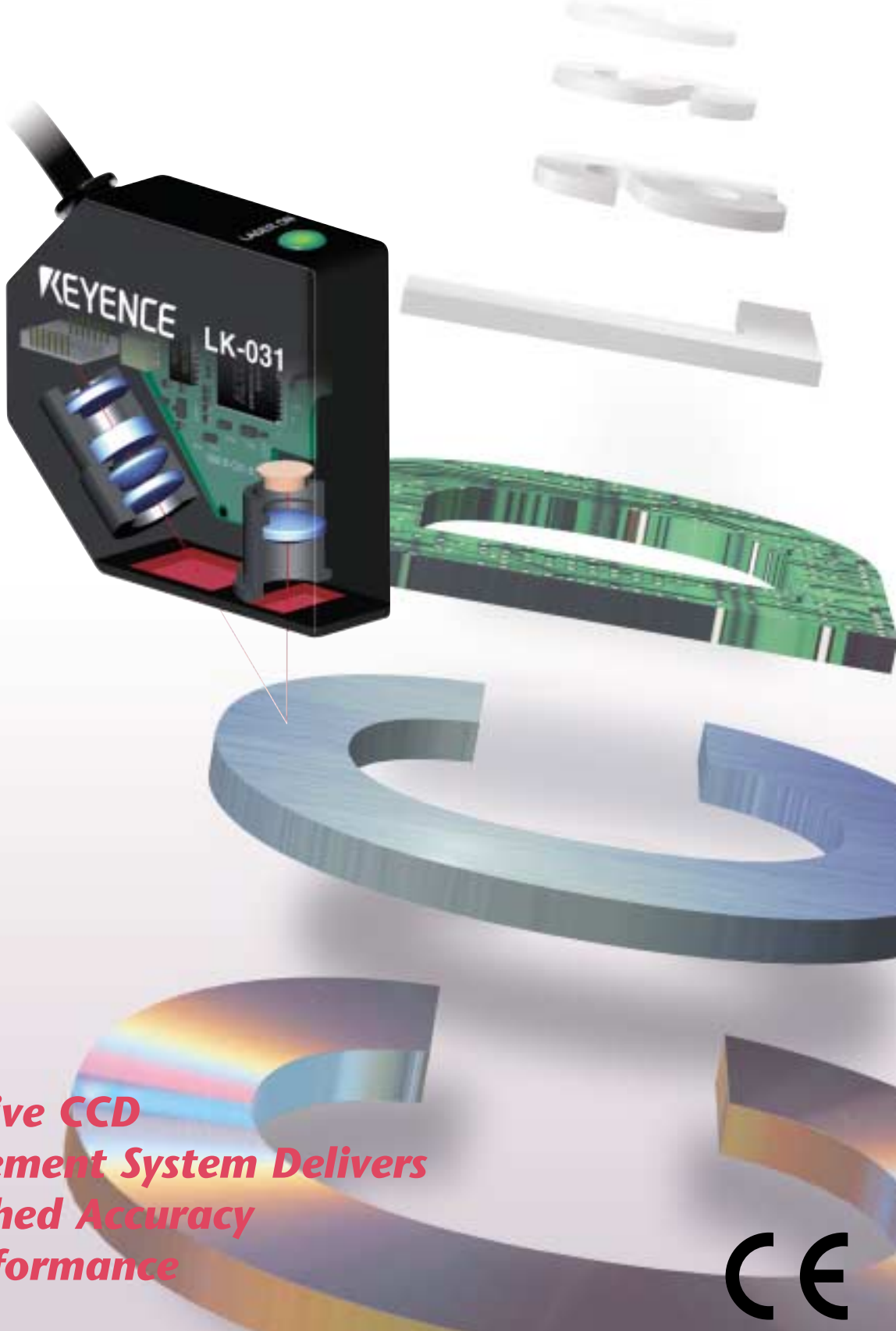
KEYENCE

Cat. No. LK-C

CCD Laser Displacement Sensor

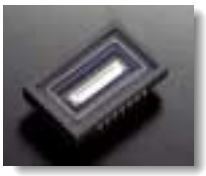
LK Series



Innovative CCD Measurement System Delivers Unmatched Accuracy and Performance

CE

The LK Series Laser Displacement Sensor features a newly developed CCD and 32-bit processor for precise measurement of height, width and position, unaffacted by color, surface texture or stray light.

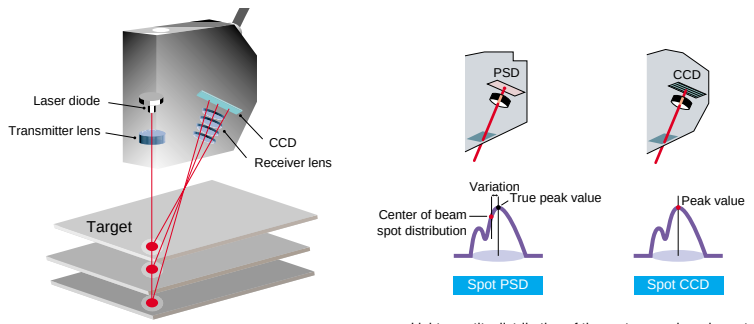


The LK Series boasts a very high resolution of 1 μm and a linearity of only ±0.1% of F.S., regardless of target surface properties.

A minimum spot diameter of 30 μm enables extremely accurate measurement of surface contour.

The LK series' measurement principle

The CCD laser displacement sensor uses a triangulation measurement system.
Conventional laser displacement sensors employ a PSD (Position Sensitive Detector) as the light-receiving element. However, the LK series uses a CCD as the light-receiving element.
The light reflected by a target passes through the receiver lens and is focused on the PSD or CCD.
The PSD uses the light quantity distribution of the entire beam spot entering the light element to determine the beam spot center and identifies this as the target position. However, the distribution of light quantity is affected by the surface condition of the target, causing variations in measured values.
The CCD detects the peak value of the light quantity distribution of the beam spot for each pixel and identifies this as the target position. Therefore, the CCD enables stable highly accurate displacement measurement, regardless of the light quantity distribution of the beam spot.

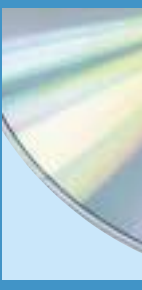


Light quantity distribution of the spot on receiver element

Advanced featu

Features

Glossy surface



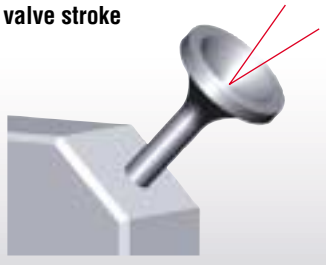
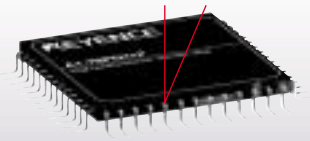
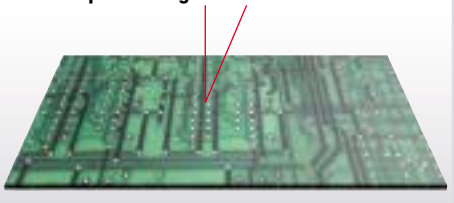
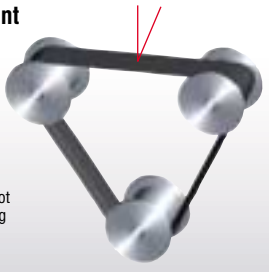
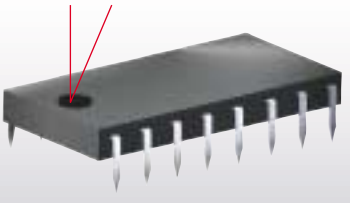
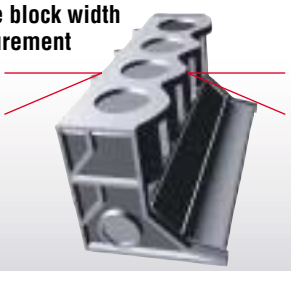
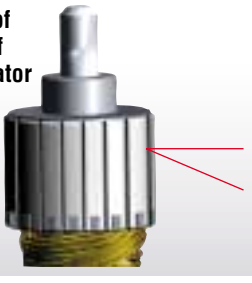
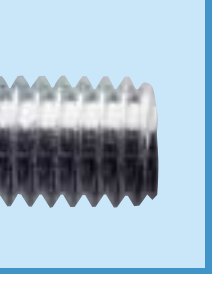
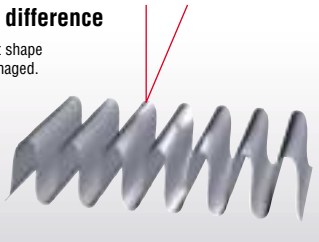
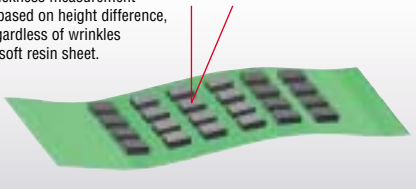
Multicolored surface

Low-reflective surface

Coarse surface

Non-contact surface

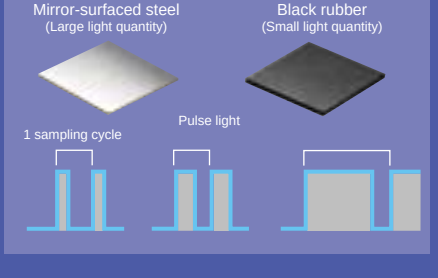
ures for solving the toughest application problems

Applications	Advantages	Automobile	Electronic component/ Home appliance
	Using the CCD as the light receiving element, the LK series enables highly accurate measurement, unaffected by the scattered reflection by the target.	**Engine valve stroke** 	**Checking of QFP pin alignment** 
	The LFTC function enables variable adjustment of the emitted light quantity up to 150 times, thus preventing a measurement error due to a color difference.	**Coating thickness measurement** Even wet targets can be measured. 	**Measurement of solder paste height on PCB** 
	The AUTO GAIN function automatically adjusts the amplification factor of the light-receiving signal, enabling stable measurement even with a low-reflective target such as black rubber.	**Measurement of fan belt runout** Measurement is not affected by printing on a rubber belt. 	**Checking orientation of ICs** 
	Because of the small beam spot (ø30 μm) and little variance of the light-receiving signal waveform, measurement is not affected by a hairline crack on the target surface.	**Engine block width measurement** 	**Measurement of groove depth of motor commutator** 
	The LK series enables non-contact shape/thickness measurement of soft, thin or hot targets which cannot be measured with contact-type sensors.	**Radiator fin height difference** The target shape is not damaged. 	**LED chip thickness measurement** Thickness measurement is based on height difference, regardless of wrinkles of soft resin sheet. 

LFTC circuit

The LK series includes an LFTC (Laser Flash Time Control) circuit* that can automatically control the laser emission time based on the target surface condition. This function enables stable measurement of glossy metal targets, low-reflective black rubber targets and targets of various colors.

* Patent pending

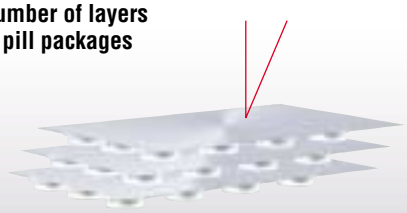


AUTO GAIN function

With a glossy target, the received light quantity is large. With a low-reflective target, the received light quantity is small. The AUTO GAIN function automatically adjusts the amplification factor of the light-receiving signal according to the received light quantity. This function enables stable measurement regardless of the light-receiving characteristics of the target.

Food/Packaging

Measurement of number of layers PTP pill packages



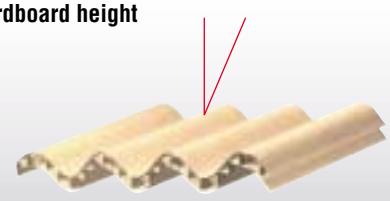
Checking swell of aluminum cap

Stable measurement regardless of printing color of cap.

Noodle dough thickness measurement

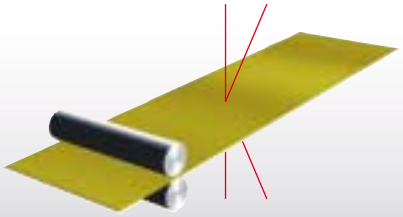
Measurement of cookie shape

Measurement of corrugated cardboard height

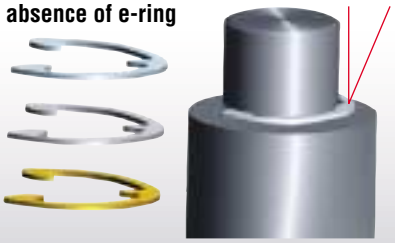


Metal/Machinery

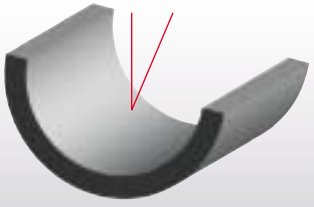
Copper sheet thickness



Presence/ absence of e-ring

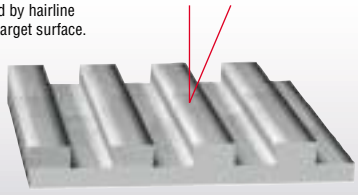


Ferrite thickness measurement



Torch control for laser beam machine

Unaffected by hairline crack on target surface.



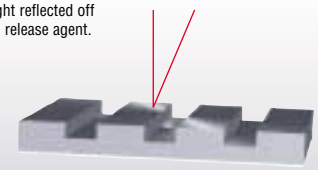
Measurement of warpage of hot aluminum casting

Contact-type sensors cannot measure a hot target.

Molding

Measurement of width/groove depth

Measurement is not affected by the light reflected off the mold release agent.



Measurement of thickness of extruded sheet

Measurement of sheet of various colors.

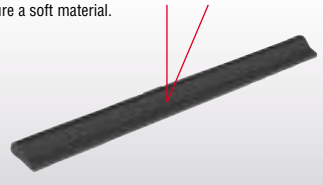
Measurement of tire tread shape

Unaffected by diffused light.

Measurement of golf ball dimple depth

Wiper thickness measurement

Contact-type sensors cannot measure a soft material.



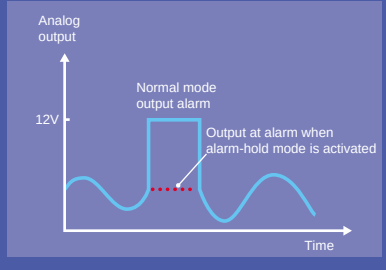
Response speed selection function

This function switches the measurement averaging time between 0.5 ms and 4 ms.* When the LK series measures a target with a wide range of reflectivity or with a large color difference, this function enables the LK series to ignore sporadic changes in measurement data to ensure stable measurement. This function enables the LK series to be used for various targets.

* With the LK-081, the measurement averaging time can be switched between 1 ms and 8 ms.

ANALOG OUTPUT HOLD Function in alarm condition

When the alarm output is activated due to a large vibration of the target for an instant during measurement, the LK series holds the analog output (measured value) immediately before the alarm output is activated. When the alarm output is reset, the LK series continues measurement.



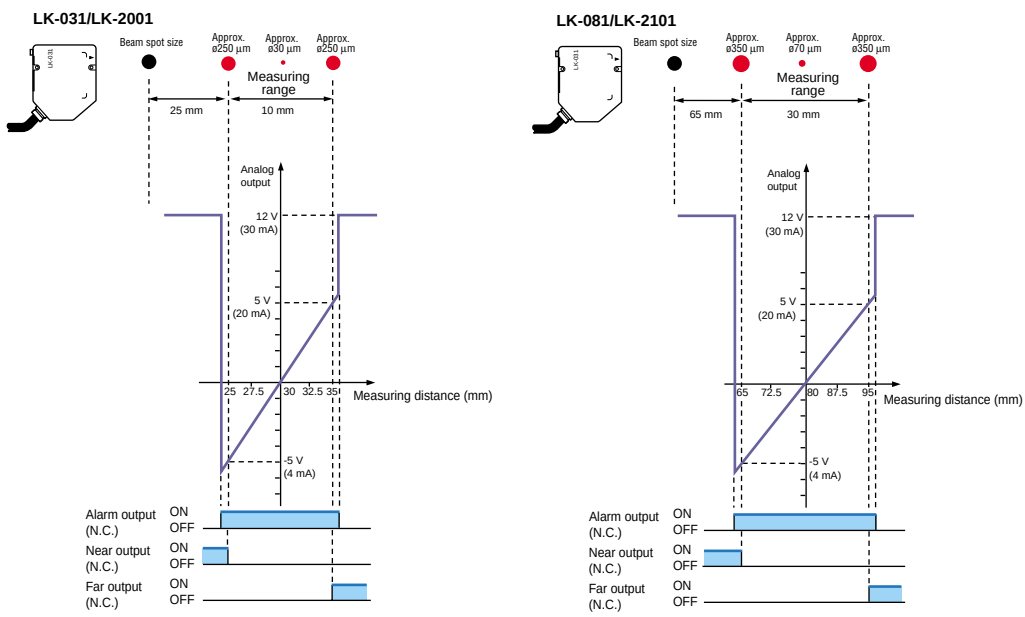
Specifications

Type		High-precision	Long-distance
Model	Sensor head	LK-031	LK-081
	Controller	LK-2001	LK-2101
Reference distance		30 mm	80 mm
Measuring range		±5 mm	±15 mm
Light source		Red semiconductor laser	
	Wavelength	670 nm	
	FDA	Class II	
	IEC 825-1 11,1993	Class 2	
Spot diameter		Approx. 30 µm	Approx. 70 µm
Resolution		1 µm [1.]	3 µm [1.]
Linearity		±0.1% of F.S.[2.]	
Sampling time		512 µs	1024 µs
Analog output	Voltage output	±5 V (1 mm/V)[3.]	±5 V (3 mm/V)[3.]
	Output impedance	100 Ω	
	Current output	4 to 20 mA (Applicable load: 0 to 350 Ω)	
Alarm output		NPN open-collector, 100 mA (40 V) max. Residual voltage: 1 V max. (N.C.)	
Other functions		AUTO ZERO, Response selection, Shift/Span adjustment, Holding output in alarm condition	
Power supply voltage		24 VDC ±10%, Ripple (P - P) 10% max.	
Power consumption		400 mA max.	
Temperature fluctuation	Sensor head	0.01% of F.S./°C	
	Controller	0.01% of F.S./°C	
Enclosure rating		IP-67	
Ambient light		Incandescent or fluorescent lamp: 10,000 lux max.	
Ambient temperature		Amplifier: 0 to 50°C, Sensor head: 0 to 50°C	
Relative humidity		35 to 85%	
Vibration		10 to 55 Hz, 1.5 mm double amplitude in X, Y and Z directions, 2 hours respectively	
Housing material		Sensor head: Aluminum die-cast, Controller: Polycarbonate	
Weight (including cable)	Sensor head	Approx. 260 g	Approx. 385 g
	Controller	Amplifier Approx. 515 g	

1. When connected to the RD series analog controller. Number of averaging measurements: 64
   NOTE) When an oscilloscope or high-speed A/D conversion board is connected, the ripple of the analog output may exceed 1 mV due to common mode noise.
2. When KEYENCE's standard target (zirconia block gauge) is used.
3. When measurement is impossible, the analog output is held at 12 V (31.2 mA).

• The LK series' controller and sensor head have been factory-calibrated as a pair. Be sure to combine units with the same serial number.

Measuring range vs. Analog output



FAR/NEAR output function

When the sensor-to-target distance is too long or too short, a FAR or NEAR signal is output to external equipment.

AUTO ZERO key

Pressing the AUTO ZERO key resets any output value to 0 V. Using a standard target, you can complete the zero adjustment with a push of this switch. The AUTO ZERO function can also be activated by short-circuiting the external input terminal.

Two-color operation indicator LED

The sensor head provides a two-color operation indicator LED. The yellow LED flashes when the target is out of the measuring range, or the received light quantity is too small or too large. The yellow LED lights when the target enters the measuring range, and the green LED lights when the target approaches the center of the measuring range.

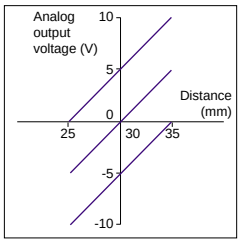
IP-67 enclosure rating

The sensor head is waterproof, conforming to IP-67 standards.

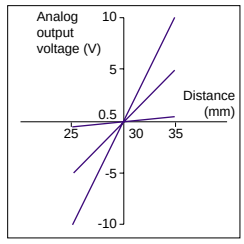
Characteristics (Typical)

LK-031

Zero-adjustment range
* Within the whole measuring range

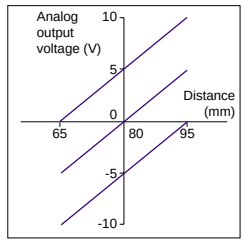


Span-adjustment range

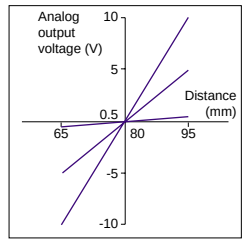


LK-081

Zero-adjustment range
* Within the whole measuring range

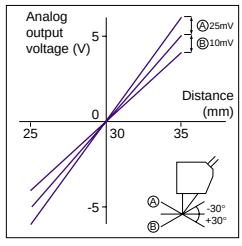


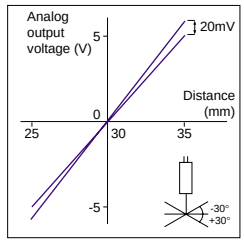
Span-adjustment range



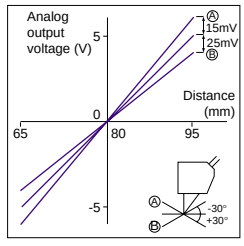
Changes in detection span when target is tilted (Target: White ceramic)

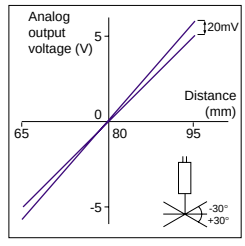
LK-031



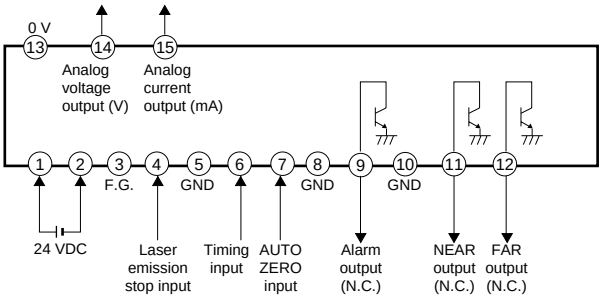


LK-081





Connections



④ Laser emission stop input
Disconnecting this terminal from the GND terminal (⑤, ⑧, ⑩) stops laser emission. Use this terminal in an emergency to stop laser emission.

⑦ AUTO ZERO input
Connecting this terminal to the GND terminal (⑤, ⑧, ⑩) resets the analog output to 0 V (12 mA). The input is a one-shot input.

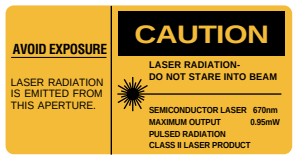
⑪ NEAR alarm output (N.C.)
The output contact opens when a target is positioned closer than the measuring range.

⑫ FAR alarm output (N.C.)
The output contact opens when a target is positioned further than the measuring range.

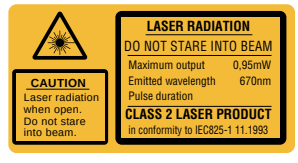
Warning

The LK series conforms to the FDA standard for Class II and IEC standard for Class 2 laser products.

FDA



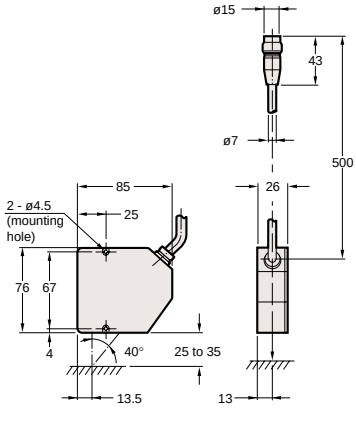
IEC



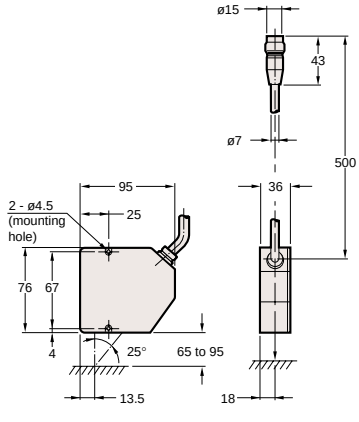
Dimensions

Sensor head

LK-031

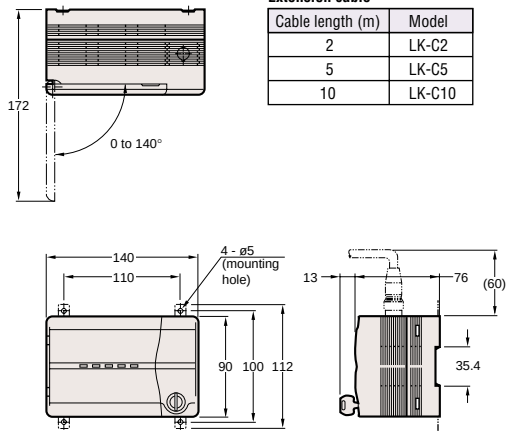


LK-081



Controller

LK-2001/LK-2101



Extension cable

Cable length (m)	Model
2	LK-C2
5	LK-C5
10	LK-C10

Specifications are subject to change without notice.

KEYENCE

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