KEYENCE

NEW **Confocal Displacement Sensor**
CL-3000 Series

High-precision measurement on any material or surface

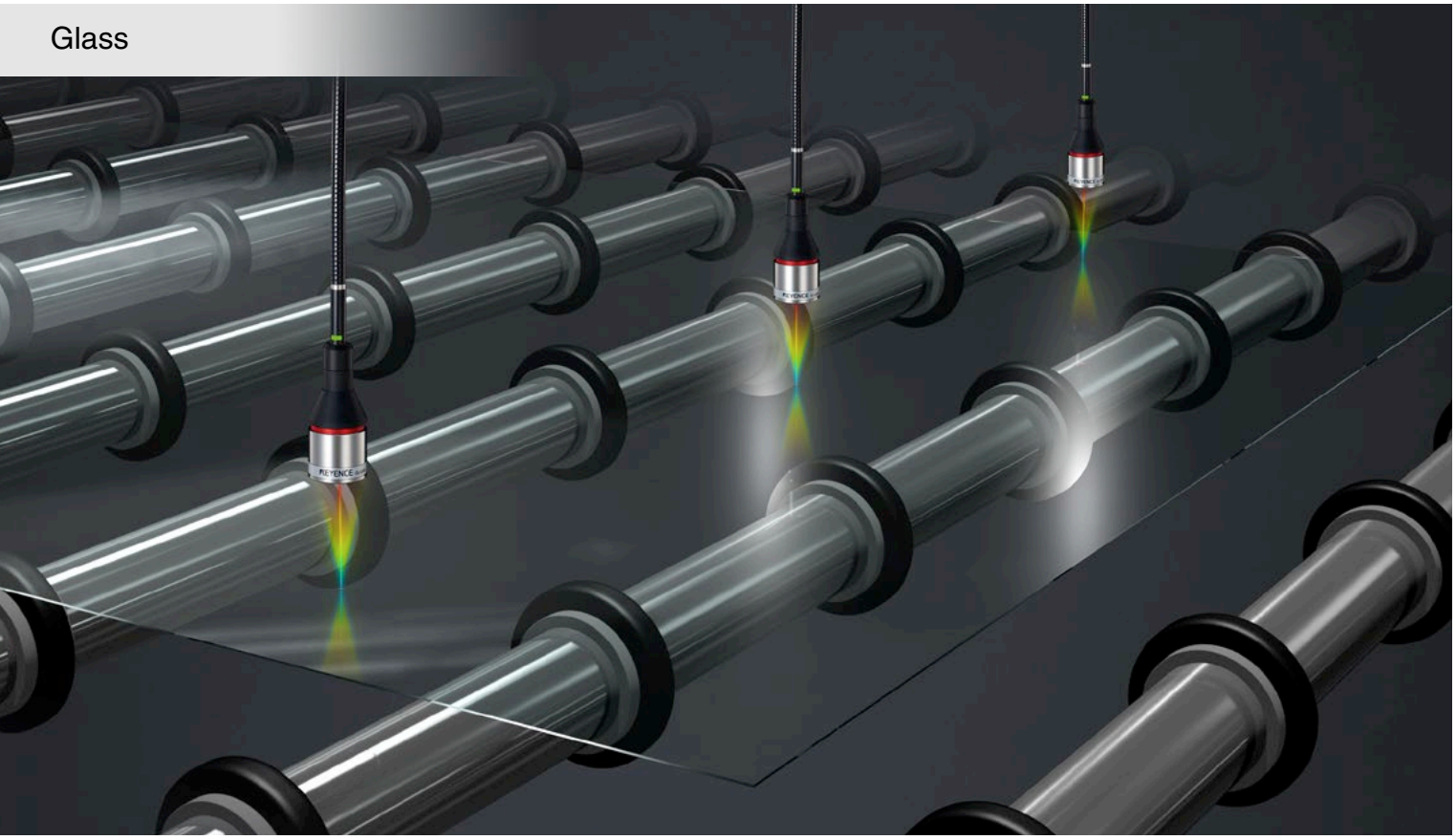
CL-3000 Series

Ultra-compact coaxial laser displacement sensors for any application in any location

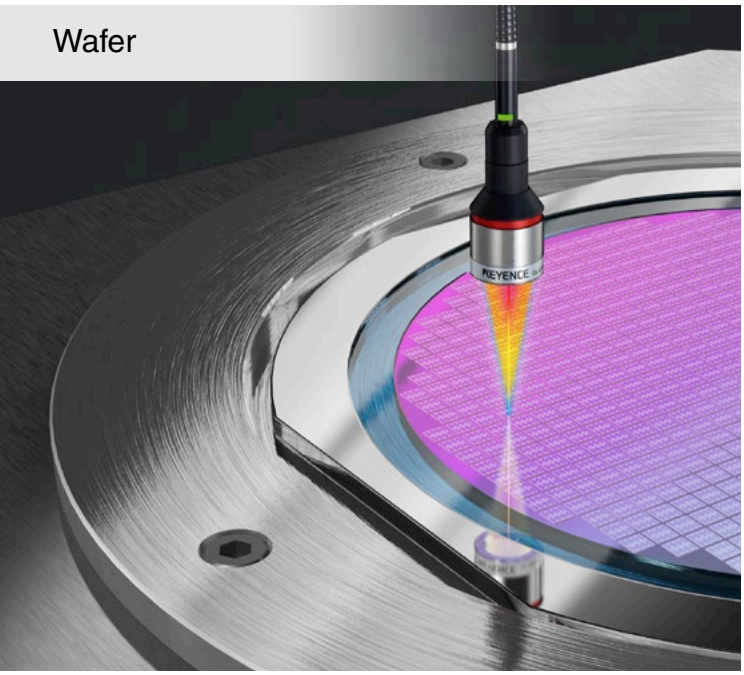
High-precision measurement on all targets, with simple sensor head installation and program settings.

CL-3000 Series ultra-compact coaxial laser displacement sensors address manufacturing challenges such as improving quality, preventing the shipment of defective parts and increasing production.

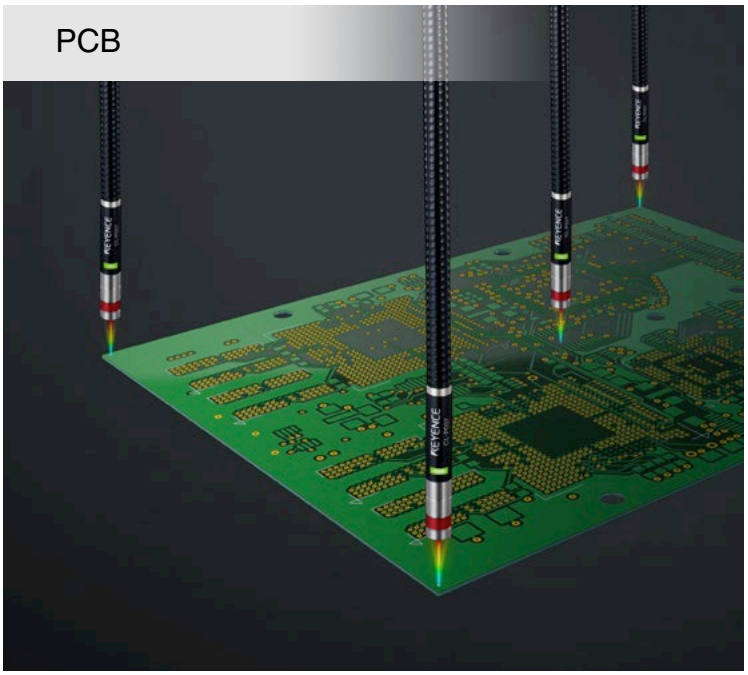
Glass



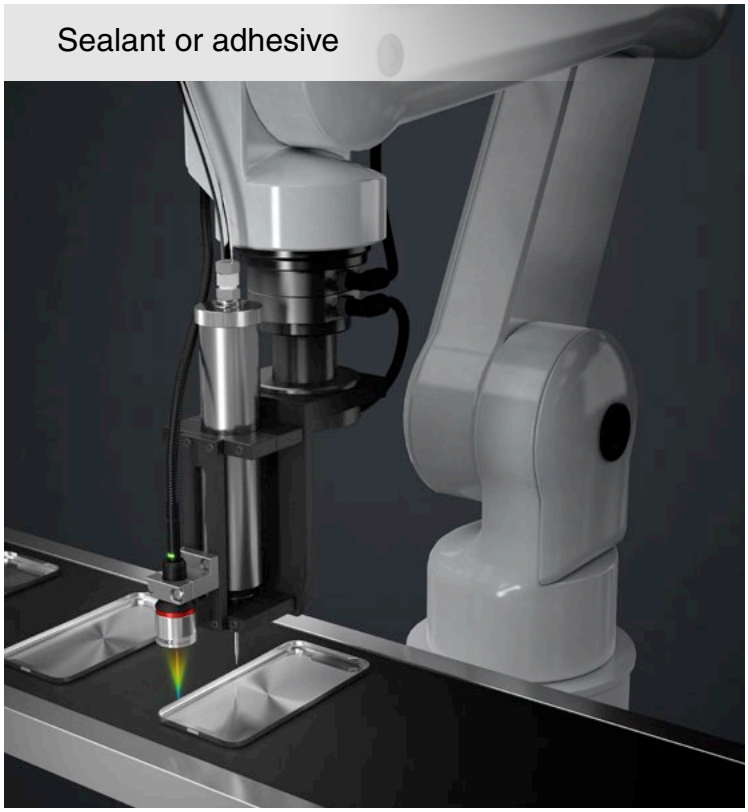
Wafer



PCB



Sealant or adhesive



Film or plastics

Machined parts

Cover a wide range of applications using the new standard in laser displacement sensors.

Confocal Displacement Sensor
CL-3000 Series

No influence from heat or electrical noise
High-precision displacement sensors that perform to specifications

In the new multi-color confocal method displacement sensors, the light sources and other parts are all mounted in the optical unit.
Since the lens is the only part inside the head, it is not impacted by heat, electrical noise or other error-producing sources not listed in the specifications.
These are high accuracy displacement sensors that you can truly rely on in manufacturing environments.

Operation Indicator

Features an operation indicator with high visibility even from a distance.

Designed to be unaffected by external error sources

Structure designed with only the lens inside the head. Without electrical components, no noise or heat is generated.

The multi-color confocal method allows for performance not possible with conventional systems

Ultra-compact and lightweight

Not only can the sensor head be installed in small and constrained spaces, it can be easily mounted on robots as well.

Effective on curved, uneven and rough surfaces

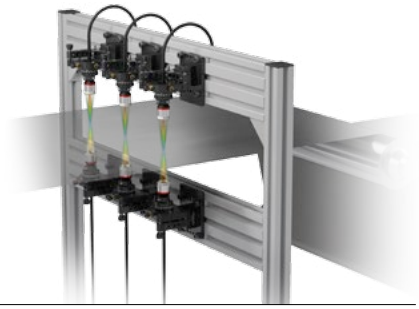
The wide angle lensing allows for high-accuracy measurement on a wide variety of target shapes, including curved or uneven surfaces, and surfaces with rough finishes.

High precision regardless of the material

Measures precisely on all targets, including transparent, mirrored, unfinished metal, ceramic and adhesive surfaces. Measures stably on targets that cast multiple reflections or absorb light.

Easy installation and high-accuracy measurement even for multi-point thickness measurements that used to be so troublesome

The adjustable fixture for thickness measurement and the optical axis alignment function make accurate set-up quick and easy, eliminating errors from mis-installation.



Ultra-compact and lightweight

With a diameter of just 8 mm (0.31"), non-contact measurement can be performed in tight spaces

Run-out measurement of a roll coater

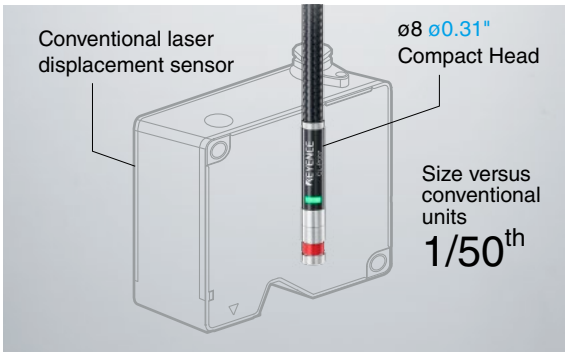
A cable enclosure rating that can withstand harsh manufacturing conditions

The flexible metal tubing around the cable protects the fragile fibers from tensile loads, shock, bending and lateral pressure. Cable length can be extended to a maximum of 30 m 98.4'.

Ultra-compact structure, with only the lens inside the head

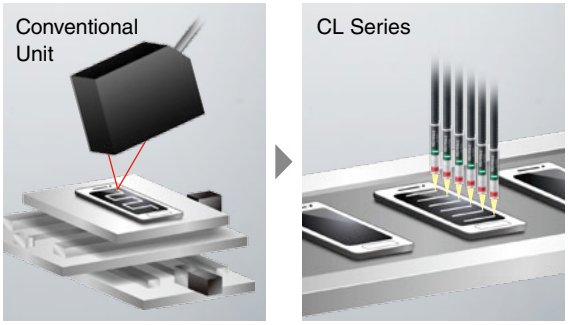
Small form factor, at just 1/50th of the conventional size

Designed with only the lens inside the head, the sensor is reduced to 1/50th the size of conventional systems. Meeting the increasing need for miniaturization in manufacturing equipment, it offers easy installation while eliminating space restrictions.



Multiple sensors can be installed side-by-side

Due to the head size of conventional laser displacement sensors, targets needing multi-point measurement need to be moved with an XY stage, increasing equipment cost and complexity.
The CL Series of ultra-compact heads can be installed in parallel even in cramped spaces, allowing users to keep equipment costs down.



Heads can be installed within 9 mm 0.35" of each other

Lightweight and easy to integrate with robots

At roughly 1/2 the weight of a conventional laser displacement sensor the CL series can be easily mounted on the end of a robot arm. Additionally, the lighter weight reduces the residual vibration when the robot arm is brought to a stop.

Effective on curved, uneven and rough surfaces

Multi-color confocal method

Sensor head

Receiving

Wavelengths of light that pass through the pinhole vary by refraction point. Only the light at wavelengths that best match the focal point passes through the pinhole.

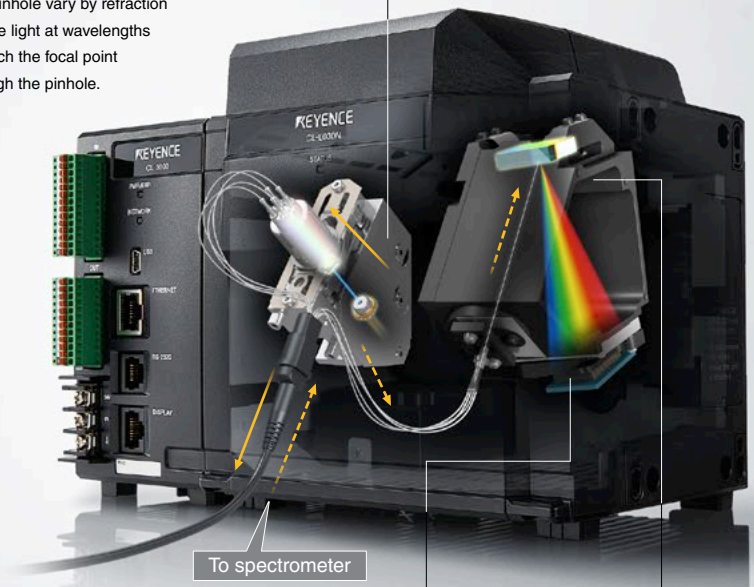
Transmitting

Transmits light at varying focal distances for each wavelength

Controller and optical unit

Light source unit

The ultra-high brightness LPD light source generates light stably at all wavelength bands.



Quad CMOS

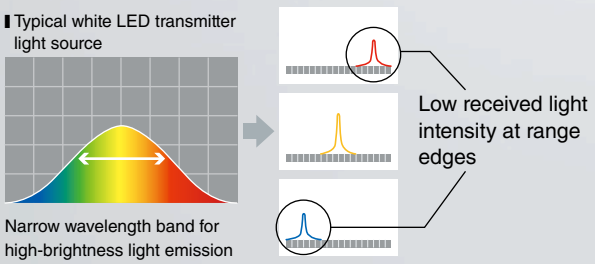
A dynamic range 26 times greater than conventional units. Light is received by four high-resolution CMOSs allowing for high accuracy measurement on all kinds of materials.

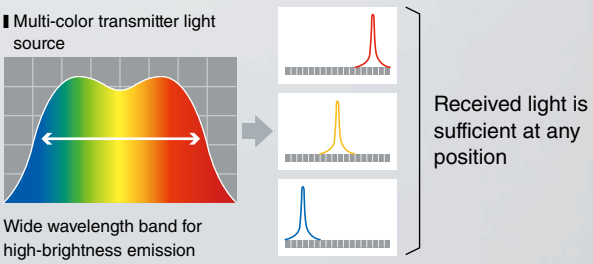
Spectrometer

The received light is split by wavelength and focused onto the Quad CMOS.

Large area, high-accuracy measurement using an ultra-high brightness multi-color transmitter light source

Multi-color light is generated using a LPD light source that emits red and green light simultaneously. The emitted light is more stable and of higher brightness over a wider range of wavelength bands compared to typical white LEDs. This ensures there are sufficient light levels at all points in the measurement range, allowing for higher accuracy.

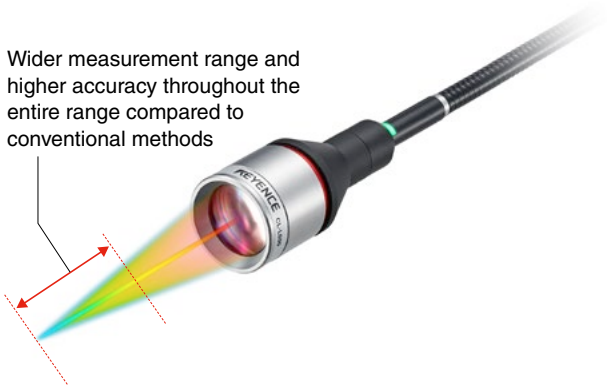




High precision due to the multi-color confocal method

Larger measurement ranges and higher accuracy across the entire measurement range

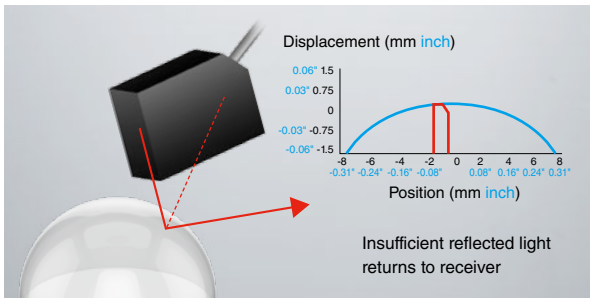
Using an ultra-high brightness multi-color transmitter light source allows for a larger measurement range and higher accuracy across the entire measurement range compared with confocal displacement sensors using white LED light sources. This allows for increased stability and higher accuracy even when the measurement point changes due to target height variance or other reasons.



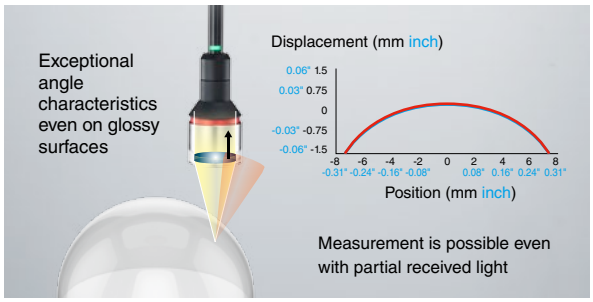
High-precision measurement even on transparent or mirrored targets with curved surfaces or oblique angles

The wide angle opening, combined with the coaxial multi-color confocal method, allow the CL Series to accurately measure curved or angled targets where only small amounts of light are reflected back from the target.

Conventional laser displacement sensor



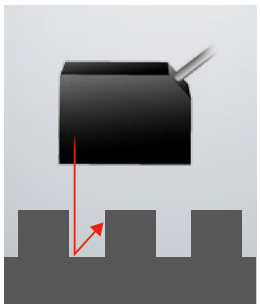
CL Series



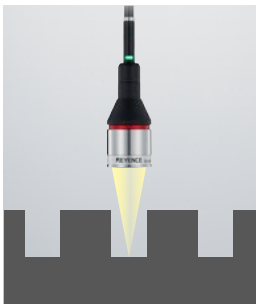
No dead angles on step heights or uneven surfaces

Measurements are not impacted by head installation direction or travel direction thanks to the coaxial multi-color confocal method.

Conventional laser displacement sensor



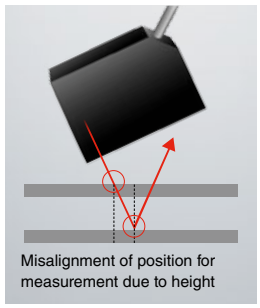
CL Series



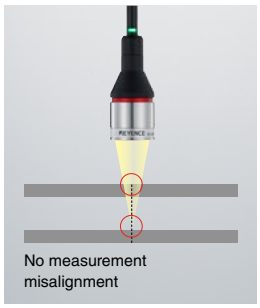
Accurate measurement even on transparent and mirrored surfaces

Conventional laser displacement sensors need to be mounted at an angle to measure off of transparent or highly-reflective targets. As the height of the target changes, this mounting angle causes the measurement point on the target to change.
The CL Series' measurement is vertical for all targets, so the measurement point remains consistent.

Conventional laser displacement sensor

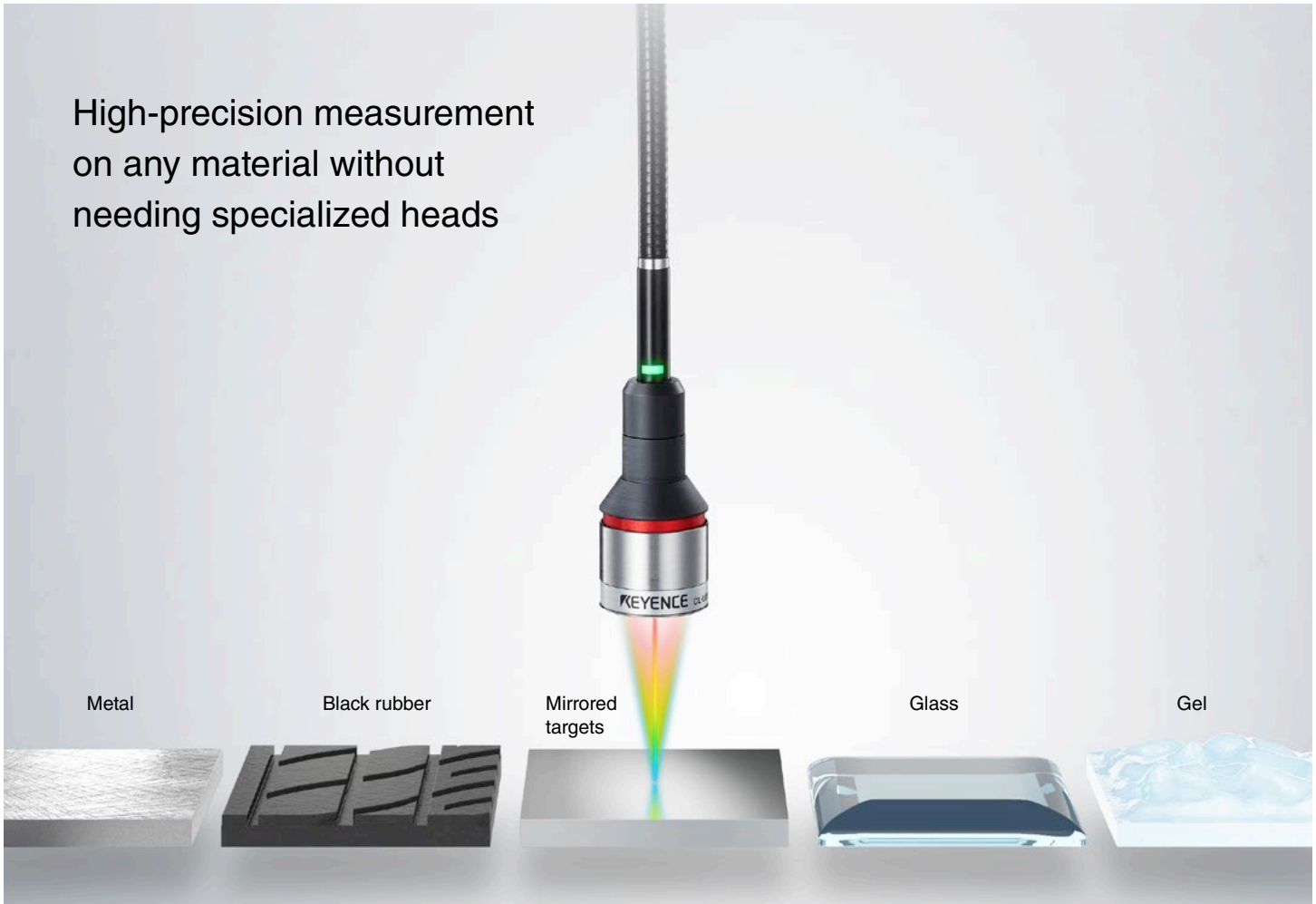


CL Series



High precision regardless of the material

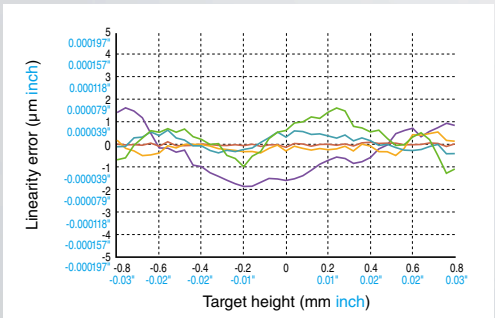
High-precision measurement on any material without needing specialized heads



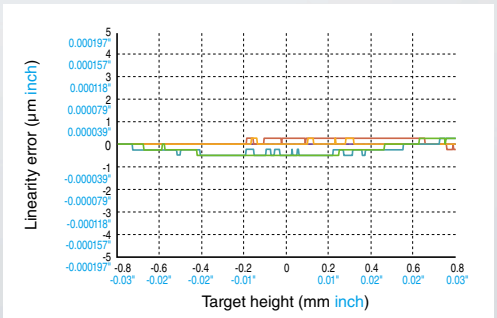
Measurement Image Charts

High-precision linearity on a wide variety of materials

Conventional laser displacement sensor (Typical)



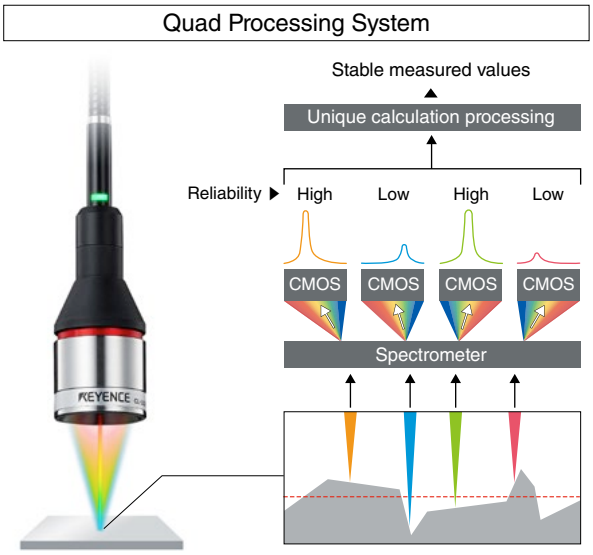
CL-3000 Series For CL-L015 / CL-L015N (Typical)



Stable, high-accuracy measurement even on difficult targets

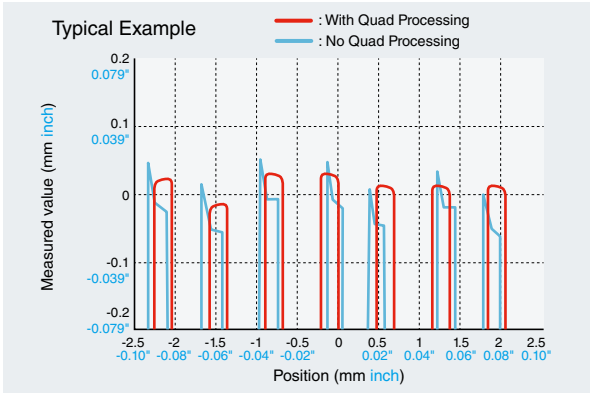
Accurate measurement even on rough surfaces

The Quad Spot system directs light onto four points on the target. The light from each of these four points is received onto four separate CMOSs and measurements are determined for each point. The signal strength and reliability of each point is evaluated and the unique processing system determines the true measurement by removing the influence from irregular reflections.



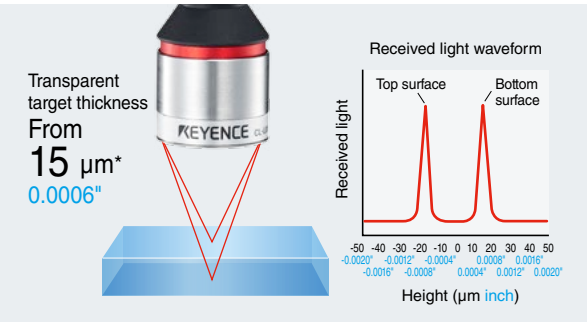
Resistant against multiple reflections

Quad processing is not impacted by irregular or multi-reflection light. This makes it possible for the CL series to stably measure on reflective or angled surfaces such as those on the connector pins of IC chips.



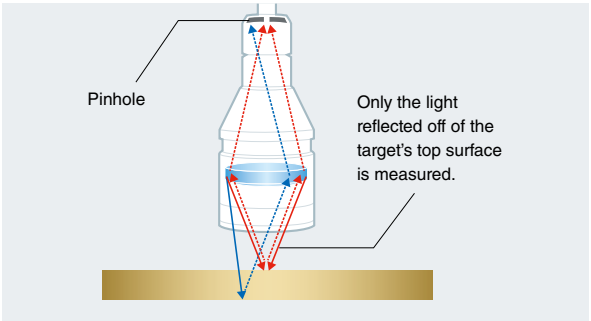
Effective for transparent film measurement

Accurately differentiates reflected light from different surfaces to measure transparent films and coatings as thin as 15µm 0.0006".



High-accuracy on translucent targets

Capable of high-accuracy measurement even on PCBs, translucent liquids and other targets that absorb light.

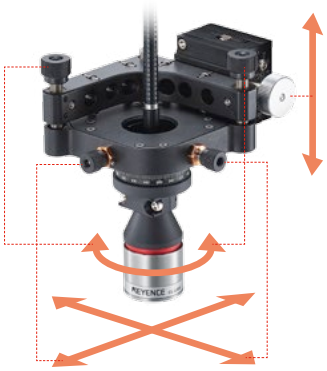


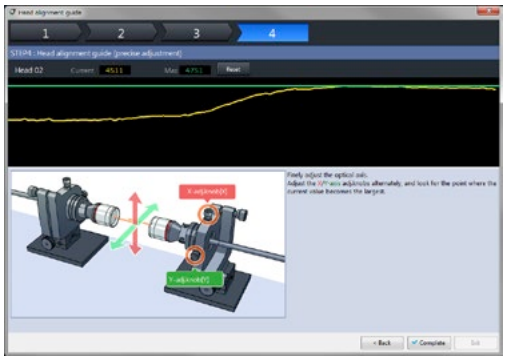
* For CL-PT010

Easy installation and high-accuracy measurement, even for multi-point thickness

Easy installation with adjustable fixture and the optical-axis alignment function

With conventional laser measurement sensors, optical axis alignment, which is critical for achieving high-accuracy thickness measurement, is challenging to configure. With the CL Series, anyone can easily align the sensors using the optical-axis alignment function included in the PC software combined with the adjustable fixture for thickness measurement.

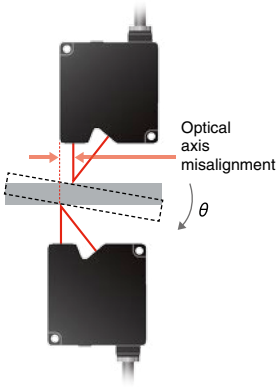




Optical-axis alignment function prevents installation errors

When taking thickness measurements from both sides of the target, major errors occur when the optical axes of both sensor heads do not align or when the target vibrates or tilts even slightly. The CL Series can align the optical axes accurately, enabling high-accuracy thickness measurement from both sides of the target.

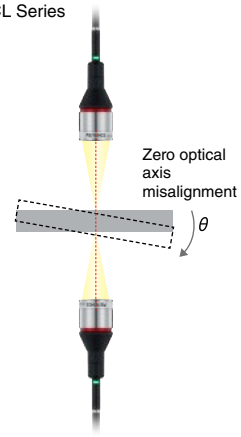
▌Triangulation method



Thickness	1000 µm 0.04"
Optical axis misalignment	500 µm 0.0197"

θ Angle	Thickness measurement result (µm inch)	Error (µm inch)
1.5	987.2 0.038866"	-12.8 -0.000504"
1.0	991.1 0.039020"	-8.6 -0.000339"
0.5	995.7 0.039201"	-4.3 -0.000169"
0.3	997.4 0.039268"	-2.6 -0.000102"
0.0	1000.0 0.039370"	0.0
-0.3	1002.6 0.039472"	2.6 0.000102"
-0.5	1004.4 0.039543"	4.4 0.000173"
-1.0	1008.9 0.039720"	8.9 0.000350"
-1.5	1013.4 0.039898"	13.4 0.000528"

▌CL Series

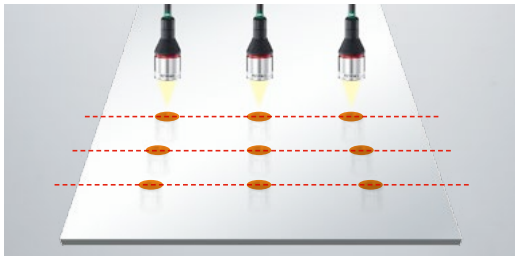


Thickness	1000 µm 0.04"
Optical axis misalignment	0 µm

θ Angle	Thickness measurement result (µm inch)	Error (µm inch)
1.5	1000.3 0.039382"	0.3 0.000012"
1.0	1000.2 0.039378"	0.2 0.000008"
0.5	1000.0 0.039370"	0.0
0.3	1000.0 0.039370"	0.0
0.0	1000.0 0.039370"	0.0
-0.3	1000.0 0.039370"	0.0
-0.5	1000.0 0.039370"	0.0
-1.0	1000.2 0.039378"	0.2 0.000008"
-1.5	1000.3 0.039382"	0.3 0.000012"

Synchronized measurement between all sensor heads allows for measurement without positional misalignment

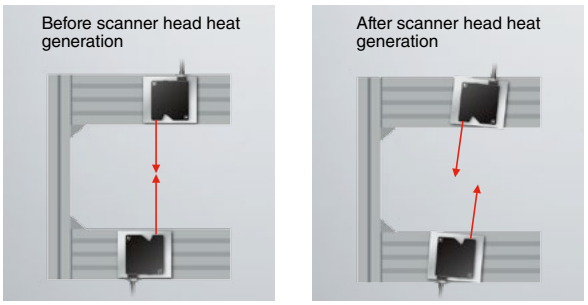
Synchronized measurement is possible since one controller operates all sensor heads. The accuracy of sheet thickness measurement is improved without the need for difficult PLC programming.



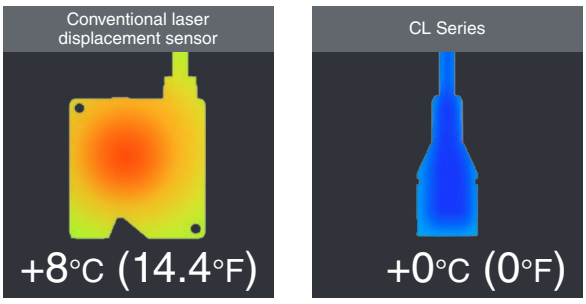
The sensor head design eliminates heat generation, enabling high-accuracy measurement

The heat generated by conventional laser displacement sensors causes thermal distortion of the fixture, making it susceptible to measurement errors resulting from optical axis misalignment. The CL Series is designed so that there are no electronic components generating heat inside the head. As a result there is no thermal distortion of the mounting jig. This is the ideal for high-accuracy measurement.

▌Conventional laser displacement sensor



▌Sensor head 10 minutes after powering on

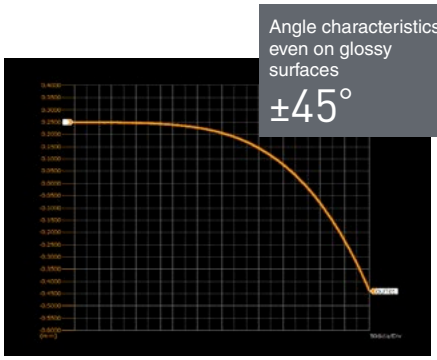


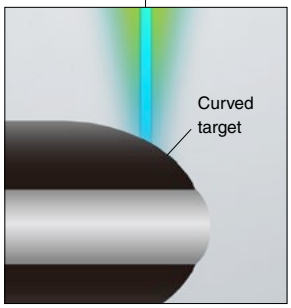
Accurate measurement of ultra-fine shapes

Profile Measurement Head **CL-PT010**

The profile measurement head can measure even very fine targets with its small beam spot

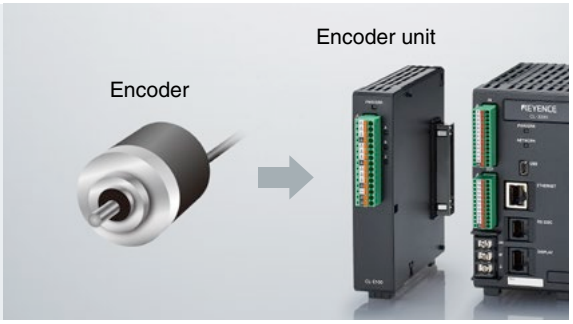
Capable of accurately tracing even target shapes with sharp angles.





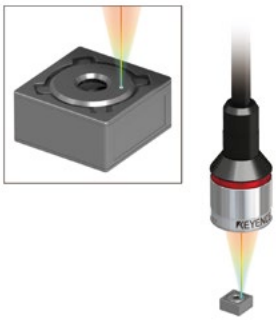
Available encoder input

Enables measurement by synchronizing with the target's position.
Uses a unitary design with a direct connection to the controller for simple synchronization.



Applications

Measurement of camera module stroke



Enables high-accuracy inspection of stroke and behavior measurements on a camera module, VCM and more.

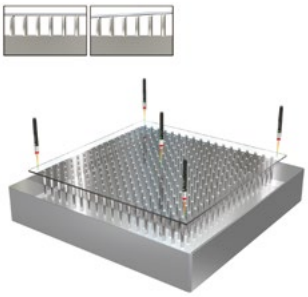
- **Ultra-high accuracy**
  Linearity from ±0.2 µm ±0.000008"
- **No heat generated**
  Measurement error eliminated
- **Effective on unfinished metal surfaces**
  Quad processing system

Measurement of coplanarity

Enables high-accuracy measurement of coplanarity on precision connectors and similar items.

- **Ultra-high accuracy**
  Linearity from ±0.2 µm ±0.000008"
- **No heat generated**
  Measurement error eliminated
- **No multiple reflection light**
  Raises inspection reliability

Glass thickness and flatness measurement



Measure glass thickness and warpage simultaneously. Effective even on tilted surfaces, enabling high-accuracy inspection.

- **Ultra-high accuracy**
  Linearity from ±0.2 µm ±0.000008"
- **No heat generated**
  Measurement error eliminated
- **No measurement misalignment**
  No errors caused by height variance

HDD motor run-out and head height measurement

All types of measurement are possible simultaneously with compact ø8 ø0.31" heads. Capable of measuring both mirrored and unfinished metal surfaces with the same sensor head.

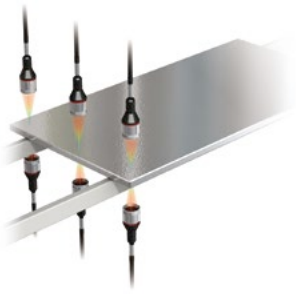
- **Compact ø8 mm ø0.31" sensor head**
  Can be installed anywhere
- **Ultra-high accuracy**
  Linearity from ±0.2 µm ±0.000008"
- **No heat generated**
  Measurement error eliminated

Plate run-out measurement

Enables high accuracy run-out measurement even on targets with rough surfaces.

- **Ultra-high accuracy**
  Linearity from ±0.2 µm ±0.000008"
- **Effective on unfinished metal surfaces**
  Quad processing system
- **No heat generated**
  Measurement error eliminated

Metal plate thickness measurement



High-precision measurement of metal plate thickness.

- **Ultra-high accuracy**
  Linearity from ±0.2 µm ±0.000008"
- **No heat generated**
  Measurement error eliminated
- **Thickness measurement from both sides**
  Easy installation with an optical-axis alignment function

Meets IP67 dust and water-resistance standards allowing use in all manufacturing environments

Can be used without worries even in processing areas with frequent water spray, thanks to its high water-resistant performance.

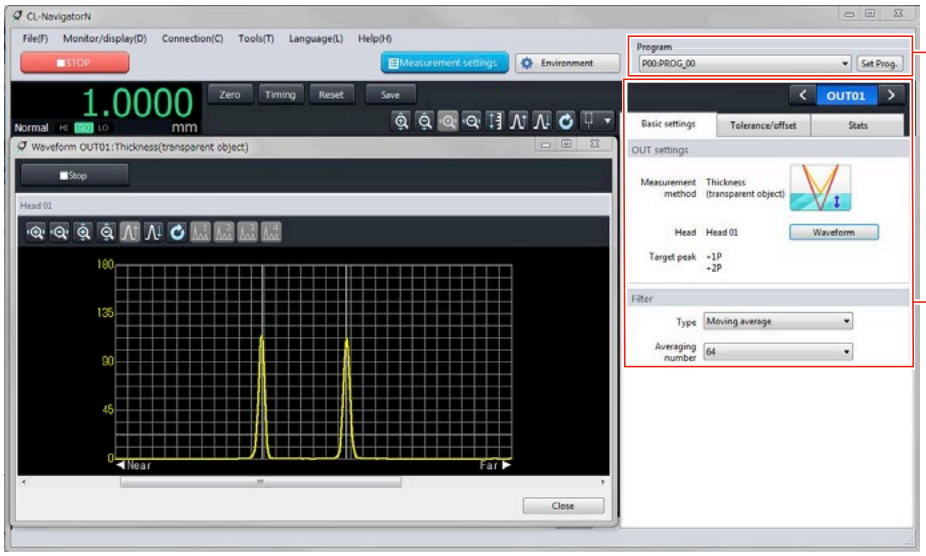
* Measurement may become unstable due to light refraction if lens is fully covered by water or oil.
* CL-PT010 meets IP64 standard.

Easy Configuration / Data Collection

Dedicated PC Software: **CL-NavigatorN**

Easy Configuration

Intuitive and easy to configure menus allow for quick programming.
Drop-down menus and icons make for simple operation, letting anyone configure the system easily.



Program Switching

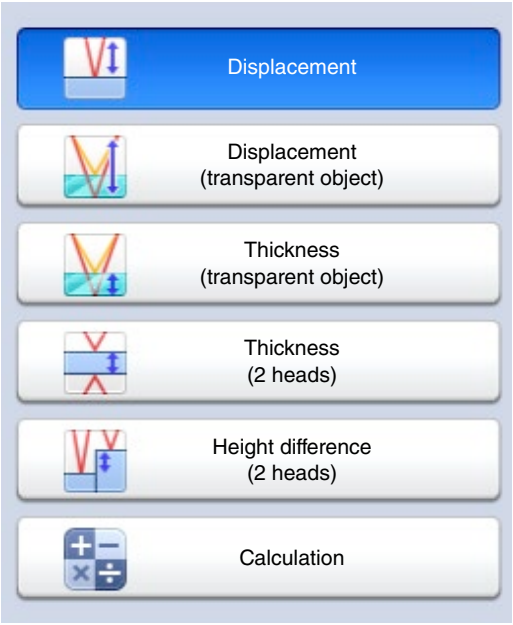
Ability to switch between eight programs. It's easy to copy settings between programs or restore initial settings.

OUT Switching

Supports eight OUT settings. No difficult settings are required, and accurate measurement is possible with minimal settings.

Measurement mode

Intuitive operation allows users to perform the desired measurement with ease. No special programming skills required; just click the icons to configure settings.

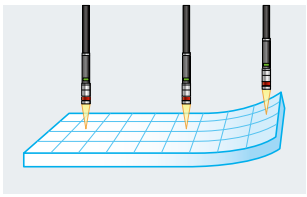


Multi-calculation function

Measured values are calculated instantly across multiple sensor heads. Complex calculations previously carried out on a PLC or PC can now be processed simply within the controller.

Warpage Measurement

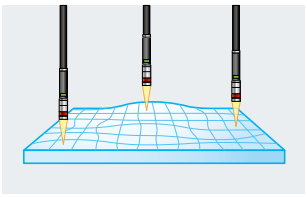
Calculates variance between reference point and all measurement points.



Measured value 1 = B - (A+C) / 2...

Flatness Measurement

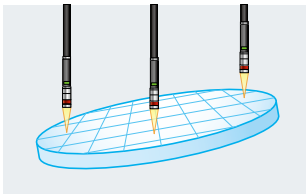
Calculates variance between MIN and MAX values within measurement points.



Measured value 1 = MAX (A,B,C...) - MIN (A,B,C...)...

Step Measurement

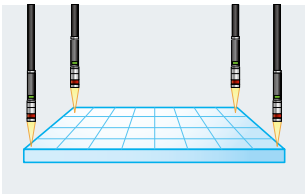
Calculates variance between all measurement points.



Measured value 1 = A - B, measured value 2 = B - C, measured value 3 = A - C...

Average Height Measurement

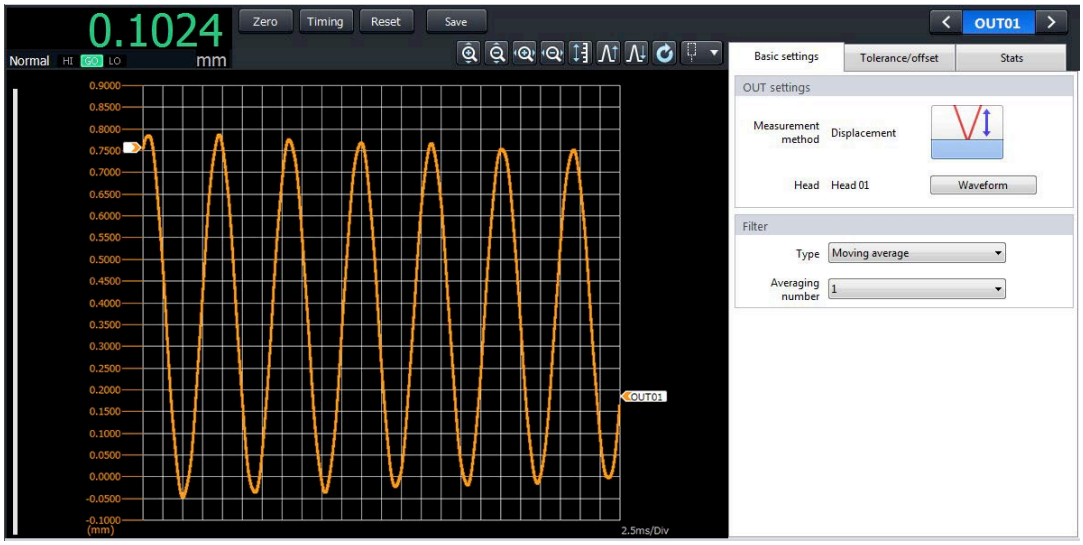
Calculates average height of a surface based on the measurements from multiple points.



Measured value 1 = Ave (A,B,C...)...

Trend Graph

Measurement values are displayed in real-time, in easy-to-understand format. Useful for initial startup at work sites. The display can be easily configured for optimal display for all applications.

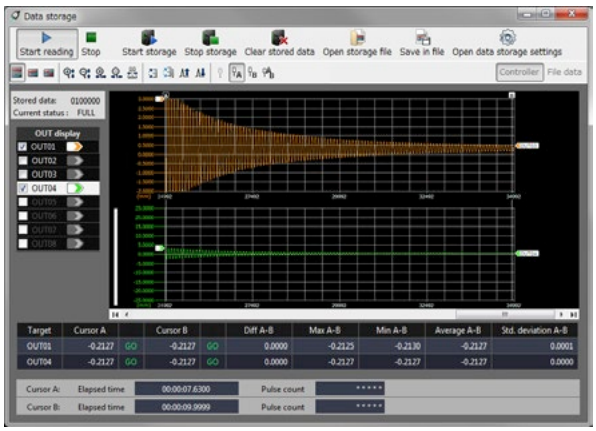


Data Storage

The controller's internal memory can store a maximum of 1.6 million measured values. The data can be loaded to a PC via USB communication.

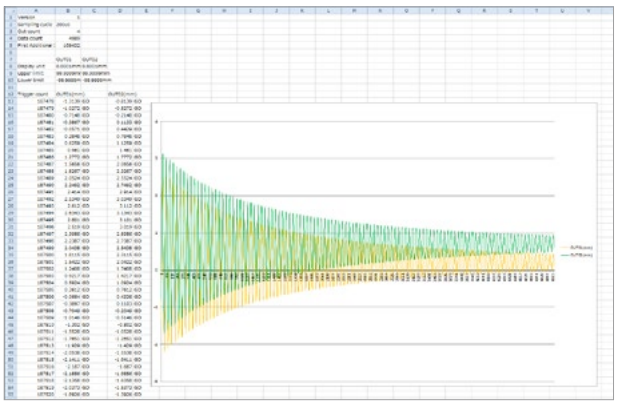
Analysis with CL-NavigatorN

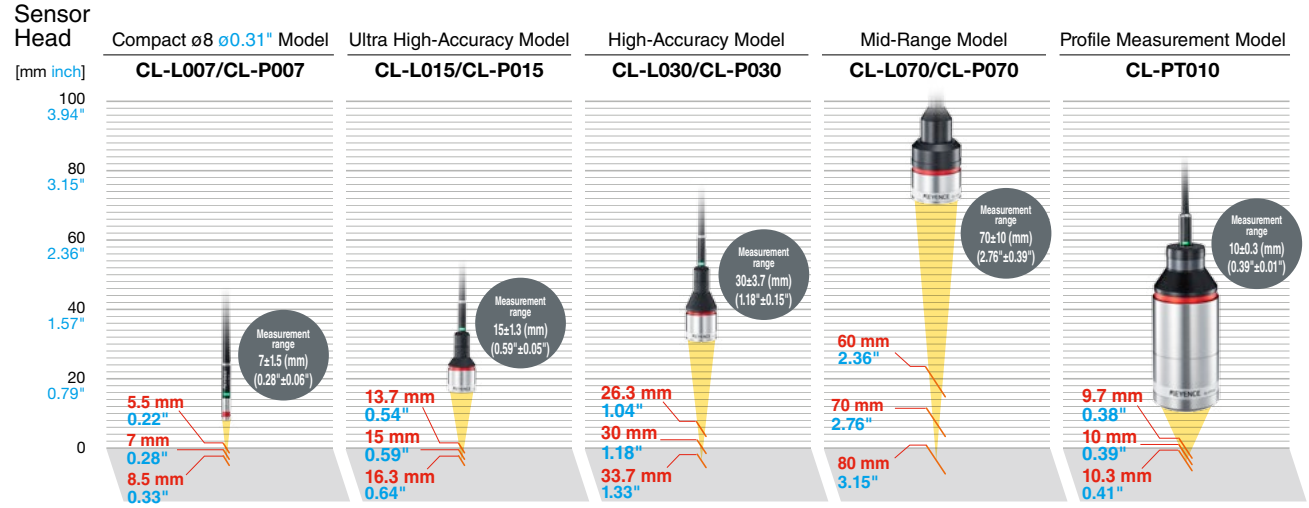
Features a full array of functions, including numerical readings via cursor, as well as zoom in, zoom out and overlap functions.



Analysis with Excel

Data collected in CL-NavigatorN can be loaded into Excel by saving in CSV format.

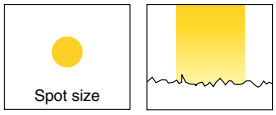




	Quad type	Spot type	Quad type	Quad type	Quad type	Spot type
Linearity (Standard)	±2.1 µm ±0.000083"	±0.96 µm ±0.000038"	±0.49 µm ±0.000019"	±0.94 µm ±0.000037"	±2.2 µm ±0.000087"	±0.22 µm ±0.000009"
Linearity (High precision)	±0.91 µm ±0.000036"	±0.55 µm ±0.000022"	±0.41 µm ±0.000016"	±0.72 µm ±0.000028"	±2.0 µm ±0.000079"	±0.2 µm ±0.000008"

Quad type

Eliminates the influence of extremely small bumps and divots with a quad processing system. Allows for stable measurement.

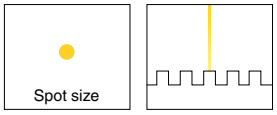


Position **Thickness** **Height** **Run-out**

	CL-L007	CL-L015	CL-L030	CL-L070
Spot diameter	ø750 µm ø0.0295"	ø300 µm ø0.0118"	ø500 µm ø0.0197"	ø600 µm ø0.0236"

Spot type

Reliably detects fine targets using an ultra-small beam spot of ø3.5 µm ø0.000138" at minimum. Ideal for profile measurement.



Appearance **Height difference** **Warpage** **Ultra small**

	CL-P007	CL-P015	CL-P030	CL-P070	CL-PT010
Spot diameter	ø50 µm ø0.0020"	ø25 µm ø0.0010"	ø38 µm ø0.0015"	ø50 µm ø0.0020"	ø3.5 µm ø0.000138"

Device Configuration List

Sensor heads

Compact ø8 ø0.31" Model
CL-L(P)007

Ultra High-Accuracy Model
CL-L(P)015

High-Accuracy Model
CL-L(P)030

Mid-Range Model
CL-L(P)070

Profile Measurement Model
CL-PT010

Controllers

Controller
CL-3000

Expansion unit
CL-H100

Relay unit
CL-H200

Encoder unit
CL-E100

Units

Optical units
CL-L(P)007N
CL-L(P)015N
CL-L(P)030N
CL-L(P)070N
CL-PT010N

Cables

Head extension cable
CL-C5 (5 m 16.4')
CL-C10 (10 m 32.8')
CL-C30 (30 m 98.4')

Expansion cable
CL-AC1 (1 m 3.3')
CL-AC2 (2 m 6.6')

Display panel cable
OP-88281 (3 m 9.8')
OP-88282 (10 m 32.8')

USB cable for PC connection
OP-51580

RS-232C cable
OP-96368

Ethernet cable
OP-66843

Dsub 9-pin connector
OP-26401

Display

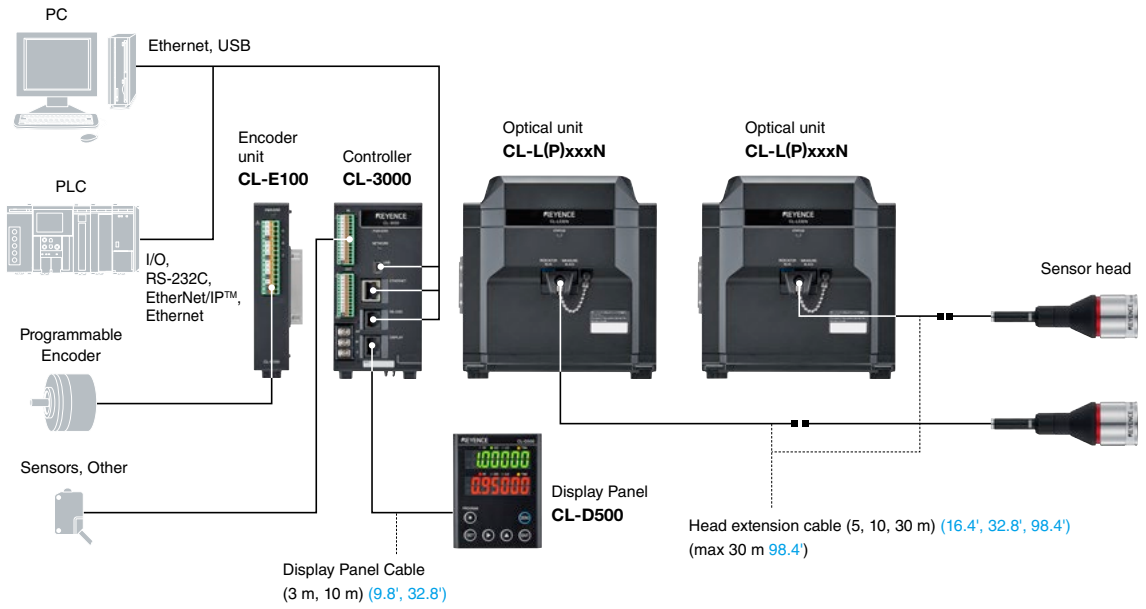
Display panel
CL-D500

Optional Parts

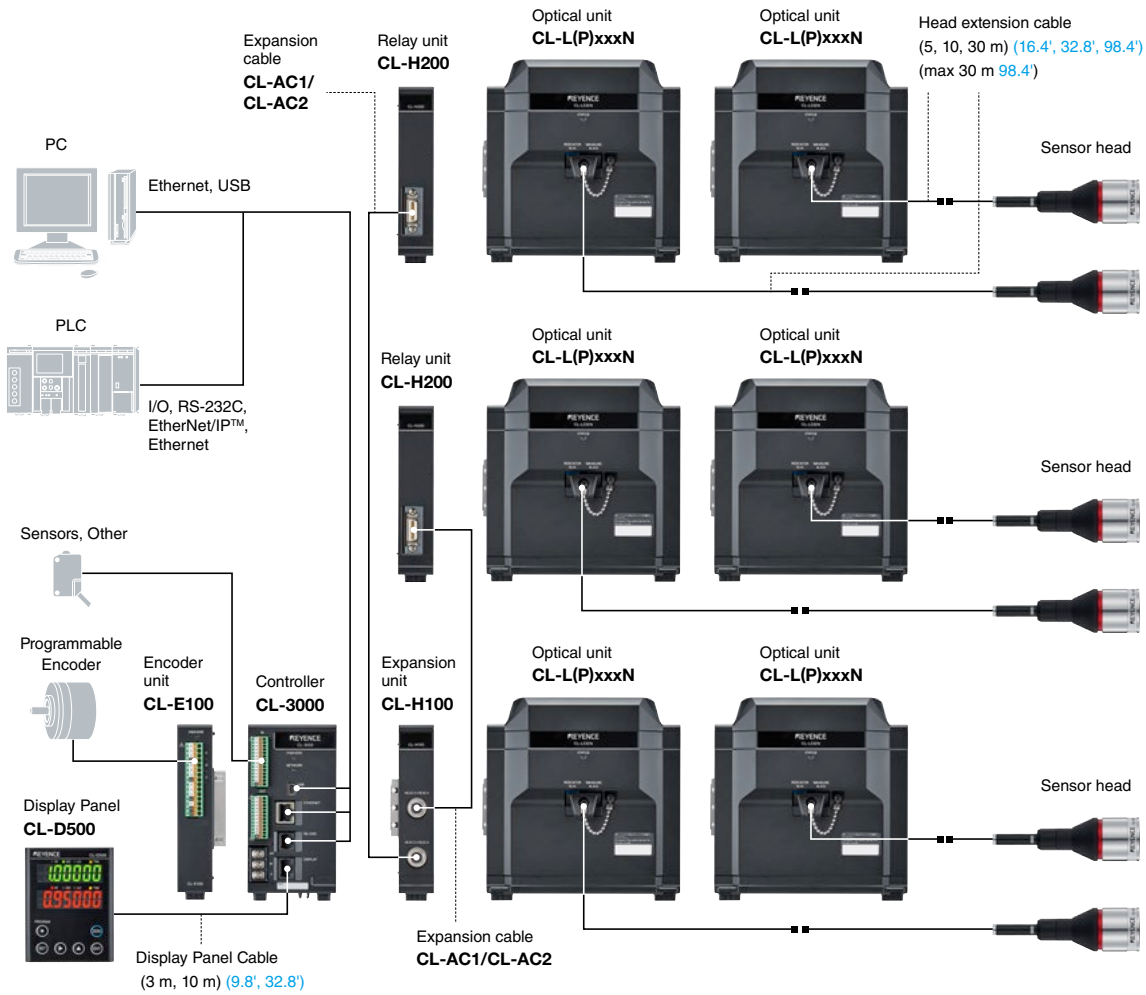
Head fixtures
For CL-L(P)015/030/070: **OP-88283**
For CL-L(P)007: **OP-88353/OP-88354/OP-88355**
For CL-PT010: **OP-88289**

Adjustable fixture for thickness measurement CL-L(P)015/030/070:
OP-88284/OP-88285/ OP-88286

Sensor Head Connections: With Two Units



Sensor Head Connections: With Six Units



Specifications

Sensor Heads and Optical Units

Quad type

Model*1	Head	CL-L007	CL-L015	CL-L030	CL-L070
	Optical unit	CL-L007N	CL-L015N	CL-L030N	CL-L070N
Reference distance		7 mm 0.28"	15 mm 0.59"	30 mm 1.18"	70 mm 2.76"
Reference measurement range	Measurement range	±1.5 mm ±0.06"	±1.3 mm ±0.05"	±3.7 mm ±0.15"	±10 mm ±0.39"
	Linearity*2	±2.1 µm ±0.000083"	±0.49 µm ±0.000019"	±0.94 µm ±0.000037"	±2.2 µm ±0.000087"
High precision measurement range	Measurement range	±0.5 mm ±0.02"	±0.5 mm ±0.02"	±1.0 mm ±0.04"	±3.0 mm ±0.12"
	Linearity*2	±0.91 µm ±0.000036"	±0.41 µm ±0.000016"	±0.72 µm ±0.000028"	±2.0 µm ±0.000079"
Resolution*3		0.25 µm 0.000010"	0.25 µm 0.000010"	0.25 µm 0.000010"	0.25 µm 0.000010"
Spot diameter		ø750 µm ø0.0295"	ø300 µm ø0.0118"	ø500 µm ø0.0197"	ø600 µm ø0.0236"
Laser class	Optical unit	Class 1			
Sampling cycle		100/200/500/1000 µs (Adjustable 4-stage)			
Environmental resistance	Enclosure rating — Head	IP67 (IEC60529)			
	Ambient operating illuminance	Target surface illuminance 30,000 lux (Incandescent lamp)			
	Operating ambient temperature	0 to 50°C 32 to 122°F			
	Operating ambient humidity	20% RH to 85% RH (no condensation)			
	Vibration resistance — Head	10 to 57 Hz, double amplitude 1.5 mm 0.06"; 2 hours each for X, Y, and Z axes			
	Vibration resistance — Optical unit	10 to 57 Hz, double amplitude 0.3 mm 0.01"; 2 hours each for X, Y, and Z axes			
	Shock resistance	15G 6 ms			
Temperature characteristic	Head	0.005% of F.S. / °C			
	Optical unit	0.015% of F.S. / °C			
Material	Head	SUS	Front: SUS Rear: Aluminum		
	Optical unit	Polycarbonate			
Weight	Head	Approx. 140 g	Approx. 180 g	Approx. 200 g	Approx. 280 g
	Optical unit	Approx. 1600 g			

*1 Sensor head and optical unit are a matched pair. Not cross compatible. *2 Value measured in displacement mode with KEYENCE reference workpiece (mirrored surface).
*3 Value measured using 16,384 average cycles with KEYENCE reference workpiece (mirrored surface).

Focused spot type

Model*1	Head	CL-P007	CL-P015	CL-P030	CL-P070	CL-PT010
	Optical unit	CL-P007N	CL-P015N	CL-P030N	CL-P070N	CL-PT010N
Reference distance		7 mm 0.28"	15 mm 0.59"	30 mm 1.18"	70 mm 2.76"	10 mm 0.39"
Reference measurement range	Measurement range	±1.5 mm ±0.06"	±1.3 mm ±0.05"	±3.7 mm ±0.15"	±10 mm ±0.39"	±0.3 mm ±0.01"
	Linearity*2	±0.96 µm ±0.000038"	±0.49 µm ±0.000019"	±0.94 µm ±0.000037"	±2.2 µm ±0.000087"	±0.22 µm ±0.000009"
High precision measurement range	Measurement range	±0.5 mm ±0.02"	±0.5 mm ±0.02"	±1.0 mm ±0.04"	±3.0 mm ±0.12"	±0.15 mm ±0.01"
	Linearity*2	±0.55 µm ±0.000022"	±0.41 µm ±0.000016"	±0.72 µm ±0.000028"	±2.0 µm ±0.000079"	±0.2 µm ±0.000008"
Resolution*3		0.25 µm 0.000010"	0.25 µm 0.000010"	0.25 µm 0.000010"	0.25 µm 0.000010"	0.25 µm 0.000010"
Spot diameter		ø50 µm ø0.0020"	ø25 µm ø0.0010"	ø38 µm ø0.0015"	ø50 µm ø0.0020"	ø3.5 µm ø0.000138"
Laser class	Optical unit	Class 1				
Sampling cycle		100/200/500/1000 µs (Adjustable 4-stage)				
Environmental resistance	Enclosure rating — Head	IP67 (IEC60529)				IP64 (IEC60529)
	Ambient operating illuminance	Target surface illuminance 30,000 lux (Incandescent lamp)				
	Operating ambient temperature	0 to 50°C 32 to 122°F				
	Operating ambient humidity	20% RH to 85% RH (no condensation)				
	Vibration resistance — Head	10 to 57 Hz, double amplitude 1.5 mm 0.06"; 2 hours each for X, Y, and Z axes				10 to 57 Hz, double amplitude 0.45 mm 0.02" 2 hours each for X, Y, and Z axes
	Vibration resistance — Optical unit	10 to 57 Hz, double amplitude 0.3 mm 0.01"; 2 hours each for X, Y, and Z axes				
	Shock resistance	15G 6 ms				
Temperature characteristic	Head	0.005% of F.S. / °C				0.1% of F.S. / °C
	Optical unit	0.015% of F.S. / °C				0.015% of F.S. / °C
Material	Head	SUS	Front: SUS Rear: Aluminum			
	Optical unit	Polycarbonate				
Weight	Head	Approx. 140 g	Approx. 180 g	Approx. 200 g	Approx. 280 g	Approx. 1100 g
	Optical unit	Approx. 1600 g				

*1 Sensor head and optical unit are a matched pair. Not cross compatible. *2 Value measured in displacement mode with KEYENCE reference workpiece (mirrored surface).
*3 Value measured using 16,384 average cycles with KEYENCE reference workpiece (mirrored surface). (Value measured with 4096 average cycles on CL-PT010 only.)

Expansion cable

Model	CL-AC1	CL-AC2
Length	1 m 3.3'	2 m 6.6'
Weight	200 g	400 g

Sensor head extension cable

Model	CL-C5	CL-C10	CL-C30
Length	5 m 16.4'	10 m 32.8'	30 m 98.4'
Weight	450 g	850 g	2500 g

Controller

Model		CL-3000
Number of optical unit connections		Controller only: 2 units; using expansion units/relay units: 6 units
Interface	EtherNet/IP™	Supports cyclic communication and message communication; RPI: 1 to 10,000 ms (0.5 ms units) Maximum number of connections: 8, complies with Version.CT14 conformance test
	Ethernet	Allows for measurement data output and control I/O via no-protocol command communication with PCs and PLCs 100Base-TX, capable of communication with CL-NavigatorN
	USB	Conforms to USB 2.0 HighSpeed, capable of communication with CL-NavigatorN
	RS-232C	Allows for measurement data output and control I/O via no-protocol command communication with PCs and PLCs Baud rate: 9600 to 115,200 bps, data length: 8 bit, stop bit: 1 bit, parity: none/even numbers/odd numbers
	Terminal (IN)	13 (supports function switching via software)
	Terminal (OUT)	11*1 (supports function switching via software)
Ratings	Power voltage	24 VDC ±10%
	Maximum current consumption	With 1 optical unit connected: 0.86 A, with 4 optical units connected: 3.3 A, with 6 optical units connected: 4.5 A
Environmental resistance	Operating ambient temperature	0 to 50°C 32 to 122°F
	Operating ambient humidity	20% RH to 85% RH (no condensation)
	Vibration resistance	10 to 57 Hz, double amplitude 0.5 mm 0.02" ; 2 hours each for X, Y, and Z axes
Monitor/Setting support software		CL-NavigatorN
Weight		Approx. 600 g

*1 Positive common connection is supported for NPN input devices, and negative common connection for PNP input devices.

Expansion Unit and Relay Unit

Model		CL-H100	CL-H200
Number of optical unit connections		Supports two CL-H200 expansion units	Supports two optical unit connections
Environmental resistance	Operating ambient temperature	0 to 50°C 32 to 122°F	
	Operating ambient humidity	20% RH to 85% RH (no condensation)	
Weight		Approx. 300 g	

Display panel

Model		CL-D500
Minimum display unit		0.001 µm
Display range		±999.999 µm to ±9999.99 mm ±0.0394" to ±393.70"
Display cycle		Approximately 10 times/second
Environmental resistance	Operating ambient temperature	0 to 50°C 32 to 122°F
	Operating ambient humidity	20% RH to 85% RH (no condensation)
Weight		Approx. 100 g

Encoder Unit

Model		CL-E100
Number of encoder axes		Incremental method (A/B/Z phase)
Minimum encoder input time		100 ns to 20 µs
Maximum current consumption		0.18 A
Service power supply		5 VDC ±10%, maximum power supply 200 mA
Input terminal		Compatible with NPN/PNP open collector output (5 V/12 V/24 V). Compatible with line driver output
Environmental resistance	Operating ambient temperature	0 to 50°C 32 to 122°F
	Operating ambient humidity	20% RH to 85% RH (no condensation)
Weight		Approx. 300 g

CL-NavigatorN OS environment

Item	Required Environment
Supported OS	Windows® 10*1 / Windows® 8/8.1*2 / Windows® 7*3
CPU	Celeron Dualcore 1.7 GHz or higher
Memory capacity	4 GB or more
Required free space on hard disk	1 GB or more
Display resolution	XGA (1024×768 pixels) or higher

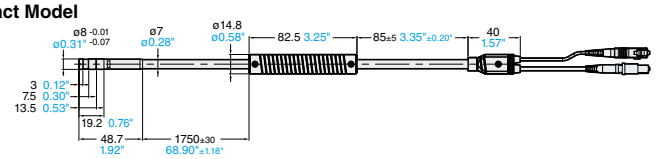
*1 Home, Pro and Enterprise Editions are supported. *2 Core, Pro and Enterprise Editions are supported. *3 Home Premium, Professional and Ultimate Editions are supported.

• Windows® and Excel are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

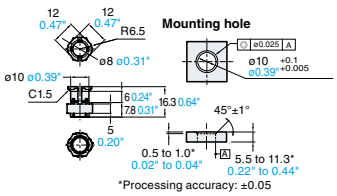
Dimensions Units: mm inch

Sensor heads

ø8 ø0.31" Compact Model
CL-L007/P007

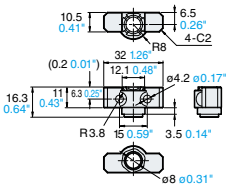


Head Fixture A
OP-88353

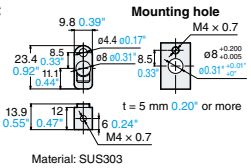


*Processing accuracy: ±0.05

Head Fixture B
OP-88354

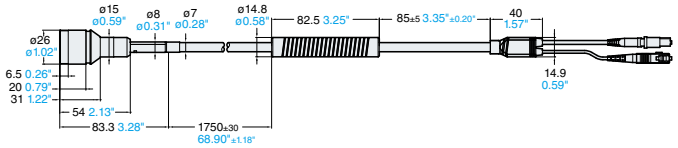


Head Fixture C
OP-88355



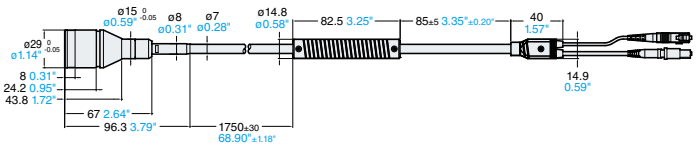
Material: SUS303

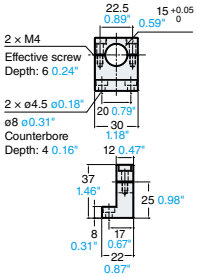
Ultra High-Accuracy Model
CL-L015/P015



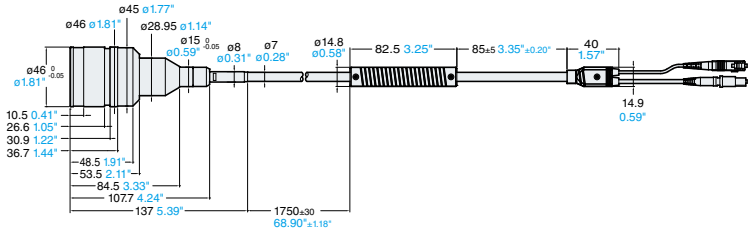
Head Fixture
OP-88283

High-Accuracy Model
CL-L030/P030

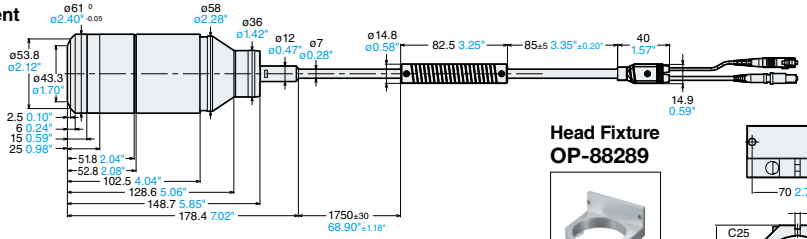




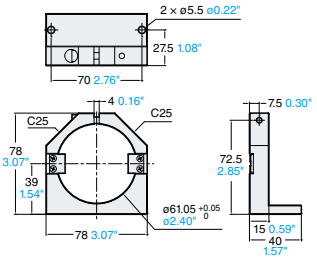
Mid-Range Model
CL-L070/P070



Profile Measurement Model
CL-PT010

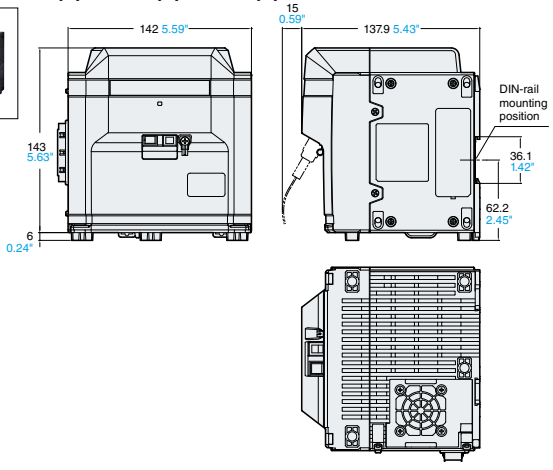


Head Fixture
OP-88289



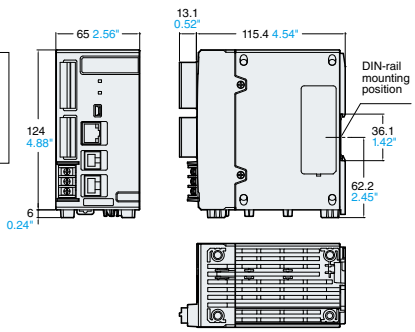
Units

Optical unit
CL-L(P)007N/L(P)015N/L(P)030N/L(P)070N/PT010N



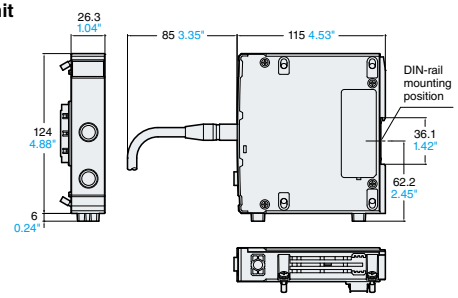
Controller

Controller
CL-3000

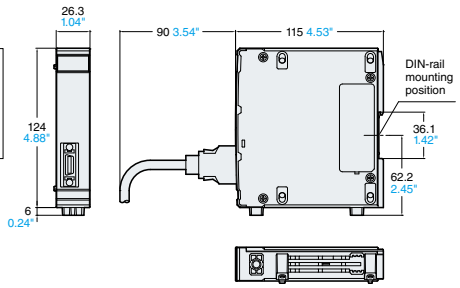


Controller

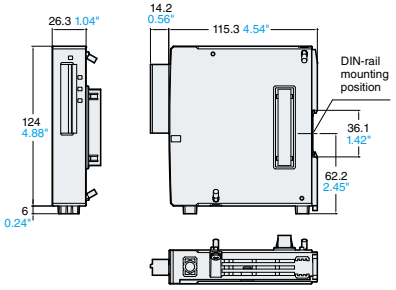
Expansion unit
CL-H100



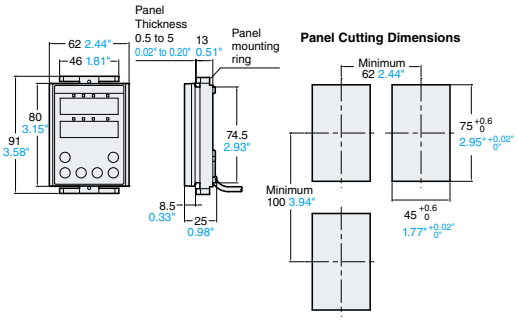
Relay unit
CL-H200



Encoder unit
CL-E100



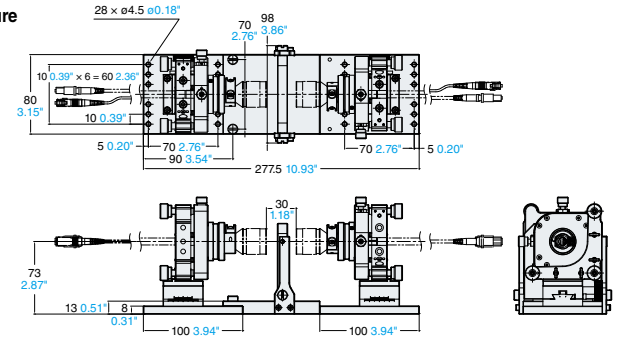
Display Panel
CL-D500



Optional Parts

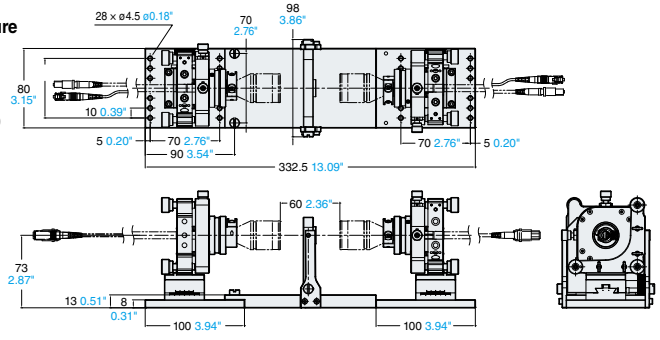
Adjustable Fixture for Thickness Measurement
OP-88284

For CL-L(P)015



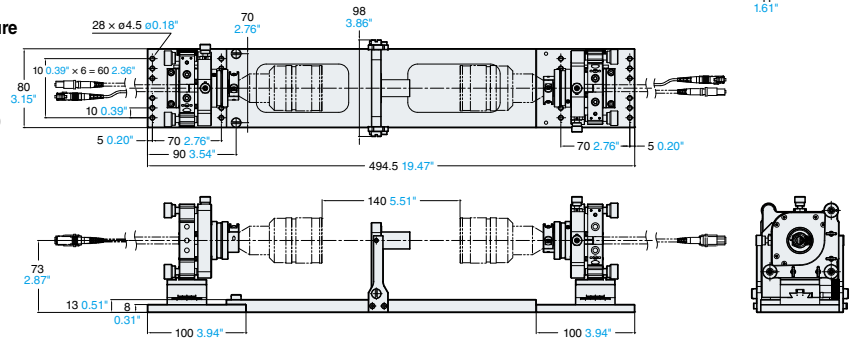
Adjustable Fixture for Thickness Measurement
OP-88285

For CL-L(P)030



Adjustable Fixture for Thickness Measurement
OP-88286

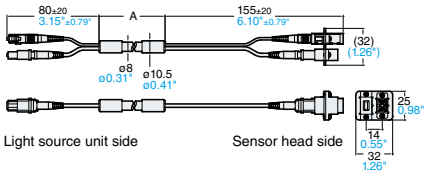
For CL-L(P)070



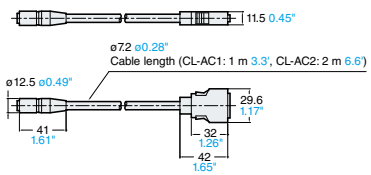
Cables

Head extension cable
CL-C5/C10/C30

*A=5 m, 10 m, 30 m 16.4', 32.8', 98.4'



Expansion cable
CL-AC1/AC2



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