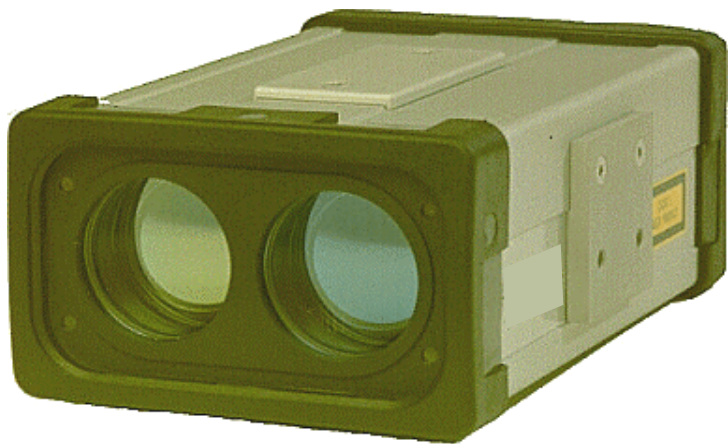


LASER DISTANCE and LEVEL SENSOR

LD90-3

- Industrial distance and speed sensing
- Collision avoidance for cranes and vehicles
- Level measurement in Silos
- Laser altimeter
- Sensor for ship docking systems



The sensors of series LD90-3 are based upon the well-proved principle of time-of-flight measurement of short laser pulses.

They can be operated with practically any target surface, i.e. "reflectorless" up to many hundred meters, and with reflecting foil or retroreflectors up to more than 1000 m.

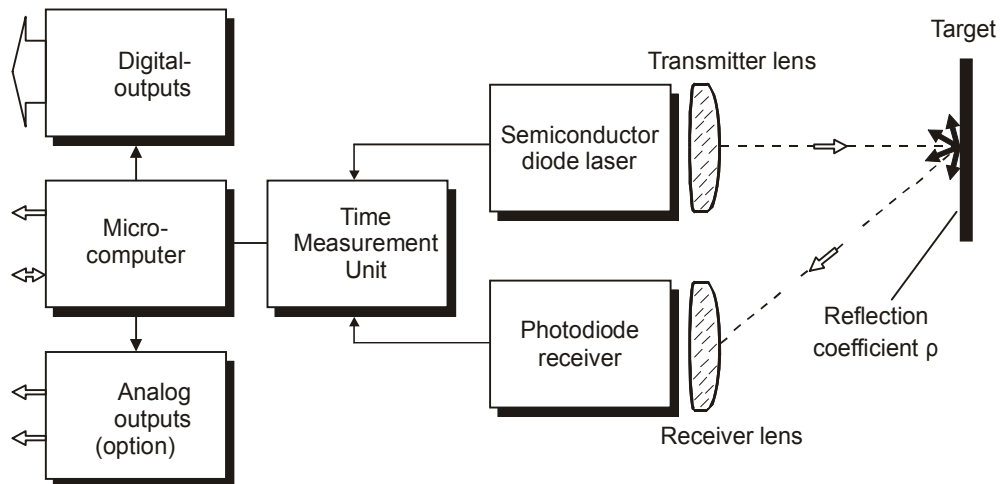
Key features

- Accurate & dynamic measurement of distance and speed
- Excellent performance and reliability; light weight and stable metal housing
- Short high-energy infrared light pulses provide excellent interference immunity
- Measurements are fast; offering update rates as high as 200 Hz / 2 kHz / 12 kHz
- Measurements can be taken through glass windows into sealed containers
- Narrow measurement beam with very low divergence provides excellent spatial resolution
- Measurements can be taken to almost any surface regardless of the incident beam angle or surface characteristics
- Measurements are unaffected by the temperature of the material surface and of temperature gradients in the medium between the sensor and the target surface

Principle of operation

An electrical pulse generator periodically drives a semiconductor laser diode sending out infrared light pulses, which are collimated and emitted by the transmitter lens. Via the receiver lens, part of the echo signal reflected by the target hits a photodiode which generates an electrical receiver signal.

The time interval between the transmitted and received pulses is counted by means of a quartz-stabilized clock frequency. The result is fed into the internal micro-computer which processes the measured data and prepares it for various data outputs.



Available instrument types (selection)

General purpose High Speed Distance and Level meter

Instrument type	Range reflector-less	Range with retro-reflector	Accuracy typically	Update rate (selectable)
LD90-3100HS	150 m	>1000 m	± 1,5 cm	1 ÷ 200 Hz

"High Penetration" Level meter

Instrument type	Range reflector-less	Range with retro-reflector	Accuracy typically	Update rate (selectable)
LD90-3200HiP	400 m	2000 m	± 2.5 cm	0.5 ÷ 3 Hz

Distance Sensor for High-Temperature targets

Instrument type	Range reflectorless	Accuracy typically	Update rate (selectable)
LD90-3100HS-HT	3 - 7 m (at 1450 °C) 2 - 10 m (at 1200 °C)	± 15 mm	1 ÷ 20 Hz

Standard Data output: RS232 or RS422 (selectable)

Option for 4 – 20 mA or 2 x PNP transistor driver switching output

Specifications of LD90-3100HS

High-Speed version of LD90-3100 for position and level measurement, for robotics applications, automatic anticollision systems, etc.

Measuring range (depending on the reflection coefficient ρ of the target)

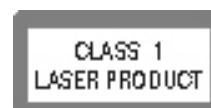
good, diffusely reflecting targets, $\rho \geq 80\%$	up to 150 m ¹⁾
bad, diffusely reflecting targets, $\rho \geq 10\%$	up to 50 m ¹⁾
Reflecting foil ²⁾ or plastic cat's-eye reflectors	> 1000 m
Minimum distance , typically	1 m

Distance measurement

Accuracy ³⁾	typically $\pm 1,5$ cm, in the worst case ± 5 cm							
Measuring time (ms or s) ⁴⁾	5ms	10ms	20ms	50ms	0.1	0.2	0.5	1
Statistical deviation (mm) ⁵⁾	± 30	± 20	± 15	± 10	± 7	± 5	± 3	± 2
Resolution (mm) ⁵⁾⁶⁾	20	20	10	10	5	5	2	2

Divergence of the infrared measuring beam ⁷⁾ 1,8 mrad

Eye safety class according to
CENELEC EN 60825-1: 2001



- 1) Typical values for average conditions. In bright sunlight, the operational range is considerably shorter than under an overcast sky. At dawn or at night the range is even higher.
- 2) Reflecting foil 3M 2000X or equivalent, minimum dimensions 0.45m x 0.45 m
- 3) Standard deviation, plus distance depending error ≤ 20 ppm
- 4) Adjustable via RS232 (RS232 data output useful only for measuring times of 10 ms or more)
- 5) Depending on measuring time
- 6) Chosen automatically by the internal microprocessor
- 7) 1 mrad corresponds to 10 cm beam width per 100 m of distance

Specifications of LD90-3200HiP

High-Penetration version of Laser Distance Meter LD90-3100 for use with or without reflectors which, because of its "*High Penetration*" facility under conditions of bad visibility, is especially well suited for level measurements in large silos, distance measurement on cranes, etc. ¹⁾

Measuring range

(depending on the reflection coefficient ρ of the target) ²⁾

good, diffusely reflecting targets, $\rho \geq 80\%$	up to 400 m
bad, diffusely reflecting targets, $\rho \geq 10\%$	up to 150 m
on Reflecting foil ³⁾	up to 2000 m

Eye safety class according to CENELEC EN 60825-1: 2001

CLASS 1
LASER PRODUCT

Distance measurement

Accuracy ^{5) 6)}	typically $\pm 2,5$ cm in the worst case $\pm 7,5$ cm			
Measuring time (s) ⁴⁾	0.3	0.5	1	2
Statistical deviation (mm) ⁵⁾	± 20	± 15	± 10	± 7
Resolution ^{5) 6)}	2 mm			
Minimum distance ⁴⁾	1 m			
Divergence of the infrared measuring beam ⁹⁾	1.6 x 0.5 mrad			

1. Last, first or strongest target return selectable
2. Typical values for average conditions. In bright sunlight, the operational range is considerably shorter than under an overcast sky. At dawn or at night the range is even higher.
3. Reflecting foil 3M 2000X or equivalent, minimum dimensions 0.45 m x 0.45 m
4. Minimum distance 5 m for full accuracy with reflecting targets
5. Standard deviation, plus distance depending error ≤ 20 ppm
6. ≥ 5 min after power up
7. Adjustable via RS232 or self-adapting
8. Depending on measuring time
9. 1 mrad corresponds to 10 cm beam width per 100 m of distance

Specifications of LD90-3100HS-HT

High-Speed, High-Temperature version of LD90-3100 for hot targets

The LD90-3100HS-HT is a laser distance meter optimized for very hot and glowing targets in steel plants, rolling mills, foundries etc. Transmitter and receiver optics are equipped with narrow-band optical filters to avoid disturbances of the measurement caused by the radiation of light and heat from the hot target surface. If necessary, the front side can be equipped with an additional protection tube, which can be flushed with nitrogen or compressed air to keep the lenses clean.

The **technical data** can, to a considerable extent, be influenced by the environmental conditions, especially by the following parameters:

- Surface temperature and reflection characteristics of the target
- Distance of the target
- Angle of the measurement beam with respect to the surface of the target
- Optical attenuation of the gases between target and instrument

Measuring range (depending on the surface temperature and the reflection coefficient of the target)

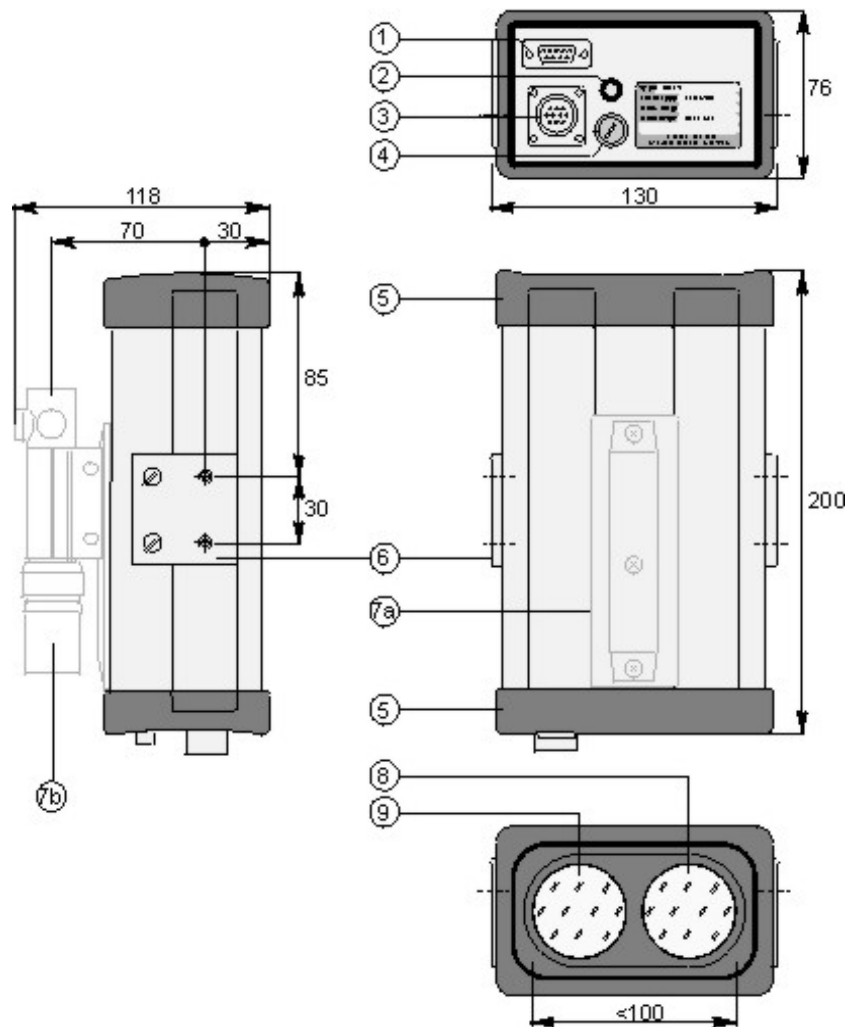
liquid steel, temperature up to 1450 °C						3 m to 7 m
glowing slabs, temperature up to 1200 °C						2 m to 10 m
other targets, temperature up to 800 °C						2 m to 100 m
Accuracy, typically ¹⁾						±15 mm
Measuring time (s) ²⁾	0.05	0.1	0.2	0.5	1	
Statistical deviation (mm) ³⁾	±20	±15	±10	±7	±5	
Resolution (mm) ³⁾⁴⁾	10	10	5	5	2	
Diameter of the infrared measuring beam						approx. 30 mm at 10 m, approx. 150 mm at 50m,

Eye safety class according to
CENELEC EN60825-1:2001
Laser class 3 R



- 1) Standard deviation plus distance depending error ≤ 20 ppm
- 2) Adjustable via RS232
- 3) Depending on measuring time
- 4) Chosen automatically by the internal microprocessor

Elements of operation and dimensional drawings



1. 9pole plug for RS232/RS422 data interface
2. LED "POWER ON"
3. 10pole socket for power supply and optional current or voltage output
4. Fuse holder
5. Rubber-armoured front and rear panel
6. Mounting plates with 2 xM6 threads on both sides of the instrument
7. (a) Mounting for aiming device (optional), (b) Telescope (optional)
8. Receiver lens
9. Transmitter lens

General technical data LD90-3

Serial data interface

RS232 or, alternatively, RS422	Baud rate selectable between 150 Bd and 19200 Bd, further 38.4 kBd and 115.2 kBd. ASCII or Siemens 3964R protocol (RK512 or Modbus optional).
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Additional data output available (optional)

Analog	current output 4-20 mA, resolution 16 bit not galvanically separated accuracy / linearity 0.5 ‰ of full scale
Switching output	2 x PNP transistor driver, built-in thermal and short-circuit protection switching current 250 mA max. switching voltage = supply voltage

Power supply

Standard	11-28 Volts DC, approx. 10 Watt built-in protecting circuitry for over-voltage and reverse polarity
Option 220 V AC	external power supply module (other voltage supply on request)

Temperature range

Operation	-10 °C to +50 °C
Storage	-20 °C to +60 °C

Physical data

Dimensions	200 x 130 x 76 mm (L x W x H)
Weight	approx. 1.5 kg
Protection class	IP64

Aiming device (optional)

Telescope or red light laser pointer to be mounted on top of the instrument.

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Data sheet: M-FE-40-PDF-3

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