

# Laser Displacement Sensors

## LB-70 Series

### Features

- High resolution of  $2\ \mu\text{m}$  0.08 Mil
- Quick response time of 0.15 ms
- Precise 0 V setting
- Long distance measurement

### Measuring distance

Long-range – 100 mm  $\pm$ 40 mm (3.94"  $\pm$  1.57")

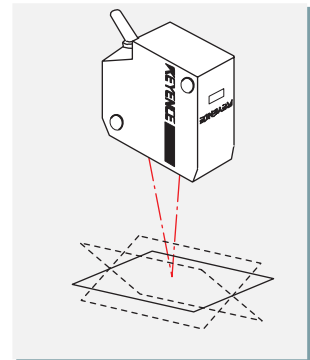
High-resolution – 40 mm  $\pm$ 10 mm (1.57"  $\pm$ 0.39")



### Description

#### Highly accurate measurement

The LB-12 offers a high resolution of  $2\ \mu\text{m}$  0.08 Mil, enabling accurate measurement of various materials. The short response time of 0.15 ms enables rapid tracking and eccentricity measurement of rotating targets. The LB Series sensors stably measure even tilted objects, allowing greater flexibility in mounting the sensor head.



#### Wide measuring range

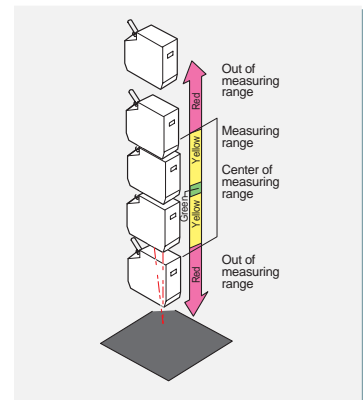
The LB-11 has an extremely wide measuring range of 60 2.36" to 140 mm 5.51". This eliminates the need to reposition the sensor head when detecting targets at varying distances and allows long-distance measurement of high-temperature targets.

#### Precise 0 V setting

Easy and accurate 0 V setting is possible at any mounting position and at any position within the measuring range.

#### LED indication of optimal setting position

The operation indicator LED lights red when the target is beyond the measuring range, yellow when the target is within the measuring range and green when the target reaches the center of the measuring range.



Out of measuring range



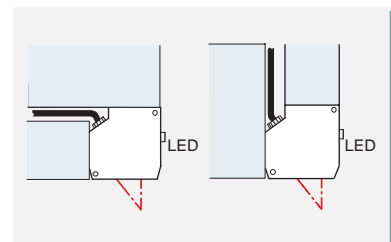
Within measuring range



Reference distance  
(Center of measuring range)

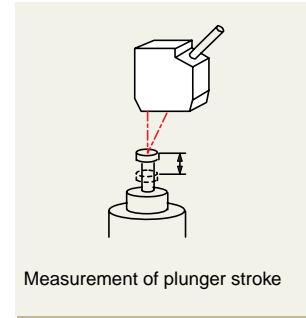
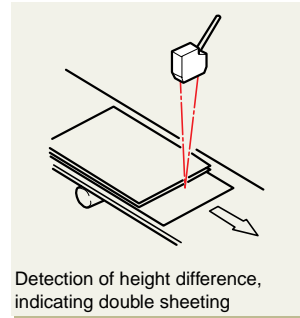
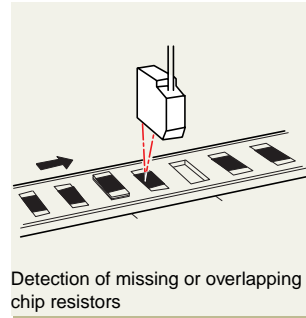
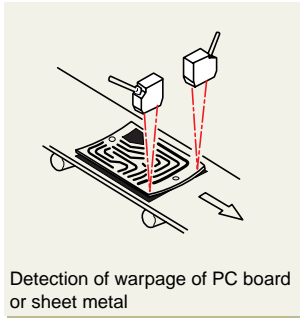
#### Easy-to-mount, heavy-duty sensor cable

The sensor cable can be positioned either vertically or horizontally when mounting the sensor. The cable is 5 times stronger than conventional cables, providing trouble-free operation, even during the punishing movements of a robot arm. (LB-11)



Refer to P.521 for a list of products complying with EMC directive.

## Applications



## Specifications

Type		Long-range		High-resolution	
Model	Sensor head	LB-11		LB-12	
	Controller	LB-70		LB-72	
Reference distance		100 mm 3.94"		40 mm 1.57"	
Measuring range		±40 mm 1.57"		±10 mm 0.39"	
Light source		Infrared semiconductor laser		Infrared semiconductor laser	
Wavelength		780 nm		780 nm	
Class	FDA	Class IIIb		Class IIIb	
	IEC	Class 3B		Class 3B	
Spot diameter		1.0 x 2.0 mm 0.04" x 0.08"		1.0 mm dia. 0.04"	
Linearity <sup>1</sup>		1.6% of F.S. (80 to 120 mm 3.15" to 4.72")		1% of F.S.	
Resolution <sup>2</sup>		10 µm 0.39 Mil (at 500 ms)/40 µm 1.56 Mil (at 20 ms)/180 µm 7.02 Mil (at 0.7 ms)		2 µm 0.08 Mil (at 60 ms)/15 µm 0.59 Mil (at 2 ms)/50 µm 1.95 Mil (at 0.15 ms)	
STABILITY indicator		LED (RED, GREEN, YELLOW)		LED (RED, GREEN, YELLOW)	
Output	Analog	Voltage <sup>3</sup> : ±4 V (0.1 V/mm)		±4 V (0.4 V/mm)	
	Impedance	100 Ω		100 Ω	
Alarm <sup>4</sup>		NPN: 50 mA max. (40 V), Residual voltage: 1 V max. (N.C.)			
Adjustment range	Zero-point adjustment range	60 to 140 mm 2.36" to 5.51"		30 to 50 mm 1.18" to 1.97"	
	Span adjustment range	0.1 V/mm ±30%		0.4 V/mm ±30%	
Response frequency		DC to 700 Hz (at 0.7 ms) (-3 dB)/ DC to 18 Hz (at 20 ms) (-3 dB)/ DC to 0.6 Hz (at 500 ms) (-3 dB)		DC to 3 kHz (at 0.15 ms)(-3 dB)/ DC to 200 Hz (at 2 ms) (-3 dB)/ DC to 6 Hz (at 60 ms)	
Sensitivity		WHITE, BLACK, and AUTO (switch-selectable)			
Temperature fluctuation <sup>3</sup>	Sensor head	0.02% of F.S./°C		0.04% of F.S./°C	
	Controller	0.04% of F.S./°C		0.03% of F.S./°C	
Laser control input		NPN or non-voltage contact		NPN or non-voltage contact	
Ambient light		Incandescent: 4,000 lux max.		Incandescent: 4,000 lux max.	
Ambient temperature		0 to +50°C		0 to +50°C	
Power supply		12 to 24 VDC ±10%		12 to 24 VDC ±10%	
Current consumption		120 mA max.		120 mA max.	
Housing	Sensor head	Die-cast zinc-based alloy		Die-cast zinc-based alloy	
	Controller	Polycarbonate		Polycarbonate	
Weight (including cable)	Sensor head	Approx. 165 g		Approx. 250 g	
	Controller	Approx. 155 g		Approx. 170 g	

1. When the measuring range is 80 mm 3.15" (LB-12: 20 mm 0.79"). Target: white mat paper

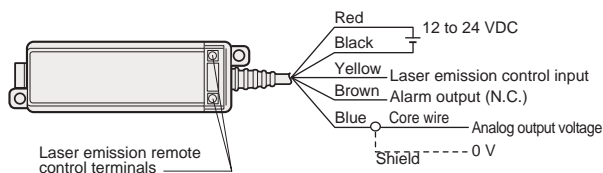
2. When the target (white paper) is measured at a distance of 100 mm 3.94" (LB-12: 40 mm 1.57") from the laser-emitting portion of the sensor head.

3. The range can be expanded to ±5 V by using the 0-ADJ and SPAN adjustment trimmers.

4. NPN output can easily be converted to PNP output by connecting the optional OP-5148 PNP Output Converter.

# LB-70 Laser Displacement Sensors

## Connections



### Laser emission control input

This external input short-circuits the yellow and black cables to stop emission. It is utilized to prevent interference when driving 2 or more sensor heads alternately, or to stop laser beam emission in an emergency. The analog output voltage just prior to short-circuiting will be retained.

### Alarm output (N.C.)

The alarm output is activated when the light quantity exceeds or falls below a specified limit.

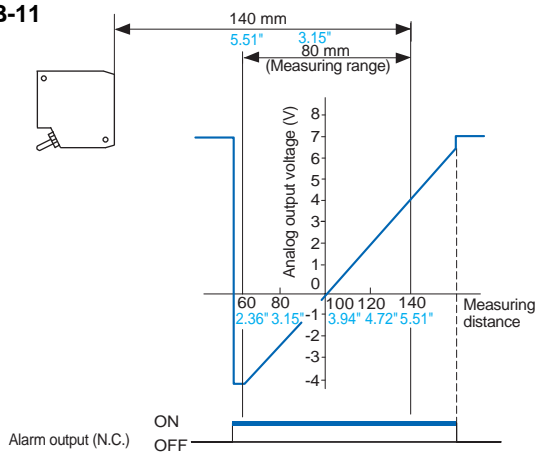
### Laser emission remote control terminals

When the terminals are short-circuited, the LASER ON alarm LED on the front panel lights and laser emission begins after 3 seconds. When the terminals are opened, the LASER ON alarm LED on the front panel turns off and laser emission stops. For shipping purposes, a short-circuit bar is inserted between the terminals.

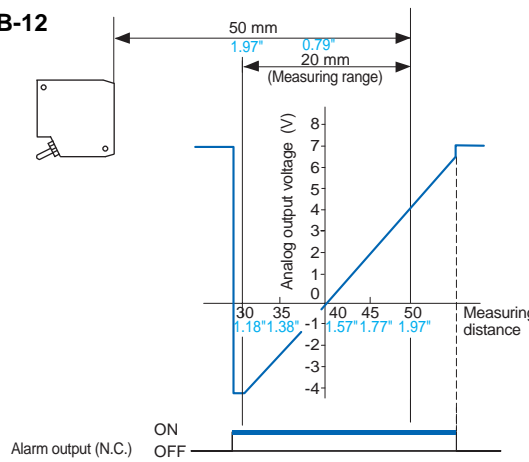
## Characteristics

### Measuring distance vs. analog output voltage

LB-11

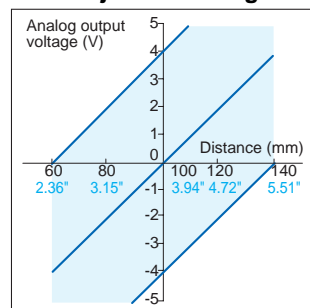


LB-12

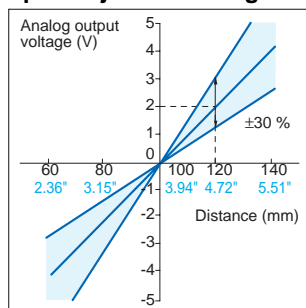


LB-11

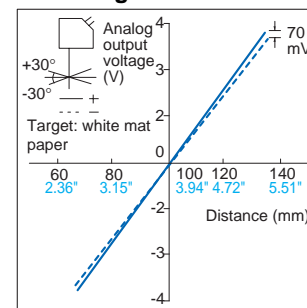
### Zero adjustment range



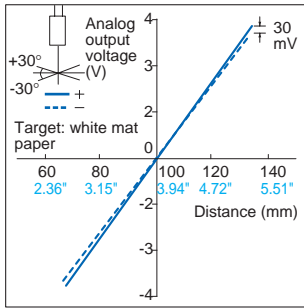
### Span adjustment range



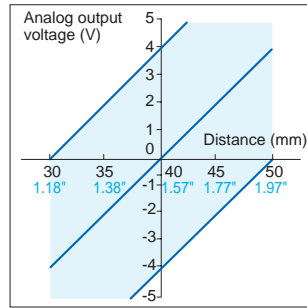
### Changes in detection span when target is tilted



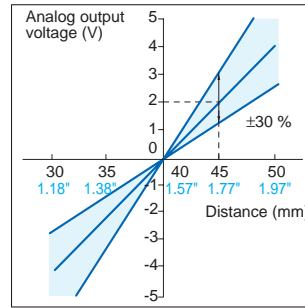
**Changes in detection span when target is tilted**



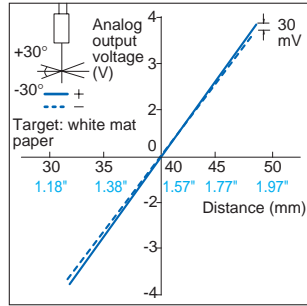
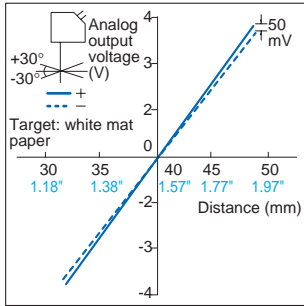
**LB-12 Zero adjustment range**



**Span adjustment range**



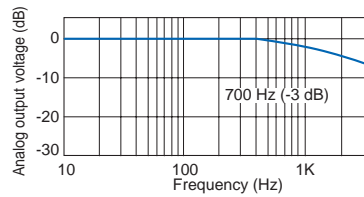
**Changes in detection span when target is tilted**



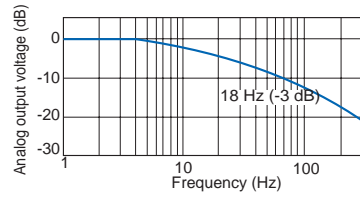
**Response frequency**

**LB-11**

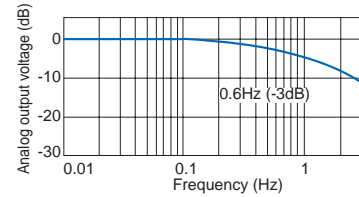
**Response speed set at 0.7ms**



**Response speed set at 20 ms**

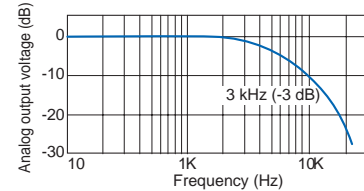


**Response speed set at 500 ms**

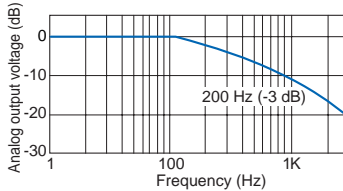


**LB-12**

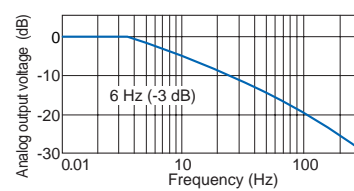
**Response speed set at 0.15 ms**



**Response speed set at 2 ms**



**Response speed set at 60 ms**

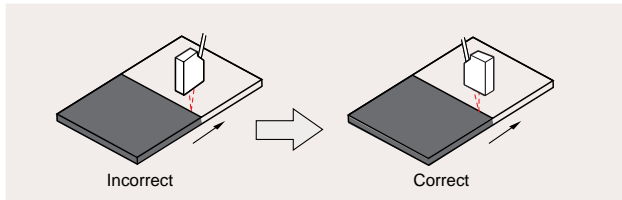


# LB-70 Laser Displacement Sensors

## Hints on Correct Use

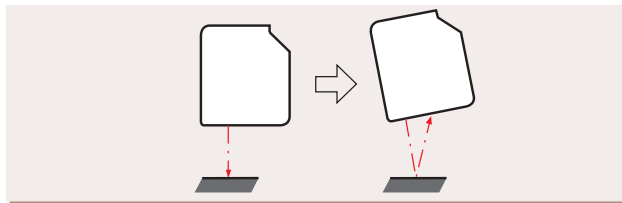
### Mounting sensor head

When a target consists of differently colored portions or different materials separated by a border, measurement error may result depending on the orientation of the sensor head. To minimize measurement deviation, install the sensor head parallel to the border line as shown in the illustration below.



### Detectable objects

Mirror-surfaced targets may not be detectable depending on the direction in which the light beam is reflected from the target. To correct this, carefully adjust the angle of the sensor head to the target.



### Compatibility

The controller and sensor head are calibrated as a pair. To keep within specifications, combine units having the same serial number.

### Noise interference

- Isolate wiring and connection cable from high-voltage lines and power lines to avoid a malfunction.
- The maximum cable length is 10 m **32.8'**. (An extension connector cable is available as an option.)

### Interference area

When using sensor heads side-by-side, confirm the interference area given below.

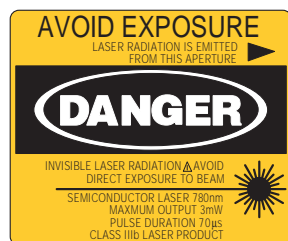
Mounting position	Interference area diagrams (a, b, c)		
	a	b	c
Model	a	b	c
LB-11/70	65 mm <b>2.56"</b>	50 mm <b>1.97"</b>	90 mm <b>3.54"</b>
LB-12/72	45 mm <b>1.77"</b>	20 mm <b>0.79"</b>	35 mm <b>1.38"</b>

## Warning

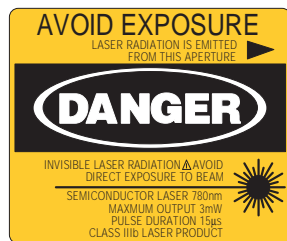
The LB-70 Series conforms to FDA and IEC standards as follows:

Model	LB-11	LB-12
FDA	Class IIIb	
IEC	Class 3B	

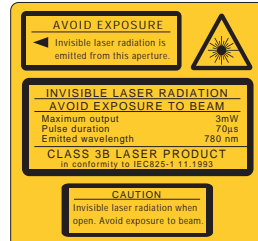
### FDA Class IIIb [LB-11]



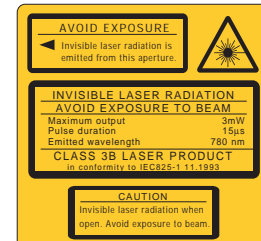
### FDA Class IIIb [LB-12]



### IEC Class 3B [LB-11]



### IEC Class 3B [LB-12]



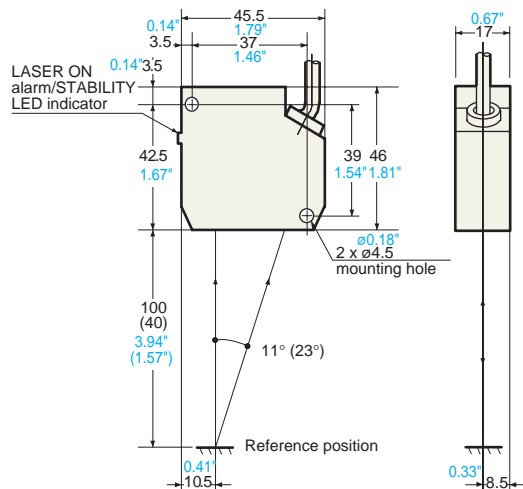
**Dimensions**

Unit: mm Inch

**Sensor head**

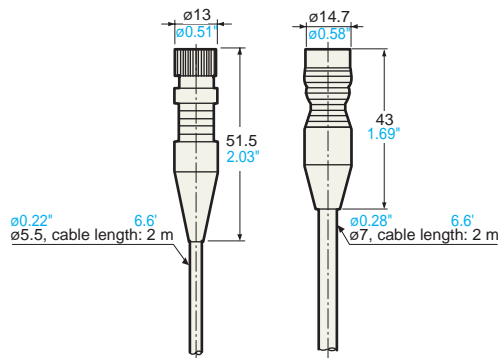
**LB-11/12**

\*Data in ( ) applies to LB-12. All other dimensions are the same for both models.



**LB-11**

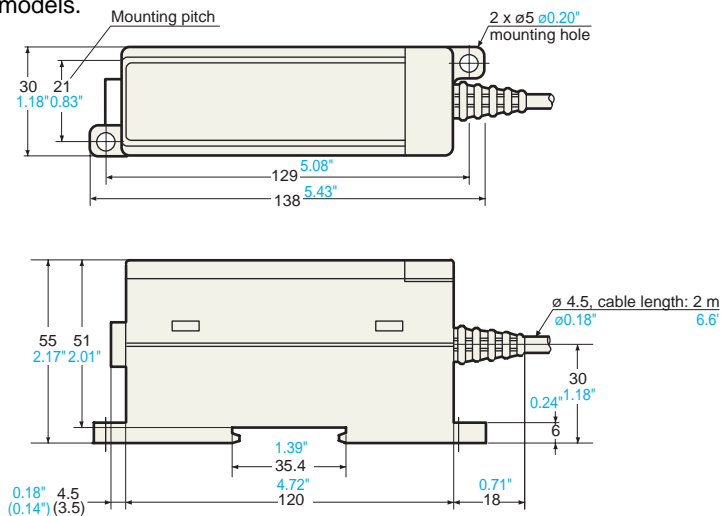
**LB-12**



**Controller**

**LB-70/72**

\*Data in ( ) applies to LB-72. All other dimensions are the same for both models.



**Options**

**RD Series Analog Sensor Controller**



The RD Series processes analog input signals from sensors. It can easily perform various arithmetic operations such as tolerance limit differentiation and peak-to-peak hold. For details on the RD Series, see the RD Series descriptions.