Data Sheet

L-Series Start-Stop Interface
Magnetostrictive Linear Position Sensors

High Pressure Stainless Steel Sensor with 100°C Electronics

Linear, Absolute Measurement
Contactless Sensing with Highest Durability
Rugged Industrial Sensor, EMC shielded and CE certified
Linearity Tolerance better 0,02 %
Repeatability 0,001 %
Start/Stop Pulse Transmission
Operating Temperature up to 100°C
Magnetostriction

The absolute Tempsonics\textsuperscript{\textregistered} linear position sensors are based on the MTS developed magnetostrictive measurement principle. That combines various magneto-mechanical effects and uses the physical height 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.

Technical Data

<table>
<thead>
<tr>
<th>Input</th>
<th>Measured variable</th>
<th>Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>50 - 3000 mm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>Start-Stop pulse</th>
<th>RS 422 differential signal</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>Resolution: 0.1 mm / 0.01 mm / 0.005 mm (controller dependent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Linearity: &lt; ± 0.02 % F.S. (Minimum ± 50 μm)</td>
</tr>
<tr>
<td></td>
<td>Repeatability: &lt; ± 0.001 % F.S.</td>
</tr>
<tr>
<td></td>
<td>Update frequency: Controller dependent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating conditions</th>
<th>Magnet speed: Any</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating pressure</td>
<td>350 bar (530 bar peak pressure)</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-40 °C ... +100 °C</td>
</tr>
<tr>
<td>Dew point, humidity</td>
<td>90% rel. humidity, no condensation</td>
</tr>
<tr>
<td>Sealing</td>
<td>IP67 if mating connector is correctly fitted</td>
</tr>
<tr>
<td>Shock test</td>
<td>100 g single hit, IEC-Standard 68-2-27</td>
</tr>
<tr>
<td>Vibration test</td>
<td>10 g / 10 - 2000 Hz, IEC-Standard 68-2-6</td>
</tr>
<tr>
<td>Norms, EMC test</td>
<td>Electromagnetic emission EN 50081-1</td>
</tr>
<tr>
<td></td>
<td>Electromagnetic immunity EN 50082-2</td>
</tr>
<tr>
<td></td>
<td>EN 61000, Criteria A, CE-qualified</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Form factor, material</th>
<th>Sensor head: Aluminum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rod with flange: Stainless steel 1.4301 / AISI 304</td>
</tr>
<tr>
<td></td>
<td>Position transmitter: Ring- or U-Magnet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installation</th>
<th>Mounting position: Any</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rod: Threaded flange M18 x 1.5 or 3/4&quot; -16 UNF-3A, hex nut M18</td>
</tr>
<tr>
<td></td>
<td>Magnet: Mounting plate and screws: amagnetic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical connection</th>
<th>Connection type: 6 pin connector M16 or 2 m cable outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Input voltage: 24 VDC (-15 / +20 %)</td>
</tr>
<tr>
<td></td>
<td>Current consumption: 100 mA typical</td>
</tr>
<tr>
<td></td>
<td>Ripple: &lt; 1 % peak-peak</td>
</tr>
<tr>
<td></td>
<td>Electric strength: 500 V (DC ground to machine ground)</td>
</tr>
</tbody>
</table>

Operating principle:
Magnetostrictive ultrasonic speed measurement = Position sensing
Formfactor

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

- A rod-shaped sensor housing protects the sensing element in which gives rise to the measurement signal.
- The sensor head accommodates the complete modular electronics 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.

Temposonics-LH ... high pressure rod design

Measuring length 50 - 3000 mm
Temposonics-LH with 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.

Connection types

Connector outlet D600
6 pin male connector M16

Cable outlet R002
Max. operating temperature: 70° C
6 wires PVC cable, 3 x 2 x 0,14 mm²
shield, cable-Ø 6 mm, bending radius
50 mm at fixed installation

Cable outlet T002
Max. operating temperature: 150° C
8 wires Teflon cable, 4 x 2 x 0,25 mm²
shield, cable-Ø 7,5 mm, bending radius
75 mm at fixed installation

Available position magnets (pls. order separately)

Ring magnet OD33 (standard)
Part No. 201 542-2
Height: 8 mm
Composite PA-ferrite-GF20
weight ca. 14 g, operating temperature -40...+100° C

U-magnet OD33
Part No. 251 416-2
Height: 8 mm
Composite PA-ferrite-GF20
weight ca. 11 g, operating temperature -40...+100° C

Ring magnet OD25,4
Part No. 400 533
Height: 8 mm
Composite PA-Ferrite, weight ca. 10 g, operating temperature -40...+100° C
Start/Stop output

Digital Temposonics-LH is equipped with a start/stop output. The sensor requires a start signal from an external indicator in the control system and returns a signal corresponding to the magnet position. The time elapsed between the two signals is proportional to the magnet position, i.e. to the displacement. Time measurement is by the controller and used for calculating the position value.

Logic diagram

![Logic diagram](image)

Linearity protocol

![Linearity protocol](image)

Sensor Temposonics-LH, stroke length 1000 mm
Tolerance allowed: ± 0.2 mm
Tolerance measured: ± 0.09 mm uncorrected
Variable mounting in any position

Rod
Mount the sensor directly via flange 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 measurement, antimagnetic material must be used for the position magnet mounting component (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.

Hydraulic sealing
Recommended is sealing of the flange facing with an O-Ring (e.g. 22.4 x 2.65) in a cylinder cover nut.

Minimum assembly distance

1. Non-magnetizable material

   Hex 46
   Tightening torque < 50 Nm

   Recommended
   sealing

   Magnet

2. Magnetizable material

   > 15
   min. 5

   Nonferrous spacer

Sample: Sensor support

Cylinder installation

Due to form factor, a rod sensor is excellently suited for direct stroke measurement in fluid cylinders. The magnet, mounted on the piston bottom, drives contactlessly along the stroke and marks exactly the position through the rod wall - independent of the used hydraulic fluid - that guarantees a longlife and trouble-free operation.

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.

Notes

• Magnet must not slide along the sensor tube
• Bore in the piston rod and type of sealing depends on pressure and piston velocity (13 mm min.)
• Do not exceed peak pressure
• Protect sensor rod from wear
**Wiring**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable color</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>gray</td>
<td>Stop (-)</td>
</tr>
<tr>
<td>2</td>
<td>pink</td>
<td>Stop (+)</td>
</tr>
<tr>
<td>3</td>
<td>yellow</td>
<td>Start (+)</td>
</tr>
<tr>
<td>4</td>
<td>green</td>
<td>Start (-)</td>
</tr>
<tr>
<td>5</td>
<td>brown</td>
<td>+ 24 Vdc (±10 %)</td>
</tr>
<tr>
<td>6</td>
<td>white</td>
<td>DC Ground (0 V)</td>
</tr>
</tbody>
</table>

View:
Front face of sensor plug
rear of mating connector

**Mating connectors** (recommended, not on delivery)

6 pin female connector M16, PG 7
Part No. STC0 9131 D

6 pin female connector M16, PG 9
Part No. STC0 9131 D06 PG9

6 pin 90° female connector M16
Insert adjustable in 45° positions
Part No. STC0 9131-6

Housing: Zinc, nickel plated
Termination: Solder
Contact insert: Silver plated
Cable clamp: PG 7 / 9
Ordering Code

Position sensor Temposonics

Sensor model

Form factor:
M - Flange M18 x 1.5 (Standard)
S - Flange 3/4" - 16 UNF - 3A

Connection type:
D600 - 6 pin connector M16
R002 - 2 m PVC cable w/o connector, Option: R001-R010 (1-10 m)
T002 - 2 m Teflon cable w/o connector, Option: T001-T010 (1-10 m)

Measuring range:
0050...3000 mm
Standard: up to 1000 in 50 mm, greater 1000 in 250 mm steps
Other length upon request

Input voltage
2 - +24 VDC

Output:
R2 - Start-Stop (100° C)

On delivery: Sensor, hex nut, pls. order magnet (see below) separately.

Accessories | Part-Nr.
--- | ---
Ring magnet OD33, Standard | 201 542-2
Ring magnet OD25,4 | 400 533
U-Magnet OD33 | 251 416-2
6 pin mating connector M16, PG7 | ST C0 9131D
6 pin mating connector M16, PG9 | ST C0 9131D06 PG9
6 pin 90° female mating connector M16 | ST C0 9131-6
PVC cable 3 x 2 x 0,14 mm² | K27
Teflon cable, temperature resistance 100° C, 4 x 2 x 0,25 mm² | K34