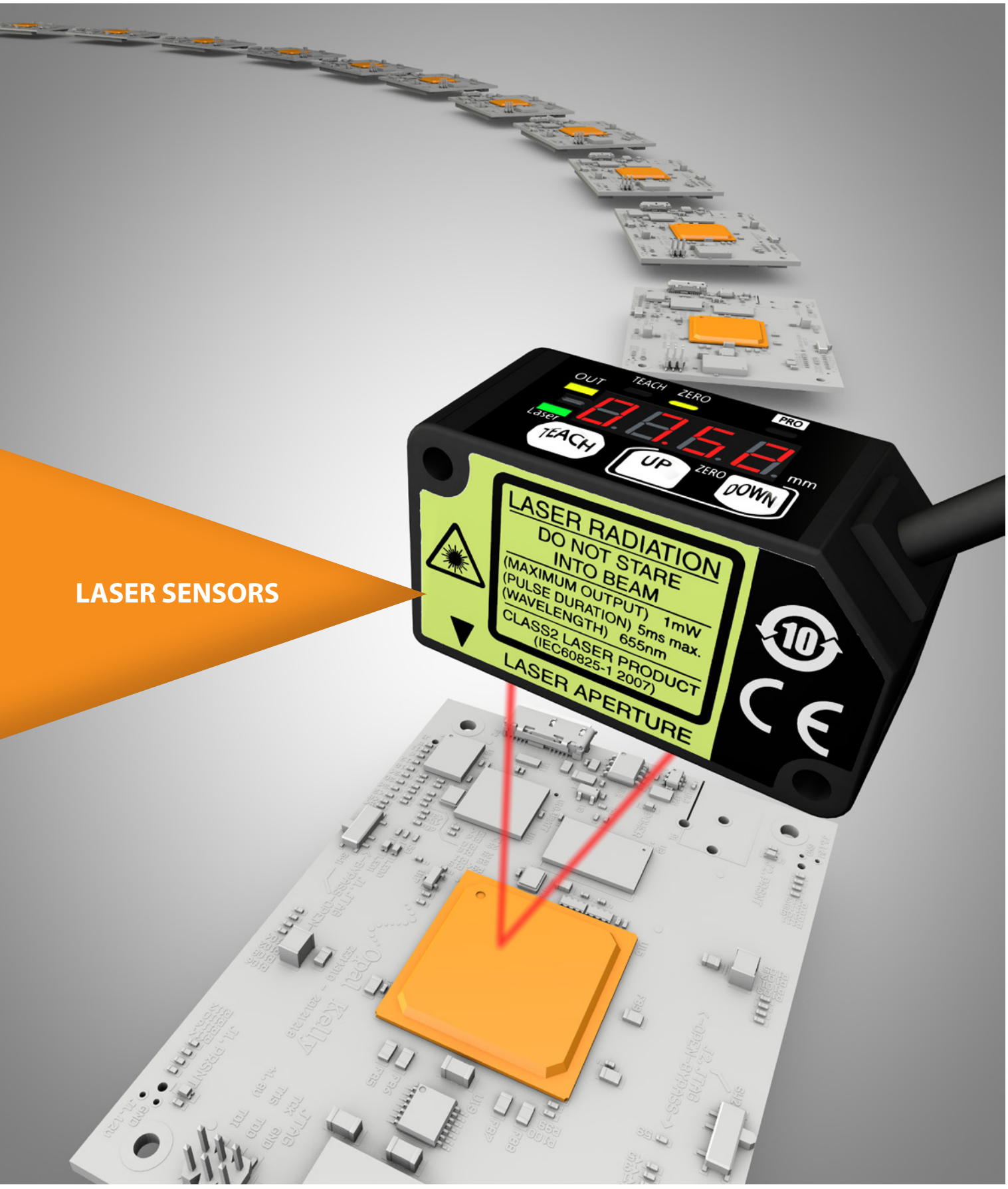
WayCon
Positionsmesstechnik

LASER SENSORS



Powerful sensors to meet growing demands

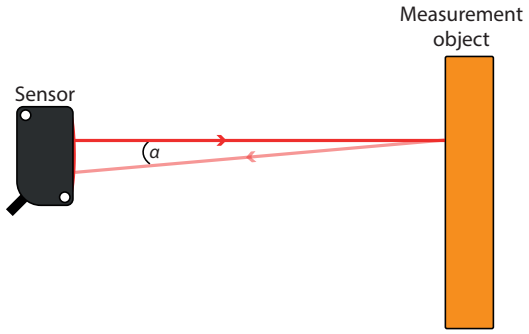
Measuring principles

Introduction

Laser sensors by WayCon work according to one of the following three measuring principles. These are the triangulation principle, the runtime measurement and the phase comparison measurement.
The LAS, LAR, LAH-G1 and LAM series are triangulation laser sensors, the LAV series utilises the runtime measurement principle and the LLD series works according to the phase comparison principle.

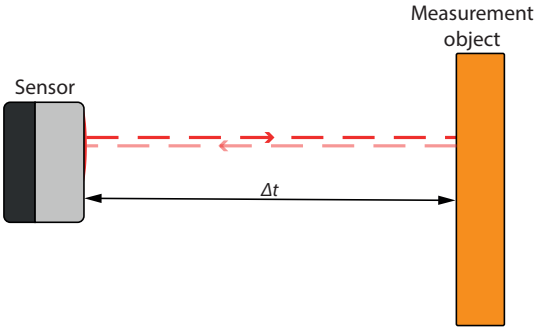
Laser triangulation principle

A laser triangulation sensor emits a beam onto the measurement object. This laser beam is reflected by the target and detected by the photodiode line of the sensor. Changing the distance between the sensor and the measurement object, also changes the angle at which the reflected beam impinges on the photodiode line. This angle is used to calculate the distance between sensor and measurement object.



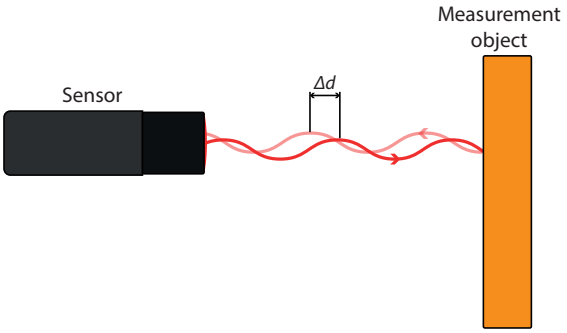
Runtime measurement principle

Runtime laser sensors emit a short pulse of light. This pulse is reflected by the measurement object and detected by the photodiode of the sensor. For long distances the measurement object can be equipped with a reflective foil. The electronics of the sensor calculates the distance based on the time the light pulse needs to travel between sensor and measurement object.



Comparative phase measurement

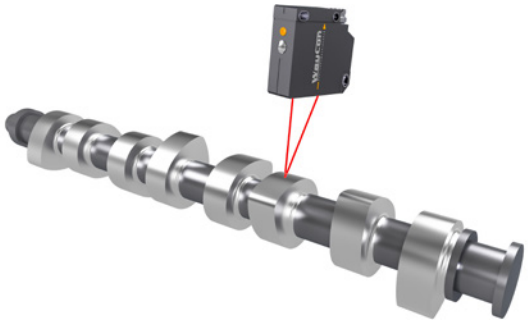
Phase comparison sensors emit high-frequency modulated laser light. The diffusely reflected and phase-shifted light is compared with the reference signal. Based on the amount of the phase shift, the distance to the measurement object can be determined with millimetre precision.



Laser Sensor LAS Series

Features

- Measurement ranges from 10 mm to 800 mm
- Linearity of up to ±6 µm
- Resolution of up to 2 µm
- Protection class IP67
- Output: 0...10 V or 4...20 mA
- Very precise distance measurement on most materials
- Individual parametrization by teach-in procedure
- Point and line laser versions
- LAS-TM: very compact housing (37 x 12.4 x 34.5 mm)
- LAS-TB: especially for surfaces with low reflectivity



Technical Data

SERIES ▶ CHARACTERISTICS ▼	LAS-TM	LAS-T5	LAS-T	LAS-TB
Measurement range max.	500 mm		800 mm	100 mm
Linearity max.	±0.006 mm	±0.012 mm	±0.11 mm	±0.045 mm
Resolution max.	0.002 mm	0.004 mm	0.02 mm	0.015 mm
Output analog	0...10 V, 4...20 mA			
Measurement frequency	1 kHz		0.25 kHz	0.5 kHz
Protection class	IP67			
Operating temperature	0...+50 °C			
Laser class	2			1
Beam type	point or line	point	point or line	line

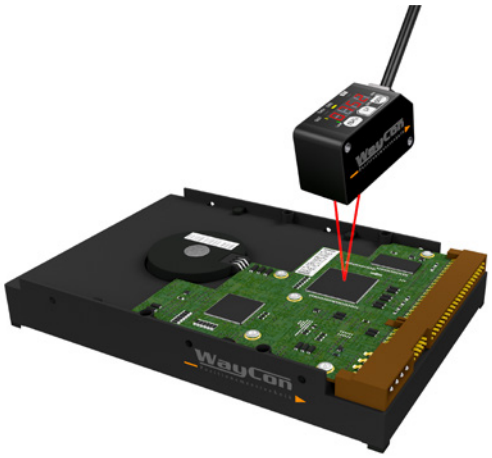
Description

LAS laser sensors use a built-in micro-controller for a very precise output signal proportional to the distance measured. The small, visible laser point ensures the easy and accurate aiming of the sensor. Distances to rough surfaces can be measured using a fine laser line in place of the laser point.

Laser Sensor LAR and LAH-G1 Series

Features

- Measurement ranges from 4 mm to 400 mm
- Linearity up to ±0.1 µm
- Resolution up to 2.5 µm
- Protection class IP67
- Output: 0...5 V, 0...10 V, 4...20 mA, 3.2...20.8 mA, PNP, NPN
- Sensors with integrated display
- Settings such as response time, hysteresis or output type configurable via display
- LAR: very compact housing (44 x 20 x 25 mm)
- LAH: diffuse reflection and specular reflection versions



Technical Data

SERIES ▶ CHARACTERISTICS ▼	LAR	LAH-G1
Measurement range max.	400 mm	300 mm
Linearity max.	±10 µm	±8 µm
Resolution max.	2.5 µm	0.5 µm
Output analog	0...5 V, 4...20 mA	0...10 V, 3.2...20.8 mA
Switching output	PNP, NPN	
Measurement frequency	0.66 kHz	5 kHz
Protection class	IP67	
Operating temperature	-10...+45 °C	
Laser class	2	2 (diffuse reflection), 1 (specular reflection)
Beam type	point	

Description

The laser sensor of the LAR and the LAH-G1 series allow easy operation even without an external display device. The integrated display enables the user to configure numerous additional functions and parameters such as hysteresis, response time or the energy saving Eco-Modus.

Laser Sensor LAM Series

Features

- Measurement ranges from 0.5 mm to 200 mm
- Linearity up to ±1 µm
- Resolution up to 0.02 µm
- Output: ±10 V, 4...20 mA, Ethernet (optional: ±5 V, 0...20 mA, 0...10 V, 0...5 V)
- Very high measurement frequency and sampling rate
- Resistant to errors caused by surface structure or colour
- Immune against environment light up to 20000 LUX
- LAM-S: for fast measurements
- LAM-F: for high dynamic measurements

Technical Data

SERIES ▶ CHARACTERISTICS ▼	LAM-S	LAM-F
Measurement range max.	200 mm	
Linearity max.	±1 µm	±1.5 µm
Resolution max.	0.02 µm	0.05 µm
Output analog	±10 V, 4...20 mA (optional: ±5 V, 0...20 mA, 0...10 V, 0...5 V)	
Output digital	Ethernet	
Measurement frequency	10 kHz	100 kHz
Protection class	sensor IP64, extern elektronics IP40	
Operating temperature	0...+50 °C	
Laser class	2	
Beam type	point	

Description

Laser sensors of the LAM series stand out with their high measurement frequency and sampling rate. This makes them especially suited for fast and high dynamic applications. Their large number of output types allows for easy integration into nearly every system.

Long Range Laser Sensor LAV Series

Features

- Measurement ranges from 0.2 m to 50 m
- Linearity up to ±25 mm
- Resolution <5 mm
- Protection class IP65
- Output: 4…20 mA, IO-Link, switching output
- High range due to runtime measurement
- Teach-In function

Technical Data

SERIES ▶ CHARACTERISTICS ▼	LAV-8	LAV-50
Measurement range max.	8 m	50 m
Linearity max.	±25 mm	
Resolution max.	<5 mm	
Output	4...20 mA, IO-Link, switching output	
Measurement frequency	100 Hz	
Protection class	IP65	
Operating temperature	-30...+50 °C	
Laser class	2	
Beam type	point	

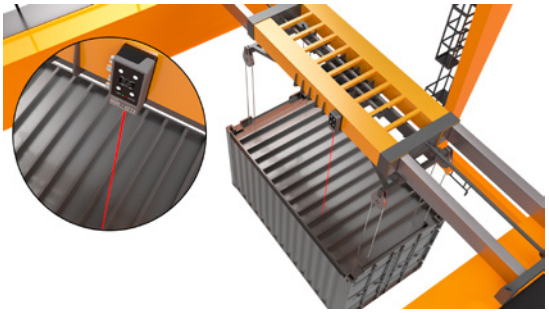
Description

Laser distance sensors of the LAV series reach measurement ranges of up to 50 m. This is possible because of the runtime measurement principle. To guaranty the accuracy on this high range, a cost-effective target board used on the measurement object. Another advantage of the LAV series is the low minimal operating temperature of -30 °C, that allows the sensors to be used for example in cooling chambers.

Long Range Laser Sensor LLD Series

Features

- Measurement ranges from 0.1 m to 500 m
- Linearity up to ±1.5 mm
- Resolution up to 0.1 mm
- Protection class up to IP67
- Output: 4…20 mA, RS232, RS422, Profibus, SSI
- Very high range due to phase comparison measurement
- Suited for outdoor applications, optional with heating system
- Integrated error detection
- LLD-500: suited for hot surfaces



Technical Data

SERIES ▶ CHARACTERISTICS ▼	LLD-150	LLD-500
Measurement range max.	150 m	500 m
Linearity max.	±2 mm	±1 mm
Resolution max.	0.1 mm	
Output analog	4...20 mA	
Output digital	RS232, RS422, Profibus, SSI	
Switching output	1x	3x
Measurement frequency	50 Hz	100 Hz
Protection class	IP65	IP67
Operating temperature	-40...+50 °C	-40...+60 °C
Laser class	2	
Beam type	point	

Description

If even greater distances are measured, this is achieved by means of phase comparison measurement and the LLD series. The LLD sensors are well suited for outdoor applications because of their high protection class and the optional heating system.

Product Overview

Draw Wire Sensors

- Ranges 50 mm - 42,5 m
- Linearity up to ±0.02 %
- Resolution up to ±0.02 %
- Output: potentiometric, analog, digital incremental, digital absolute, Bus

Laser Sensors

- Ranges 0.5 mm - 500 m
- Linearity up to ±1 µm
- Resolution up to 0.2 µm
- Triangulation or optical phase comparison

Linear Potentiometers

- Ranges 10 mm - 2000 mm
- Linearity up to ±0.05 %
- Output: potentiometric, analog
- Protection class up to IP67

Magnetic Scales

- Ranges up to 99.99 m
- Linearity up to ±2 µm
- Resolution up to 0.5 µm
- Output: analog, TTL, HTL, SSI, BiSS, 1 Vpp, tachometer

Digital Length Gauges

- Ranges 12 mm - 30 m
- Linearity up to ±0.2 µm
- Output: TTL, HTL
- Protection class up to IP64

Ultrasonic Sensors

- Ranges 100 mm - 6000 mm
- Linearity up to ±0.3 %
- Resolution up to 0.125 mm
- Output: analog, proximity switch

Magnetostrictive Transducers

- Ranges 50 mm - 4000 mm
- Linearity up to ±0.02 %
- Resolution up to 2 µm
- Output: analog, SSI, CANopen, tachometer

Digital Linear Scales

- Ranges 150 mm - 2000 mm
- Linearity up to ±0.5 µm
- Resolution up to 5 µm
- Output: TTL, HTL

Capacitive Sensors

- Ranges 50 mm - 42,5 m
- Linearity up to ±0.2 %
- Resolution dynamic up to 0.01 %
- Output: analog

Encoders/Rotary Transducers

- Single- and Multiturn
- Analog Multiturn up to 120 turns
- Solid-, hollow- and through hollow shaft
- Output: analog, digital incremental, digital absolute

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