

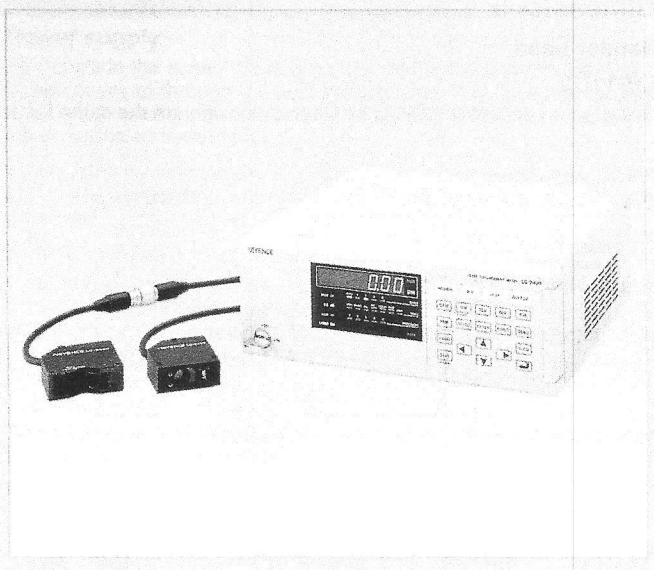
LC SERIES

Ultra-high Accuracy Laser Displacement Meters

With a resolution of $0.01\text{ }\mu\text{m}$, this compact controller is suited to a variety of applications.

The cost-effective design enables the controller to be used internally with or externally without the display unit.

Refer to P. 110 for a list of products complying with the EMC directive.



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Features

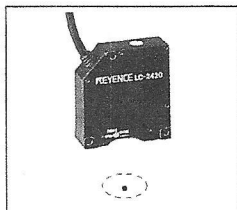
Advanced optics and triangulation measurement system

- Resolution: $0.01\text{ }\mu\text{m}$ (LC-2420)
- Linearity: $\pm 0.05\%$ of F.S.
- Detecting range: Up to 50 mm (LC-2450)

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

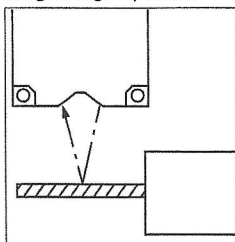
Visible laser beam spot

The laser beam spot is only $12\text{ }\mu\text{m}$ in diameter. Even when measuring minute targets, you can easily position the sensor head with the beam spot.



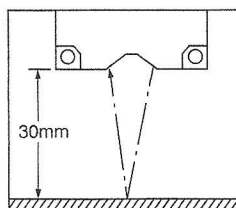
50kHz sampling rate

The high-speed processing circuit developed by KEYENCE is incorporated in this unit. Now you can more accurately measure the eccentricity of a motor shaft rotating at high speeds.



Superior operating distance

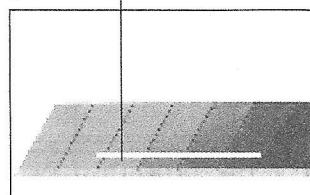
The LC-2430 has a operating distance of 30 mm, a distance unmatched in specular-reflective sensor heads. The LC series can be used in situations where the sensor head cannot be mounted in close proximity to the target because there is no mounting space or because the targets travel on a conveyor.



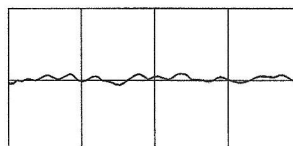
Target surface measurement

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

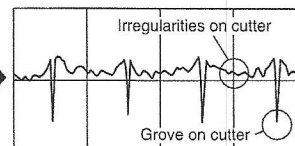
Measurement of irregularities and grooves on cutter



Conventional meter



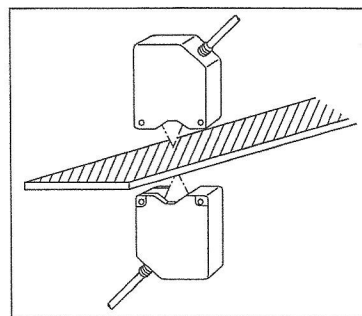
LC-2400



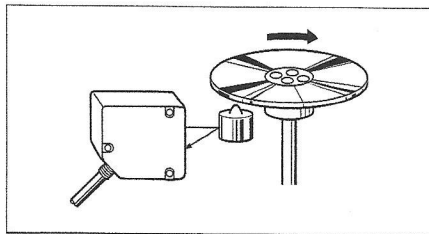
Thickness measurement

With the addition of a expansion board, one controller can control two sensor heads. Connection is easily and troublesome settings are not required.

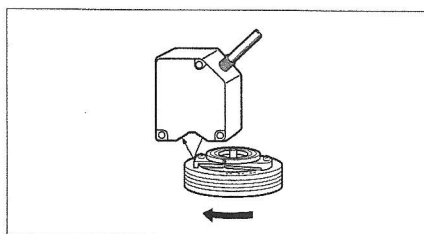
The thickness of a plate can be measured using two sensor heads positioned above and below the plate.



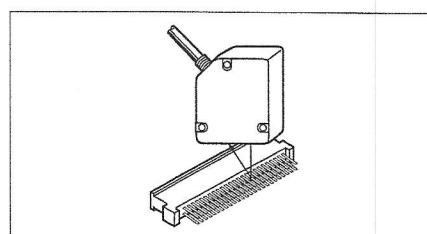
Applications



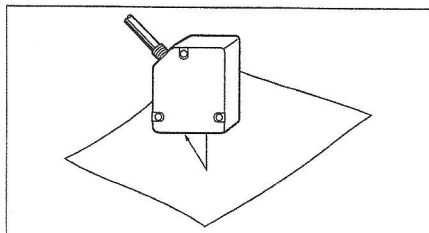
Measurement of CD pickup travel



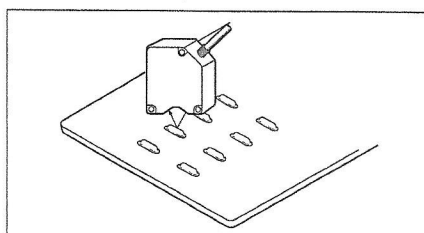
Measurement of VCR cylinder head runout



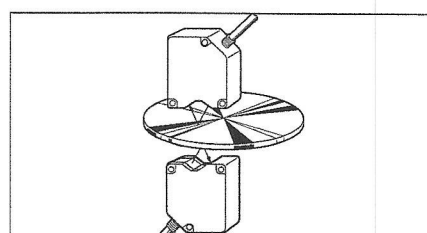
Measurement of pin pitch and alignment



Measurement of paper roughness



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		±0.5 mm		±3 mm		
Operating distance		10 mm		30 mm		30 mm		
Light source		Red semiconductor laser						
Wave length		670 nm						
Class		FDA		Class II				
		IEC 825-1 11. 1993		Class 2		Class 1		
Minimum spot diameter		20 x 12 μm		30 x 20 μm		35 x 20 μm		
Resolution ¹		0.01 μm		0.02 μm		0.2 μm		
Linearity ¹		±0.05% of F.S.						
Sampling frequency		50 kHz						
Response frequency		20 kHz (-3dB, Averaging measurements: 1)						
Response time		100 μs						
Averaging measurements		1 to 131072 (18 selectable settings)						
OFFSET range		±199.99 μm		±499.98 μm		±2.9998 mm		
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				
		Intensity data output		1LSB=0.01 μm		1LSB=0.02 μm		
		Upper/lower limit output		1LSB=0.2 μm		1LSB=0.5 μm		
		INTENSITY alarm output		TTL level, negative logic				
		AREA OVER alarm output						
		Output timing input						
	50-pin connector ²	Displacement data output		16-bit parallel NPN open-collector, negative logic				
		Intensity data output		1LSB=0.01 μm		1LSB=0.02 μm		
		Output timing input		1LSB=0.2 μm		1LSB=0.5 μm		
		Output timing input		16-bit parallel NPN open-collector, negative logic 1LSB=2				
Control I/O	Control Input	HOLD timing input		TTL level, negative logic				
		AUTO-ZERO ON/OFF input		Non-voltage input (contact, solid state)				
		Program selection input						
		1CH/2CH selection input						
		LASER REMOTE input						
		Control Output	Upper/lower limit output		NPN open-collector, 100 mA (30V) max.			
	Intensity alarm output							
	AREA OVER alarm output							
	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.				±0.03% of F.S.		
Power supply		100 to 240 VAC±10%, 50/60 Hz						
Power consumption		(when using the control unit separately: ±15 VDC ±3%, 0.5 A, +5 V ±5%, 3A)						
Ambient temperature		70 VA max.						
Relative humidity		0 to 40°C						
		35 to 85%						
Weight		Sensor head		Approx. 500 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.

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 ($\mu\text{m/V}$)

2.5	5	10	25	50	100
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Analog voltage output (intensity)

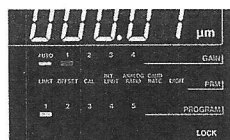
Analog voltage (0 to 5 V) proportional to the intensity level is continuously output. The analog voltage output is useful for monitoring changes in intensity level over a period of time and for setting upper/lower intensity limits.

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.

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 I/O

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

Digital I/O (Optional)

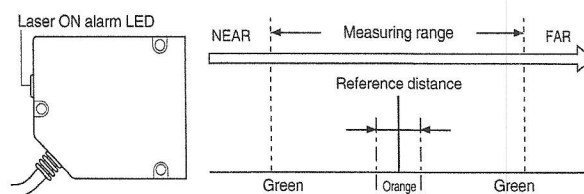
This displacement meter is equipped with the digital I/O terminal that can be connected to a computer. This enables high-speed processing of measured values.

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	$\pm 0.02 \text{ mm}$
LC-2430	$\pm 0.05 \text{ mm}$
LC-2440	$\pm 0.3 \text{ mm}$
LC-2450	$\pm 0.8 \text{ mm}$

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 take the appropriate measures to prevent measurement error from occurring.

Display	Error	Cause of problem
dAr	DARK	Insufficient light quantity
brl	BRIGHT	Excessive light quantity
FAR	FAR	Exceeds measuring range by +5%
nEAR	NEAR	Exceeds measuring range by -5%
F-Err	F-ERROR	Abnormality of filter
Err-1	ERROR-1	Incorrect connection of sensor head
Err-2	ERROR-2	Abnormality of GP-IB interface

Number of averaging measurements

Up to 131,072 measured values can be averaged to ensure accurate measured values.

The number of averaging measurements can be selected from 18 set 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.