Temposonics®

Absolute, Non-Contact Position Sensors

R-Series
Analog

Temposonics® RP and RH
Stroke length 50…7600 mm

100% field adjustable Null and Span

- **Rugged industrial sensor**
- **Linear and absolute measurement**
- **LEDs for sensor diagnostics**
- **Non-contact sensing with highest durability**
- **Superior accuracy: Linearity better 0.01 % F.S.**
- **Repeatability 0.001 % F.S.**
- **Direct analog output, position + speed**
- **Dual magnet position measurement**

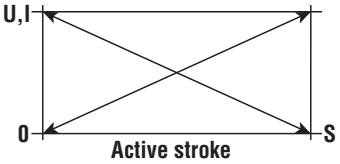
Sensor diagnostic display

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	Magnet out of setup range
Flashing	ON	Programming mode

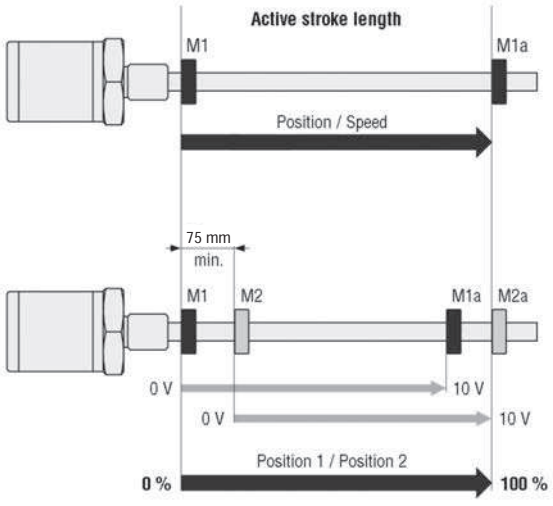
Output

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 position output over the entire active stroke length and one velocity output with 1 magnet.
- Dual magnets sensor provides two identical positions outputs; a separate output is provided før 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:

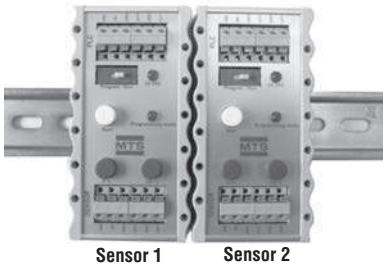
1. Hand-Programmer R-Analog for 1 magnet sensor

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

Hand-Programmer R-Analog, part no. 253 124

2. Cabinet-Programmer R-Analog

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



Cabinet-Programmer R-Analog, part no. 253 408

10 x 55 x 31 mm

3. USB-Programmer R-Analog for 1 or 2 magnet's sensors

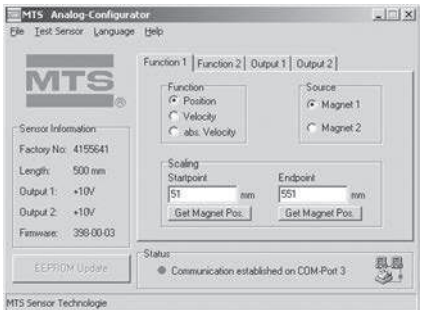
This hardware converter is required to communicate via USB-port of a Windows PC to the sensor. Customized settings are possible by using the MTS programming software (CD-ROM) for:

- 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

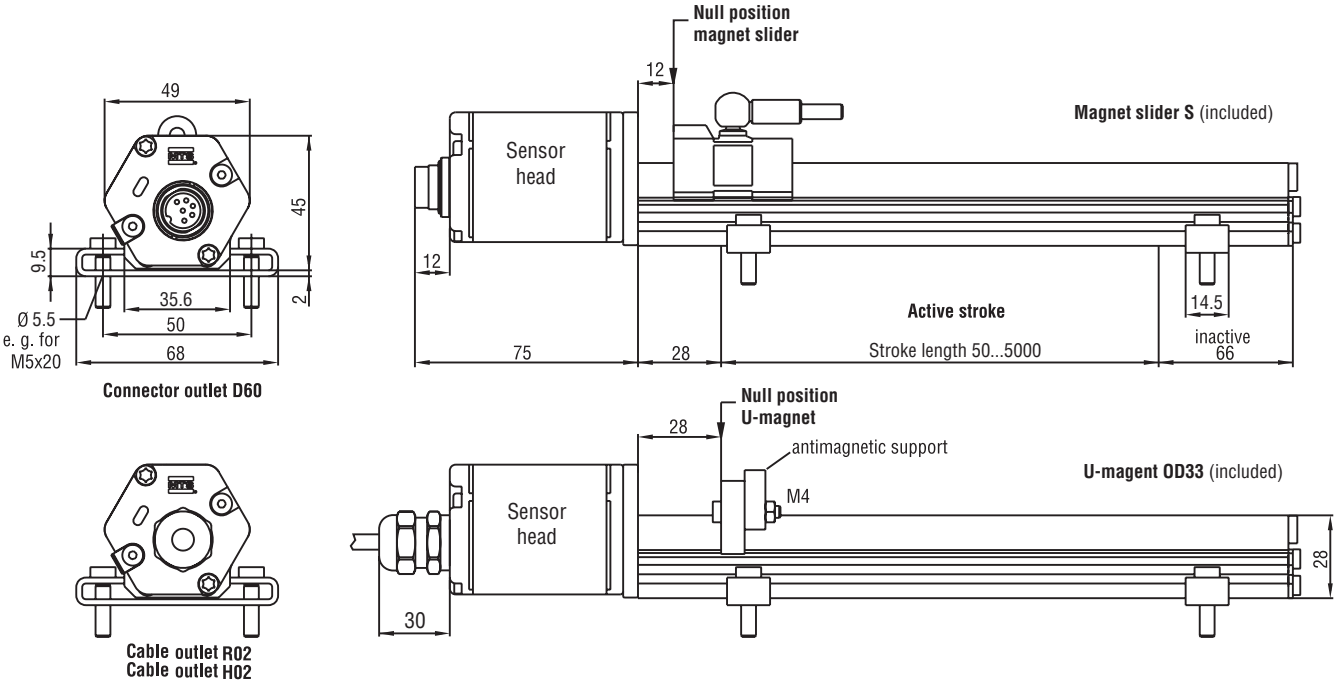
Input	
Measured value	Position, velocity / dual magnet position measurements
Stroke length	Profile: 50…5000 mm, Rod: 50…7600 mm
Output	
Voltage	0…10 / 10…0 / -10…+10 / +10…-10 VDC (min. load controller: > 5 kOhms)
Current	4(0)…20 mA / 20…4(0) mA (min/max. load: 0/500 Ohms)
Accuracy	
Position measurement:	
- Null/Span adjustment	100 % of electrical stroke (min. range 25 mm)
- Resolution	16 bit; 0.0015 % (Minimum 1 µm)
- Linearity	< ± 0.01 % F.S. (Minimum ± 50 µm)
- Repeatability	< ± 0.001 % F.S. (Minimum ± 1 µm)
- Hysteresis	< 4 µm
- Update time	0.5 ms up to 1200 mm / 1.0 ms up to 2400 mm / 2.0 ms up to 4800 mm / 5.0 ms up to 7600 mm stroke length
- Ripple	< 0.01 % F.S.
Velocity measurement:	
- Range	0.025 - 10 m/s
- Deviation	< 0.5 %
- Resolution	0.1 mm/s Option 0.01 mm/s
- Update time (ms)	see position measurement
Temperature coefficient	< 30 ppm/°C
Operating conditions	
Magnet speed	any
Operating temperature	-40 °C…+75 °C
Dew point, humidity	90% rel. humidity, no condensation
Ingress protection[1]	Profile: IP65, Rod: IP67, IP68 for cable outlet, RS: IP69K
Shock test	100 g single hit, IEC-Standard 60068-2-27
Vibration test	15 g / 10 - 2000 Hz, IEC-Standard 60068-2-6
Standards, EMC test	Electromagnetic emission EN 61000-6-4 Electromagnetic immunity EN 61000-6-2 EN 61000-4-2/3/4/6, Level ¾, Criterium A, CE-qualified
Design, material	
Diagnostic display	LEDs beside connector
Profile model:	
Sensor head	Aluminum
Sensor stroke	Aluminum
Position magnet	Magnet slider or removable U-magnet
Rod model:	
Sensor head	Aluminum
Rod with flange	Stainless steel 1.4301 / AISI 304
Pressure rating	350 bar, (700 bar peak) for hydraulic rod
Position magnet	Ring magnets, U-magnets
Installation	
Mounting position	any orientation
Profile	Movable mounting clamps fixed with M5 x 20 screws or T-slot nuts M5 in base channel
U-magnet, removable	Mounting plate and screws from antimagnetical material
Rod	Threaded flange M18 x 1.5 or ¾" -16 UNF-3A, Hex nut M18
Position magnet	Mounting plate and screws from antimagnetical material
Electrical connection	
Connection type	6 pin connector M16 or cable outlet
Supply voltage	24 VDC (-15 / +20 %); connection to an approved power supply with energy limitation (IEC 61010-1) resp. class 2 according to National Electric Code (USA) / Canadian Electric Code
- Polarity protection	up to -30 VDC
- Overvoltage protection	up to 36 VDC
Current drain	100 mA typical
Ripple	≤ 0.28 Vpp
Electric strength	500 VDC (DC ground to machine ground)

[1] The IP rating is not part of the UL approval

Stable profile design

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

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



Wiring	Pin	Cable	Function
	1	grey	**Output 1:** Position #1 0...10/10...0/-10...+10/+10...-10 V 4(0)...20/20...4(0) mA
	2	pink	DC Ground
	3	yellow	**Output 2:** Position #2 or velocity 0...10/10...0/-10...+10/+10...-10 V 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 included in delivery (see chapter accessories)

Position magnets
Magnet slider S (part no. 252 182)
Magnet slider V (part no. 252 184)
U-magnet OD33 (part no. 251 416-2)

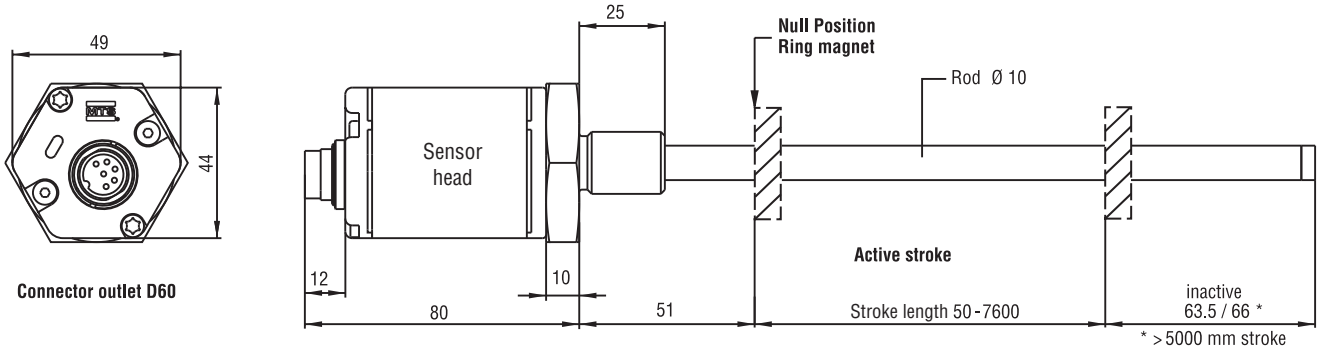
Connection types
6 pin female connector (part no. 370 623)
6 pin female connector M16, 90° (part no. 370 460)

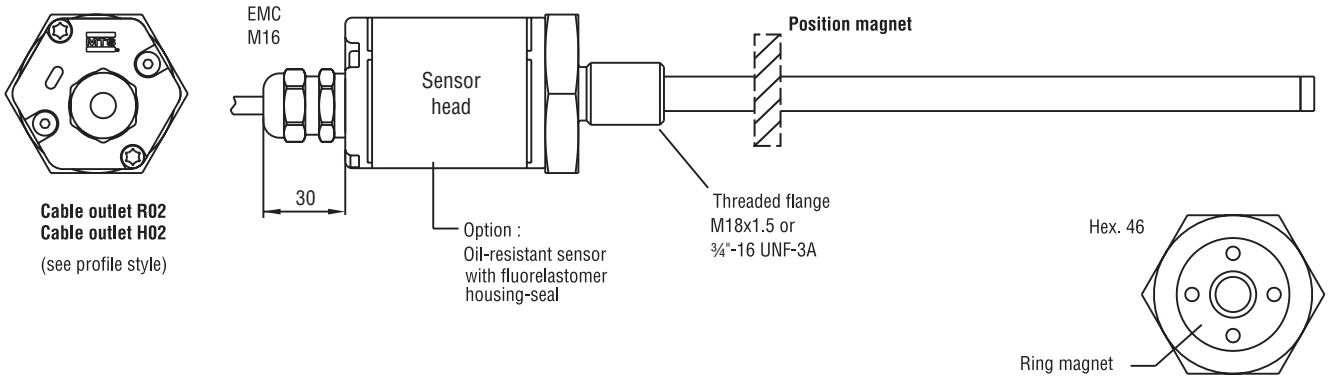
High pressure rod design

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

Advantage

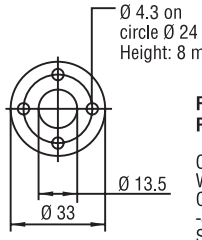
the completely operable sensor cartridge can be replaced for servicing easily without opening the fluid circuit.





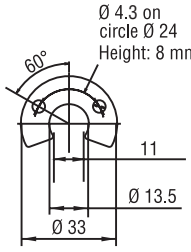
= Magnets must be ordered separately (details see chapter accessories)

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



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 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
6 pin female connector (part no. 370 623)
6 pin female connector M16, 90° (part no. 370 460)

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

3 / 7 digits

Sensor model
RP - Profile
RH - Hydraulic rod

Design
Profile Temposonics® RP:
S - Magnet slider, joint at top
V - Magnet slider, joint at front
M - U-magnet, OD33
Rod Temposonics® RH:
M - Flange M18 x 1.5 (Standard)
V - Flange M18 x 1.5 (Fluorelastomer housing-seal)
D - Flange M18 x 1.5 with bushing on rod end
R - Flange M18 x 1.5 with thread M4 at rod end
J - Flange M22 x 1.5, rod Ø 12.7 mm, 800 bar
S - Flange ¾" - 16 UNF - 3A

Stroke length
Profile - 0050…5000 mm
Rod - 0050…7600 mm
Standard: See chart
Other length upon request.

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

Supply voltage
1 - +24 VDC
A - +24 VDC, high vibration resistant (stroke length 25…2000 mm)

Output

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

Included in delivery rod model:
Sensor and O-ring.
Magnets must be ordered separately.

1 Output with 1 magnet

Output 1 (position magnet 1)

V01 = 0…10 VDC	**A01** = 4…20 mA
V11 = 10…0 VDC	**A11** = 20…4 mA
V21 = -10…+10 VDC	**A21** = 0…20 mA
V31 = +10…-10 VDC	**A31** = 20…0 mA

2 Outputs with 2 magnets

Output 1 (position magnet 1)	+ Output 2 (position magnet 2)
V02 = 0…10 VDC	0…10 VDC
V12 = 10…0 VDC	10…0 VDC
V22 = -10…+10 VDC	-10…+10 VDC
V32 = +10…-10 VDC	+10…-10 VDC
A02 = 4…20 mA	4…20 mA

Stroke Length Standard RP	
Stroke length	**Ordering steps**
≤ 500 mm	25 mm
500…2500 mm	50 mm
2500…5000 mm	100 mm

2 Outputs with 1 magnet

Output 1 (position magnet 1) + Output 2 (absolute speed magnet 1)

Magnet direction >>>>>	Head Null Tip
V01 xxx.x = 0…10 VDC	+10.....0.....+10 VDC
V11 xxx.x = 10…0 VDC	+10.....0.....+10 VDC
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 VDC	-10.....0.....+10 VDC
V71 xxx.x = 10…0 VDC	+10.....0.....-10 VDC
A41 xxx.x = 4…20 mA	4.....12..... 20 mA

Stroke Length Standard RH	
Stroke length	**Ordering steps**
< 500 mm	5 mm
500…750 mm	10 mm
750…1000 mm	25 mm
1000…2500 mm	50 mm
2500…5000 mm	100 mm
> 5000 mm	250 mm

Output 1 (position magnet 1) + Output 2 (position magnet 1)
V03 = 0…10 VDC 10…0 VDC

Output 1 (position magnet 1) + Output 2 (electronics temperature)
A04 = 4…20 mA 4…20 mA (-40°C…+100°C)

Fill in blanks (xxxx) 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 VDC) = V01 0055
- Speed range 2: 25…90 mm/s (1025…1090)
Sample: (-50…0…50 mm/s = 4…12…20 mA) = A41 1050

Accessories page 67 and following.