

## Data Sheet

# L-Series Analog + Digital

## Magnetostrictive Linear Position Sensors

Document Part No.  
05012010

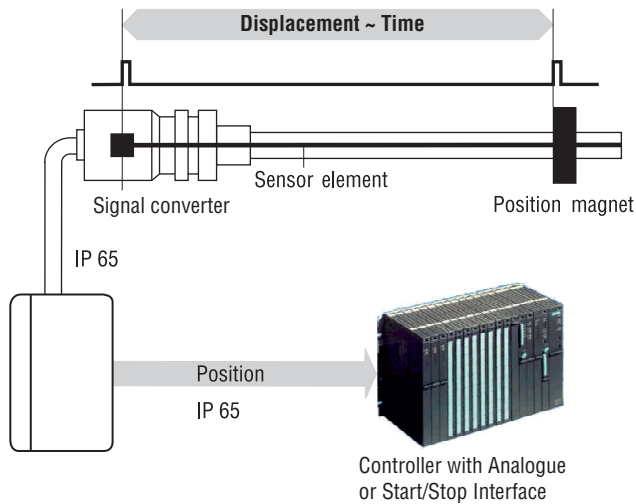


**A Compact Sensor for Hydro Cylinders**

- 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

# Temposonics® LD

Analog + Digital



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  
Measuring Range  
Output

Displacement  
50 - 5000 mm  
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)

Adjustment of NULL and SPAN  
Resolution

Start/Stop pulse: RS422 Differential signal  
Analogue: 100% of measuring range (F.S.)  
Analogue: Infinite, restricted by output ripple  
Digital: 0,1 mm; 0,01 mm (controller depending)

Linearity  
Repeatability  
Update Frequency  
Connection Type  
Input Voltage  
Current Drain  
Ripple  
Temperature Coefficient  
Electric Strength  
Operating Temperature  
Dew Point, Humidity  
EMV-Test

< ± 0,02 % F.S. (Minimum ± 50 µm)  
< ± 0,001 % F.S.  
Analogue: 1kHz / Digital: controller dependent  
Cable outlet  
24 VDC (-15 / +20 %)  
100 mA typical  
< 1 % peak to peak  
< 40 ppm/ °C  
500 V (DC ground to machine ground)  
-40 °C...+75 °C  
90 % rel. humidity, no condensation  
Electromagnetic emission EN 50081-2; Electromagnetic immunity EN 50082-2  
EN 6100-4-2/3/4/6 Level 3/4 Criteria A,  
LD-sensor installed in a ground metal housing

Shockrating  
Vibration Rating  
Mounting  
Magnet speed  
Sensor rod + flange  
- Pressure Rating  
Sensor Electronic Housing  
Sealing  
Sensor Installation  
Magnet Type

100 g, 6 ms / IEC-Standard 68-2-27  
10 g, 10 - 2000 Hz / IEC-Standard 68-2-6  
Any orientation  
Any  
Stainless steel 1.4301 / AISI 304  
350 bar, 700 bar peak pressure  
Aluminium diecasting housing  
IP 65  
Fitting flange or thread M18 x 1,5  
Ring magnet

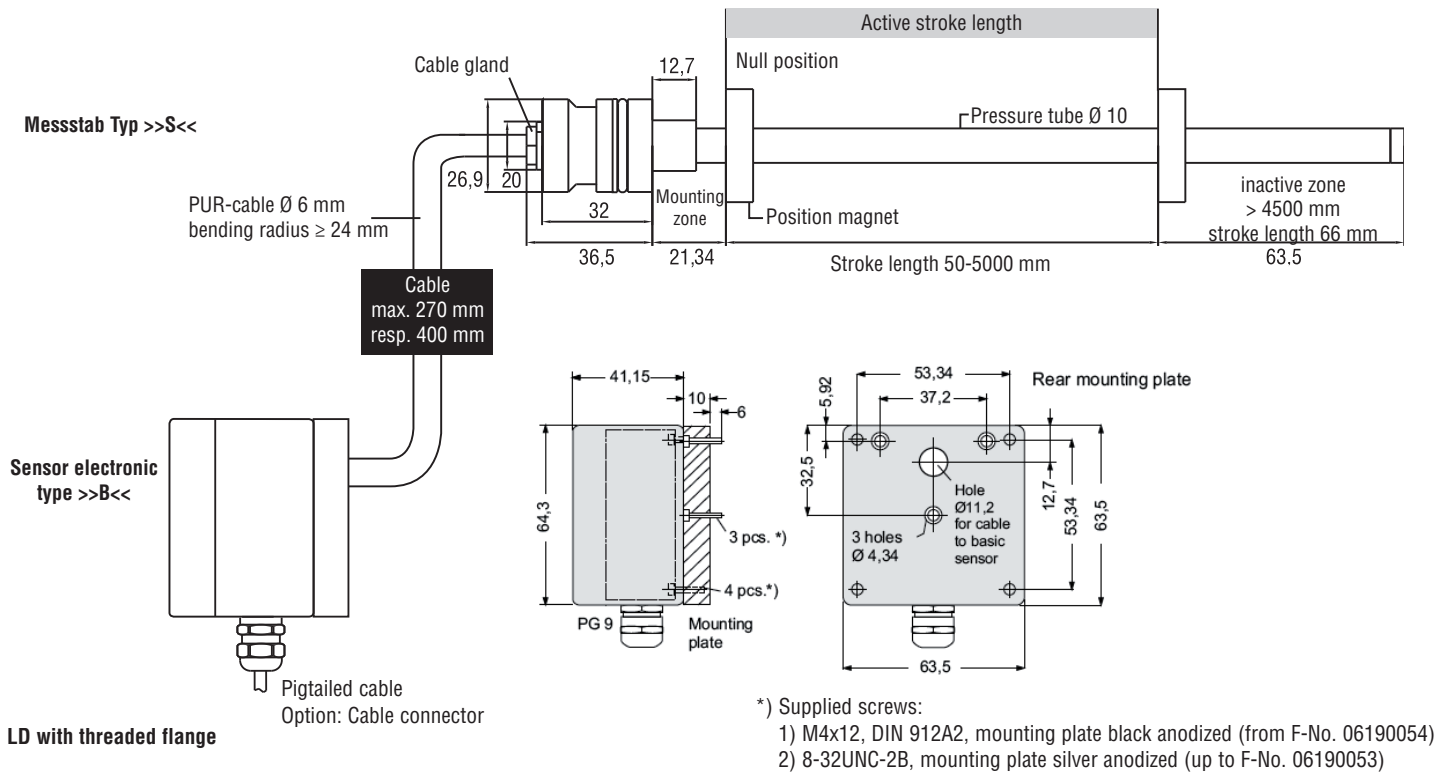
**Temposonics® LD**

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.

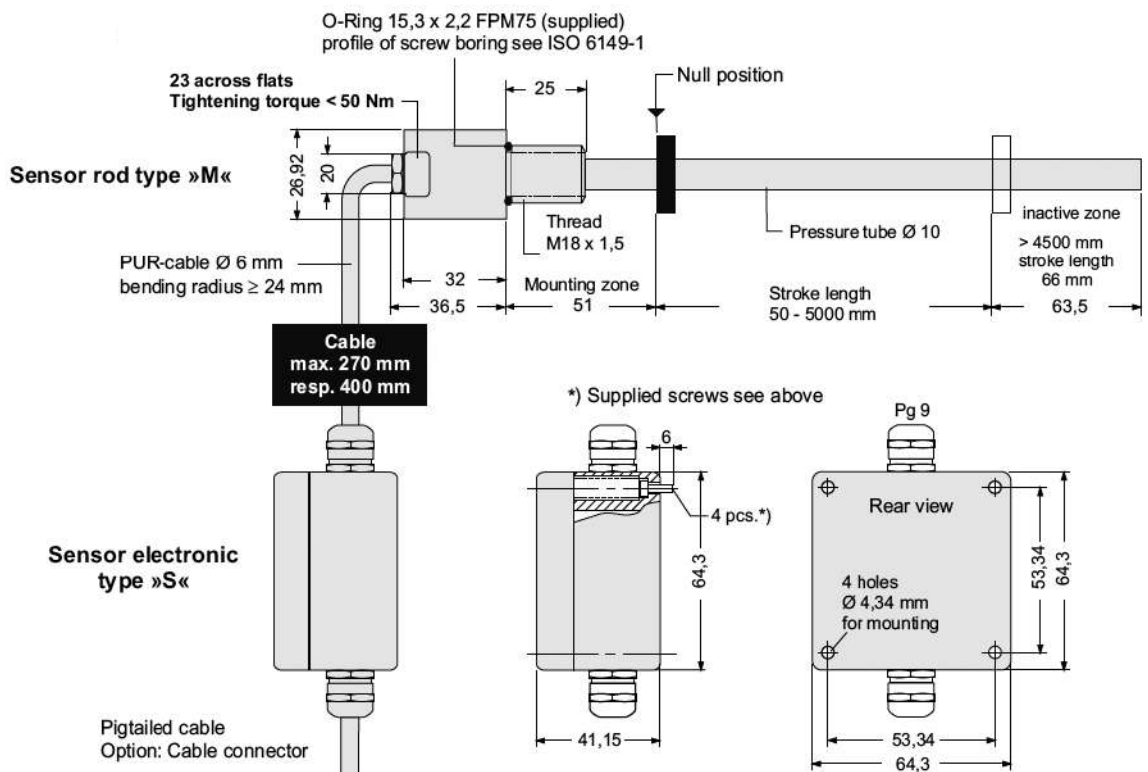
- The pressure proof stainless steel sensor rod with fitting or threaded flange protects the sensing element in which gives rise to the measurement signal. It fits into the bored piston rod.

- The external standard industrial housing accommodates the modular electronic interface with active signal conditioning. The sensor electronic is connected to the basic sensor 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**

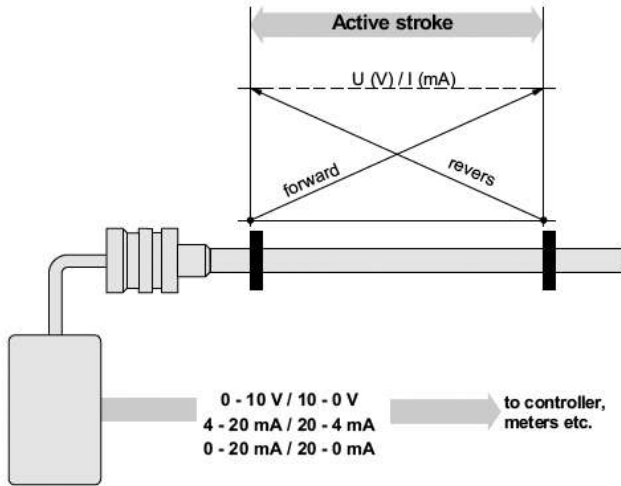


**LD with threaded flange**



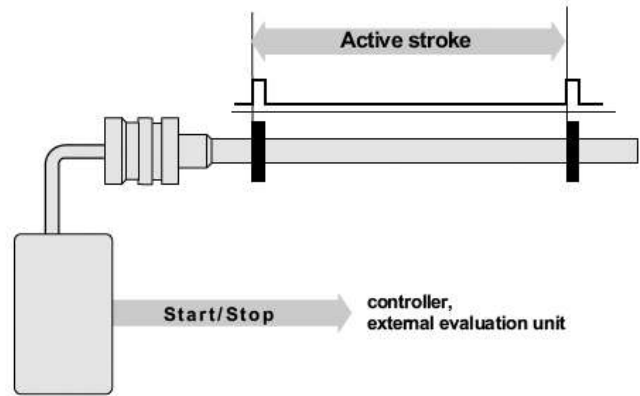
## Analog Output

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 signalconditioning electronics are needed when interfacing with controllers or meters.



## 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.



## 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.

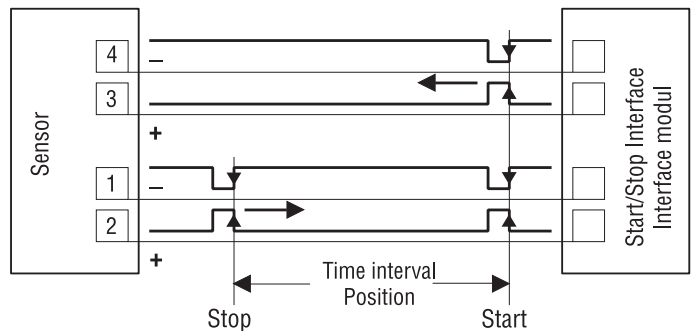
Following tools are available:

### 1. Handheld-Programmer G-Analog

for setups of measuring length inside the ordered output by pushing up/down-buttons.



## Logic diagram Start/Stop



### 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

**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.

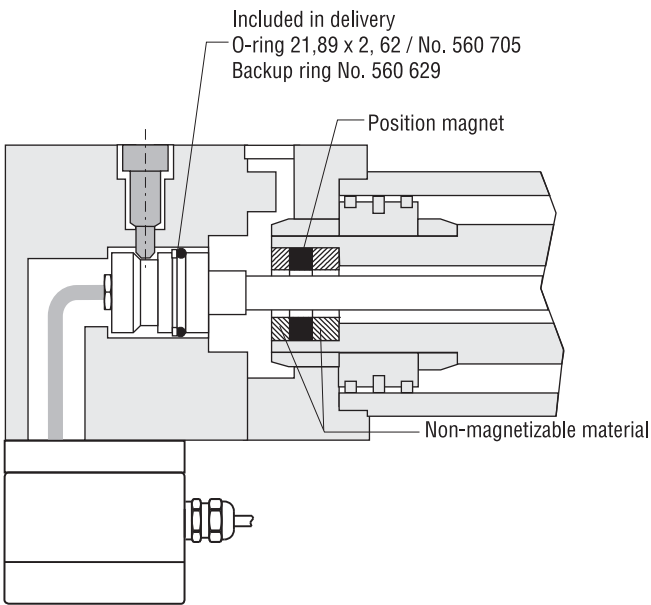
**When installing the sensor in the cylinder notice following:**

- Magnet must not slide along the sensor tube.
- The bore in the piston rod and type of sealing ate 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.

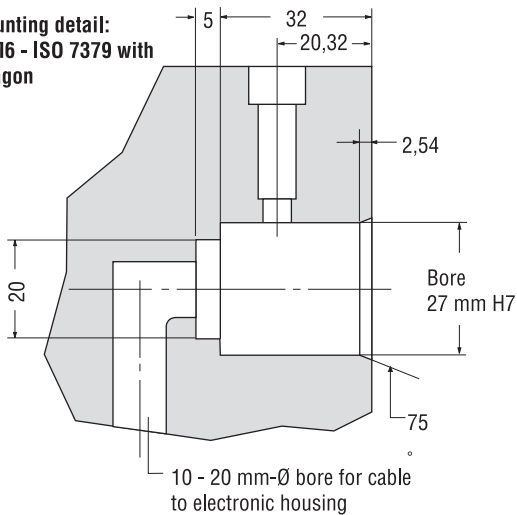
**Mounting ring magnet**

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

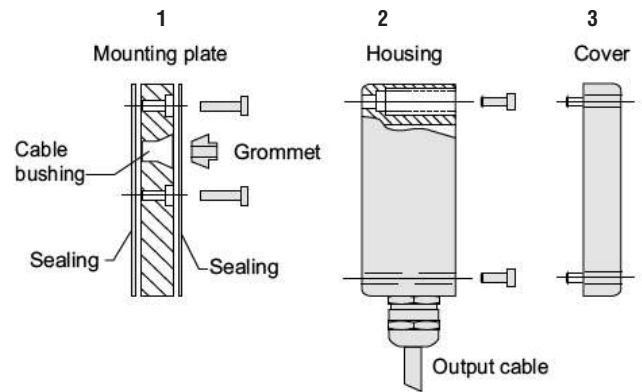
**Rod style »S« with Electronics Housing style Typ »B«**



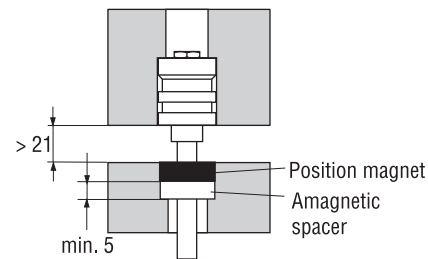
**Example mounting detail:  
Setscrew 8 M6 - ISO 7379 with  
internal hexagon**



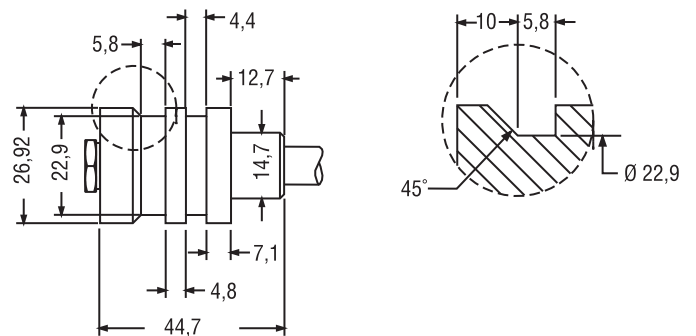
**Monting Sensor electronic type »B«**



**Minimum tolerances for magnetizable material**



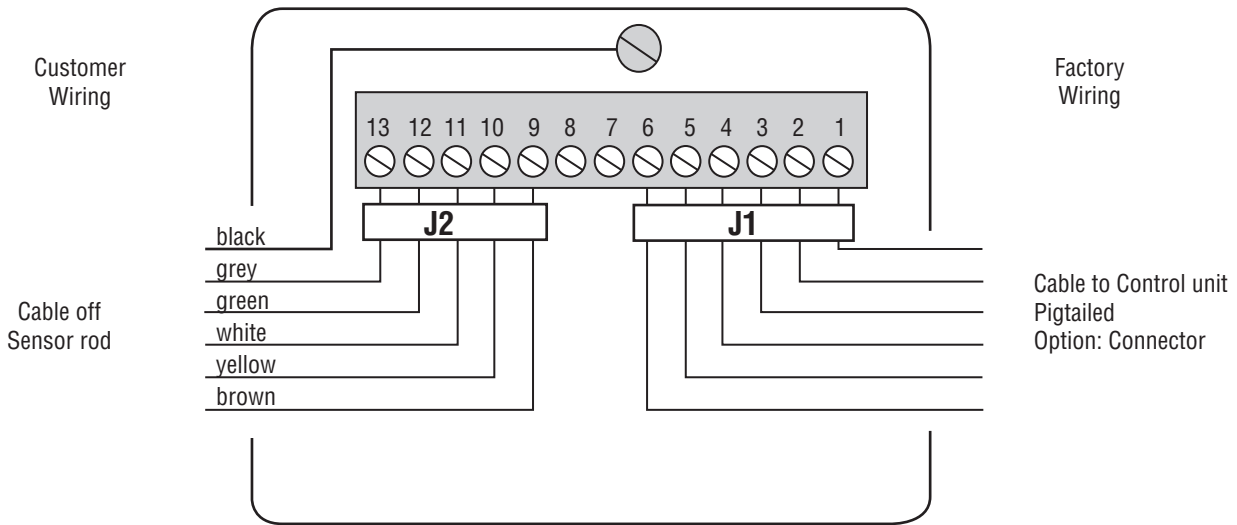
**Detail: Flange**



**⚠ ATTENTION**

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

**Sensor Electronics Housing**

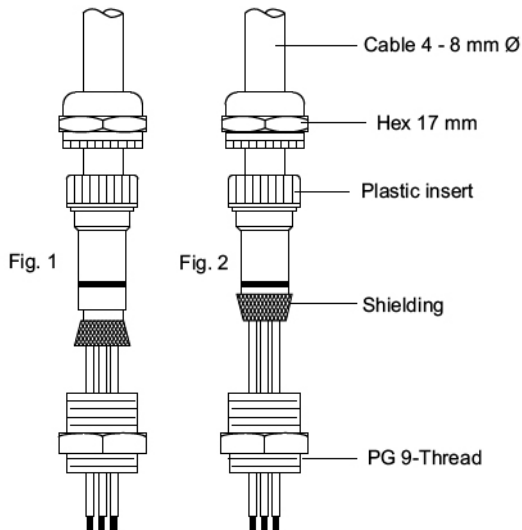


Terminal	Colour	Function
9	brown	V in
10	yellow	SE out
11	white	GND
12	green	WG (-)
13	grey	WG (+)
Screw	black	Frame GND

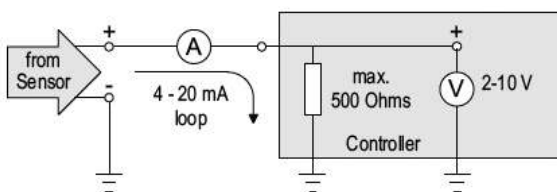
**⚠** For side entry housing connect shield on EMC cable gland

**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.

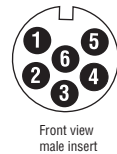


Typical 4 - 20 mA wiring



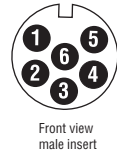
**1. Start/Stop Output**

Terminal	Colour	Function	Option: Connector
1	white	DC Ground (0 V)	Pin 6
2	pink	Stop (+)	Pin 2
3	yellow	Start (+)	Pin 3
4	grey	Stop (-)	Pin 1
5	green	Start (-)	Pin 4
6	brown	+24 VDC	Pin 5



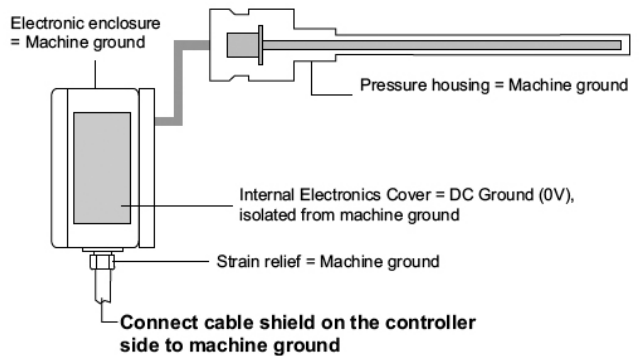
**2. Analog Output**

Terminal	Colour	Function	Option: Connector
1	white	DC Ground (0V)	Pin 6
2	pink	DC Ground	Pin 2
3	green	PC Programmer only	Pin 4
4	grey	0-10, 10-0 V, 4(0)-20, 20-(0)4 mA	Pin 1
5	yellow	PC Programmer only	Pin 3
6	brown	+24 VDC	Pin 5



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

**Typical Grounding**



**⚠** Cable shield and DC Ground have to be isolated separately!

**Temposonics® LD**

**Sensor rod style**

- S - Fiting 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**

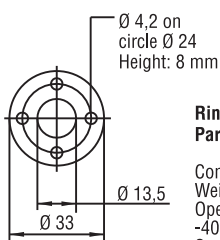
- L1 - 270 mm
- L2 - 400 mm

**Lieferumfang:**

- Messstab
- Sensorelektronik

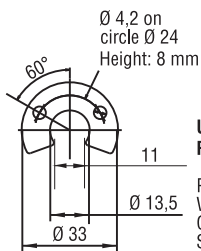
**Magnete und Zubehör  
bitte extra bestellen.**

**Position magnets (order seperately)**



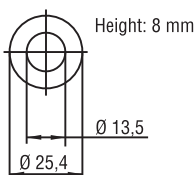
**Ring magnet OD33**  
Part No. 201 542-2

Composite PA-Ferrite-GF20  
Weigth ca. 14 g  
Operating temperature:  
-40 ... +100°C  
Surface pressure max. 40 N/mm<sup>2</sup>  
Fastening Torque for M4 screws max. 1 Nm



**U-Magnet OD33**  
Part No. 251 416-2

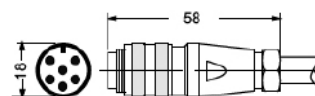
PA-Ferrit-GF20  
Weigth ca. 11 g  
Operating temperature: -40 ... +100°C  
Surface pressure max. 40 N/mm<sup>2</sup>  
Fastening torque for M4 screws max. 1 Nm



**Ring magnet OD25,4**  
Part No. 400 533

Composite: PA-Ferrite  
Weigth ca. 10 g  
Operating temperature:  
-40 ... +100°C  
Surface pressure max. 40 N/mm<sup>2</sup>

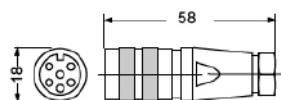
**Male connector M16 wired on cable**



**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**

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)



# Temposonics

AN AMPHENOL COMPANY

**UNITED STATES**  
**Temposonics, LLC**  
Americas & APAC Region  
3001 Sheldon Drive  
Cary, N.C. 27513  
Phone: +1 919 677-0100  
E-mail: [info.us@temposonics.com](mailto:info.us@temposonics.com)

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**GERMANY**  
**Temposonics**  
**GmbH & Co. KG**  
EMEA Region & India  
Auf dem Schüffel 9  
58513 Lüdenscheid  
Phone: +49 2351 9587-0  
E-mail: [info.de@temposonics.com](mailto:info.de@temposonics.com)

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**ITALY**  
Branch Office  
Phone: +39 030 988 3819  
E-mail: [info.it@temposonics.com](mailto:info.it@temposonics.com)

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**FRANCE**  
Branch Office  
Phone: +33 6 14 060 728  
E-mail: [info.fr@temposonics.com](mailto:info.fr@temposonics.com)

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**UK**  
Branch Office  
Phone: +44 79 44 15 03 00  
E-mail: [info.uk@temposonics.com](mailto:info.uk@temposonics.com)

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**SCANDINAVIA**  
Branch Office  
Phone: + 46 70 29 91 281  
E-mail: [info.sca@temposonics.com](mailto:info.sca@temposonics.com)

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**CHINA**  
Branch Office  
Phone: +86 21 2415 1000 / 2415 1001  
E-mail: [info.cn@temposonics.com](mailto:info.cn@temposonics.com)

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**JAPAN**  
Branch Office  
Phone: +81 3 6416 1063  
E-mail: [info.jp@temposonics.com](mailto:info.jp@temposonics.com)

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