Data Sheet

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

A Compact Sensor for Hydro Cylinders

ISO 9001 CERTIFIED

Temposonics® AN AMPHENOL COMPANY
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.

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**Measured Variables**

<table>
<thead>
<tr>
<th>Measured Variables</th>
<th>Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring Range</td>
<td>50 - 5000 mm</td>
</tr>
<tr>
<td>Output</td>
<td>Voltage: 0...10 VDC or 10...0 VDC (Minimum load: &gt; 5 kOhm)</td>
</tr>
<tr>
<td></td>
<td>Current: 4(0)...20 mA or 20...4(0) mA (Min/Max. 0 / 500 Ohm)</td>
</tr>
</tbody>
</table>

**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 ºC

**Dew Point, Humidity**

- 90 % rel. humidity, no condensation

**EMV-Test**

- Electromagnetic emission EN 50081-2; Electromagnetic immunity EN 50082-2

**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
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.

### LD with fitting flange

**Messestab Typ >>S<<**

- PUR-cable Ø 6 mm
- bending radius ≥ 24 mm

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

- Pigtailed cable
- Option: Cable connector

**LD with threaded flange**

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

- PUR-cable Ø 6 mm
- bending radius ≥ 24 mm

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

- Pigtailed cable
- Option: Cable connector

### Active stroke length

- Null position
- Pressure tube Ø 10
- Position magnet
- Inactive zone > 4500 mm
- Stroke length 66 mm
- Stroke length 50-5000 mm

### Mounting zone

- Position magnet
- Cable gland

### Cable details

- Cable max. 270 mm resp. 400 mm
- PUR-cable Ø 6 mm
- bending radius ≥ 24 mm

### Sensor electronic type >>B<<

- Type >>B<<
- Messstab Typ >>S<<

### Cable gland

- PG 9
- 3 pcs. (*)
- 4 pcs. (*)

### Mounting plate

- 3 holes Ø 4.34 mm
- Hole 011.2 for cable to basic sensor

### Recessed plate

- Hole Ø 10.2
- 3 holes Ø 4.34 mm for mounting

### O-Ring

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

### Tightening torque

- < 50 Nm

### Null position

- 23 across flats

### Sensor electronic type >>S<<

- Pigtailed cable
- Option: Cable connector

### (*) Supplied screws see above

1) M4×12, DIN 91242, mounting plate black anodized (from F-No. 06190054)
2) 8-32UNC-2B, mounting plate silver anodized (up to F-No. 06190053)
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.
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 they 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.).

Minimum tolerances for magnetizable material

Example mounting detail:
Setscrew 8 M6 - ISO 7379 with internal hexagon

10 - 20 mm bore for cable to electronic housing

ATTENTION

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

Customer Wiring

Factory Wiring

Cable to Control unit
Pigtailed
Option: Connector

Terminal Colour Function Option: Connector

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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<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>
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<tr>
<td>6</td>
<td>brown</td>
<td>+24 VDC</td>
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</table>

Cable gland PG 9-EMC

EMC standard screwed cable gland for shielded cable. Simply to handle, as the cable shield must be removed backup over the plastic insert.

Typical Grounding

Electronic enclosure = Machine ground
Pressure housing = 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!

All dimensions in mm
Temposonics® LD

**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**
- O2 - 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)**
- OD33, Standard: Ring magnet OD33
  - Part No. 201 542-2
  - Composite PA-Ferrite-GF20
  - Weight ca. 14 g
  - Operating temperature: -40 ... +100°C
  - Surface pressure max. 40 N/mm²
  - Fastening torque for M4 screws max. 1 Nm
- OD33, 6 pol.: Ring magnet OD25,4
  - Part No. 400 533
  - Composite: PA-Ferrite
  - Weight ca. 10 g
  - Operating temperature: -40 ... +100°C
  - Surface pressure max. 40 N/mm²

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

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

**Accessories**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring magnet OD33, Standard</td>
<td>201 542-2</td>
</tr>
<tr>
<td>U-Magnet OD33</td>
<td>251 416-2</td>
</tr>
<tr>
<td>Ring magnet OD25,4</td>
<td>400 533</td>
</tr>
<tr>
<td>6 pol. female cable connector M16</td>
<td>370 623</td>
</tr>
<tr>
<td>O-Ring 21,89 x 2,62</td>
<td>560 705</td>
</tr>
<tr>
<td>O-Ring 15,3 x 2,2 FPM</td>
<td>401 133</td>
</tr>
<tr>
<td>Backup ring</td>
<td>560 629</td>
</tr>
</tbody>
</table>

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

All dimensions in mm
<table>
<thead>
<tr>
<th>Region</th>
<th>Address</th>
<th>Phone Number</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNITED STATES</strong></td>
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<td>Americas &amp; APAC Region</td>
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<td>58513 Lüdenscheid</td>
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<tr>
<td>GmbH &amp; Co. KG</td>
<td>EMEA Region &amp; India</td>
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<td><strong>ITALY</strong></td>
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<td><strong>CHINA</strong></td>
<td>Phone: +86 21 2415 1000 / 2415 1001</td>
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