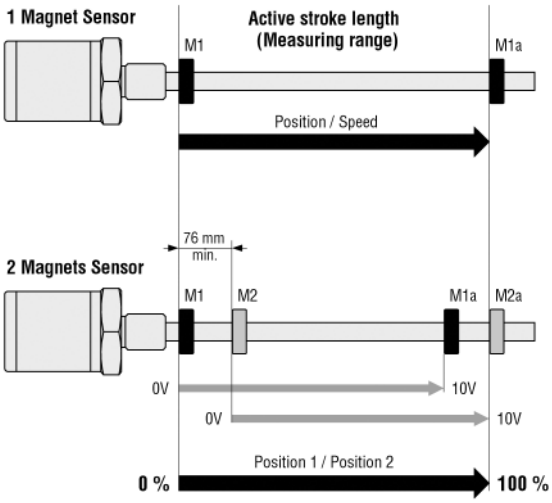
Output

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



Availability

• Single Magnet Sensor provides one 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.



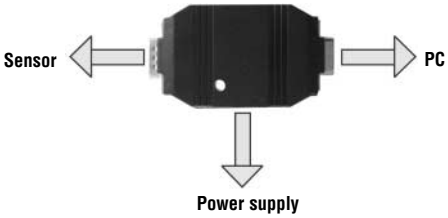
Sensor field programming

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-Analog 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 O/100 % buttons.

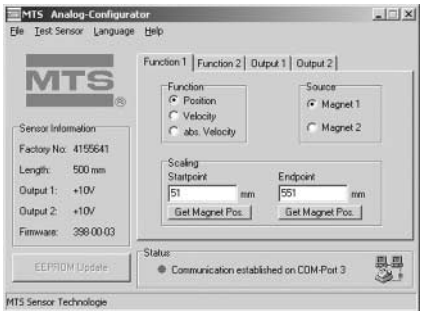
Hand-Programmer R-Analog, Part No. 253 124

2. PC-Programmer R-Analog for 1 or 2 Magnets Sensors
This hardware converter is required to communicate via serial 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
(PC-Programmer, Power supply, Cable, Software)

Windows sensor programming

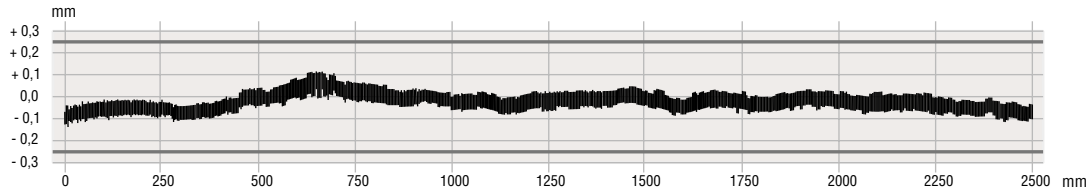


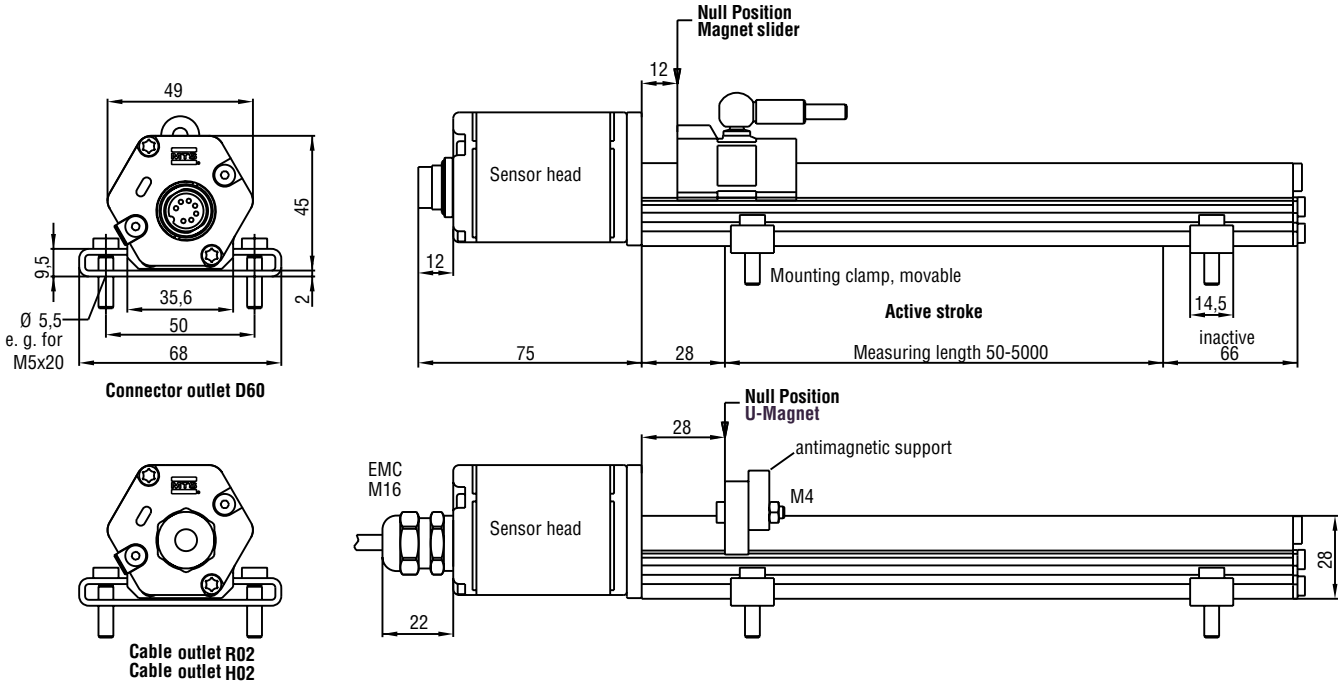
Technical Data

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	15g / 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 2 m cable
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 V (DC ground to machine ground)

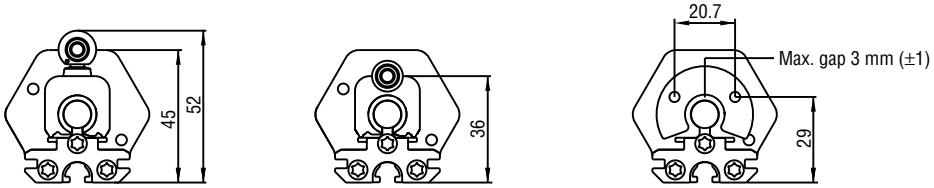
Linearity protocol

Temposonics-RP, stroke 2500 mm
Tolerance allowed: ± 0,25 mm
Tolerance measured: typical ± 0,116 mm
uncorrected





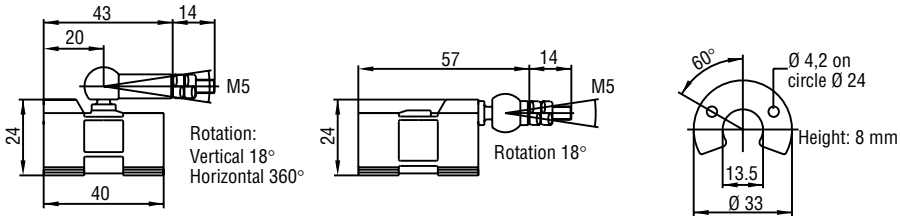
Selection of position magnet (upon delivery)



Magnet slider S
Part No. 252 182

Magnet slider V
Part No. 252 184

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



GFK, Magnet Hardferrite
Weigth ca. 30 g
Operating temperature:
-40 ... +75°C

GFK, Magnet Hardferrite
Weigth ca. 30 g
Operating temperature:
-40 ... +75°C

Composite PA-Ferrite-GF20
Weigth ca. 11g
Operating temperature:
-40 ... +100°C

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 types

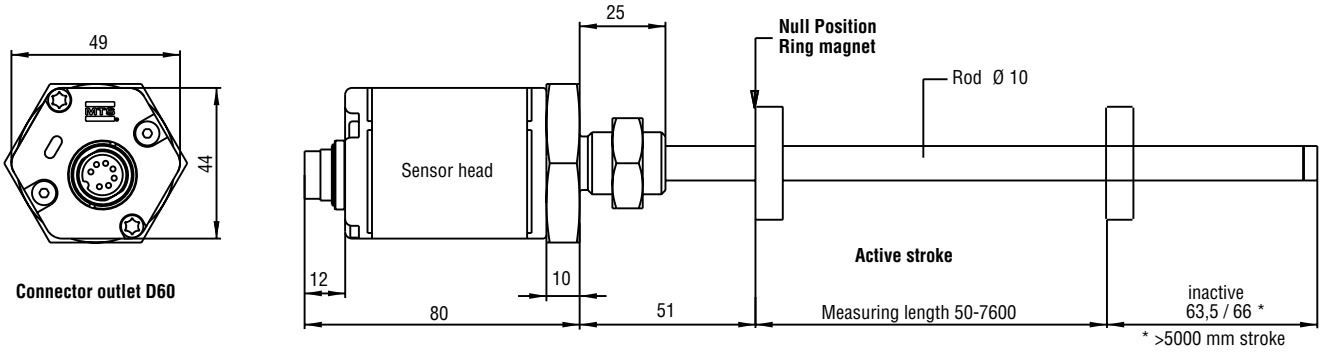
1. Connector outlet D60
6 pin Male receptacle M16

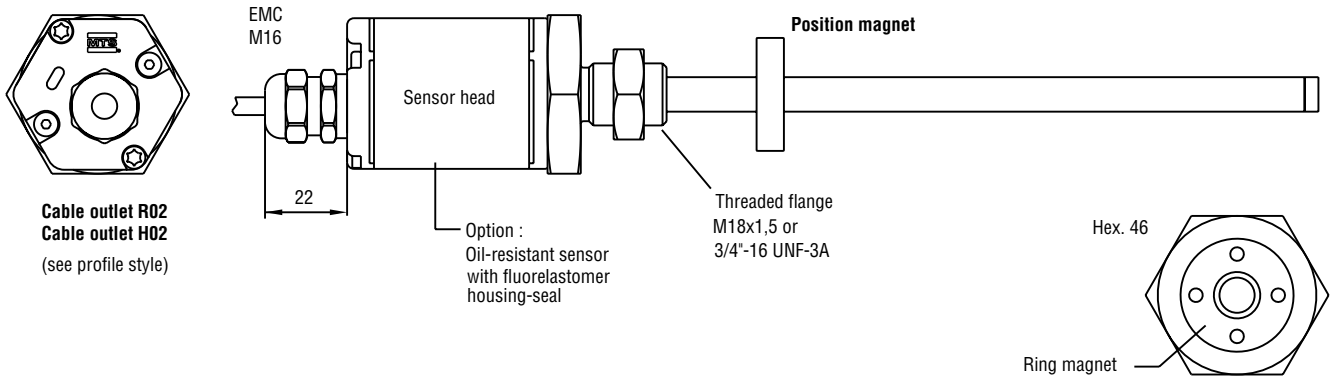
2. Cable outlet R02
2 m PVC cable 3 x 2 x 0,14 mm²
Outer cable dia. 6 mm

3. Cable outlet H02
2 m PUR cable 3 x 2 x 0,25 mm²
Cable Ø 6,8 mm

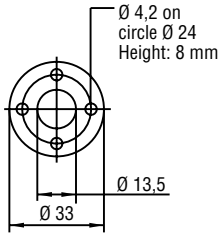
Screened unshielded twisted pair
50 mm bending radius at fixed installation

All measurements in mm



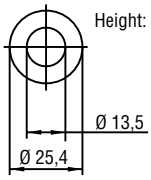


Selection of position magnet (not on delivery)



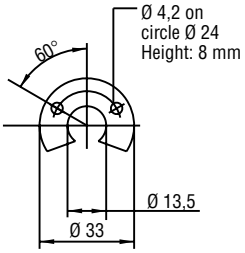
Ring magnet OD33
Part No. 201 542-2

Composite PA-Ferrite-GF20
Weigth ca. 14g
Operating temperature:
-40 ... +100°C



Ring magnet OD25,4
Part No. 400 533

Composite: PA-Ferrite
Weigth ca. 10g
Operating temperature:
-40 ... +100°C



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

Composite PA-Ferrite-GF20
Weigth ca. 11g
Operating temperature:
-40 ... +100°C

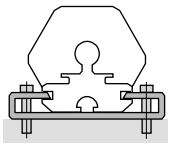
High Pressure Rod Design

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.

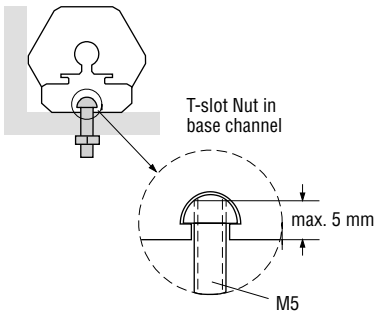
Advantage…
the completely operable sensor cartridge can be replaced for servicing easily without opening the fluid circuit.

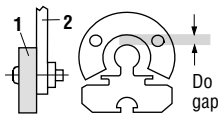
Flexible installation in any position

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 - whilst the magnet is mounted at the mobile machine part.



Mounting clamp with screws M5x20
Tightening torque: max. 5 Nm



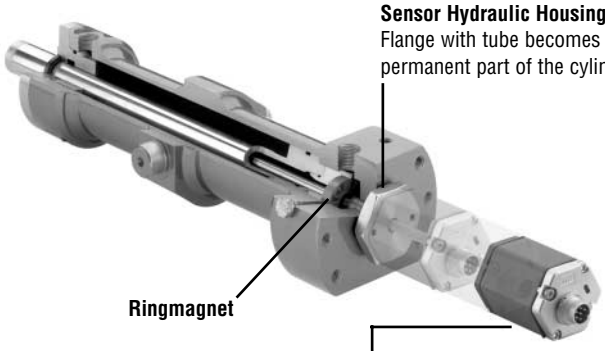


Do not exceed max.
gap of 3 mm (± 1)

1 U-Magnet
2 Mounting plate and screws non-ferrous material

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

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

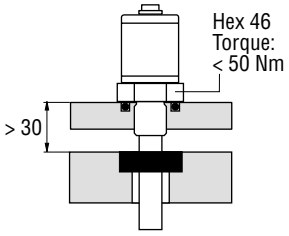


Sensor Hydraulic Housing
Flange with tube becomes a permanent part of the cylinder

Sensor Cartridge
Electronic head + sensor element, easy to replace in field with two screws M4 (2,5 mm hexagon socket)

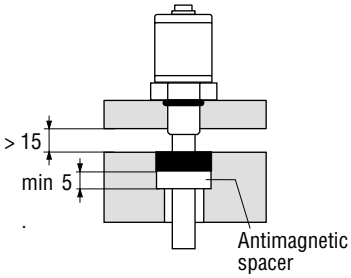
Minimum assembly distance

1. Non-magnetizable material



Recommended hydraulic sealing

2. Magnetizable material



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

Cylinder installation

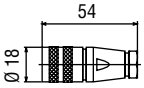
When used for direct stroke measurement in fluid cylinders, the sensor's high pressure, stainless steel rod installs into a bore in the piston head/rod assembly as illustrated. That guarantees a longlife and trouble-free operation - independent of used hydraulic fluid.
The sensor cartridge can be removed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

Wiring

Male insert sensor plug
rear of cable connector

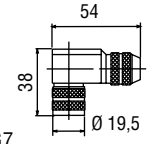
Pin	Cable	Function
1	grey	**Output 1:** Position # 1 0...10 / 10...0 / -10...+10 / +10...-10 V 4(0)...20 / 20...4(0) mA
2	pink	DC Ground
3	yellow	**Output 2:** Position # 2 or Speed 0...10 / 10...0 / -10...+10 / +10...-10 V 4...20 / 20...4 mA
4	green	DC Ground
5	brown	+ 24 VDC (-15/+20 %)
6	white	DC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

Cable connector (recommended, not on delivery)



6 pin female connector M16, PG7
Part No. ST C0 9131 D

6 pin female connector M16, PG9
Part No. ST C0 9131 D06 PG9



6 pin 90° female connector M16
insert adjustable in 45° positions
Part No. ST C0 9131-6

Housing: Zinc nickel plated
Termination: Solder
Contact insert: Silver plated
Cable clamp: PG7
Max. Cable-Ø 6mm
Cable clamp: PG9, M16
Max. Cable-Ø 8 mm

Temposonics [ ][ ] [ ] [ ][ ][ ][ ][ ] **M** [ ][ ][ ] **1** [ ][ ][ ][ ][ ][ ][ ]

3 / 7 digits

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

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

Accessories (selection)	**Part No.**
Magnet slider type »S«	252 182
Magnet slider type »V«	252 184
U-Magnet OD33, corresponding type »M«	251 416-2
Ring magnet OD33, Standard	201 542-2
Ring magnet OD25,4	400 533
O-Ring 15,3 x 2,2 Fluorelastomer FPM 75	401 133
Mounting clamp	400 802
T-slot nut M5 for base channel mounting	401 602
6 pin female cable connector M16, PG7	STC 09131 D
6 pin female cable connector M16,	STC 09131 D06 PG9
6 pin 90°-female cable connector M16,	STC 09131-6
PVC-cable 3 x 2 x 0,14 mm²	K27
PUR-cable 3 x 2 x 0,25 mm²	K59

Accessories (selection)	**Part No.**
MTS-Servicetools	
Hand-Programmer R-Analog	253 124
Cabinet Programmer	253 408
PC-Programmer R-Analog, incl. power supply	253 134
100 - 240 VAC / 24 VDC, connection cable and CD-ROM	

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, hex nut, pls. order magnet sparately.

www.mtssensor.de
www.temposonics-shop.de
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