L-Series Analog + Digital
Magnetostrictive Linear Position Sensors

- Absolute Sensor
- Non-contact Measurement
- Modular Construction
- Stable Design
- Highest Durability
- Measuring Range: 50 - 5000 mm
- Linearity: Better 0.02 %
- Repeatability: 0.001 %
- Direct Analog Output (V/mA): 100% field adjustable
- Digital Pulse Output, Start-Stop
The absolute Temposonics linear position sensors are based on the Temposonics developed magnetostrictive measurement principle. That combines various magneto-mechanical effects and uses the physical high precise speed-measurement of an ultrasonic wave (torsion pulse in its sensor element) for position detecting. The integral signal processing transforms the measurements into analogue or digital standardized 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.

### Measured Variables
- **Displacement**: 50 - 5000 mm
- **Output Voltage**: 0...10 VDC or 10...0 VDC
  - (Minimum load: > 5 kOhm)
- **Current**: 4(0)...20 mA or 20...4(0) mA
  - (Min/Max. 0 / 500 Ohm)
- **Start/Stop pulse**: RS422 Differential signal
- **Adjustment of NULL and SPAN**
  - Analogue: 100% of measuring range (F.S.)
  - Digital: 0.1 mm; 0.01 mm (controller depending)
- **Linearity**: < ± 0.02 % F.S. (Minimum ± 50 µm)
- **Repeatability**: < ± 0.001 % F.S.
- **Update Frequency**
  - Analogue: 1kHz / Digital: controller dependent
- **Connection Type**: Cable outlet
- **Input Voltage**: 24 VDC (-15 / +20 %)
- **Current Drain**: 100 mA typical
- **Ripple**: < 1 % peak to peak
- **Temperature Coefficient**: < 40 ppm/°C
- **Electric Strength**: 500 V (DC ground to machine ground)
- **Operating Temperature**: -40 °C...+75 °C
- **Dew Point, Humidity**: 90 % rel. humidity, no condensation
- **EMV-Test**
  - Electromagnetic emission EN 50081-2; Electromagnetic immunity EN 50082-2
  - EN 61000-4-2/3/4/6 Level 3/4 Criteria A, LD-sensor installed in a ground metal housing
- **Shockrating**: 100 g, 6 ms / IEC-Standard 68-2-27
- **Vibration Rating**: 10 g, 10 - 2000 Hz / IEC-Standard 68-2-6
- **Mounting**: Any orientation
- **Magnet speed**: Any
- **Sensor rod + flange**: Stainless steel 1.4301 / AISI 304
- **Pressure Rating**: 350 bar, 700 bar peak pressure
- **Sensor Electronic Housing**: Aluminium diecasting housing
- **Sealing**: IP 65
- **Sensor Installation**: Fitting flange or thread M18 x 1,5
- **Magnet Type**: Ring magnet
**Temposonics® LD**

The compact position sensor system was designed for installation in hydraulic cylinders, specifically for use in standard clevis head cylinders or any space limited cylinder applications.

- The pressure proof stainless steel sensor rod with fitting or threaded flange protects the sensing element in which gives rise to the measurement signal. It fits into the bored piston rod.

- The external standard industrial housing accommodates the modular electronic interface with active signal conditioning. The sensor electronic is connected to the basicsensor via inside terminal screws and to the controller with integrated cable outlet.

- The position magnet, the only moving part is mounted on the piston bottom. The permanent magnet travels wearfree and contactless along the stationary sensor tube. Its magnetic field starts the measurement signal through sensor's rod wall.

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**LD with fitting flange**

**Messstab Typ >>S<<**

- **Pressure tube Ø 10**
  - **Stroke length 50-5000 mm**
  - **stroke length 66 mm**
  - **inactive zone > 4500 mm**
- **Position magnet**
- **Mounting zone**
- **Null position**
- **Pressure tube Ø 10**

**Sensor electronic type >>B<<**

- **Cable max. 270 mm resp. 400 mm**

**LD with threaded flange**

**Sensor rod type >>M<<**

- **Pressure tube Ø 10**
  - **Stroke length 50-5000 mm**
  - **stroke length 66 mm**
  - **inactive zone > 4500 mm**
- **Mounting zone**
- **Null position**
- **Thread M18 x 1.5**

**Sensor electronic type >>S<<**

- **Cable max. 270 mm resp. 400 mm**

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*) Supplied screws:

1) M4x12, DIN 912A2, mounting plate black anodized (from F-No. 06190054)
2) 8-32UNC-2B, mounting plate silver anodized (up to F-No. 06190053)

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O-Ring 15.3 x 2.2 FPM75 (supplied) profile of screw boring see ISO 6149-1

23 across flats
Tightening torque < 50 Nm

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Pigtailed cable Option: Cable connector

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Option: Cable connector

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*Option: Cable connector
Analog Output
Temposonics® LD sensors provide direct analog outputs, including voltage (0-10 V) and current (4-20 or 0-20 mA), forward and reverse acting. Resolution is only limited by the output ripple. Since the outputs are direct, no signal-conditioning electronics are needed when interfacing with controllers or meters.

Sensor field programming
LD sensors are preconfigured at the factory by model code designation. If needed, Temposonics offers different external service tools for modifying sensor parameters inside the active electrical stroke (50 mm minimum clearance between setpoints) via the standard connection cable. There is no need to open the sensors electronics.

Following tools are available:
1. Handheld-Programmer G-Analog
   for setups of measuring length inside the ordered output by pushing up/down-buttons.
2. PC-Programmer G-Analog
   This hardware converter is required to communicate via serial port of Windows PC to the sensor. Customized settings are possible by using a Temposonics programming software (CD-ROM) for:
   1. Null and Span
   2. Forward and reverse acting
   3. Output: Voltage/Current output values encl. range

Digital Start/Stop pulse
Digital LD sensor is equipped with a start/stop output. The sensor requires a start signal from an external indicator in onsite 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 indicator and used for calculating the position value. Generation and evaluation of the start/stop pulse is made by a customized Start/Stop interface module of many controller companies.

Logic diagram Start/Stop
Cylinder installation

Temposonics® LD is designed for installation into hydraulic cylinders. Mounting of a LD sensor requires the use of a O-ring (black) and a backup-ring (orange). Both are supplied with the sensor. The sensor will be fixed via special screw.

Interconnection cable
When mounted in the manner as shown below, interconnection cable is shielded according to EMC standard at the cylinder end cap. However, when the LD sensor is mounted in an alternative way, proper care must be taken to shield the interconnection cable.

When installing the sensor in the cylinder notice following:
• Magnet must not slide along the sensor tube.
• The bore in the piston rod and type of sealing are determined by cylinder manufacturers as that depend on hydraulic pressure and piston velocity. We recommend 13 mm bore diameter at minimum. Do not exceed peak pressure.
• Protect sensor rod from wear.

Mounting ring magnet
For accurate position measurements mount the magnet with non-magnetizable material (screws, etc.).

Rod style »S« with Electronics Housing style Typ »B«

Example mounting detail: Setscrew M6 - ISO 7379 with internal hexagon

Mounting Sensor electronic type »B«

Minimum tolerances for magnetizable material

Detail: Flange

ATTENTION
Only the mounting of sensorsystem as shown here fullfill the EMC standards of Electromagnetic Emission and Immunity.
Sensor Electronics Housing

**Temposonics® LD**

**Analog + Digital**

Customer Wiring

Factory Wiring

Cable off

Sensor rod

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**1. Start/Stop Output**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Colour</th>
<th>Function</th>
<th>Option: Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>white</td>
<td>DC Ground (0 V)</td>
<td>Pin 6</td>
</tr>
<tr>
<td>2</td>
<td>pink</td>
<td>Stop (+)</td>
<td>Pin 2</td>
</tr>
<tr>
<td>3</td>
<td>yellow</td>
<td>Start (+)</td>
<td>Pin 3</td>
</tr>
<tr>
<td>4</td>
<td>grey</td>
<td>Stop (-)</td>
<td>Pin 1</td>
</tr>
<tr>
<td>5</td>
<td>green</td>
<td>Start (-)</td>
<td>Pin 4</td>
</tr>
<tr>
<td>6</td>
<td>brown</td>
<td>+24 VDC</td>
<td>Pin 5</td>
</tr>
</tbody>
</table>

**2. Analog Output**

<table>
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<tr>
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<th>Colour</th>
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<td>Pin 2</td>
</tr>
<tr>
<td>3</td>
<td>green</td>
<td>PC Programmer only</td>
<td>Pin 4</td>
</tr>
<tr>
<td>4</td>
<td>grey</td>
<td>0-10, 10-0 V, 4(0)-20, 20-(0)4 mA</td>
<td>Pin 1</td>
</tr>
<tr>
<td>5</td>
<td>yellow</td>
<td>PC Programmer only</td>
<td>Pin 3</td>
</tr>
<tr>
<td>6</td>
<td>brown</td>
<td>+24 VDC</td>
<td>Pin 5</td>
</tr>
</tbody>
</table>

Wiring of 10-0 V and 20-4(0) mA outputs is valid for LD sensors from fabrication # (F-No.) 0546 xxxx.

**Typical Grounding**

Electronic enclosure = Machine ground

Internal Electronics Cover = DC Ground (0 V), isolated from machine ground

Strain relief = Machine ground

Connect cable shield on the controller side to machine ground

Cable shield and DC Ground have to be isolated separately!
Temposonics® LD
Analog + Digital

Sensor rod style
S - Fitting flange (with housing »B« only)
M - Threaded flange (with housing »S« only)

Sensor electronic housing style
B - Bottom cable entry
S - Side cable entry

Cable type electronic housing
R - PVC-cable
H - PUR-cable

Cable outlet
PT - Pigtailed
D6 - Cable with 6 pin male connector

Cable length, electronic housing
02 - 2 meters, Standard
01-10 - 01 up to 10 meters

Measuring length
0050 - 5000 mm
(up to 1000 mm in 50 mm steps; up to 5000 mm in 250 mm steps; Option: In 5 mm steps)

Input voltage
2 - ±24 VDC

Output signal
R0 - Start/Stop
V8 - 0-10 V
V9 - 10-0 V
A4 - 4-20 mA
A5 - 20-4 mA
A6 - 0-20 mA
A7 - 20-0 mA

Integral cable length of Sensor rod
L1 - 270 mm
L2 - 400 mm

Position magnets (order separately)

Ring magnet OD33
Part No. 201 542-2
Composite PA-ferrite-GF20
Weigh 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-ferrite-GF20
Weigh ca. 11 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque for M4 screws max. 1 Nm

Ring magnet OD25,4
Part No. 400 533
Composite: PA-ferrite
Weigh ca. 10 g
Operating temperature: -40 ... +100°C
Surface pressure max. 40 N/mm²

Male connector M16 wired on cable
6 pin DIN male connector
Part No. 370 372
Housing: Zinc, nickel plated
Termination: Solder
Contact insert: Silver plated
Cable clamp: PG 7
Cable-Ø: 6 mm

Mating female connector M16
6 pin DIN female connector
Part No. 370 623

Accessories
Part No.
Ring magnet OD33, Standard 201 542-2
U-Magnet OD33 251 416-2
Ring magnet OD25,4 400 533
6 pol. female cable connector M16 370 623
O-Ring 21,89 x 2,62 560 705
O-Ring 15,3 x 2,2 FPM 401 133
Backup ring 560 629

From F-No. 0546 xxxx LD-Analogue sensors are adjustable with following servicetools:
Handheld-Programmer G-Analogue 253 294
PC-Programmer G-Analogue incl. power supply 253 145
(100-240 VAC/24 VDC), cable and programming software (CD)

All dimensions in mm