Temposonics®

Absolute, Non-Contact Position Sensors

Data Sheet
R-Series SSI

Temposonics® RP and RH
Stroke length 25…7600 mm

Perfect data processing
0.5 µm

- Rugged industrial sensor
- Linear and absolute measurement
- LEDs for sensor diagnostics
- Non-contact sensing with highest durability
- Superior accuracy: Resolution up to 0.5 µm
- Linearity better 0.01 % F.S.
- Repeatability 0.001 % F.S.
- Direct SSI output, Gray/binary
- Synchronous measurement for real-time sensing

Discontinued

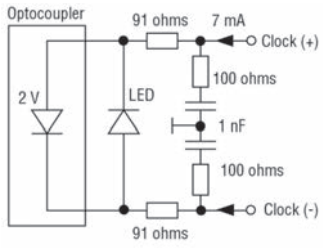
Sensor diagnostic display

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

Sensor input



SSI (Synchronous Serial Interface)

The sensors fulfill all requirements of the SSI standard for absolute encoders. Its position value is encoded in a binary format and transmitted at high speed to the control device.

MTS offers the ideal solution for high dynamic applications by using different synchronisation modes. Corresponding to the application you can choose the following modes:

Async

In asynchronous mode the Temposonics® SSI sensor support the PLC with position values as fast as possible. The sensor works independently (free running mode).

Syn1

In synchronous mode 1 the output of the Temposonics® SSI sensor is matched to the data request cycle of the controller. The contouring error is as small as possible, the delay is equal to the cycle time of the sensor's stroke.

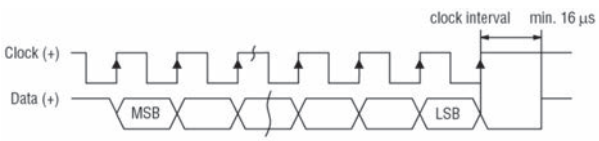
Syn2

The synchronous mode 2 is most suitable for applications where the polling cycle of the controller can be faster than the measurement cycle time of the Temposonics® SSI sensor. The values for the PLC will be oversampled up to 10 kHz. The delay is similar to the asynchronous mode.

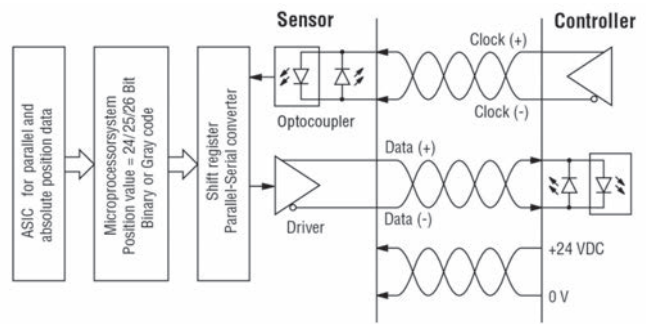
Syn3

The function of the synchronous mode 3 is similar to Syn2 but here any delay will be compensated.

Timing diagram



Logic diagram



Sensor field 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

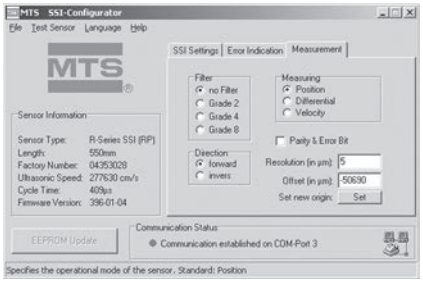
This hardware converter is required to communicate via USB-port of Windows PC to the sensor. Customized settings are possible by using a MTS programming software (CD-ROM) for:

- *Data length*
- *Data format*
- *Resolution*
- *Measuring direction*
- *Synchronous / asynchronous measurement*
- *Offset, begin of the measurement range*
- *Alarm value (Magnet missing)*
- *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

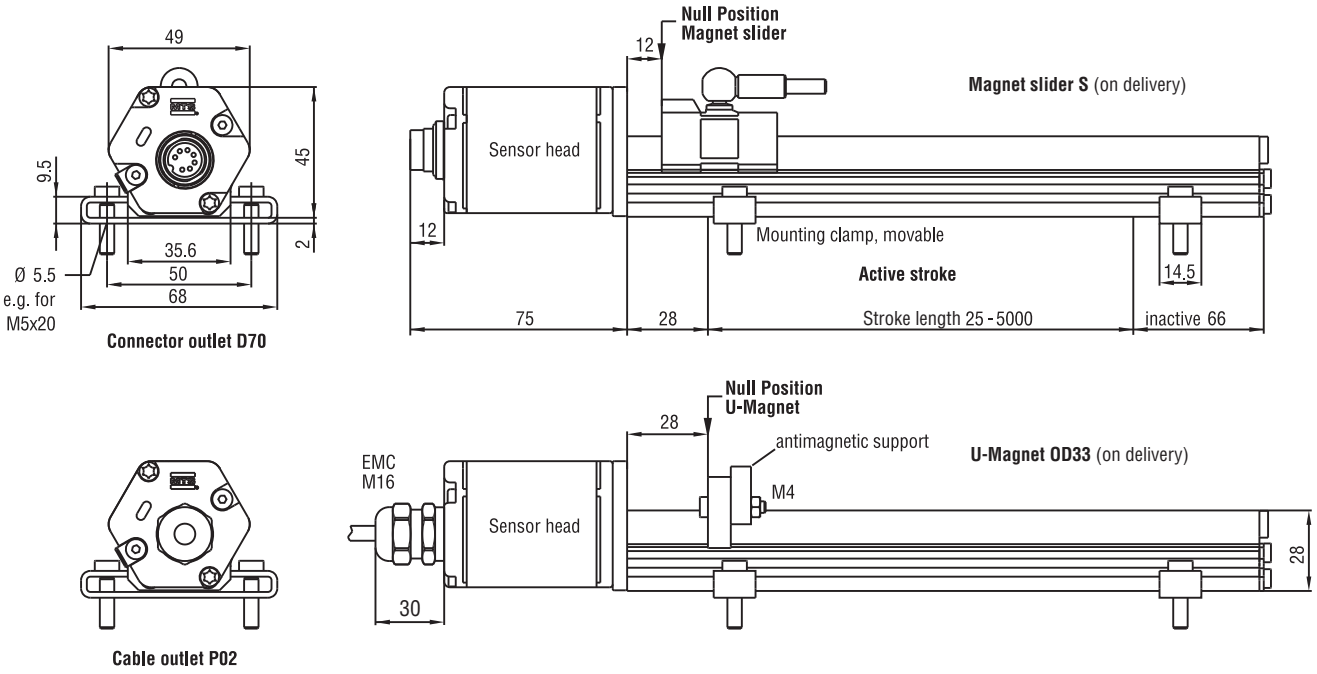
Input	
Measured value	Position, position difference between 2 magnets, velocity, internal temperature
Stroke length	Profile 25…5000 mm / Rod 25…7600 mm
Output	
Interface	SSI (Synchronous Serial Interface) - differential signal in SSI standard (RS 422)
Data format	Binary or Gray, optional Parity and Errorbit and internal temperature
Data length	8…32 bit
Update time	Stroke length 300 750 1000 2000 5000 mm Measurement rate 3.7 3.0 2.3 1.2 0.5 kHz
Data speed	70 kBaud*…1 MBaud, depending on cable length: Length < 3 < 50 < 100 < 200 < 400 m Baud rate 1 MBd < 400 kBd < 300 kBd < 200 kBd < 100 kBd
Accuracy	
Resolution	Position: 0.5 µm, 2 µm, 5 µm, 10 µm i.a. / velocity over 10 measured values: 0.1 mm/s (at 1 ms cycle time)
Linearity	< ± 0.01 % F.S. (minimum ± 40 µm) Option internal linearization Linearity tolerance: RP/RH < 300 mm: typ. ± 15 µm, max. ± 25 µm, > 300…600 mm: typ. ± 20 µm, max. ± 30 µm > 600…1200 mm: typ. ± 30 µm, max. ± 50 µm RP 1200…3000 mm: typ. ± 45 µm, max. ± 90 µm, 3…5 m: typ. ± 85 µm, max. ± 150 µm
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
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 Option: Vibration resistant 30 g (av)
Standards, EMC test	Electromagnetic emission EN 61000-6-4 Electromagnetic immunity EN 61000-6-2 EN 61000-4-2/3/4/6, Level 3/4, 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 option: 800 bar, 1200 bar peak hydraulic rod
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 ¾" -16 UNF-3A
Position magnet	mounting plate and screws from antimagnetical material
Electrical connection	
Connection type	7 pin connector M16 or cable outlet
Supply voltage	24 VDC (-15 / +20 %); UL Recognition requires an approved power supply with energy limitation (UL 61010-1), or Class 2 rating according to the National Electrical Code (USA) / Canadian Electrical Code.
- Polarity protection	up to -30 VDC
- Overvoltage protection	up to 36 VDC
Current drain	100 mA typical
Ripple (LF)	≤ 0.28 Vpp
Electric strength	500 VDC (DC ground to machine ground)

[1] The IP rating is not part of the UL recognition
* with standard monoflop of 16 µs

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	Data (-)
	2	pink	Data (+)
	3	yellow	Clock (+)
	4	green	Clock (-)
	5	brown	+24 VDC
Male insert sensor plug rear of cable connector	6	white	0 V (GND)
	7	do not connect	

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)

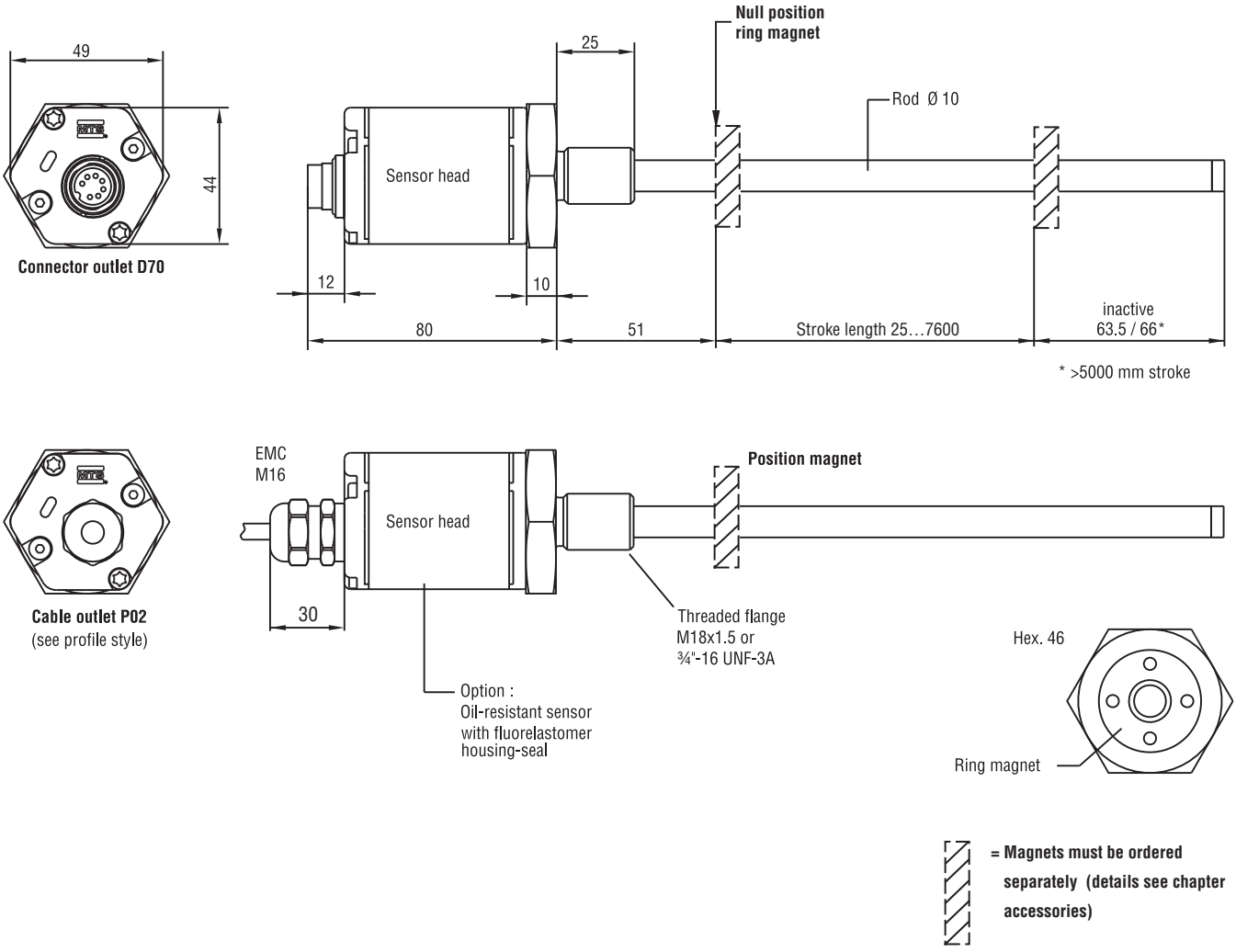
Connection types
7 pin female connector M16 (part no. 370 624)
7 pin female connector M16, 90° (part no. 560 779)

High pressure rod design

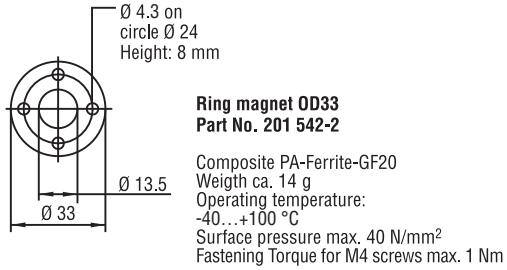
Temposonics® RH with a pressure-resistant stainless steel flange and sensing rod is suitable for use in hydraulic cylinders and externally in all applications where space is a problem. Position measurement is via ring or U-magnets travelling along the sensing rod without any mechanical contact.

Advantage…

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

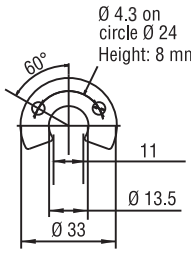


Standard position magnets (not included in delivery, please order seperatly)



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 I

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
7 pin female connector M16 (part no. 370 624)
7 pin female connector M16, 90° (part no. 560 779)

Temposonics®

								M				1	S											
														[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]		

Sensor model
RP - Profile
RH - Rod

Design
Profile Temposonics® RP:
S - Magnet slider, joint at top
V - Magnet slider, joint at front
G - Magnet slider, joint at top, blacklash free
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 Standard RP	
Stroke length	**Ordering steps**
≤ 500 mm	25 mm
500…2500 mm	50 mm
2500…5000 mm	100 mm

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

Stroke length
Profile - 0025…5000 mm
Rod - 0025…7600 mm
Standard: See chart
Other 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)

Supply voltage / Conditions of use
1 - +24 VDC
A - +24 VDC / vibration resistant (stroke length 25…2000 mm)

Output
S [1][2][3][4][5][6][7][8][9] = 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 • **8** - 0.001 • **9** - 0.0005
[4] Performance: **1** - Standard • **8** - Noise reduction filter (8 values) • **D** - No filter + error delay 10 cycles
G - Noise reduction filter (8 values) + error delay 10 cycles • **K** - Peak reduction filter (8 values)
N - Peak reduction filter (8 values) + error delay 10 cycles
[5][6] Signal options: **00** - Measuring direction forward
01 - Measuring direction reverse
02 - Measuring direction forward, synchronised measurement
05 - Measuring direction forward, Bit 25 = Alarm, Bit 26 = Parity even
16 - Measuring direction forward, internal linearization
99 - for optional further combinations (use next fields **[7]**,**[8]**,**[9]**)

[7] Measurement contents **1** - Position • **2** - Differential • **3** - Velocity • **4** - Position + temperature (only with data length = 24 bit)
5 - Differential + temperature (only with data length = 24 bit) • **6** - Velocity + temperature (only with data length = 24 bit)
[8] Direction and sync. mode **1** - Forward async • **2** - Forward sync1 • **3** - Forward sync2 • **4** - Forward sync3 • **5** - Reverse async • **6** - Reverse sync1
7 - Reverse sync2 • **8** - Reverse sync3
[9] Internal linearization & communication diagnostics **0** - No further option • **1** - Linearity Correction Option • **2** - Additional alarm bit + parity even bit (not available for temperature output, only data length 26 bit) **4** - Additional alarm bit + parity even bit and Linearity Correction Option (not available for temperature output, only data length 26 bit)

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. Use signed magnets for sensors w/LCO

Accessories page 67 and following.

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