Ultra-high Accuracy Laser Displacement Meters

LC Series

Features

- Resolution of 0.01 µm* 0.0004 Mil
- Linearity: ±0.05% of F.S.*
- 12 µm 0.48 Mil diameter beam spot
- 50 kHz sampling rate

* Model: LC-2400A only

Measuring range

Specular-reflective – 30 mm ±0.5 mm (1.18" ± 0.02")

Diffuse-reflective – 50 mm ±8 mm (1.97" ± 0.31")

CE

Refer to P.551 for a list of products complying with EMC directive.

Description

Advanced optics and triangulation measurement system

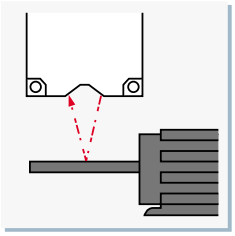
The LC Series uses a triangulation measurement system making it the world's most accurate laser displacement meter.

Visible laser beam spot

The beam spot is only 12 µm 0.48 Mil in diameter. Even when measuring minute targets, you can easily position the sensor head with the beam spot.

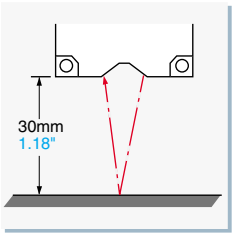
50kHz sampling rate

Utilizing a high-speed processing circuit developed by KEYENCE, you can more accurately measure the eccentricity of a motor shaft rotating at high speeds.



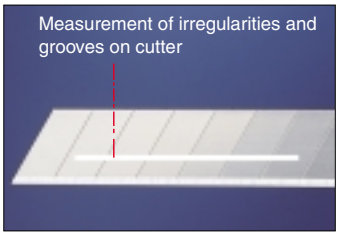
Superior operating distance

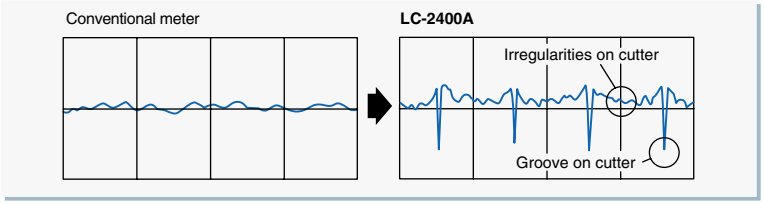
The LC-2430 has an operating distance of 30 mm 1.18", a distance unmatched in specular-reflective sensor heads. The LC Series can be used in situations where the sensor head cannot be mounted in close proximity to the target.



Target surface measurement

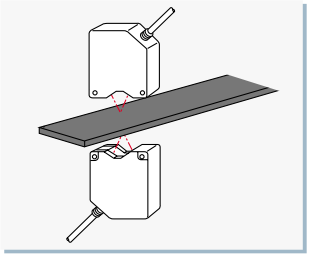
The LC Series can measure irregularities or groove depth on a surface that cannot be measured with conventional displacement meters.



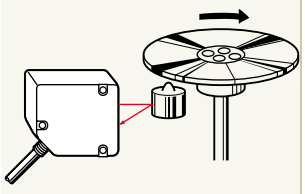


Thickness measurement

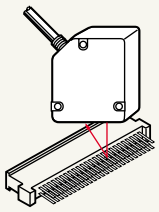
With the addition of an expansion board, one controller can control two sensor heads. Connections and setup are easy.
The thickness of a plate can be measured using two sensor heads positioned above and below the plate.



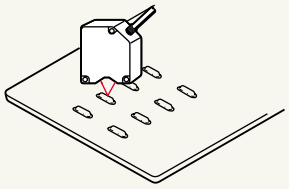
Applications



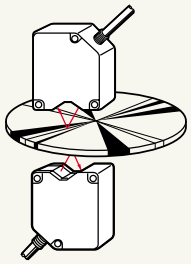
Measurement of CD pickup travel



Measurement of pin pitch and alignment



Measurement of solder paste height on PC boards



Measurement of silicon wafer thickness

Specifications

Model		Sensor head	Specular-reflective		Diffuse-reflective	
			LC-2420	LC-2430	LC-2440	LC-2450
		Controller	LC-2400A			
Measuring range			±0.2 mm 0.007"	±0.5 mm 0.02"	±3 mm 0.12"	±8 mm 0.31"
Operating distance			10 mm 0.39"	30 mm 1.18"	30 mm 1.18"	50 mm 1.97"
Light source			Red semiconductor laser			
	Wavelength		670 nm	670 nm	670 nm	670 nm
	Class	FDA	Class II	Class II	Class II	Class II
		IEC	Class 2	Class 2	Class 2	Class 2
Minimum spot diameter			20 x 12 µm 0.79 x 0.48 Mil	30 x 20 µm 1.18 x 0.80 Mil	35 x 20 µm 1.38 x 0.80 Mil	45 x 20 µm 1.77 x 0.80 Mil
Resolution [1]			0.01 µm 0.0004 Mil	0.02 µm 0.0008 Mil	0.2 µm 0.008 Mil	0.5 µm 0.02 Mil
Linearity [1]			±0.05% of F.S.	±0.05% of F.S.	±0.05% of F.S.	±0.05% of F.S.
Sampling frequency			50 kHz	50 kHz	50 kHz	50 kHz
Response frequency			20 kHz (-3dB, Averaging measurements: 1)			
Response time			100 µs	100 µs	100 µs	100 µs
Averaging measurements			1 to 131072 (18 selectable settings)			
OFFSET range			±199.99 µm 7.80 Mil	±499.98 µm 19.50 Mil	±2.9998 µm 0.12 Mil	±7.9995 µm 0.31Mil
Gain adjustment			AUTO/MANUAL (4 settings)			
Analog Output		Displacement data output	±10 V, Output impedance: 0 Ω, 6 settings			
		Intensity data output	0 to 5 V, Output impedance: 0 Ω			
Digital I/O	96-pin connector [2]	Displacement data output	TTL level, positive logic			
			1LSB=0.01 µm 0.0004 Mil	1LSB=0.02 µm 0.0008 Mil	1LSB=0.2 µm 0.008 Mil	1LSB=0.5 µm 0.02 Mil
			Intensity data output, Upper/lower limit output, INTENSITY alarm output, AREA OVER alarm output, Output timing input			
			TTL level, negative logic			
	50-pin connector [2]	Displacement data output	16-bit parallel NPN, negative logic			
			1LSB=0.01 µm 0.0004 Mil	1LSB=0.02 µm 0.0008 Mil	1LSB=0.2 µm 0.008 Mil	1LSB=0.5 µm 0.02 Mil
		Intensity data output	16-bit parallel NPN, negative logic 1LSB=2			
		Output timing input	TTL level, negative logic			
Control I/O	Control Input		**HOLD timing, AUTO-ZERO ON/OFF, Program selection, 1CH/2CH selection, LASER REMOTE**			
			Non-voltage (contact, solid state)			
	Control Output		**Upper/lower limit, Intensity alarm, AREA OVER alarm**			
			NPN: 100 mA max. (30V)			
Interface		RS-232C	Displacement data output and control input (baud rate: 75 to 19200 bps selectable)			
		GP-IB [3]	Displacement data output and control input			
Measurement stability(20 ±5°C) [4]			±0.2% of F.S.	±0.2% of F.S.	±0.03% of F.S.	±0.2% of F.S.
Power supply			100 to 240 VAC±10%, 50/60 Hz (when using the control unit separately: ±15 VDC ±3%, 0.5 A, +5 V ±5%, 3A)			
Power consumption			70 VA max.	70 VA max.	70 VA max.	70 VA max.
Ambient temperature			0 to +40°C	0 to +40°C	0 to +40°C	0 to +40°C
Weight		Sensor head	Approx. 500 g	Approx. 500 g	Approx. 250 g	Approx. 250 g
		Controller	Approx. 6.8 kg (Approx. 2 kg, excluding the display unit)			

1. Using a standard specular-reflective object (LC-2420/LC- 2430) or white diffuse-reflective object (LC-2440/LC-2450) as a target with the averaging measurements set to 512.
2. Can be used only when the display unit is removed from the controller.
3. Optionally available
4. Data was obtained when the standard target and the sensor head were fixed to a steel plate (LC-2420/LC-2430) or an aluminum plate (LC-2440/LC-2450) at a temperature of 20°C.

LC Ultra-high Accuracy Laser Displacement Meters

Functions

Data processing modes

Each of the four modes can be set by simply pressing a key.

Data processing mode	Function
NORMAL	Measures displacement from reference position.
PEAK TO PEAK (P-P)	Measures displacement between maximum and minimum values.
PEAK	Measures maximum value.
BOTTOM	Measures minimum value.

Analog voltage output range selectable

You can select from six analog voltage output ranges. By selecting the analog voltage output range based on the measuring range, a minute change in measured values can be monitored with high accuracy without being affected by noise interference.

Output range of LC-2420 sensor head (µm/ V)

2.5	5	10	25	50	100
0.1 Mil	0.2 Mil	0.39 Mil	0.98 Mil	1.95 Mil	3.9 Mil

Analog voltage output (intensity)

Analog voltage (0 to 5 V) proportional to the intensity level is continuously output. The analog voltage output is useful for monitoring changes in intensity level over a period and for setting upper/lower intensity limits.

AUTO GAIN

The controller can be set to automatically switch between 4 gain levels. Receiving sensitivity will automatically adjust to different target colors and materials.

Five program storage capability

Up to five sets of parameters can be stored in EEPROM. All of the settings, including preset tolerance and calibration, can be easily switched depending on the workpiece.

Light intensity limits

If the measured value is inaccurate because of excessive or insufficient reflected light or ambient light, setting upper and lower limits for received light intensity will eliminate this problem.

AUTO ZERO

Pressing this button sets the current measured value to “0”, regardless of target position. This simplifies offset target positioning.

Output hold

The displayed value and output value are retained by simply pressing a key.

Easy confirmation of reference distance

When the target is in the center area of the measuring range, the LED indicator lights orange. When it is outside the center area but in the measuring range, the LED indicator lights green. This allows you to easily find the reference distance (position where the laser beam spot is smallest) and mount or adjust the sensor head.

Sensor head	Range the LED lights orange
LC-2420	±0.02 mm 0.0008"
LC-2430	±0.05 mm 0.002"
LC-2440	±0.3 mm 0.01"
LC-2450	±0.8 mm 0.03"

Error message

The LC displays an error message to indicate that a problem has occurred. Since the displayed error message reveals the cause of the problem, you can act to prevent further errors from occurring.

Interface

Analog voltage output

Analog voltage is output in proportion to the measured value, enabling quick data processing and analysis. The output range can be changed to 6 steps.

RS-232C

The RS-232C interface enables communication with a computer. Thus, data transfer and remote operation for changing settings are possible.

Digital I/O (optional)

This displacement meter is equipped with the digital I/O terminal that can be connected to a computer. This enables high-speed processing of measured values.

GP-IB I/O (optional)

The GP-IB I/O allows up to 15 devices to be interconnected, making it easier to systematize the measuring instrument.

Control output

This displacement meter is equipped with the HIGH and LOW comparator outputs as the standard function.
In addition, the LIGHT INTENSITY alarm output (DARK, BRIGHT) and the AREA OVER alarm output (FAR, NEAR) are provided.

Hints on Correct Use

If the ambient temperature changes by 10°C, it takes approximately 60 minutes for the temperature distribution in the LC controller to become uniform.

Compatibility

With the LC Series, the controller and sensor head are calibrated in pairs. Therefore, to meet specifications, be sure to combine a controller and sensor head having the same serial number.

Measures to reduce noise interference

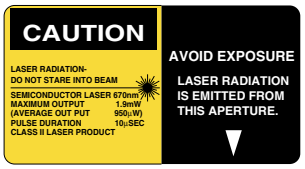
- Keep the wiring or connection cable away from high-voltage lines or power lines to prevent the LC Series from malfunctioning due to noise. Be sure to keep wiring separate.
- Be sure to earth-ground the LC Series through the earth ground terminal. Insulating the sensor head is also effective in reducing noise.

Warning

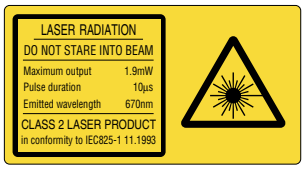
The LC Series conforms to FDA and IEC standards as follows:

Model	LC-2420	LC-2430	LC-2440	LC-2450
FDA	Class II			
IEC	Class 2			

FDA Class II



IEC Class 2

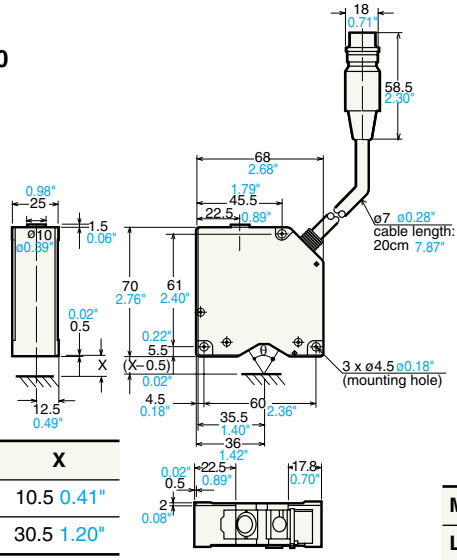


Dimensions

Unit: mm Inch

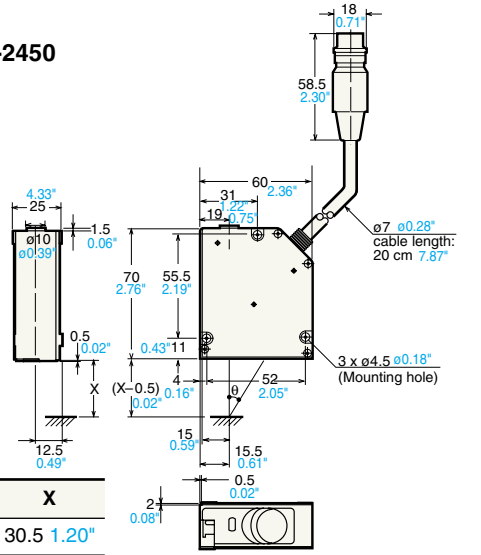
Sensor head

LC-2420/LC-2430



Model	θ	X
LC-2420	63°	10.5 0.41"
LC-2430	45°	30.5 1.20"

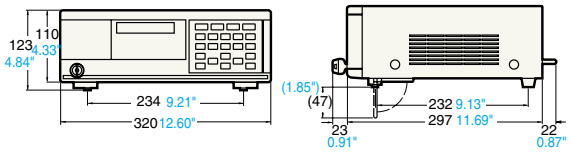
LC-2440/LC-2450



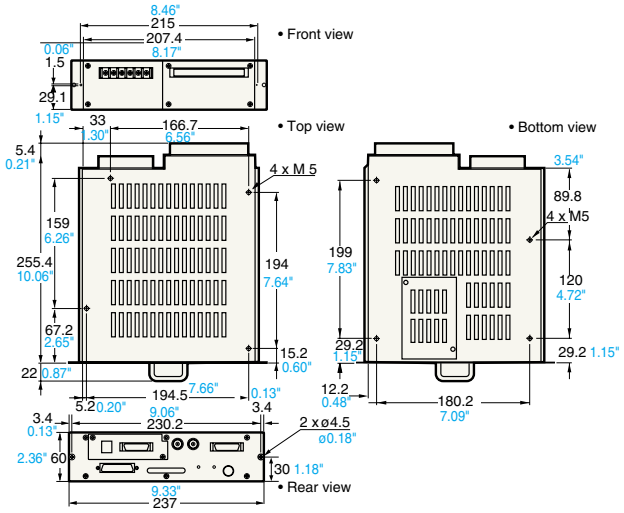
Model	θ	X
LC-2440	30°	30.5 1.20"
LC-2450	22°	50.5 1.99"

Controller

LC-2401/LC-2400A



Control unit LC-C1A



Connecting cable