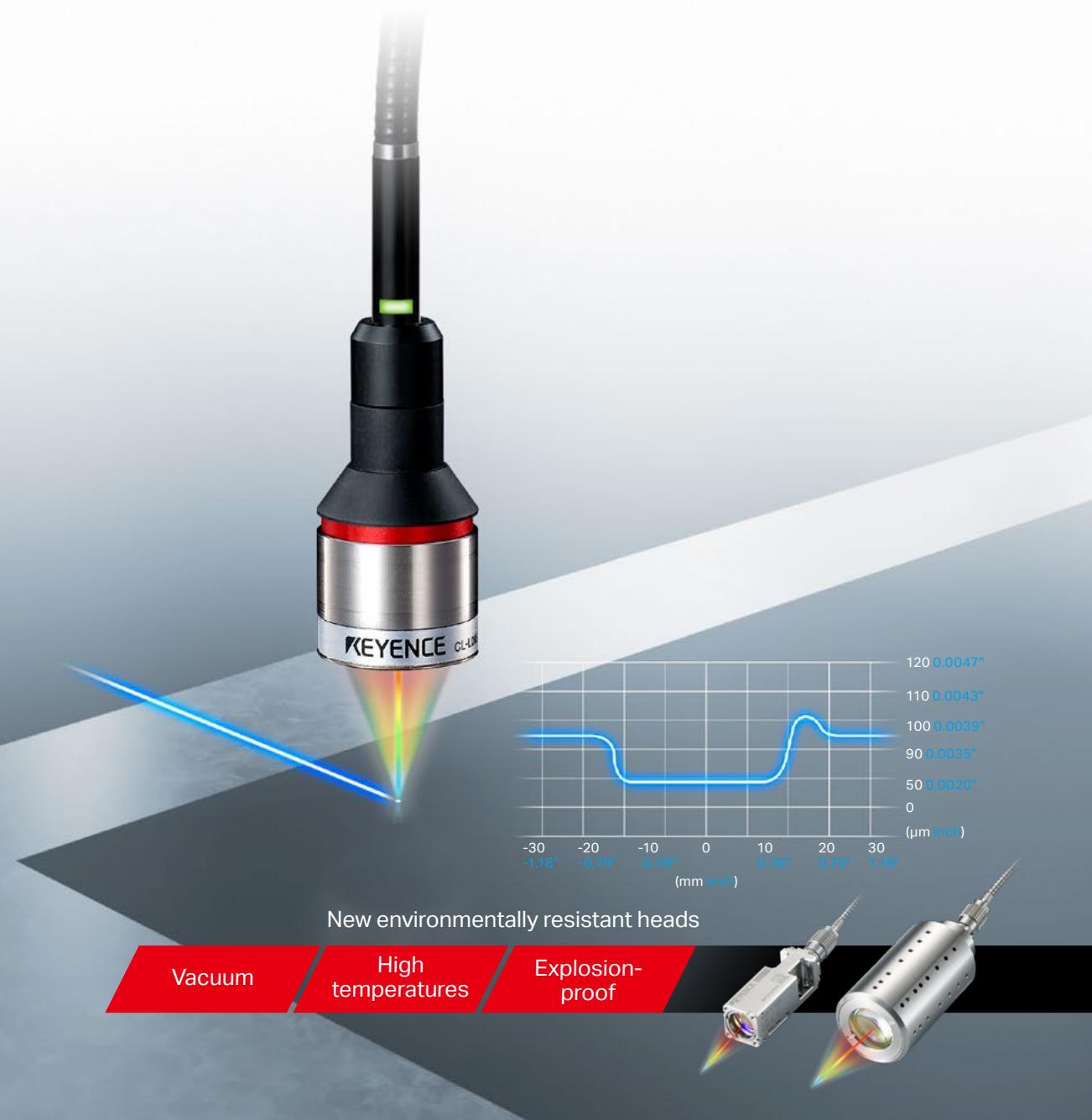




# Confocal Displacement Sensor

**NEW** CL-3000 Series

High Accuracy in a Compact &  
Durable Design



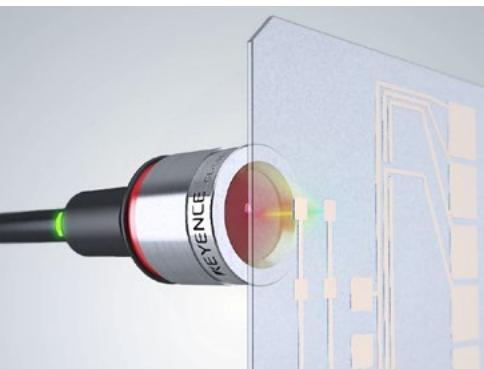
**CL-3000 Series**

# Complete Lineup of Measurement Solutions —



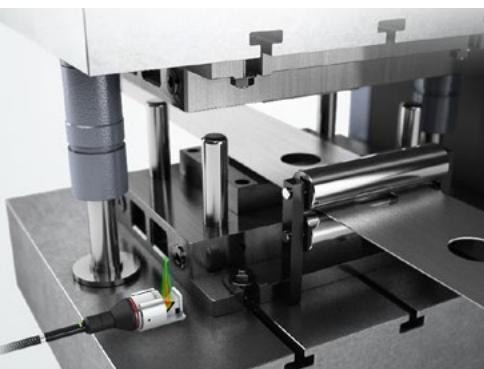
Compact ø8 ø0.31" type  
**CL-L(P)007**

Reference distance: 7 mm 0.28"  
Measurement range: ±1.5 mm ±0.06"



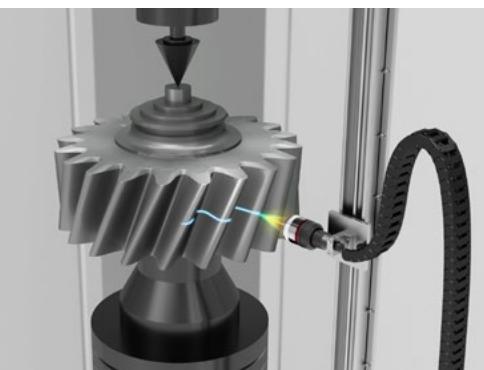
Ultra-high-accuracy model  
**CL-L(P)015**

Reference distance: 15 mm 0.59"  
Measurement range: ±1.3 mm ±0.05"



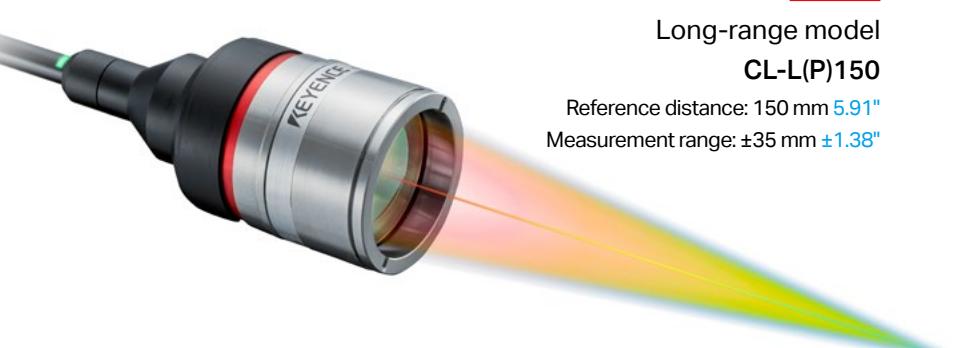
High-accuracy model  
**CL-L(P)030**

Reference distance: 30 mm 1.18"  
Measurement range: ±3.7 mm ±0.15"



Mid-range model  
**CL-L(P)070**

Reference distance: 70 mm 2.76"  
Measurement range: ±10 mm ±0.39"



NEW

Long-range model  
**CL-L(P)150**

Reference distance: 150 mm 5.91"  
Measurement range: ±35 mm ±1.38"

# CL-3000 Series

NEW

Vacuum and heat-resistant model

**CL-V020**

Reference distance: 20 mm **0.79"**

Measurement range:  $\pm 1.3 \text{ mm} \pm 0.05"$



NEW

Vacuum and heat-resistant model

**CL-V050**

Reference distance: 50 mm **1.97"**

Measurement range:  $\pm 4 \text{ mm} \pm 0.16"$



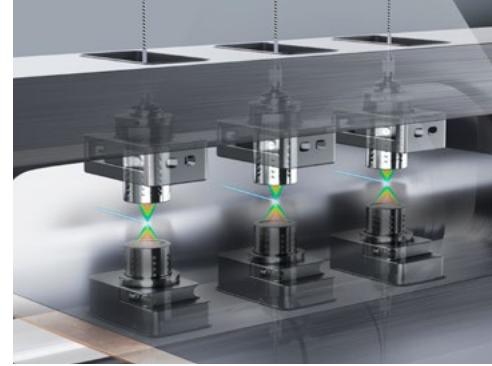
NEW

Ultra-high-accuracy thickness measurement model

**CL-S015**

Reference distance: 15 mm **0.59"**

Measurement range:  $\pm 1 \text{ mm} \pm 0.04"$



NEW

Ultra-high-accuracy explosion-proof model

**CL-S015EX**

Reference distance: 15 mm **0.59"**

Measurement range:  $\pm 1 \text{ mm} \pm 0.04"$



Profile measurement model

**CL-PT010**

Reference distance: 10 mm **0.39"**

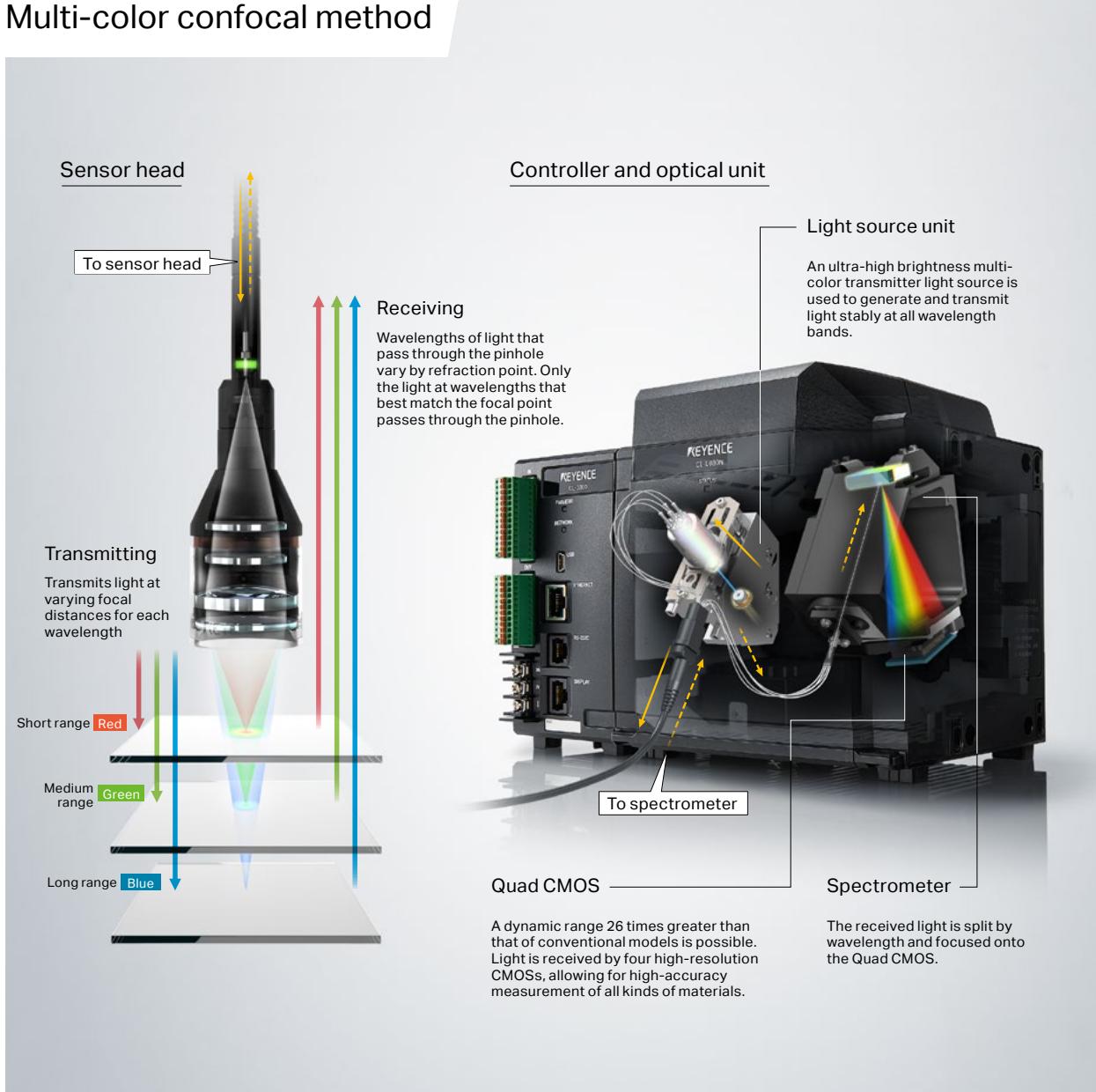
Measurement range:

$\pm 0.3 \text{ mm} \pm 0.01"$



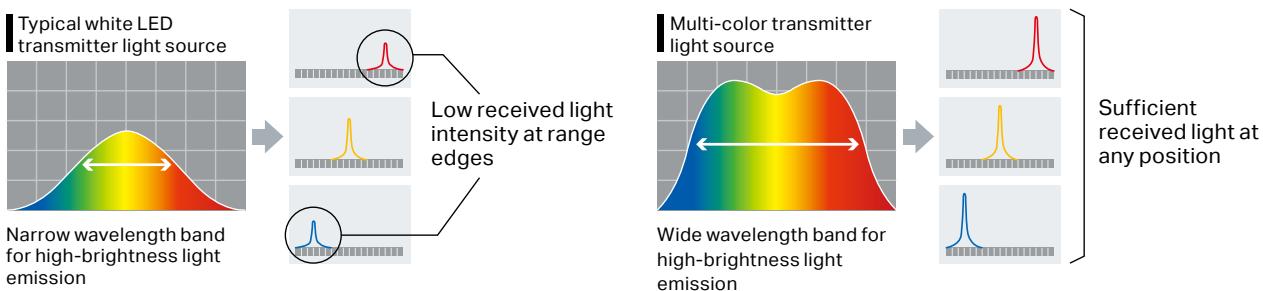
# High-precision measurement of any material without needing specialized heads

## Multi-color confocal method



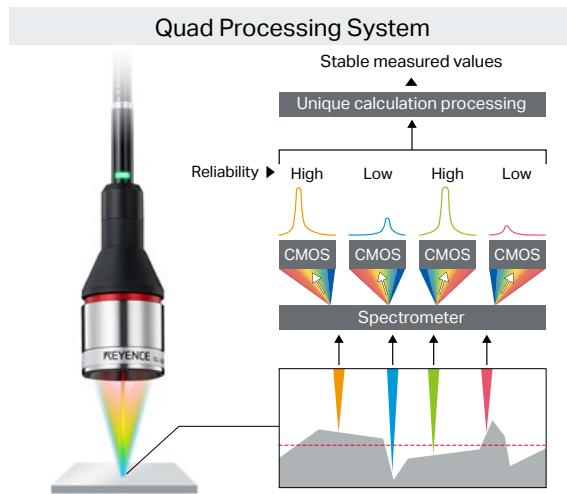
### High-accuracy measurement over a large area using an ultra-high brightness multi-color light source

Multi-color light is generated by using a blue laser to irradiate a fluorescent element 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.



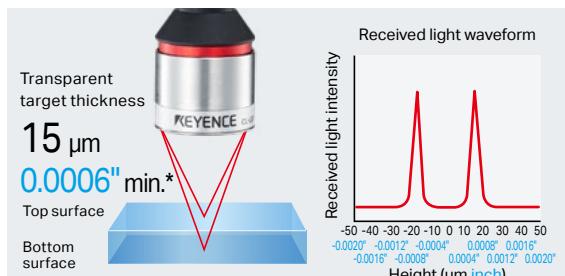
## Accurate measurement even on rough surfaces

Light is focused at four points within the measurement spot, and the reflected light is received by four CMOS. The reliability of the measured values is quantified from the light received, and stable, accurate measurements are calculated using unique processing that eliminates influences from extremely small irregularities.



## Effective for transparent film measurement

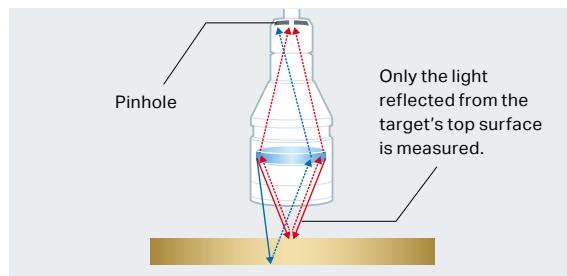
Accurately differentiates reflected light from different surfaces to measure transparent films and glass coatings as thin as 15 µm 0.0006".



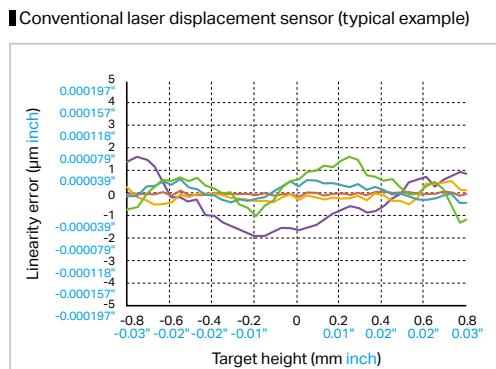
\* With the CL-PT010

## High accuracy measurement of translucent targets

High-accuracy measurement is possible even on PCBs, translucent liquids, and other targets that absorb light.

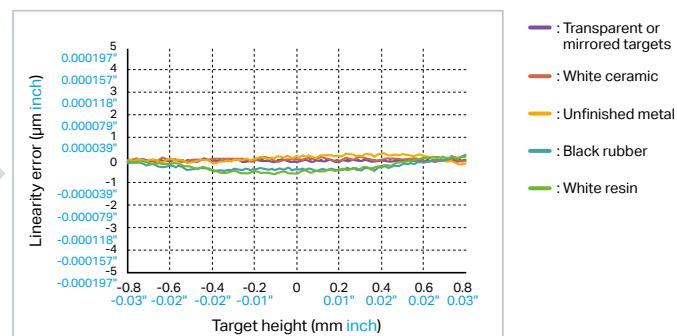


## Highly accurate linearity on a wide variety of materials



CL-3000 Series

With the CL-L015 (typical example)



# Solving Real World Problems at Manufacturing Sites

Problems with conventional models

Improvements with the  
CL-3000 Series

## No space for installation

Sensor heads cannot be installed because there is minimal available space during retrofitting. Potential heat generated from the sensor head is also a concern.

## Compact heads

Only the lens and fiber optics are included inside the head. No electronic components means a dramatically reduced size and no heat generation.

## Conventional sensors cannot be mounted in difficult environments

No laser displacement sensors are available that can be used in these difficult installation environments (ultra-high vacuum, high temperature, explosion-proof, etc.) where high precision measurement is needed.

## Advanced environmental resistance

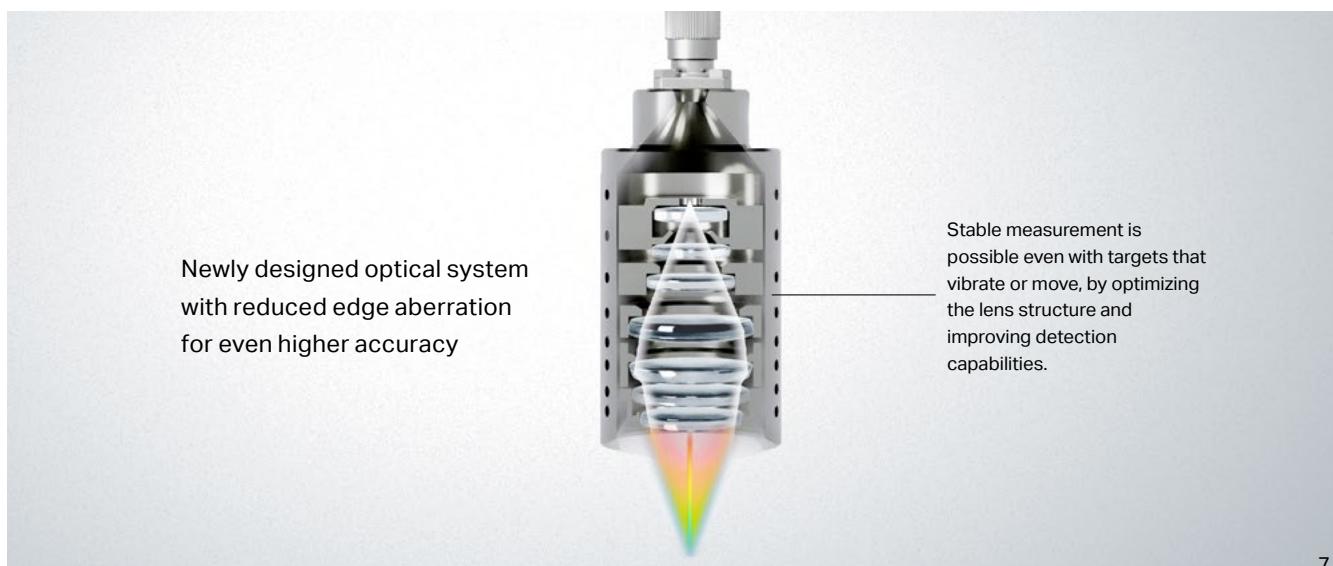
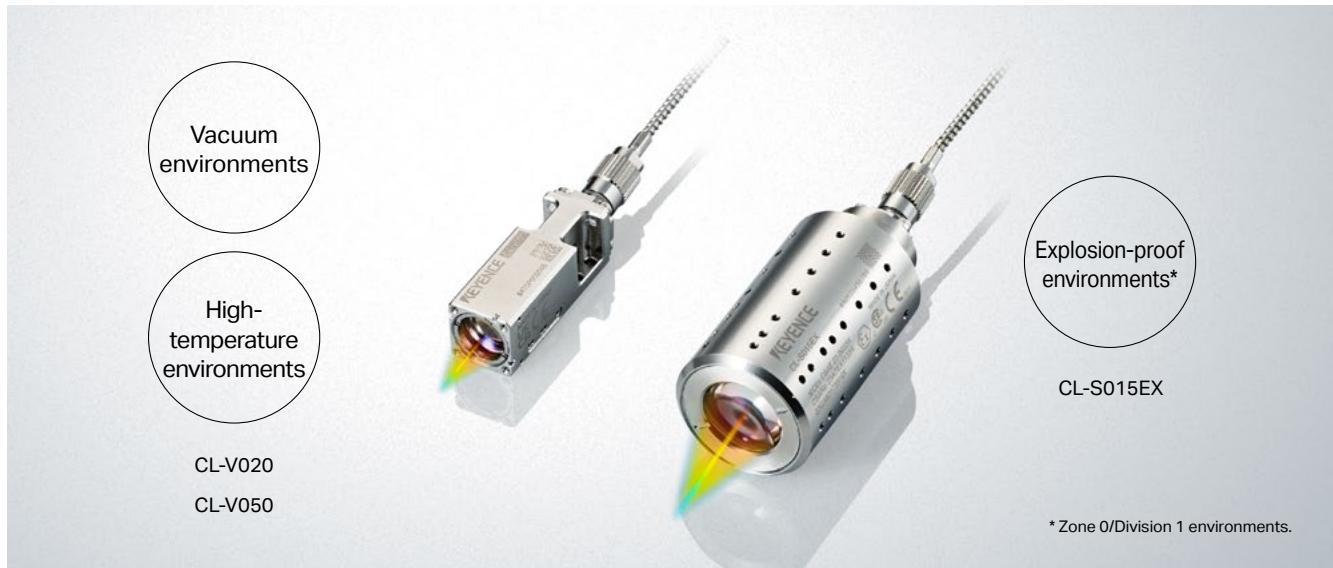
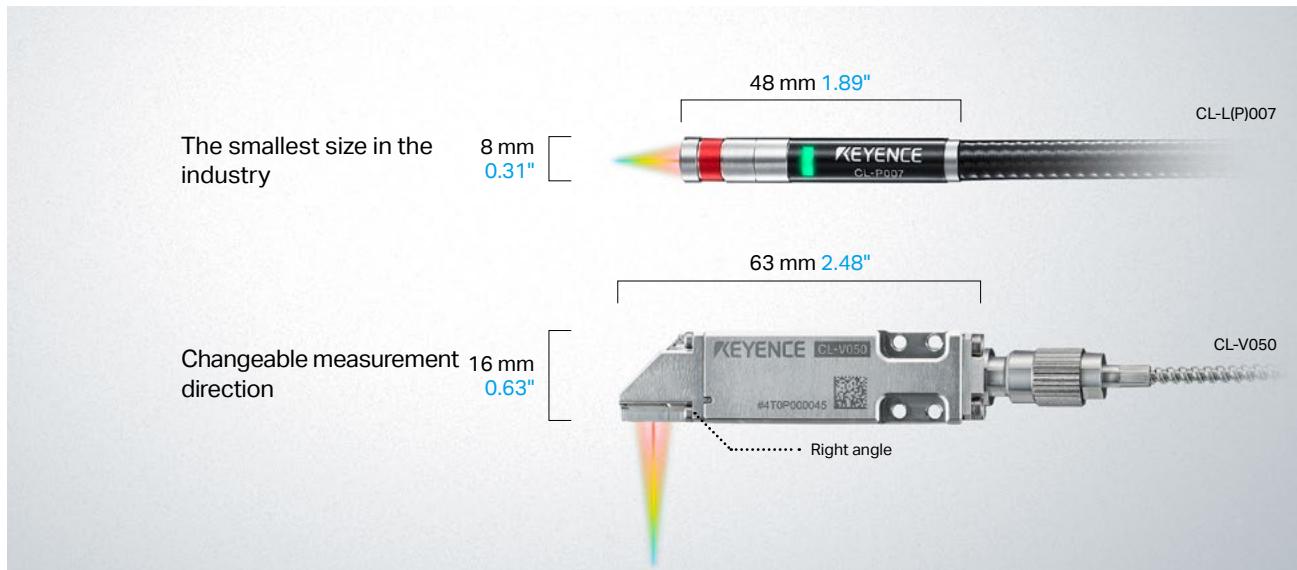
Measurement is now possible even at temperatures as high as 200°C [392°F](#), in ultra-high-vacuum environments, and in explosion-proof areas.

## Higher-accuracy thickness measurements are needed

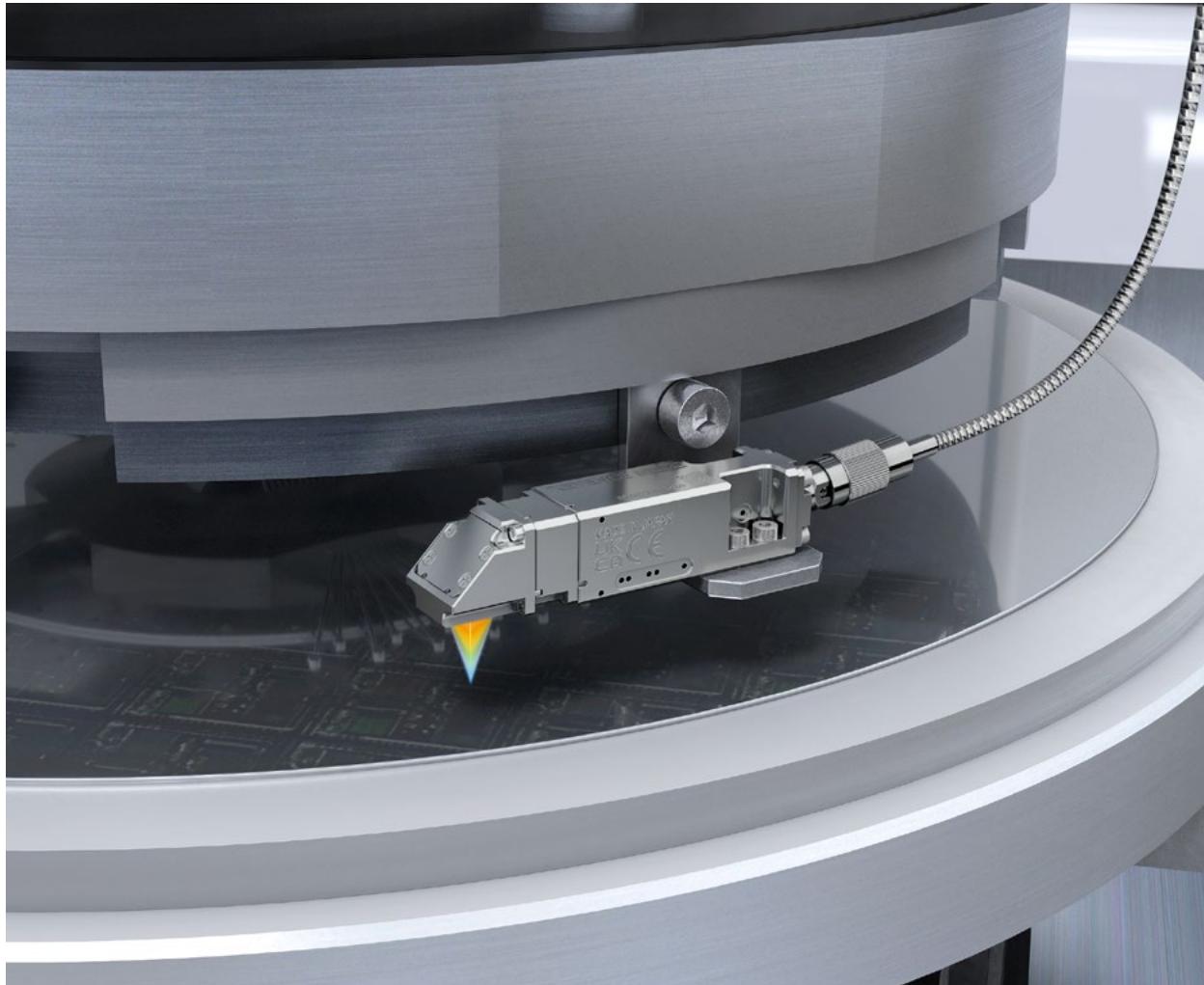
Optical-axis alignment is difficult, making it impossible to utilize the laser displacement sensor to its fullest for thickness measurements.

## Even higher accuracy

High-accuracy 1 µm [0.000039"](#) inline measurements are now possible between two sensors with newly designed lenses and a dedicated alignment jig.

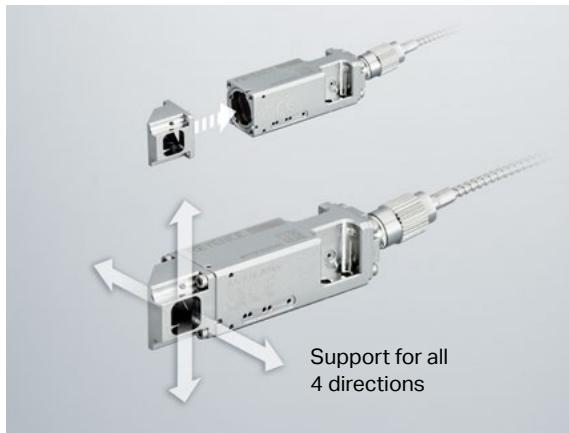


## Ultra-compact heads for worry-free installation

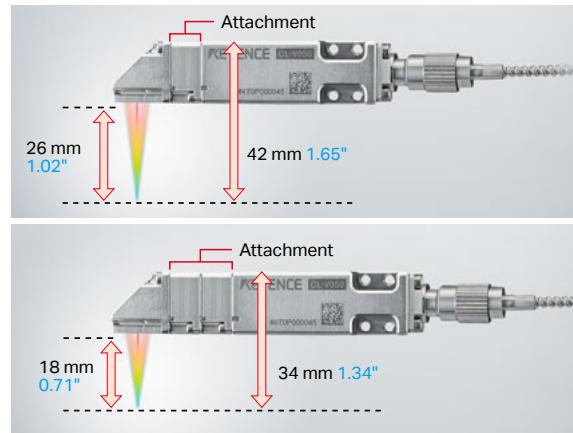


### NEW Space-saving side view attachments [CL-V020/V050]

The dedicated side view attachments allow for measurement in 4 additional directions, making installation possible even in tight spaces.

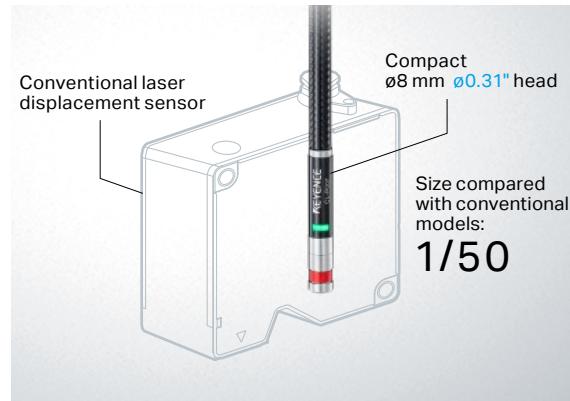


Adding additional attachments also makes it possible to adjust the reference distance. This helps to make installation even more flexible.



## **Ultra-compact design (1/50th the size of conventional models)**

Designed with only the lens and fiber optics inside the head, the sensor is reduced to 1/50th the size of conventional systems. To meet the increasing need for miniaturization of manufacturing equipment, the CL-3000 Series is easy to install and overcomes common space restrictions.



## **Lightweight and easy to integrate with robots**

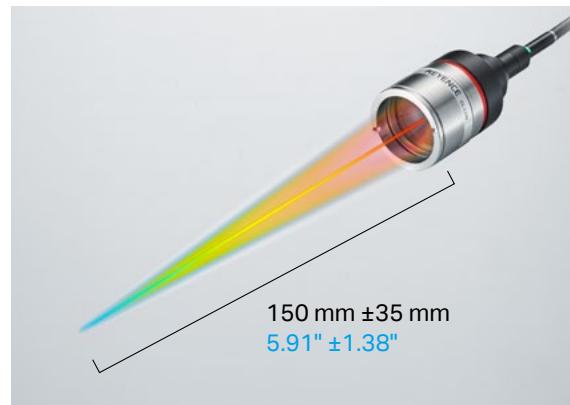
At roughly half the weight of a conventional laser displacement sensor, the CL-3000 Series can be easily mounted to the end of a robot arm. The lighter weight also reduces residual vibration when the robot arm is brought to a stop.



## **Compact head with best-in-class measurement range\***

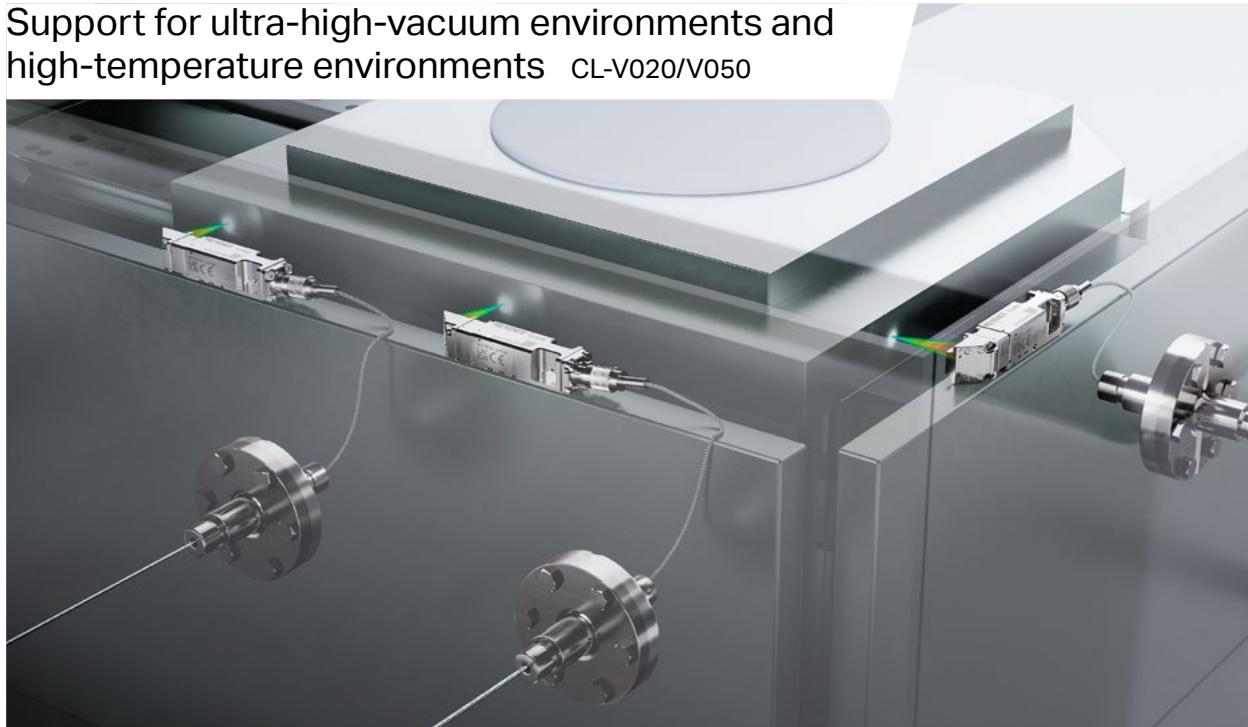
The compact head features a reference distance of 150 mm **5.91"** and wide measurement range at  $\pm 35$  mm  **$\pm 1.38"$**  thanks to a revolutionary new optical system.

\* White confocal laser displacement sensor



## High-accuracy measurement in any environment

Support for ultra-high-vacuum environments and high-temperature environments CL-V020/V050



### **WORLD'S FIRST** Support for ultra-high-vacuum environments\*

The CL-V020/V050 do not use any organic adhesives in the sensor head, making it possible to minimize outgassing and operate in ultra-high-vacuum environments.



### Dedicated feedthrough [OP-88859]

Dedicated CF16 feedthroughs are available for easy integration with vacuum chambers.



### First-in-class 200°C 392°F heat resistance

The CL-V020/V050 can handle ambient temperatures of up to 200°C (392°F), allowing for use in environments with drastic temperature fluctuations.



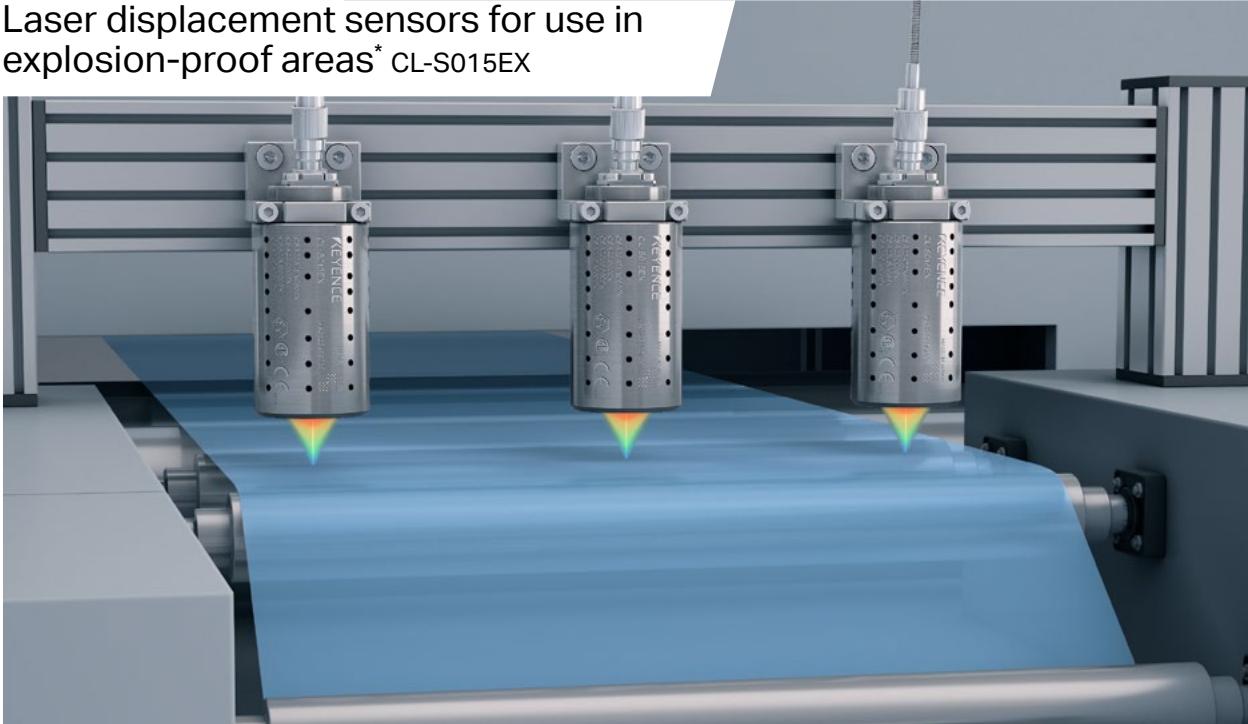
### Baked prior to shipping

Sensor heads (CL-V020/V050) are baked and degassed before shipping to ensure safe usability in vacuum environments.



\* As a white confocal laser displacement sensor.

## Laser displacement sensors for use in explosion-proof areas\* CL-S015EX



\* As a laser displacement sensor in Zone 0/Division 1 environments.

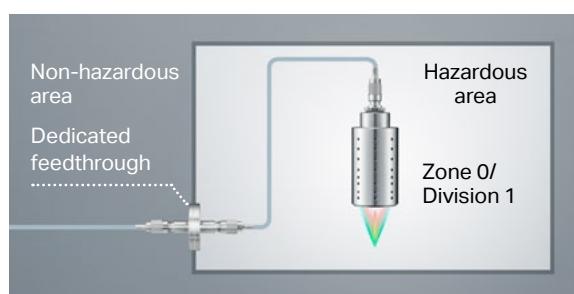
### Class I, Division 1/Class I, Zone 0 explosion-proof design

This model complies with the technical standards required for devices that use optical radiation and has passed IECEx, ATEX, and NRTL/ACO certifications. This means that it can be used in hazardous locations where explosion-proof ratings are necessary, for example post-coating measurement on rolls is now possible.

| Model                | IECEx              |   | ATEX        |   | NRTL/ACO             |   |
|----------------------|--------------------|---|-------------|---|----------------------|---|
|                      | Sensor head        | Optical unit  | Sensor head | Optical unit  | Sensor head          | Optical unit  |
|                      | CL-S015EX          | CL-S015EXG<br>CL-S015EXN  | CL-S015EX   | CL-S015EXG<br>CL-S015EXN  | CL-S015EX            | CL-S015EXG<br>CL-S015EXN  |
| Zone/<br>Division    | Zone 0             | Do not install in a hazardous location.<br>(associated equipment) | Zone 0      | Do not install in a hazardous location.<br>(associated equipment) | Zone 0<br>Division 1 | Do not install in a hazardous location.<br>(associated equipment) |
| Certification number | IECEx CSAE23.0033X | CSA Ne 23ATEX1133X  |             | 23CA80171819X   |                      |   |

### Easy integration in explosion-proof areas

The dedicated feedthrough (OP-88859) allows for easy integration into hazardous areas without extensive modifications in these locations.



### Reliable IP67 dust and water-resistant design\*

The high water-resistant performance allows for use without worry in processing areas where water spray is likely.

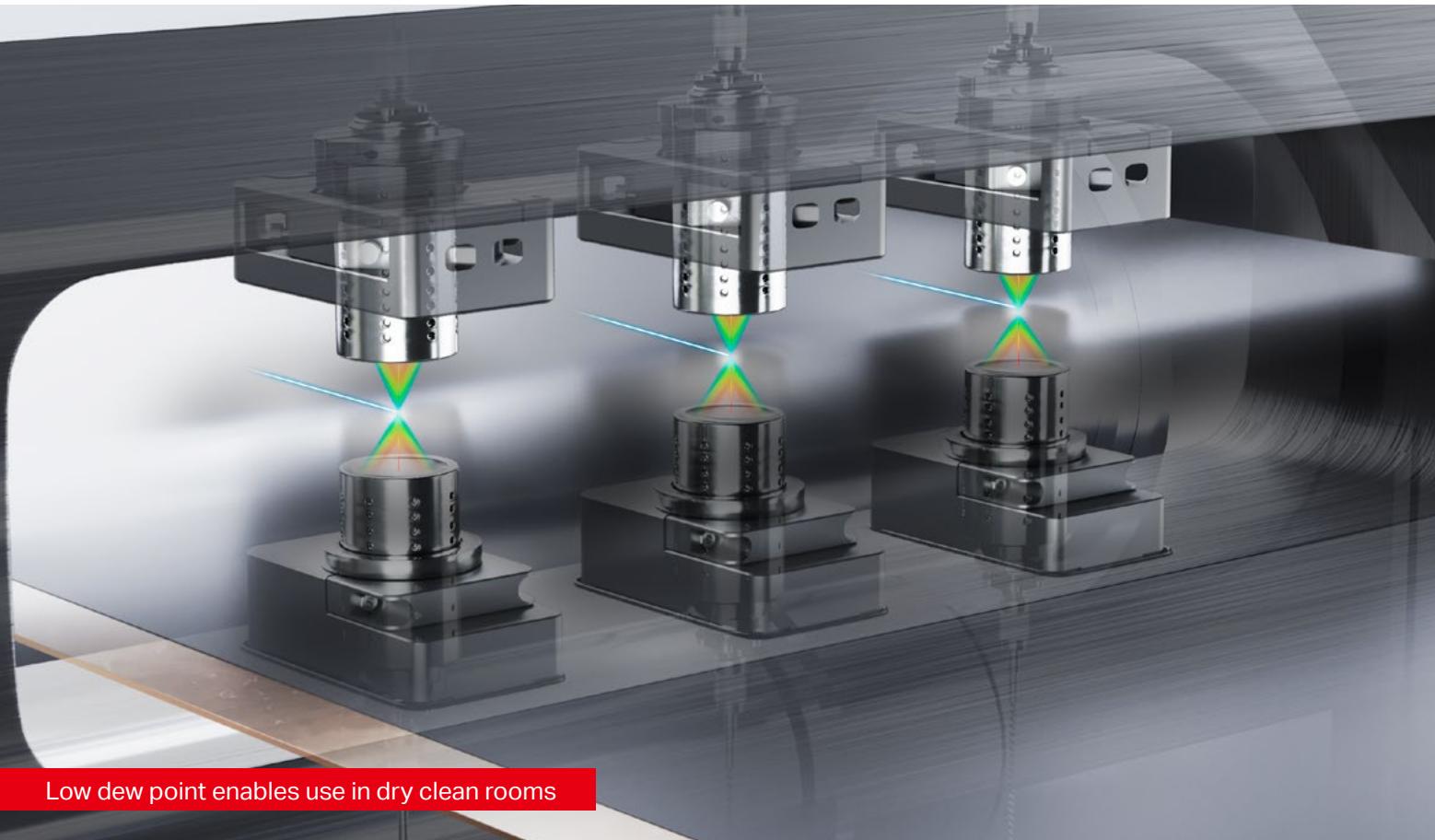
Measurement may become unstable due to light refraction if the lens is fully covered by water or oil.

\* Excluding the CL-V020/V050 and CL-S015/S015EX/CL-PT010.



Even higher accuracy

## Newly designed optical system and dedicated jig for ultra-stable thickness measurement

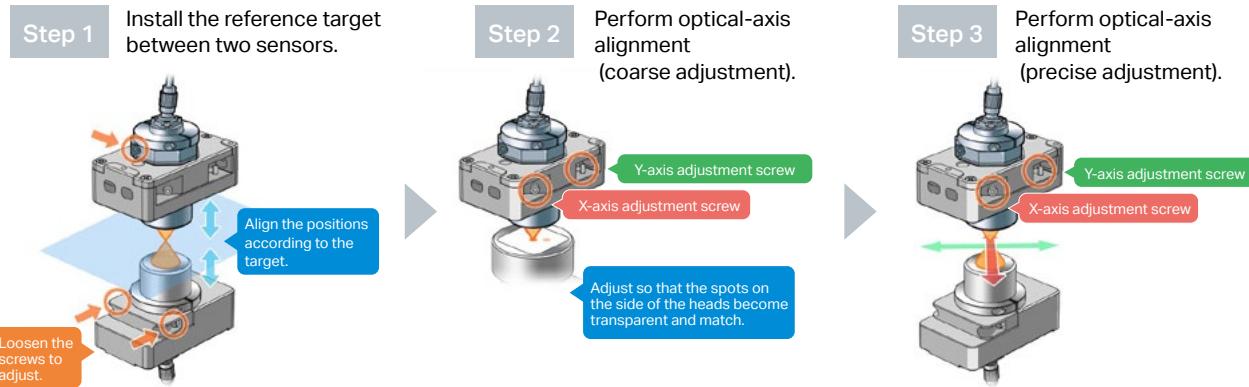


### Athermal design ensures minimal changes in measured values over time

The CL-S015 thickness measuring head includes an optical system designed to not be impacted by temperature change of the unit. When using a mounting jig and frame with the same material as the sensor head (SUS), the temperature characteristics of the sensor head and the linear expansion of the SUS frame cancel each other out. This ensures thickness measurements remain virtually unchanged even if the ambient temperature changes.

### Easy, 3-step optical-axis alignment with dedicated PC software

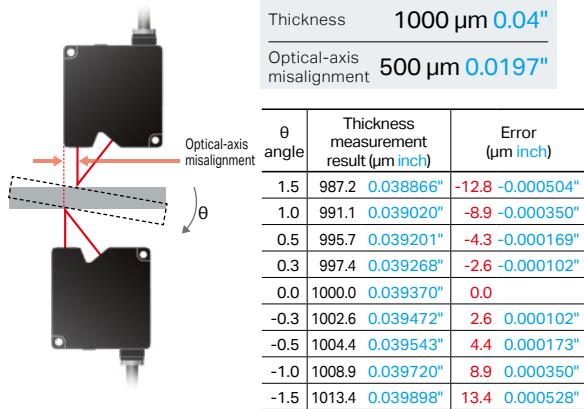
With the CL Series, anyone can easily manage precise optical-axis alignment using the optical-axis alignment function included in the PC software and the dedicated jig.



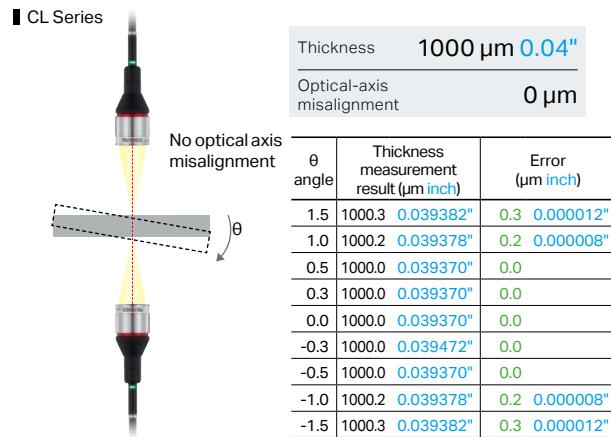
## Optical-axis alignment function prevents installation errors

When measuring thickness from both sides of a 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



■ CL Series



## New optical system designed for minimal lens aberration and new adjustment jig [OP-88864]

The CL-S015 utilizes a new optical system that minimizes lens aberration to reduce the effects of target fluctuations and variations in angle and surface conditions.

The new OP-88864 adjustment jig offers the following features:

- The SUS design allows for safe use in processes where copper and copper alloys should be avoided, such as for batteries.
- The jig is safe to use in dry clean rooms and other environments with low humidity and low dew points.
- The distance between the measurement points can be as close as 50 mm 1.97" when using the OP-88864 horizontally to install the sensor heads.



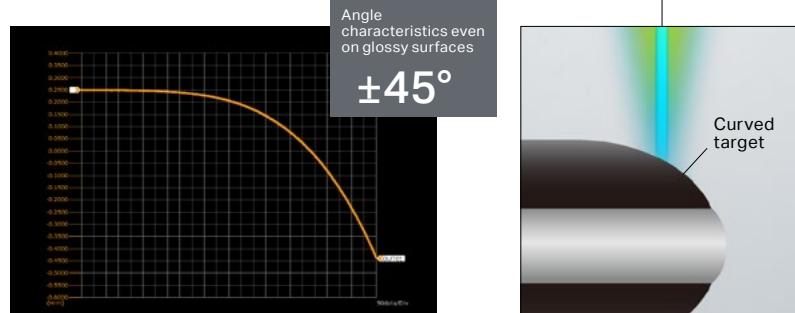
# Accurate measurement of extremely detailed shapes

Profile Measurement Head CL-PT010



Small beam spot for measurement of very fine parts

Accurate tracing is possible even for targets with sharp angles.

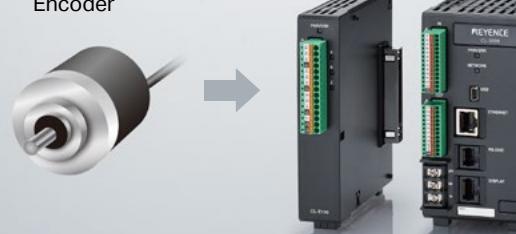


## Available encoder unit

Measurement is possible by synchronizing with the target's position. The direct connection of an encoder to the controller allows for simple and easy synchronization.

Encoder

Encoder unit



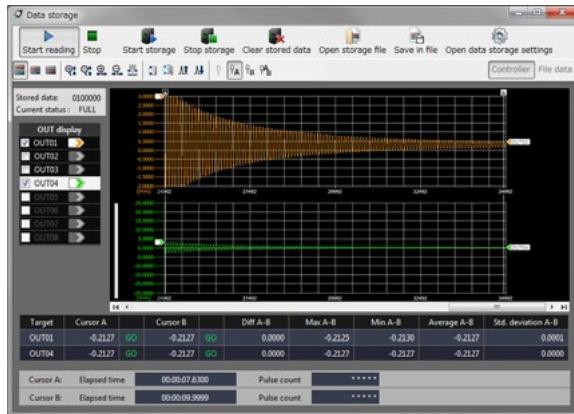
# Dedicated PC Software: CL-NavigatorN

## Data storage function

The controller's internal memory can store a maximum of 1.6 million measured values, and the data can also be loaded to a PC via USB communication. Settings can be freely configured, including sampling rate, number of points, and data collection via external signals.

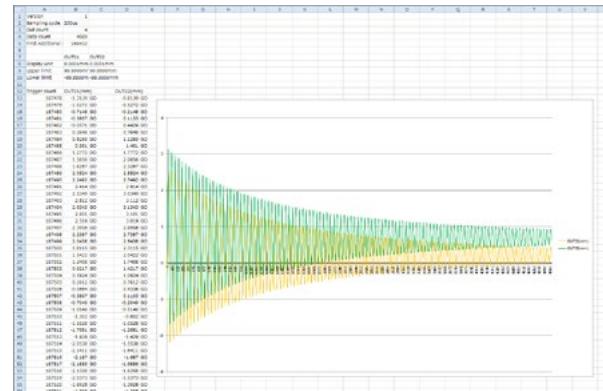
### Analysis using CL-NavigatorN

CL-NavigatorN includes a waveform display that features a full array of functions, including numerical readings via the cursor, zooming in and out, and overlays.



### Excel-based analysis

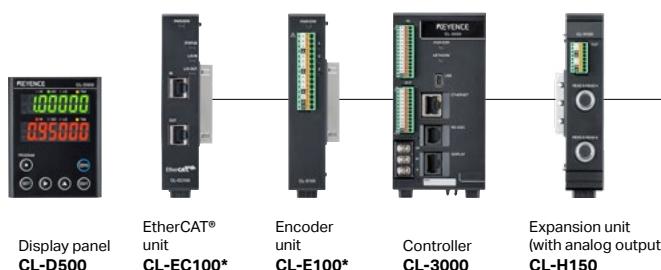
Data collected in CL-NavigatorN can be saved as a CSV file and loaded into Excel.



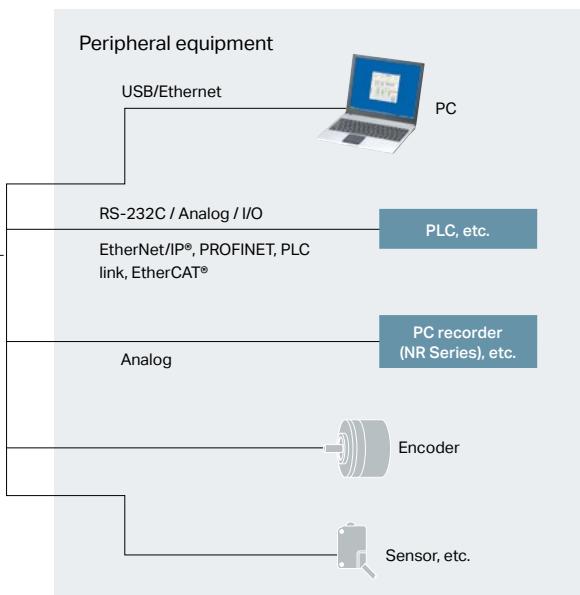
## Multi-I/O communication options

Seven different I/O interfaces are provided for outputting measured values to a host PC or PLC, or for synchronizing measurements with equipment.

Take advantage of 7 types of I/O, including USB. Using an expansion unit also allows for use with encoders and data loggers. Take advantage of the I/O that best suits your needs to expand your range of control.

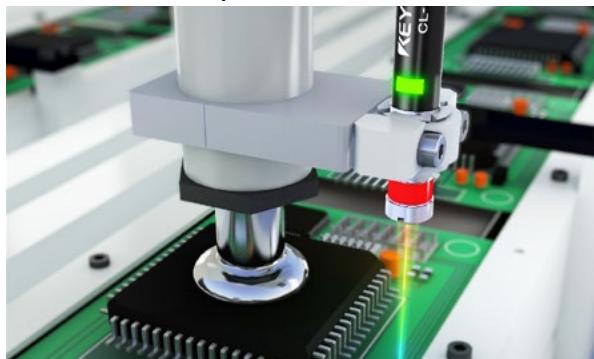


\* The CL-E100 and CL-EC100 cannot be connected simultaneously.



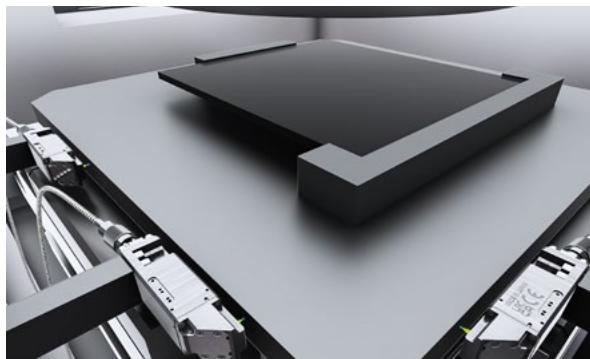
## Electronics/Semiconductor Industry

### Height position measurement during mounter adsorption



The ultra-compact  $\varnothing 8\text{ mm}$   $\varnothing 0.31\text{"}$  coaxial head can be mounted even in tight spaces to measure the positional height of components directly below the adsorption collet.

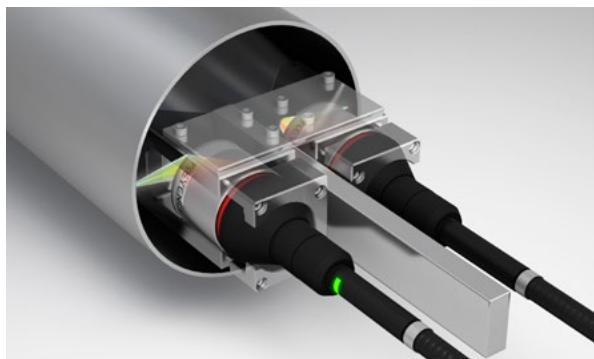
### Vacuum stage position measurement



In addition to being able to check the home position of a stage, the compact heads can also be used in a vacuum and installed in tight spaces.

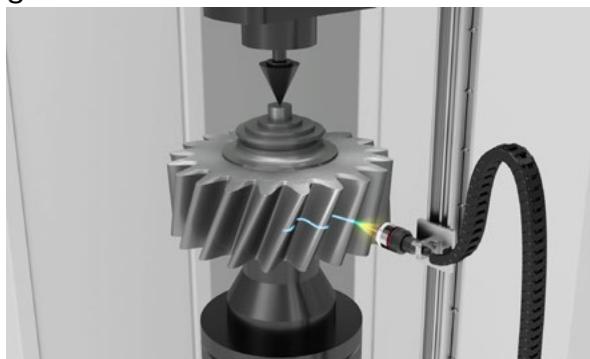
## Automotive/Metal Industry

### Pipe inner diameter measurement



Non-contact measurement of the inner diameter of pipes is possible. Using a side view attachment (OP-88861) allows for non-contact measurement even in locations with limited space for installation.

### Shape measurement for machined gears



Coaxial measurement of height differences of up to 70 mm  $2.76"$  ensures accurate measurement of machined shapes, including large worm gears.

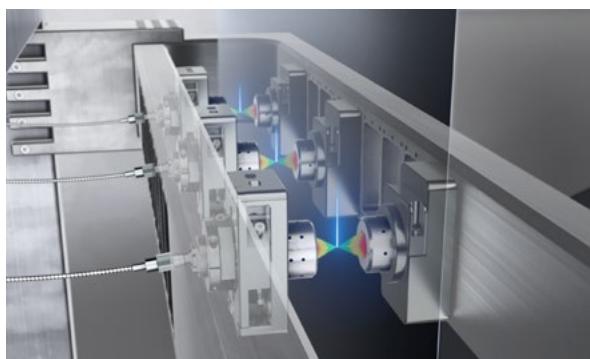
## Battery and film industries

### Plastic bottle thickness measurement



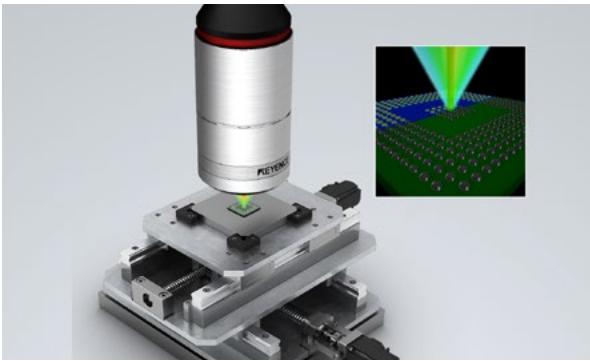
The CL Series calculates the light reflected from the top surface and the bottom surface to measure the thickness of transparent objects. The compact head also allows for measurement of multiple locations in a limited space.

### Metal plate thickness measurement



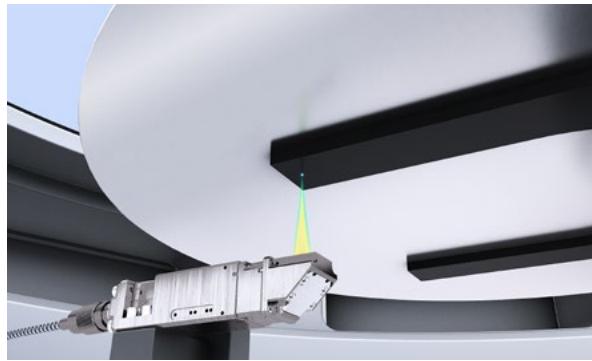
Non-contact thickness measurement is possible for metal plates. The CL Series makes accurate thickness measurement with minimal influence from ambient temperatures incredibly easy.

## BGA reball height measurement



The ultra-small 3.5 µm **0.000138"** beam spot makes it possible to measure the height of re-mounted solder balls. Accurate height profile measurement is also possible for spherical surfaces with angle characteristics of up to  $\pm 45^\circ$ .

## Height measurement of vacuum transfer robot end effector



Measurement of changes in the position of robot end effectors over time. The compact head can be installed in a vacuum, making it possible to measure changes over time in areas that cannot be monitored from outside.

## Disk rotor runout measurement



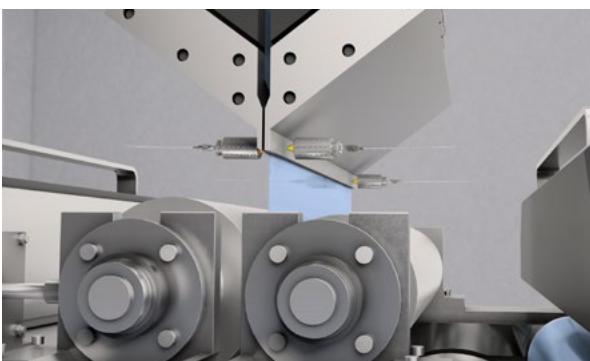
While conventional models use contact-based measurement, the CL Series offers stable, high-speed non-contact measurement thanks to its Quad processing system, which is able to handle rough surfaces with ease.

## Battery stack width measurement



Non-contact width measurement is possible after stacking with the CL Series, allowing for easy and accurate non-contact measurement of targets that are difficult to measure with large calipers and other tools.

## Measurement of thermal expansion of dies



The amount of thermal expansion of a die can be measured without contact. The CL Series' compact heads can be installed even with limited space in equipment, and up to six sensor heads can be connected to a controller and used for measurement simultaneously.

## Case height measurement before electrolyte injection



Case height can be measured to control the height of the injector. The CL Series' coaxial measurement system enables stable height measurement even in the deepest part of a hole.

## Heads — Standard quad-type/spot-type

|                           | Compact ø8 $\phi 0.31"$ type<br><b>CL-L007/CL-P007</b>                           | Ultra-high-accuracy model<br><b>CL-L015/CL-P015</b>                              | High-accuracy model<br><b>CL-L030/CL-P030</b>                                    | Mid-range model<br><b>CL-L070/CL-P070</b>                                      | Long-range model<br><b>[NEW] CL-L150/CL-P150</b>                                |
|---------------------------|--|--|--|--|---|
| (mm inch)                 |  |  |  |  |   |
| 120<br>4.72"              |  |  |  |  |   |
| 100<br>3.94"              |  |  |  |  |   |
| 80<br>3.15"               |  |  |  |  |   |
| 60<br>2.36"               |  |  |  |  |   |
| 40<br>1.57"               |  |  |  |  |   |
| 20<br>0.79"               | 5.5 mm<br>0.22"<br>7 mm<br>0.28"<br>8.5 mm<br>0.33"                              | 13.7 mm<br>0.54"<br>15 mm<br>0.59"<br>16.3 mm<br>0.64"                           | 26.3 mm<br>1.04"<br>30 mm<br>1.18"<br>33.7 mm<br>1.33"                           | 60 mm<br>2.36"<br>70 mm<br>2.76"<br>80 mm<br>3.15"                             | 115 mm<br>4.53"<br>150 mm<br>5.91"<br>185 mm<br>7.28"                           |
| 0                         | Measurement range<br>$7 \pm 1.5 \text{ mm}$<br>$0.28 \pm 0.05"$                  | Measurement range<br>$15 \pm 1.3 \text{ mm}$<br>$0.59 \pm 0.05"$                 | Measurement range<br>$30 \pm 3.7 \text{ mm}$<br>$1.18 \pm 0.15"$                 | Measurement range<br>$70 \pm 10 \text{ mm}$<br>$2.76 \pm 0.39"$                | Measurement range<br>$150 \pm 35 \text{ mm}$<br>$5.91 \pm 1.38"$                |
| Linearity (standard)      | $\pm 0.96 \mu\text{m} \pm 0.000038"$<br>( $\pm 0.83 \mu\text{m} \pm 0.000033"$ ) | $\pm 0.49 \mu\text{m} \pm 0.000019"$<br>( $\pm 0.36 \mu\text{m} \pm 0.000014"$ ) | $\pm 0.94 \mu\text{m} \pm 0.000037"$<br>( $\pm 0.81 \mu\text{m} \pm 0.000032"$ ) | $\pm 2.2 \mu\text{m} \pm 0.000087"$<br>( $\pm 2.0 \mu\text{m} \pm 0.000079"$ ) | $\pm 5.65 \mu\text{m} \pm 0.000222"$<br>( $\pm 5.5 \mu\text{m} \pm 0.000217"$ ) |
| Linearity (high accuracy) | $\pm 0.55 \mu\text{m} \pm 0.000022"$<br>( $\pm 0.43 \mu\text{m} \pm 0.000017"$ ) | $\pm 0.41 \mu\text{m} \pm 0.000016"$<br>( $\pm 0.28 \mu\text{m} \pm 0.000011"$ ) | $\pm 0.72 \mu\text{m} \pm 0.000028"$<br>( $\pm 0.59 \mu\text{m} \pm 0.000023"$ ) | $\pm 2.0 \mu\text{m} \pm 0.000079"$<br>( $\pm 1.9 \mu\text{m} \pm 0.000075"$ ) | $\pm 4.65 \mu\text{m} \pm 0.000183"$<br>( $\pm 4.5 \mu\text{m} \pm 0.000177"$ ) |
| Ambient temperature       |  |  |  | 0 to 50°C 32 to 122°F  |   |

The Quad processing system eliminates influence from extremely small irregularities, allowing for stable measurement.

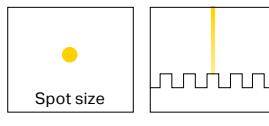
Position   Thickness   Height   Runout



|               | CL-L007                                  | CL-L015                                  | CL-L030                                  | CL-L070                                  | CL-L150                                 |
|---------------|--|--|--|--|---|
| Spot diameter | $\phi 750 \mu\text{m}$<br>$\phi 0.0295"$ | $\phi 300 \mu\text{m}$<br>$\phi 0.0118"$ | $\phi 500 \mu\text{m}$<br>$\phi 0.0197"$ | $\phi 600 \mu\text{m}$<br>$\phi 0.0236"$ | $\phi 1000 \mu\text{m}$<br>$\phi 0.04"$ |

Reliable detection of fine targets is possible using the ultra-small beam spot adjustable down to  $\phi 3.5 \mu\text{m}$   $0.000138"$ —ideal for profile measurement.

Position   Thickness   Height   Runout



|               | CL-P007                                 | CL-P015                                 | CL-P030                                 | CL-P070                                 | CL-P150                                 |
|---------------|---|---|---|---|---|
| Spot diameter | $\phi 50 \mu\text{m}$<br>$\phi 0.0020"$ | $\phi 25 \mu\text{m}$<br>$\phi 0.0010"$ | $\phi 38 \mu\text{m}$<br>$\phi 0.0015"$ | $\phi 50 \mu\text{m}$<br>$\phi 0.0020"$ | $\phi 75 \mu\text{m}$<br>$\phi 0.0030"$ |

## Heads — Special spot-type

|                           | 20 mm 0.79" vacuum and heat-resistant model<br><b>[NEW] CL-V020</b>              | 50 mm 1.97" vacuum and heat-resistant model<br><b>[NEW] CL-V050</b>             | Ultra-high-accuracy 15 mm 0.59" model<br><b>[NEW] CL-S015</b>                   | Explosion-proof 15 mm 0.59" model<br><b>[NEW] CL-S015EX</b>                     | Profile measurement model<br><b>CL-PT010</b>                                     |
|---------------------------|--|---|---|---|--|
| (mm inch)                 |  |   |   |   |  |
| 80<br>3.15"               |  |   |   |   |  |
| 60<br>2.36"               |  |   |   |   |  |
| 40<br>1.57"               |  |   |   |   |  |
| 20<br>0.79"               | 18.7 mm<br>0.74"<br>20 mm<br>0.79"<br>21.3 mm<br>0.84"                           | 46 mm<br>1.81"<br>50 mm<br>1.97"<br>54 mm<br>2.13"                              | 14 mm<br>0.55"<br>15 mm<br>0.59"<br>16 mm<br>0.63"                              | 14 mm<br>0.55"<br>15 mm<br>0.59"<br>16 mm<br>0.63"                              | 9.7 mm<br>0.38"<br>10 mm<br>0.39"<br>10.3 mm<br>0.41"                            |
| 0                         | Measurement range<br>$20 \pm 1.3 \text{ mm}$<br>$0.79 \pm 0.05"$                 | Measurement range<br>$50 \pm 4 \text{ mm}$<br>$1.97 \pm 0.16"$                  | Measurement range<br>$15 \pm 1 \text{ mm}$<br>$0.59 \pm 0.04"$                  | Measurement range<br>$15 \pm 1 \text{ mm}$<br>$0.59 \pm 0.04"$                  | Measurement range<br>$10 \pm 0.3 \text{ mm}$<br>$0.39 \pm 0.01"$                 |
| Linearity (standard)      | $\pm 0.45 \mu\text{m} \pm 0.000018"$<br>( $\pm 0.3 \mu\text{m} \pm 0.000012"$ )  | $\pm 1.4 \mu\text{m} \pm 0.000055"$<br>( $\pm 1.25 \mu\text{m} \pm 0.000049"$ ) | $\pm 0.35 \mu\text{m} \pm 0.000014"$<br>( $\pm 0.2 \mu\text{m} \pm 0.000008"$ ) | $\pm 0.35 \mu\text{m} \pm 0.000014"$<br>( $\pm 0.2 \mu\text{m} \pm 0.000008"$ ) | $\pm 0.22 \mu\text{m} \pm 0.000009"$<br>( $\pm 0.11 \mu\text{m} \pm 0.000004"$ ) |
| Linearity (high accuracy) | $\pm 0.38 \mu\text{m} \pm 0.000015"$<br>( $\pm 0.23 \mu\text{m} \pm 0.000009"$ ) | $\pm 1.3 \mu\text{m} \pm 0.000051"$<br>( $\pm 1.15 \mu\text{m} \pm 0.000045"$ ) | $\pm 0.25 \mu\text{m} \pm 0.000010"$<br>( $\pm 0.1 \mu\text{m} \pm 0.000004"$ ) | $\pm 0.25 \mu\text{m} \pm 0.000010"$<br>( $\pm 0.1 \mu\text{m} \pm 0.000004"$ ) | $\pm 0.2 \mu\text{m} \pm 0.000008"$<br>( $\pm 0.09 \mu\text{m}$ )                |
| Ambient temperature       | - 20 to 200°C - 4 to 392°F   |   | - 20 to 70°C - 4 to 158°F   |   | 0 to 50°C 32 to 122°F  |
| Vacuum                    | Ultra-high-vacuum environments   |   |   | Vacuum environments   |  |

|               | CL-V020                                 | CL-V050                                | CL-S015                                 | CL-S015EX                               | CL-PT010                                   |
|---------------|---|--|---|---|--|
| Spot diameter | $\phi 20 \mu\text{m}$<br>$\phi 0.0008"$ | $\phi 40 \mu\text{m}$<br>$\phi 0.016"$ | $\phi 10 \mu\text{m}$<br>$\phi 0.0004"$ | $\phi 10 \mu\text{m}$<br>$\phi 0.0004"$ | $\phi 3.5 \mu\text{m}$<br>$\phi 0.000138"$ |

## ■ Heads

Compact ø8 **ø0.31"**  
type  
**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**



Long-range model  
**CL-L(P)150**  
**[NEW]**



20 mm **0.79"** vacuum and  
heat-resistant model  
**CL-V020**  
**[NEW]**



50 mm **1.97"** vacuum and  
heat-resistant model  
**CL-V050**  
**[NEW]**



Ultra-high-accuracy  
15 mm **0.59"** model  
**CL-S015**  
**[NEW]**



Explosion-proof  
15 mm **0.59"** model  
**CL-S015EX**  
**[NEW]**



Profile measurement  
model  
**CL-PT010**



## ■ Controllers

Controller  
**CL-3000/  
3050**



Expansion  
unit  
**CL-H100**



Expansion  
unit  
(with analog  
output)  
**CL-H150**



Relay unit  
**CL-H200**



Encoder  
unit  
**CL-E100**



EtherCAT®  
unit  
**CL-EC100**



## ■ Optical Units

Optical unit

**CL-L(P)007N(G)** **CL-PT010N(G)**  
**CL-L(P)015N(G)** **CL-L(P)150N(G)**  
**CL-L(P)030N(G)**  
**CL-L(P)070N(G)**



Optical unit  
**CL-V020N(G)**  
**CL-V050N(G)**  
**CL-S015N(G)**  
**CL-S015EXN(G)**



## ■ Displays

Display panel  
**CL-D500**



## ■ Cables

Head extension cable

**CL-C5** (5 m **16.4'**)  
**CL-C10** (10 m **32.8'**)  
**CL-C30** (30 m **98.4'**)

Head extension cable  
(for CL-S/CL-V)

**CL-CV2** (2 m **6.6')**  
**CL-CV5** (5 m **16.4')**  
**CL-CV15** (15 m **49.2'**)

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**

Ethernet cable  
**OP-66843**

RS-232C cable

**OP-96368**

Dsub 9-pin connector  
**OP-26401**

## ■ Optional Parts

Fixing jig

For CL-L(P)015/030/070/150: **OP-88283**  
For CL-L(P)007: **OP-88353/OP-88354/OP-88355**  
For CL-PT010: **OP-88289**  
For CL-S015/015EX: **OP-88863**



1 ch vacuum feedthrough  
**OP-88859**



Side view attachment

For CL-L(P)007: **OP-88860**  
For CL-L(P)030: **OP-88861**  
For CL-V020/050: **OP-88862**



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

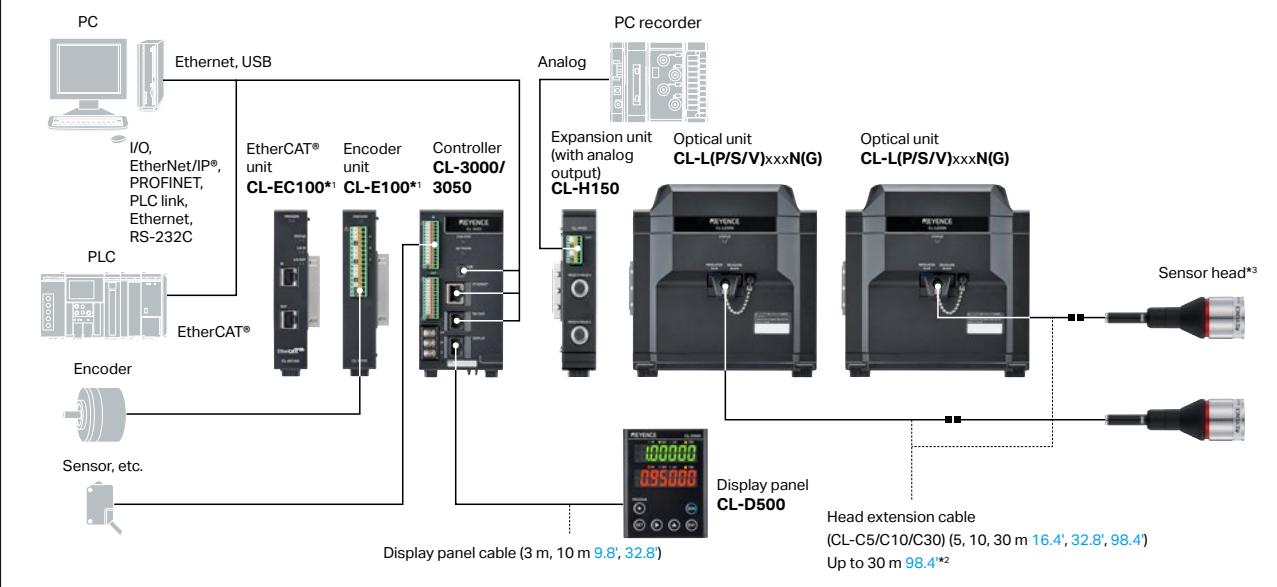


Adjustable fixture for  
thickness  
measurement  
For CL-S015/ 015EX:  
**OP-88864**



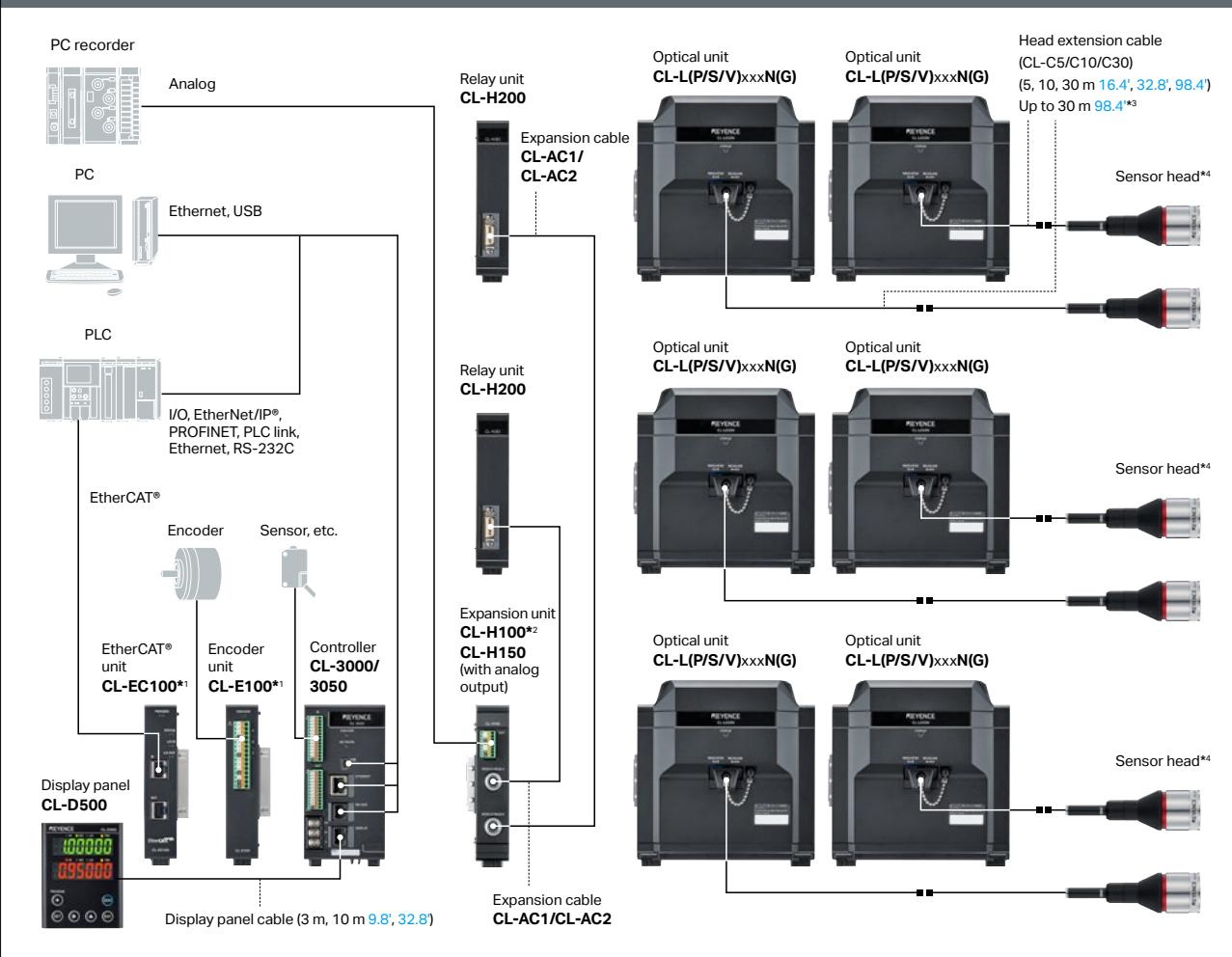
## System Configuration

### With 2 sensor heads connected



\*1 CL-E100 and CL-EC100 units cannot be connected simultaneously. \*2 A head extension cable (CL-V2/V5/V15) is used for CL-S and CL-V heads. (2, 5, 15 m 6.6', 16.4', 49.2') (30 m 98.4' max.) \*3 All sensor heads can be mixed for use.

### With 6 sensor heads connected



\*1 CL-E100 and CL-EC100 units cannot be connected simultaneously. \*2 Analog output is not possible with the CL-H100.

\*3 A head extension cable (CL-V2/V5/V15) is used for CL-S and CL-V heads. (2, 5, 15 m 6.6', 16.4', 49.2') (30 m 98.4' max.) \*4 All sensor heads can be mixed for use.



## I Sensor heads and optical units

### Quad type

| Model <sup>*1</sup>             | Head                          | <b>CL-L007</b>  | <b>CL-L015</b>  | <b>CL-L030</b>  | <b>CL-L070</b>   | <b>[NEW] CL-L150</b>                                       |
|---------------------------------|-------------------------------|---|---|---|--|--|
|                                 | Optical unit                  | <b>CL-L007N(G)</b>  | <b>CL-L015N(G)</b>  | <b>CL-L030N(G)</b>  | <b>CL-L070N(G)</b>   | <b>CL-L150N(G)</b>   |
| Reference distance              |                               | 7 mm <b>0.28"</b>   | 15 mm <b>0.59"</b>  | 30 mm <b>1.18"</b>  | 70 mm <b>2.76"</b>   | 150 mm <b>5.91"</b>  |
| Reference measurement range     | Measurement range             | ±1.5 mm <b>±0.06"</b>                                       | ±1.3 mm <b>±0.05"</b>                                       | ±3.7 mm <b>±0.15"</b>                                       | ±10 mm <b>±0.39"</b>   | ±35 mm <b>±1.38"</b>                                       |
|                                 | Linearity <sup>*2*3</sup>     | ±2.1 µm <b>±0.000083"</b><br>(±1.95 µm <b>±0.000077"</b> )  | ±0.49 µm <b>±0.000019"</b><br>(±0.36 µm <b>±0.000014"</b> ) | ±0.94 µm <b>±0.000037"</b><br>(±0.81 µm <b>±0.000023"</b> ) | ±2.2 µm <b>±0.000087"</b><br>(±2.0 µm <b>±0.000079"</b> )                              | ±5.65 µm <b>±0.000222"</b><br>(±5.5 µm <b>±0.000217"</b> ) |
| High-accuracy measurement range | Measurement range             | ±0.5 mm <b>±0.02"</b>                                       | ±0.5 mm <b>±0.02"</b>                                       | ±1.0 mm <b>±0.04"</b>                                       | ±3.0 mm <b>±0.12"</b>  | ±15 mm <b>±0.59"</b>                                       |
|                                 | Linearity <sup>*2*3</sup>     | ±0.91 µm <b>±0.000036"</b><br>(±0.78 µm <b>±0.000031"</b> ) | ±0.41 µm <b>±0.000016"</b><br>(±0.28 µm <b>±0.000011"</b> ) | ±0.72 µm <b>±0.000028"</b><br>(±0.59 µm <b>±0.000023"</b> ) | ±2.0 µm <b>±0.000079"</b><br>(±1.9 µm <b>±0.000075"</b> )                              | ±4.65 µm <b>±0.000183"</b><br>(±4.5 µm <b>±0.000177"</b> ) |
| Resolution <sup>*3*4</sup>      |                               | 0.25 µm <b>±0.000010"</b><br>(0.015 µm)                     | 0.25 µm <b>±0.000010"</b><br>(0.003 µm)                     | 0.25 µm <b>±0.000010"</b><br>(0.015 µm)                     | 0.25 µm <b>±0.000010"</b><br>(0.025 µm)  | 0.25 µm <b>±0.000010"</b><br>(0.1 µm <b>±0.000004"</b> )   |
| Spot diameter                   |                               | ø750 µm <b>ø0.295"</b>                                      | ø300 µm <b>ø0.0118"</b>                                     | ø500 µm <b>ø0.0197"</b>                                     | ø600 µm <b>ø0.0236"</b>  | ø1000 µm <b>ø0.04"</b>                                     |
| Laser class                     | Optical unit                  |   |   | Class I   |  |  |
| Sampling cycle                  |                               |   |   | 100/200/500/1000 µs (Adjustable 4-stage)                    |  |  |
| Environmental resistance        | Enclosure rating              | Head  |   |   | IP67 (IEC60529)  |  |
|                                 | Ambient operating illuminance |   |   |   | Target surface illuminance: 3000 lux (Incandescent lamp)                               |  |
|                                 | Operating ambient temperature |   |   |   | 0 to 50°C <b>32 to 122°F</b>   |  |
|                                 | Operating ambient humidity    |   |   |   | 85% RH or less (no condensation)   |  |
|                                 | Vibration resistance          | Head  |   |   | 10 to 57 Hz, double amplitude 1.5 mm <b>±0.06"</b> ; 2 hours each for X, Y, and Z axes |  |
|                                 |                               | Optical unit  |   |   | 10 to 57 Hz, double amplitude 0.3 mm <b>±0.01"</b> ; 2 hours each for X, Y, and Z axes |  |
| Temperature characteristics     | Shock resistance              |   |   |   | 15 G, 6 ms   |  |
|                                 | 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 <b>4.94 oz</b>                                | Approx. 180 g <b>6.35 oz</b>                                | Approx. 200 g <b>7.06 oz</b>                                | Approx. 280 g <b>9.88 oz</b>   | Approx. 380 g <b>13.41 oz</b>                              |
|                                 | Optical unit                  |   |   |   | Approx. 1600 g <b>3.53 lb</b>  |  |

\*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 Values in parentheses are for models subject to export control. Model designations end with (G), not (N).

\*4 Value measured using 16,384 average cycles with KEYENCE reference workpiece (mirrored surface).

### Spot type

| Model <sup>*1</sup>             | Head                          | <b>CL-P007</b>  | <b>CL-P015</b>  | <b>CL-P030</b>  | <b>CL-P070</b>   | <b>[NEW] CL-P150</b>                                       |
|---------------------------------|-------------------------------|---|---|---|--|--|
|                                 | Optical unit                  | <b>CL-P007N(G)</b>  | <b>CL-P015N(G)</b>  | <b>CL-P030N(G)</b>  | <b>CL-P070N(G)</b>   | <b>CL-P150N(G)</b>   |
| Reference distance              |                               | 7 mm <b>0.28"</b>   | 15 mm <b>0.59"</b>  | 30 mm <b>1.18"</b>  | 70 mm <b>2.76"</b>   | 150 mm <b>5.91"</b>  |
| Reference measurement range     | Measurement range             | ±1.5 mm <b>±0.06"</b>                                       | ±1.3 mm <b>±0.05"</b>                                       | ±3.7 mm <b>±0.15"</b>                                       | ±10 mm <b>±0.39"</b>   | ±35 mm <b>±1.38"</b>                                       |
|                                 | Linearity <sup>*2*3</sup>     | ±0.96 µm <b>±0.000038"</b><br>(±0.83 µm <b>±0.000033"</b> ) | ±0.49 µm <b>±0.000019"</b><br>(±0.36 µm <b>±0.000014"</b> ) | ±0.94 µm <b>±0.000037"</b><br>(±0.81 µm <b>±0.000032"</b> ) | ±2.2 µm <b>±0.000087"</b><br>(±2.0 µm <b>±0.000079"</b> )                              | ±5.65 µm <b>±0.000222"</b><br>(±5.5 µm <b>±0.000217"</b> ) |
| High-accuracy measurement range | Measurement range             | ±0.5 mm <b>±0.02"</b>                                       | ±0.5 mm <b>±0.02"</b>                                       | ±1.0 mm <b>±0.04"</b>                                       | ±3.0 mm <b>±0.12"</b>  | ±15 mm <b>±0.59"</b>                                       |
|                                 | Linearity <sup>*2*3</sup>     | ±0.55 µm <b>±0.000022"</b><br>(±0.43 µm <b>±0.000017"</b> ) | ±0.41 µm <b>±0.000016"</b><br>(±0.28 µm <b>±0.000011"</b> ) | ±0.72 µm <b>±0.000028"</b><br>(±0.59 µm <b>±0.000023"</b> ) | ±2.0 µm <b>±0.000079"</b><br>(±1.9 µm <b>±0.000075"</b> )                              | ±4.65 µm <b>±0.000183"</b><br>(±4.5 µm <b>±0.000177"</b> ) |
| Resolution <sup>*3*4</sup>      |                               | 0.25 µm <b>±0.000010"</b><br>(0.015 µm)                     | 0.25 µm <b>±0.000010"</b><br>(0.003 µm)                     | 0.25 µm <b>±0.000010"</b><br>(0.015 µm)                     | 0.25 µm <b>±0.000010"</b><br>(0.025 µm)  | 0.25 µm <b>±0.000010"</b><br>(0.1 µm <b>±0.000004"</b> )   |
| Spot diameter                   |                               | ø50 µm <b>ø0.0020"</b>                                      | ø25 µm <b>ø0.0010"</b>                                      | ø38 µm <b>ø0.0015"</b>                                      | ø50 µm <b>ø0.0020"</b>   | ø75 µm <b>ø0.0030"</b>                                     |
| Laser class                     | Optical unit                  |   |   | Class I   |  |  |
| Sampling cycle                  |                               |   |   | 100/200/500/1000 µs (Adjustable 4-stage)                    |  |  |
| Environmental resistance        | Enclosure rating              | Head  |   |   | IP67 (IEC60529)  |  |
|                                 | Ambient operating illuminance |   |   |   | Target surface illuminance: 3000 lux (Incandescent lamp)                               |  |
|                                 | Operating ambient temperature |   |   |   | 0 to 50°C <b>32 to 122°F</b>   |  |
|                                 | Operating ambient humidity    |   |   |   | 85% RH or less (no condensation)   |  |
|                                 | Vibration resistance          | Head  |   |   | 10 to 57 Hz, double amplitude 1.5 mm <b>±0.06"</b> ; 2 hours each for X, Y, and Z axes |  |
|                                 |                               | Optical unit  |   |   | 10 to 57 Hz, double amplitude 0.3 mm <b>±0.01"</b> ; 2 hours each for X, Y, and Z axes |  |
| Temperature characteristics     | Shock resistance              |   |   |   | 15 G, 6 ms   |  |
|                                 | 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 <b>4.94 oz</b>                                | Approx. 180 g <b>6.35 oz</b>                                | Approx. 200 g <b>7.06 oz</b>                                | Approx. 280 g <b>9.88 oz</b>   | Approx. 380 g <b>13.41 oz</b>                              |
|                                 | Optical unit                  |   |   |   | Approx. 1600 g <b>3.53 lb</b>  |  |

\*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 Values in parentheses are for models subject to export control. Model designations end with (G), not (N).

\*4 Value measured using 16,384 average cycles with KEYENCE reference workpiece (mirrored surface).

## I Sensor heads and optical units

### Spot type

| Model <sup>*1</sup>             | Head                          | High-accuracy model                      | Explosion-proof model   | 20 mm 0.79" vacuum-resistant model                                  | 50 mm 1.97" vacuum-resistant model           | Profile measurement model  |  |  |
|---------------------------------|-------------------------------|--|---|---|--|--|--|--|
|                                 |                               | [NEW] CL-S015                            | [NEW] CL-S015EX   | [NEW] CL-V020   | [NEW] CL-V050                                | CL-PT010   |  |  |
|                                 | Optical unit                  | CL-S015N(G)                              | CL-S015EXN(G)   | CL-V020N(G)   | CL-V050N(G)                                  | CL-PT010N(G)   |  |  |
| Reference distance              |                               | 15 mm 0.59"                              | 15 mm 0.59"   | 20 mm 0.79"   | 50 mm 1.97"                                  | 10 mm 0.39"  |  |  |
| Reference measurement range     | Measurement range             | ±1.0 mm ±0.04"                           | ±1.0 mm ±0.04"  | ±1.3 mm ±0.05"  | ±4 mm ±0.16"                                 | ±0.3 mm ±0.01"   |  |  |
| Linearity <sup>*2*3</sup>       | Linearity <sup>*2*3</sup>     | ±0.35 µm ±0.000014" (±0.2 µm ±0.000008") | ±0.35 µm ±0.000014" (±0.2 µm ±0.000008")                                      | ±0.45 µm ±0.000018" (±0.3 µm ±0.000012")                            | ±1.4 µm ±0.000055" (±1.25 µm ±0.000049")     | ±0.22 µm ±0.000009" (±0.11 µm ±0.000004")                                      |  |  |
| High-accuracy measurement range | Measurement range             | -0.2 mm/-1.0 mm -0.01/-0.04"             | -0.2 mm/-1.0 mm -0.01/-0.04"  | ±0.5 mm ±0.02"  | ±1.6 mm ±0.06"                               | ±0.15 mm ±0.01"  |  |  |
| Linearity <sup>*2*3</sup>       | Linearity <sup>*2*3</sup>     | ±0.25 µm ±0.000010" (±0.1 µm ±0.000004") | ±0.25 µm ±0.000010" (±0.1 µm ±0.000004")                                      | ±0.38 µm ±0.000015" (±0.23 µm ±0.000009")                           | ±1.3 µm ±0.000051" (±1.15 µm ±0.000045")     | ±0.2 µm ±0.000008" (±0.09 µm)  |  |  |
| Resolution <sup>*3*4</sup>      |                               | 0.25 µm 0.000010" (0.003 µm)             | 0.25 µm 0.000010" (0.003 µm)  | 0.25 µm 0.000010" (0.01 µm)   | 0.25 µm 0.000010" (0.03 µm)                  | 0.25 µm 0.000010" (0.001 µm)   |  |  |
| Spot diameter                   |                               | ø10 µm ø0.0004"                          | ø10 µm ø0.0004"   | ø20 µm ø0.0008"   | ø40 µm ø0.0016"                              | ø3.5 µm ø0.000138"   |  |  |
| Laser class                     |                               | Class I                                  |   |   |  |  |  |  |
| Sampling cycle                  |                               | 100/200/500/1000 µs (Adjustable 4-stage) |   |   |  |  |  |  |
| Environmental resistance        | Enclosure rating              | Head                                     | IP50  | IP40 degassed structure for vacuum environments <sup>*5</sup>       |  | IP64 (IEC60529)  |  |  |
|                                 | Ambient operating illuminance |  | Target surface illuminance: 30000 lux (Incandescent lamp)                     |   |  |  |  |  |
|                                 | Operating ambient temperature | Head                                     | -20 to 70°C -4 to 158°F   | -20 to 200°C -4 to 392°F  |  | 0 to 50°C 32 to 122°F  |  |  |
|                                 | Optical unit                  |  | 0 to 50°C 32 to 122°F   |   |  |  |  |  |
|                                 | Operating ambient humidity    | Head                                     | 85% RH or less (no condensation)  |   |  |  |  |  |
|                                 | Optical unit                  |  | 85% RH or less (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 |  |  |
|                                 | Optical unit                  |  | 10 to 57 Hz, double amplitude 0.3 mm 0.01"; 2 hours each for X, Y, and Z axes |   |  |  |  |  |
|                                 | Shock resistance              |  | 15 G, 6 ms  |   |  |  |  |  |
|                                 | Vacuum                        |  | Vacuum environments   |   | Ultra-high-vacuum environments <sup>*6</sup> |  |  |  |
| Temperature characteristics     | Explosion-proof rating        |  | None  | Usable in explosion-proof environments<br>* See the attached table. |  | None   |  |  |
|                                 | Head                          |  | 0.005% of F.S./°C <sup>*7</sup>   |   | 0.013% of F.S./°C <sup>*7</sup>              | 0.015% of F.S./°C <sup>*7</sup>  |  |  |
|                                 | Optical unit                  |  | 0.015% of F.S./°C   |   | 0.1% of F.S./°C <sup>*7</sup>                |  |  |  |
| Material                        | Head                          | SUS303/304                               | SUS303/304  | SUS304  | SUS304                                       | Front: SUS, Rear: Aluminum   |  |  |
|                                 | Optical unit                  |  | Polycarbonate   |   |  |  |  |  |
| Weight                          | Head                          | Approx. 350 g 12.36 oz                   | Approx. 350 g 12.36 oz  | Approx. 100 g 3.53 oz   | Approx. 100 g 3.53 oz                        | Approx. 1100 g 2.43 lb   |  |  |
|                                 | Optical unit                  |  | Approx. 1600 g 5.53 lb  |   |  |  |  |  |

\*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 Values in parentheses are for models subject to export control. Model designations end with (G), not (N).

\*4 Value measured using 16,384 average cycles with KEYENCE reference workpiece (mirrored surface). (Value measured with 4096 average cycles on CL-PT010 only.)

\*5 The enclosure rating is equivalent to IP50 when the included sticker is attached.

\*6 Operation verification has been performed in environments of 10^-6 Pa.

\*7 These figures are based on the case where a jig made of SUS303 (or SUS304) is fixed between the head and the object.

### I Expansion cables

| Model  | CL-AC1        | CL-AC2         |
|--------|---------------|----------------|
| Length | 1 m 3.3'      | 2 m 6.6'       |
| Weight | 200 g 7.06 oz | 400 g 14.12 oz |

### I Head extension cables (for CL-S/CL-V)

| Model  | CL-CV2        | CL-CV5       | CL-CV15       |
|--------|---------------|--------------|---------------|
| Length | 2 m 6.6'      | 5 m 16.4'    | 15 m 49.2'    |
| Weight | 100 g 3.53 oz | 150 g 5.3 oz | 250 g 8.83 oz |

### I CL-S015EX/CL-S015EXN explosion-proof specifications

| Model                       | IECEx                                  |   | ATEX                                   |   | NRTL/ACO   |  |
|-----------------------------|--|---|--|---|--|--|
|                             | Head                                   | Optical unit  | Head                                   | Optical unit  | Head   | Optical unit   |
| CL-S015EX                   | CL-S015EX                              | CL-S015EXN(G)   | CL-S015EX                              | CL-S015EXN(G)   | CL-S015EX  | CL-S015EXN(G)  |
| Explosion-proof performance | Ex op is IICT6 Ga                      | [Ex op is IICT6 Ga]   | II 1G Ex op is IICT6 Ga                | II (1) G [Ex op is IICT6 Ga]                                  | Class I, Zone 0, AEx op is IICT6 Ga Class I, Division 1, Groups A, B, C, D, T6 | Class I, Zone 0, [AEx op is IICT6 Ga] Class I, Division 1, Groups A, B, C, D, T6 |
| Zone/Division               | Zone 0                                 | Do not install in a hazardous location (associated equipment) | Zone 0                                 | Do not install in a hazardous location (associated equipment) | Zone 0/Division 1  | Do not install in a hazardous location (associated equipment)                    |
| Ambient temperature         | -20°C ≤ Ta ≤ 70°C<br>-4°F ≤ Ta ≤ 158°F | 0°C ≤ Ta ≤ 50°C<br>32°F ≤ Ta ≤ 122°F                          | -20°C ≤ Ta ≤ 70°C<br>-4°F ≤ Ta ≤ 158°F | 0°C ≤ Ta ≤ 50°C<br>32°F ≤ Ta ≤ 122°F                          | -20°C ≤ Ta ≤ 70°C<br>-4°F ≤ Ta ≤ 158°F   | 0°C ≤ Ta ≤ 50°C<br>32°F ≤ Ta ≤ 122°F   |
| Certification number        | IECEx CSAE 23.0033X                    |   | CSA Ne 23ATEX1133X                     |   | 23CA80171819X  |  |

## ■ Controllers

| Model                              | CL-3000/3050   |  |
|------------------------------------|--|--|
| 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; RP1: 1 to 10000 ms (0.5 ms units)<br>Maximum number of connections: 8, Complies with Version CT14 conformance testing; Cannot be used when using PROFINET, PLC link, or EtherCAT® |
|                                    | PROFINET   | Compliant with Conformance Class A; Cannot be used when using EtherNet/IP®, PLC link, or EtherCAT®   |
|                                    | PLC link   | Mitsubishi Electric: MELSEC iQ-R Series, iQ-F Series, Q Series, L Series, FX Series<br>Cannot be used when using EtherNet/IP®, PROFINET or EtherCAT®   |
|                                    | Ethernet*2   | Allows for measurement data output and control I/O via no-protocol command communication with PCs and PLCs<br>100Base-TX, capable of communication with CL-NavigatorN  |
|                                    | USB*2  | 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<br>Baud rate: 9600 to 115200 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%  |
|                                    | Max. 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   | 85% RH or less (no condensation)   |
|                                    | Vibration resistance   | 10 to 57 Hz, double amplitude 0.3 mm 0.01"; 2 hours each for X, Y, and Z axes  |
| Monitor/setup support software     | CL-NavigatorN  |  |
| Weight                             | Approx. 600 g 21.18 oz   |  |

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

\*2 Sample DLL and LabVIEW programs are available. Contact your local sales office for details.

## ■ Expansion units and relay units

| Model                              | Expansion unit                       |                                  | Expansion unit (with analog output)       | Relay unit |
|------------------------------------|--------------------------------------|----------------------------------|---|------------|
|                                    | CL-H100                              | CL-H150                          | CL-H200                                   |            |
| Number of optical unit connections | Supports two CL-H200 expansion units |                                  | Supports two optical unit connections     |            |
| Terminal block                     | Analog voltage output                | None                             | ±10 V ×4 outputs, output impedance: 100 Ω | None       |
| Environmental resistance           | Operating ambient temperature        | 0 to 50°C 32 to 122°F            |   |            |
|                                    | Operating ambient humidity           | 85% RH or less (no condensation) |   |            |
| Weight                             | Approx. 300 g 10.59 oz               |                                  |   |            |

## ■ Encoder unit

| Model                      | CL-E100   |                                  |
|----------------------------|---|----------------------------------|
| Number of encoder axes     | Incremental method (A/B/Z phase)  |                                  |
| Minimum encoder input time | 100 ns to 20 μs   |                                  |
| Max. current consumption   | 0.18 A  |                                  |
| Service power supply       | 5 VDC ±10%, maximum power supply: 200 mA  |                                  |
| Input terminals            | 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  | 85% RH or less (no condensation) |
| Weight                     | Approx. 300 g 10.59 oz  |                                  |

## ■ EtherCAT® unit

| Model                                   | CL-EC100                      |   |
|---|-------------------------------|---|
| EtherCAT® communication specifications* | Compliant standard            | IEEE802.3u (100BASE-TX)   |
|   | Communication speed           | 100 Mbps (100BASE-TX)   |
|   | Communication cycle           | Shortest: 125 μs  |
|   | Connection cable              | STP cable, Category 5e or above   |
|   | Node interval                 | 100 m 328.1'  |
|   | Communication port            | RJ45 × 2  |
|   | Supported functions           | Process Data Object (PDO) communication<br>(Cyclic communication: Process data communication)<br>Service Data Object (SDO) communication<br>(Non-cyclic communication: Mailbox communication)<br>CoE<br>Distributed Clock<br>Explicit Device Identification |
| Environmental resistance                | Operating ambient temperature | 0 to 50°C 32 to 122°F   |
|   | Operating ambient humidity    | 85% RH or less (no condensation)  |
| Weight                                  | Approx. 330 g 11.65 oz        |   |

\* Cannot be used when using EtherNet/IP®, PROFINET, or PLC link.

• Cannot be used simultaneously with an encoder unit.

## ■ CL-NavigatorN OS environment

| Item                             | Required Environment                       |
|----------------------------------|--|
| Supported OS                     | Windows11 Pro / Windows 10*1 / Windows 7*2 |
| CPU                              | Celeron dual core 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 Home Premium, Professional and Ultimate Editions are supported.

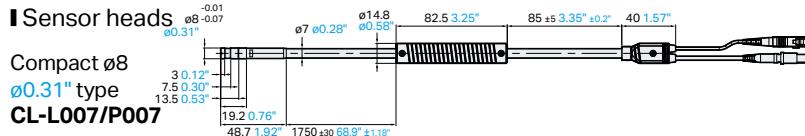
• Windows and Excel are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

• Model subject to export control: CL-NavigatorG.

## ■ Display panel

| Model                    | CL-D500  |                                  |
|--------------------------|--|----------------------------------|
| Minimum display unit     | 0.001 μm   |                                  |
| Display range            | ±999.999 μm to ±9999.99 mm<br>±0.0394" to ±393.70" |                                  |
| Display cycle            | Approx. 10 times/second                            |                                  |
| Environmental resistance | Operating ambient temperature                      | 0 to 50°C 32 to 122°F            |
|                          | Operating ambient humidity                         | 85% RH or less (no condensation) |
| Weight                   | Approx. 100 g 3.53 oz                              |                                  |

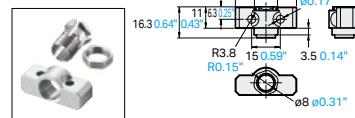
## I Sensor heads



Head mounting  
fixture A  
**OP-88353**



Head mounting  
fixture B  
**OP-88354**

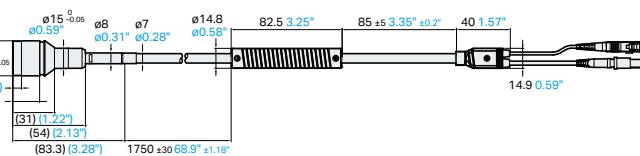


Head mounting  
fixture C  
**OP-88355** 23

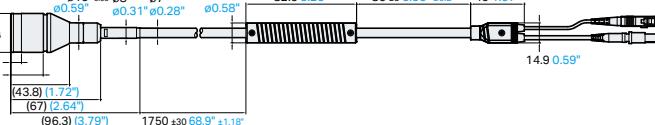


Material: SI IS303

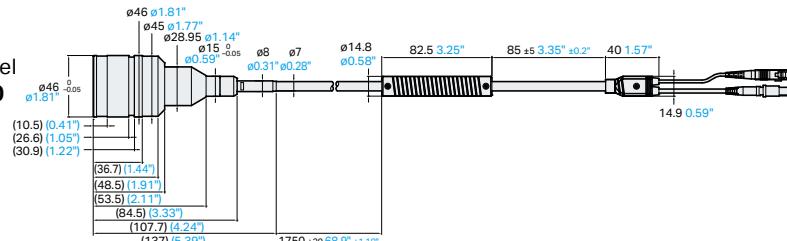
Ultra-high-  
accuracy model  
**CL-L015/P015**



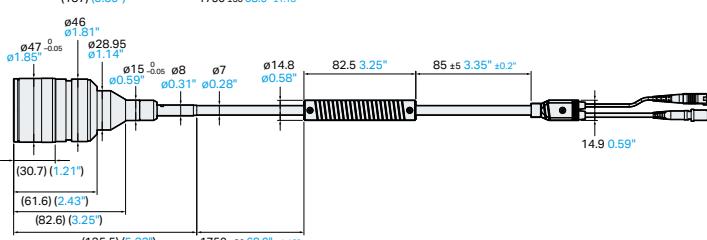
High-accuracy  
model  
**CL-L030/P03**



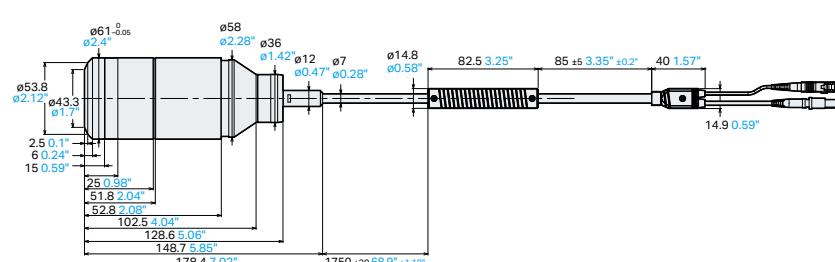
Mid-range mode  
**CL-L070/P070**



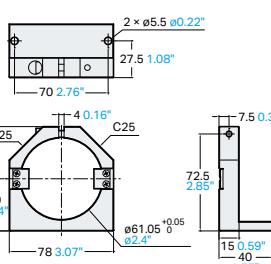
## Long-range model **CL-L150/P150**



Profile  
measurement  
model  
**CI-BT010**

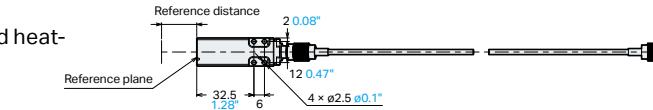


Head mounting fixture  
**OP-88289**

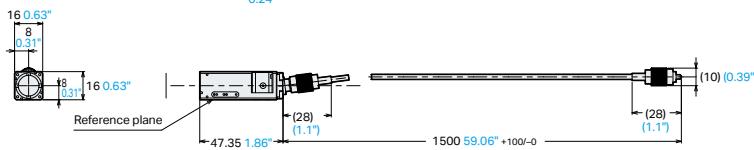


## I Sensor heads

20 mm **0.79"** vacuum and heat-resistant model  
**CL-V020**



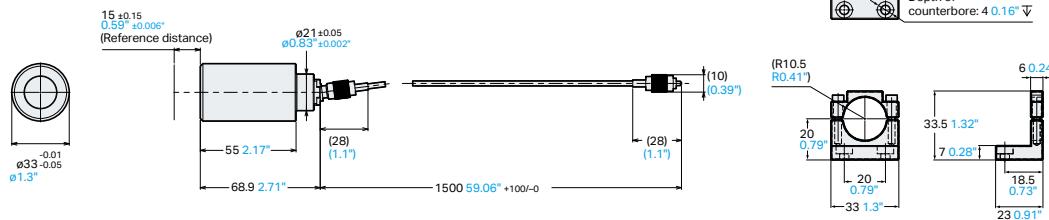
50 mm **1.97"** vacuum and heat-resistant model  
**CL-V050**



Simple head mounting fixture  
**OP-88863**

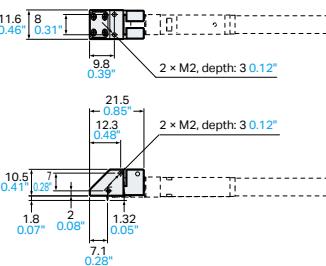


Ultra-high-accuracy 15 mm **0.59"** model  
**CL-S015**

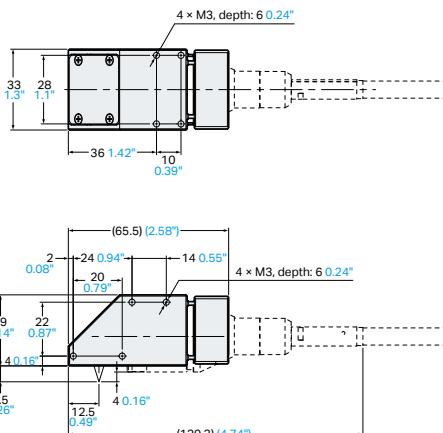


Explosion-proof 15 mm **0.59"** model  
**CL-S015EX**

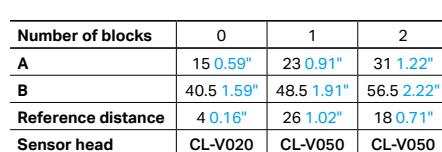
Side view attachment for CL-L(P)007:  
**OP-88860**



Side view attachment for CL-L(P)030:  
**OP-88861**



Side view attachment for CL-V020/CL-V050:  
**OP-88862**

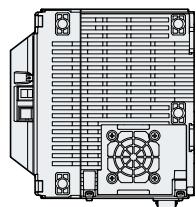
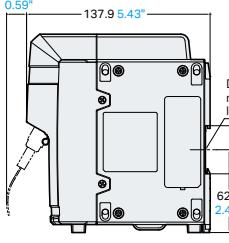
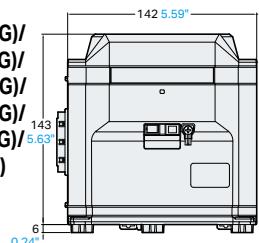


| Number of blocks   | 0                 | 1                 | 2                 |
|--------------------|-------------------|-------------------|-------------------|
| A                  | 15 <b>0.59"</b>   | 23 <b>0.91"</b>   | 31 <b>1.22"</b>   |
| B                  | 40.5 <b>1.59"</b> | 48.5 <b>1.91"</b> | 56.5 <b>2.22"</b> |
| Reference distance | <b>4 0.16"</b>    | <b>26 1.02"</b>   | <b>18 0.71"</b>   |
| Sensor head        | CL-V020           | CL-V050           | CL-V050           |

## Optical Units and Controllers

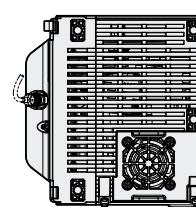
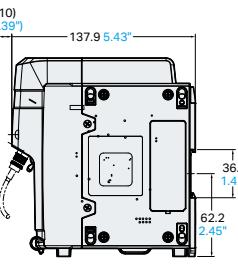
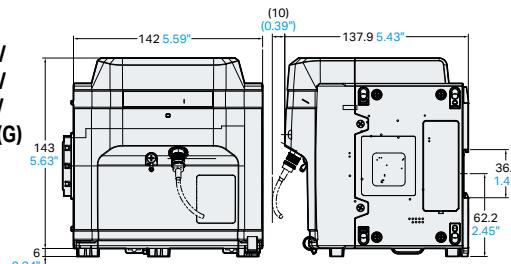
### Optical unit

**CL-L(P)007N(G)/  
L(P)015N(G)/  
L(P)030N(G)/  
L(P)070N(G)/  
L(P)150N(G)/  
PT010N(G)**



### Optical unit

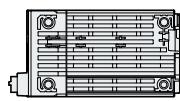
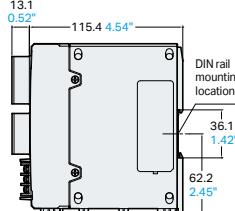
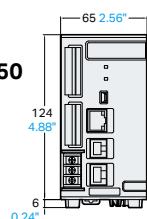
**CL-V020N(G)/  
V050N(G)/  
S015N(G)/  
S015EXN(G)**



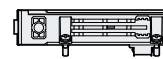
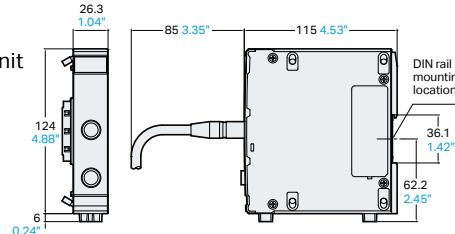
## Controllers

### Controller

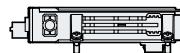
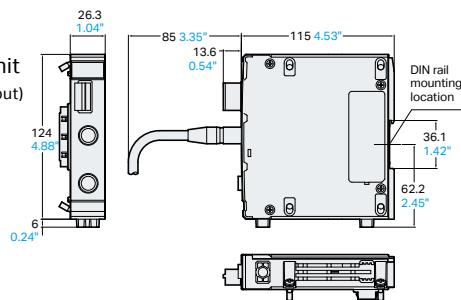
**CL-3000/3050**



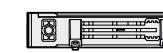
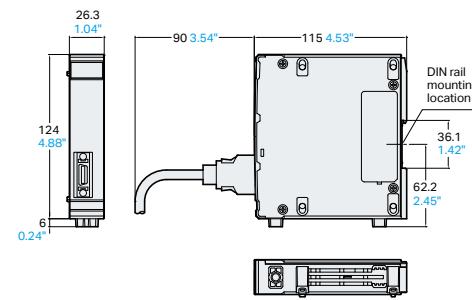
**Expansion unit  
CL-H100**



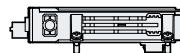
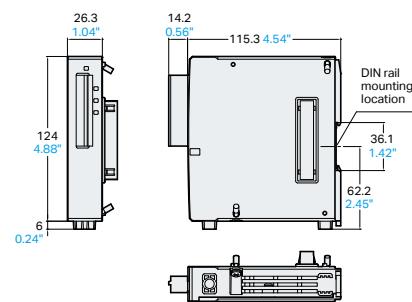
**Expansion unit  
(with analog output)  
CL-H150**



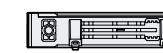
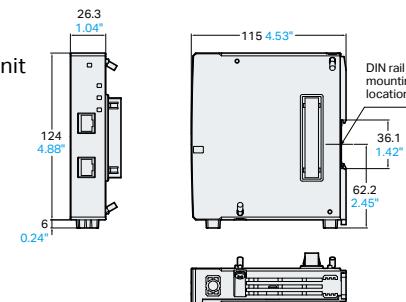
**Relay unit  
CL-H200**



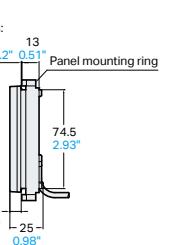
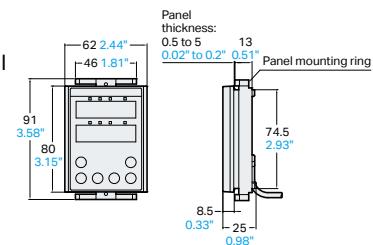
**Encoder unit  
CL-E100**



**EtherCAT® unit  
CL-EC100**



**Display panel  
CL-D500**

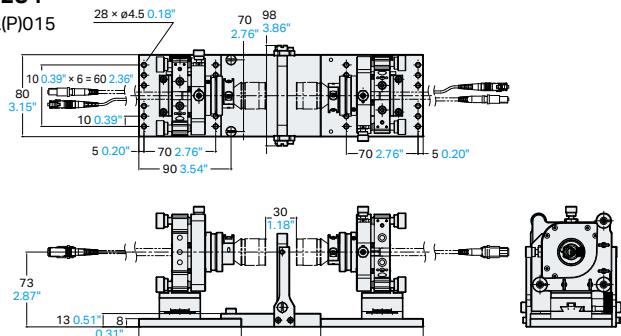


## ■ Optional Parts

Adjustable fixture for thickness measurement

**OP-88284**

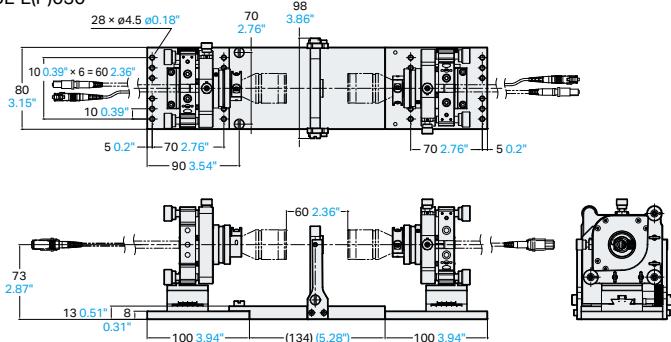
For CL-L(P)015



Adjustable fixture for thickness measurement

**OP-88285**

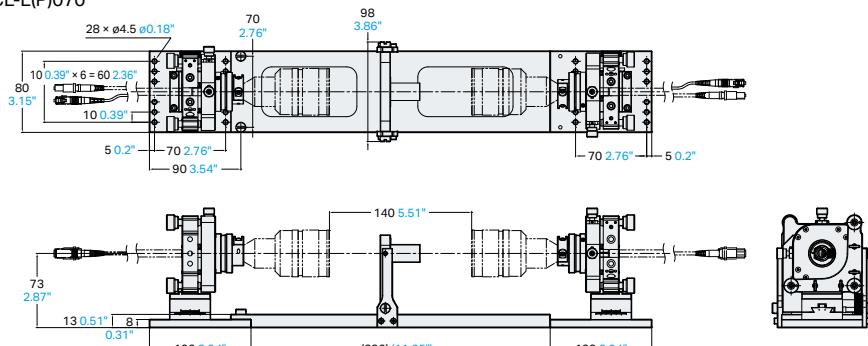
For CL-L(P)030



Adjustable fixture for thickness measurement

**OP-88286**

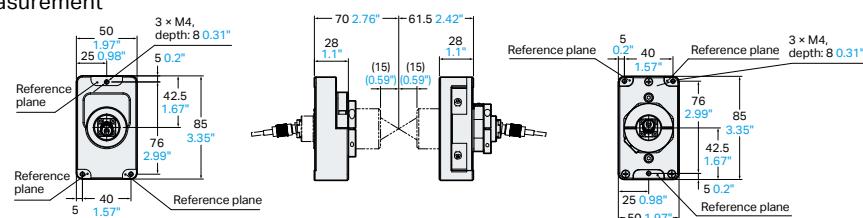
For CL-L(P)070



Adjustable fixture for thickness measurement

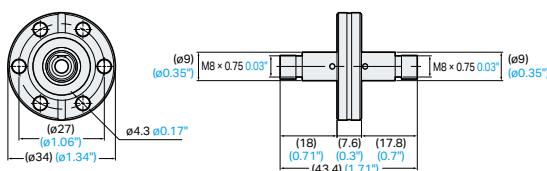
**OP-88864**

For CL-S015/  
CL-S015EX



1 ch vacuum  
feedthrough

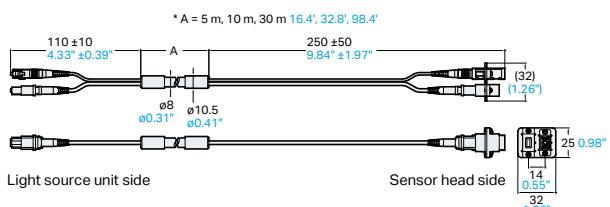
**OP-88859**



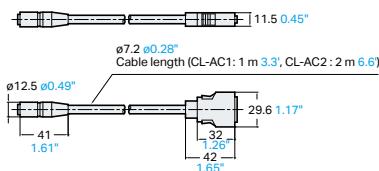
## ■ Cables

Head extension cable

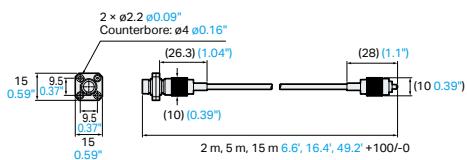
**CL-C5/C10/C30**



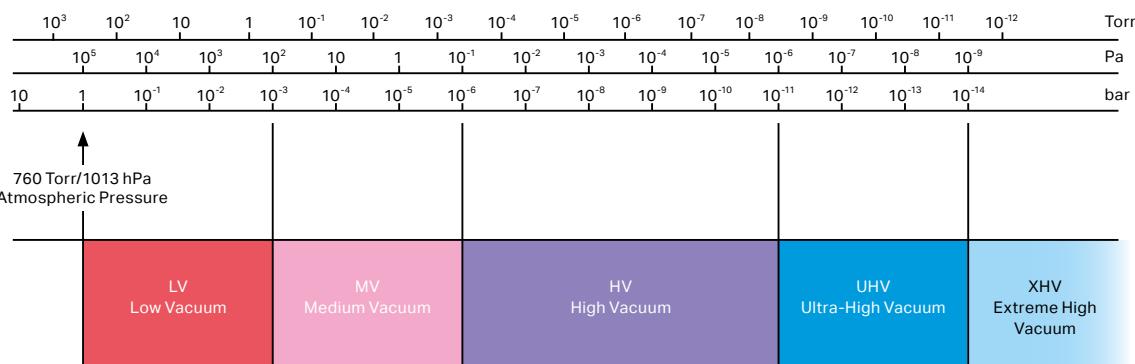
Expansion cable  
**CL-AC1/AC2**



Head extension cable (for CL-S/CL-V)  
**CL-CV2/CV5/CV15**



## Pressure/Vacuum Classification Chart



## Explosion-proof classifications

### ICL-S015EX/CL-S015EXN explosion-proof specifications

| Model                       | IECEx                                  |   | ATEX                                   |   | NRTL/ACO   |   |
|-----------------------------|--|---|--|---|--|---|
|                             | Head                                   | Optical unit  | Head                                   | Optical unit  | Head   | Optical unit  |
|                             | CL-S015EX                              | CL-S015EXN(G)   | CL-S015EX                              | CL-S015EXN(G)   | CL-S015EX  | CL-S015EXN(G)   |
| Explosion-proof performance | Ex op is IIC T6 Ga                     | [Ex op is IIC T6 Ga]  | II 1G Ex op is IIC T6 Ga               | II (1) G [Ex op is IICT6 Ga]                                  | Class I, Zone 0, AEx op is IIC T6 Ga<br>Class I, Division 1, Groups A, B, C, D, T6 | Class I, Zone 0, [AEx op is IICT6 Ga]<br>Class I, Division 1, Groups A, B, C, D, T6 |
| Zone/Division               | Zone 0                                 | Do not install in a hazardous location (associated equipment) | Zone 0                                 | Do not install in a hazardous location (associated equipment) | Zone 0/Division 1  | Do not install in a hazardous location (associated equipment)                       |
| Ambient temperature         | -20°C ≤ Ta ≤ 70°C<br>-4°F ≤ Ta ≤ 158°F | 0°C ≤ Ta ≤ 50°C<br>32°F ≤ Ta ≤ 122°F                          | -20°C ≤ Ta ≤ 70°C<br>-4°F ≤ Ta ≤ 158°F | 0°C ≤ Ta ≤ 50°C<br>32°F ≤ Ta ≤ 122°F                          | -20°C ≤ Ta ≤ 70°C<br>-4°F ≤ Ta ≤ 158°F   | 0°C ≤ Ta ≤ 50°C<br>32°F ≤ Ta ≤ 122°F  |
| Certification number        | IECEx CSAE 23.0033X                    |   | CSANE 23ATEX1133X                      |   | 23CA80171819X  |   |

## Area classifications

### Class I, Division 1:

Where ignitable concentrations of flammable gases, vapours or liquids can exist all of the time or some of the time under normal operating conditions.

### Zone 0:

Area in which an explosive gas atmosphere is present continuously, or for long periods, or frequently.

### Zone 1:

Area in which an explosive gas atmosphere is likely to occur occasionally in normal operation.

### Class I, Division 2:

Where ignitable concentrations of flammable gases, vapours or liquids are not likely to exist under normal operating conditions.

### Zone 2:

Area in which an explosive gas atmosphere is not likely to occur in normal operation, but, if it does occur, will exist for a short period only.

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