

The NO.1^{*}
industry leader

in application compatibility
with 34 different sensor head variations



Panasonic Laser Displacement Sensors are the No. 1* industry leader in application compatibility with 34 different sensor head variations

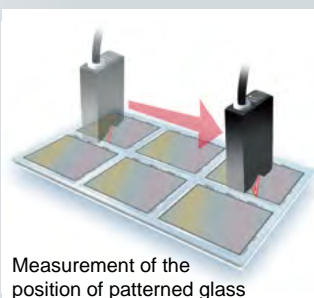
*As of May 2017, in-company survey

Examples of Applied Use

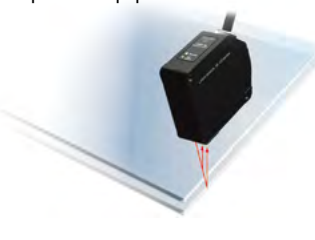
Compatibility

for meeting your diverse needs!

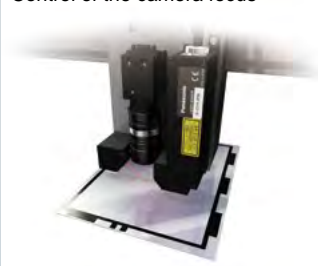
Semiconductor and liquid crystal industries



Measurement of gap for exposure equipment



Control of the camera focus



Electrical and electronics-related industries

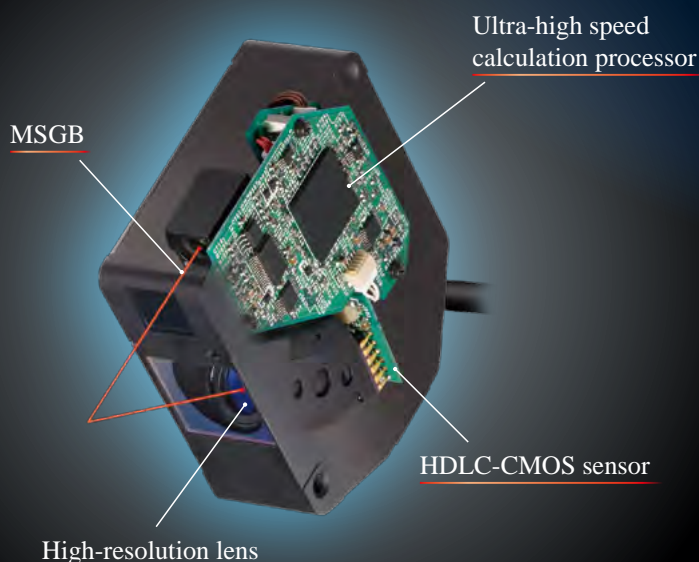
Detection of deformed narrow pitch connector leg pins



Measurement of HDD surface variations



Measurement of the heights of chip parts

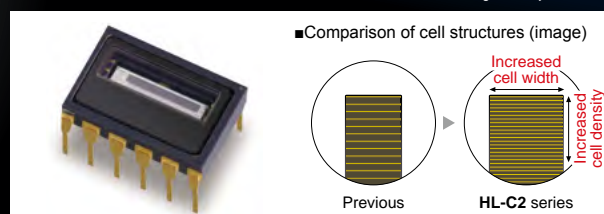


Combining our accumulated and the latest technologies to accomplished* functionality

Our proprietary measurement CMOS, the "HDLC-CMOS Sensor"

The HDLC-CMOS sensors have been developed specially for the HL-C2 series. High density light-receiving cells and a processing speed close to the maximum limit result in high resolutions and high speeds which exceed all expectations for laser displacement sensors.

HDLC: High Density Linear Cell



A diverse track record proving our products' capabilities and reliability

Since its debut, the HL-C2 series has come to be used for our customers' measurement applications in a wide variety of industries. We provide the most capable laser displacement sensors with high-speed, high-accuracy functionality to meet our customers' requests for measurement applications.

Automotive-related industries

Measurement of disk brake thickness



Measurement of the shape of a camshaft

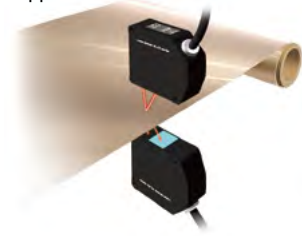


Precision checking of vehicle bodies

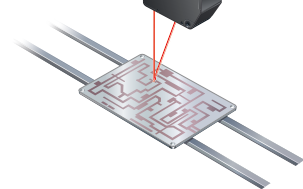


Metal / plastic / rubber industries

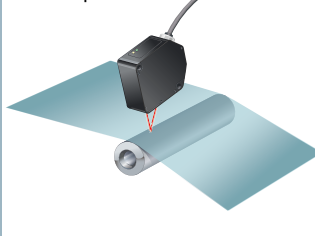
Thickness measurement of copper-clad laminate



Height control of adhesive application onto substrates



Thickness measurement of transparent film



measurement expertise
create the most
in the industry

*As of May 2017, in-company survey

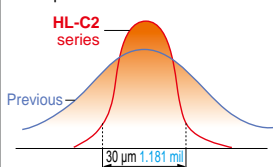


"MSGB" laser with sharp and fine projection

We have created the ideal laser using our proprietary optical technologies and aperture construction. Furthermore, emission adjustment algorithms have been redesigned to maintain ideal emission conditions.

MSGB: Micro Spot Gaussian Beam

■ Comparison of beam diameter



| | |
|-------------|-----------------------------|
| HL-C201A | ø20 μm ø0.787 mil approx. |
| HL-C203B | ø30 μm ø1.181 mil approx. |
| HL-C205B | ø70 μm ø2.756 mil approx. |
| HL-C208B | ø100 μm ø3.937 mil approx. |
| HL-C211B | ø80 μm ø3.150 mil approx. |
| HL-C235BE | ø250 μm ø9.843 mil approx. |
| HL-C235CE-W | ø400 μm ø15.748 mil approx. |

Image

"Ultra high-speed calculation processor"

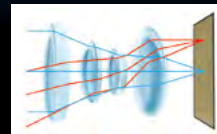
Using our specialized proprietary IC and custom algorithms for high-speed processing, information is digitally transmitted between the sensor head and controller. Both high-speed transmission and stability are realized for measurement values.



"High-resolution lens" for realizing stable optical path lengths

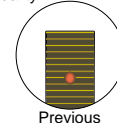
We designed a new high-resolution lens to reduce lens aberration as much as possible. Light entering from any angle can be gathered at a minimum point to realize even higher precision.

HiR: High Resolution

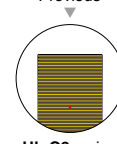


Image

■ Comparison of beam quality



Previous

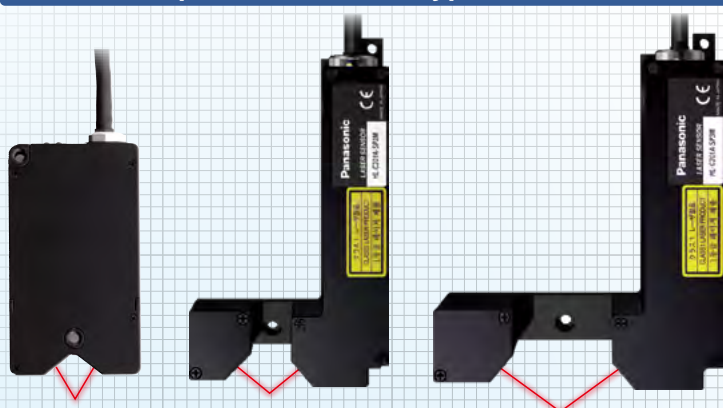


HL-C2 series

Image

A Full Product Lineup for Meeting the Application Needs of Customers

Dedicated specular reflection type



HL-C201A(-MK)

Measurement center distance

10 mm
0.394 in

Measuring range

±1 mm
±0.039 in

Resolution

0.01 μm
0.0004 mil

HL-C201A-SP2(M)

Measurement center distance

8 mm
0.315 in

Measuring range

±0.8 mm
±0.031 in

Resolution

0.01 μm
0.0004 mil

HL-C201A-SP3(M)

Measurement center distance

15 mm
0.591 in

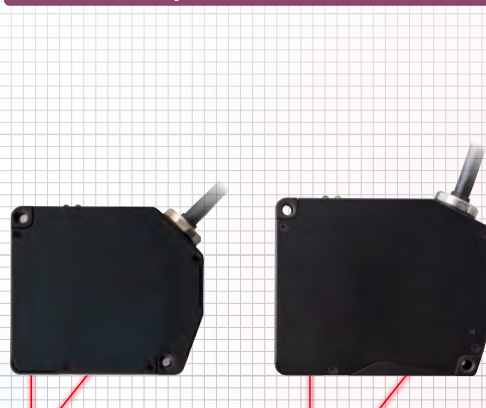
Measuring range

±1 mm
±0.039 in

Resolution

0.01 μm
0.0004 mil

Diffuse or specular reflection mixed use type



HL-C203B(-MK)

Measurement center distance

30 mm
1.181 in

Measuring range

±5 mm
±0.197 in

Resolution

0.025 μm
0.001 mil

HL-C205B(-MK)

HL-C205C(-MK)

Measurement center distance

50 mm
1.969 in

Measuring range

±5 mm
±0.197 in

Resolution

0.05 μm
0.002 mil

Separated emitter and receiver for stable measurement

■HL-C201A-SP2(M), HL-C201A-SP3(M)

The laser emitter and receiver are separated so that the detection point can be positioned at the center axis of the camera lens.

Previously...



The nozzle's drop-down point and displacement sensor's measurement point could not be placed on the same axis.

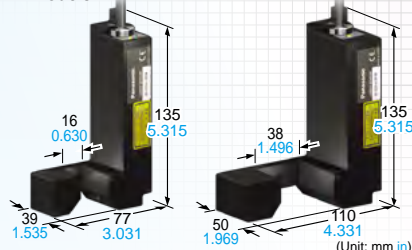
Separated construction for light emission and reception



By aligning the drop-down point and measurement point along the same axis, more stable measurements becomes possible.

A choice of sensor heads to match your application

2 formats and 2 types provide a choice of 4 models.



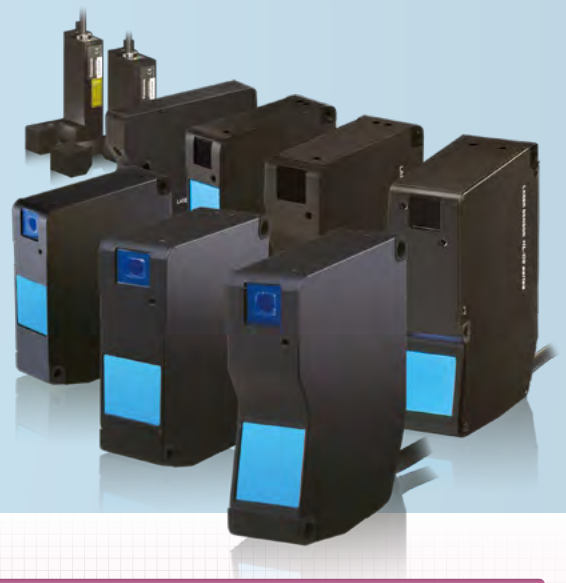
Measurement center distance: 8 mm **0.315 in**

- Small beam spot type
HL-C201A-SP2
- Linear beam spot type
HL-C201A-SP2M

Measurement center distance: 15 mm **0.591 in**

- Small beam spot type
HL-C201A-SP3
- Linear beam spot type
HL-C201A-SP3M

We brought together our accumulated measurement expertise with the latest technologies to create the world-class HL-C2 series. These sensors will meet your various short-range and long-range needs.



HL-C208B(-MK)

HL-C208C(-MK)

Measurement center distance

85 mm

3.346 in

Measuring range

±20 mm

±0.787 in

Resolution

0.15 μm

0.006 mil



HL-C211B(-MK)

HL-C211C(-MK)

Measurement center distance

110 mm

4.331 in

Measuring range

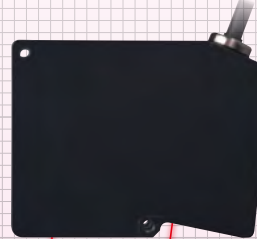
±15 mm

±0.591 in

Resolution

0.1 μm

0.004 mil



HL-C235BE(-MK)

HL-C235CE(-MK)

Measurement center distance

350 mm

13.780 in

Measuring range

±50 mm

±1.969 in

Resolution

0.5 μm

0.020 mil



HL-C235CE-W(MK)

Measurement center distance

350 mm

13.780 in

Measuring range

±200 mm

±7.874 in

Resolution

2 μm

0.079 mil

These models can be used for both
diffuse and specular reflection

■HL-C203B(-MK), HL-C205□(-MK), HL-C208□(-MK),
HL-C211□(-MK), HL-C235□E(-MK), HL-C235CE-W(MK)

Diffuse reflection
set up



Specular reflection
set up



A Diverse Array of Sensor Heads for Your Application Needs

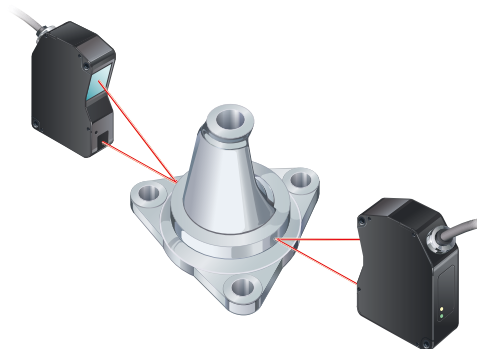
For automobile and vehicle parts measurement

Automobile and vehicle parts production facilities

Measurement
mode
setting

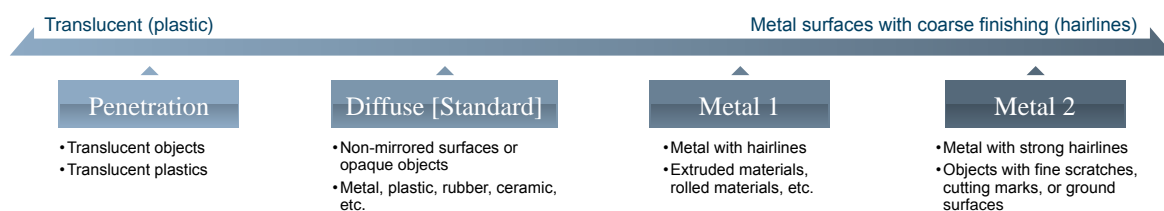
Long-range
sensor
head

Linear
beam
spot type



The measurement mode setting is compatible with a variety of workpieces

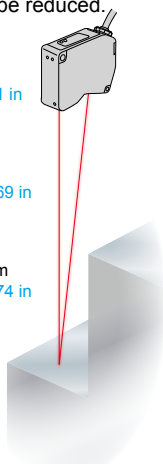
Select the optimal digital processing for the object to be measured.



Long-range sensor heads

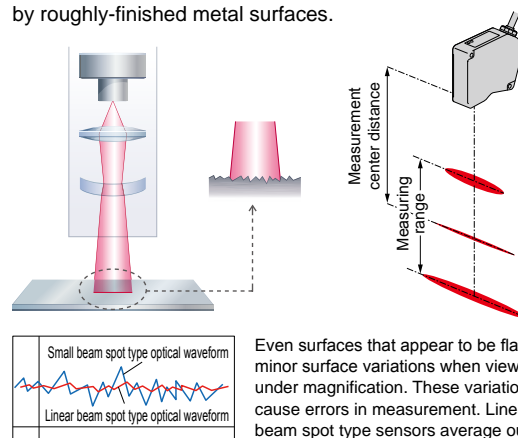
Our lineup includes long-range sensor heads with measurement center distances of 110 mm **4.331 in** and 350 mm **13.780 in**. By keeping distance from the workpiece, the risk of sensor damage from contact with the workpiece can be reduced.

- Measurement center distance: 110 ±15 mm
4.331 ±0.591 in
HL-C211B(-MK)
HL-C211C(-MK)
- Measurement center distance: 350 ±50 mm
13.780 ±1.969 in
HL-C235BE(-MK)
HL-C235CE(-MK)
- Measurement center distance: 350 ±200 mm
13.780 ±7.874 in
HL-C235CE-W(MK)



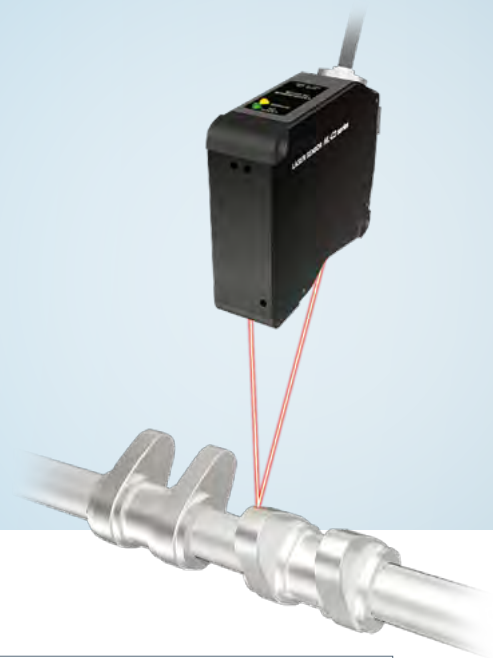
Linear beam spot type sensor heads

We offer linear beam spot type sensor heads with various measurement center distances that are not easily distorted by roughly-finished metal surfaces.



Even surfaces that appear to be flat have minor surface variations when viewed under magnification. These variations can cause errors in measurement. Linear beam spot type sensors average out the influence of these variations, allowing for stable measurement of roughly-finished workpieces.

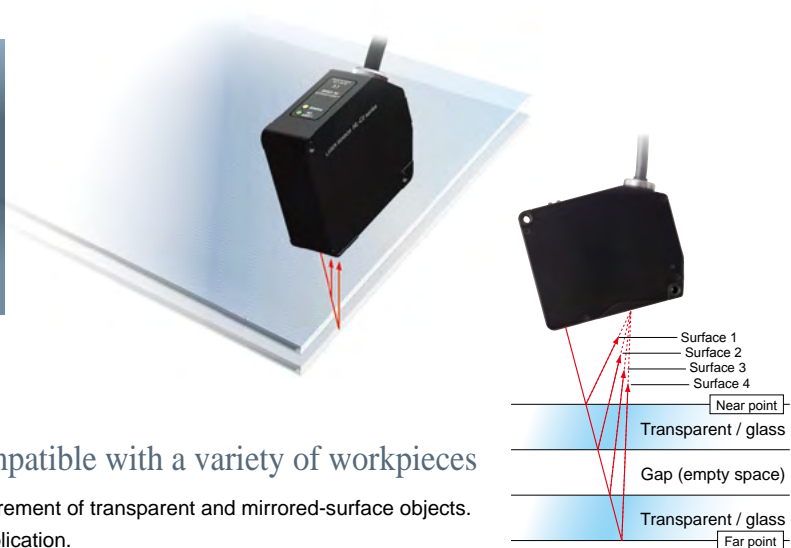
The diverse capabilities of the HL-C2 series can be used for stable measurement with higher precision for a variety of materials.



For measurement of glass height and thickness FPD and solar panel production facilities

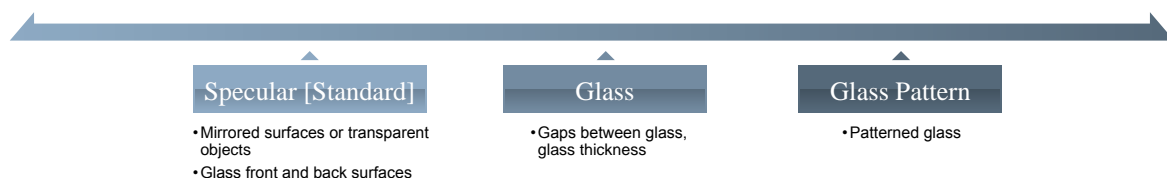
Measurement
mode
setting

Emission
adjustment
area
specification



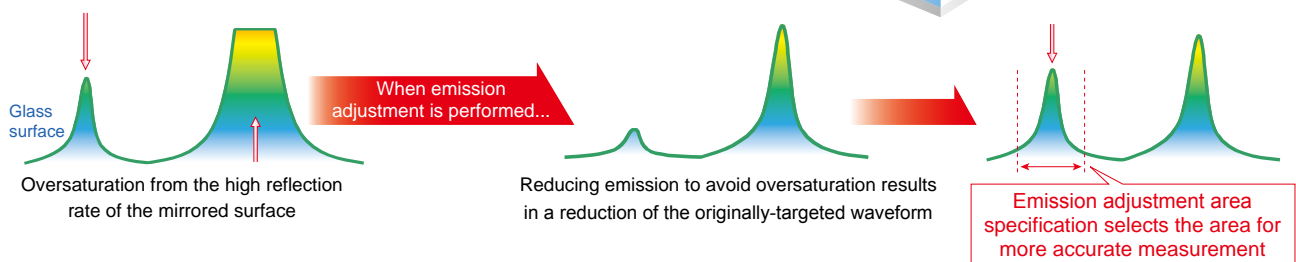
The measurement mode setting is compatible with a variety of workpieces

A specular reflection installation is required for measurement of transparent and mirrored-surface objects. Select the digital processing for the measurement application.



Emission adjustment area specification allows for measurement of glass surfaces

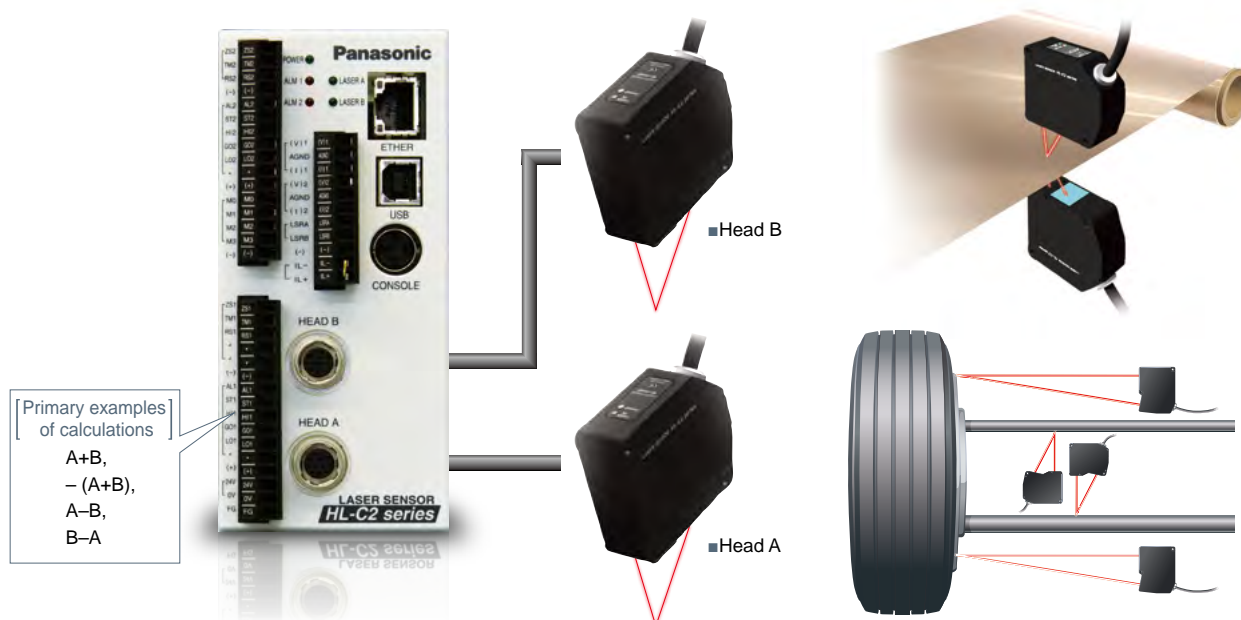
Glass surfaces can be accurately measured by combining the "Emission Adjustment" that determines the optimal emission amounts with the "Emission Adjustment Area Specification" that identifies the specific area to measure the emission.



Controllers that Provide Both Convenience and Improved Product Quality

On-board processing for calculations of 2 sensor heads

The controller is equipped to perform basic calculations and output results for applications such as thickness measurement for sandwiched layers and 2-point gap measurement. This can reduce computational burdens for host controllers (such as PLCs).



Connectivity to host controllers

Our controller lineup offers Ethernet, USB, and RS-232C connections. The controllers can connect to devices such as PCs and PLCs.

*An API (Application Programming Interface) and sample programs can be downloaded for free from our web site for operating the controller using a PC connected by USB.



Ethernet compatible
HL-C21C(-P)

Ethernet

USB

Console

* Ethernet is a registered trademark of Fuji Xerox Co., Ltd. and Xerox Corporation.



RS-232C compatible
HL-C2C(-P)

RS-232C

USB

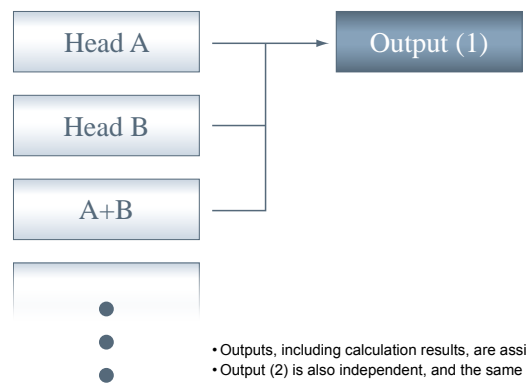
Console

Since two sensor heads can be connected for simultaneous use, and since basic calculations optimized for applications such as thickness measurement or difference measurement are integrated in the controller, independent control is possible. Accumulating the measurement values without sacrificing high-speed sampling contributes to the high quality of the product.



A full range of output ports allows output in line with your needs

Both Output (1) and Output (2) mounted on the controller provide independent analog outputs, various output signals (judgment, alarm, etc.), and various input signals (laser emission stop, zero set, etc.).



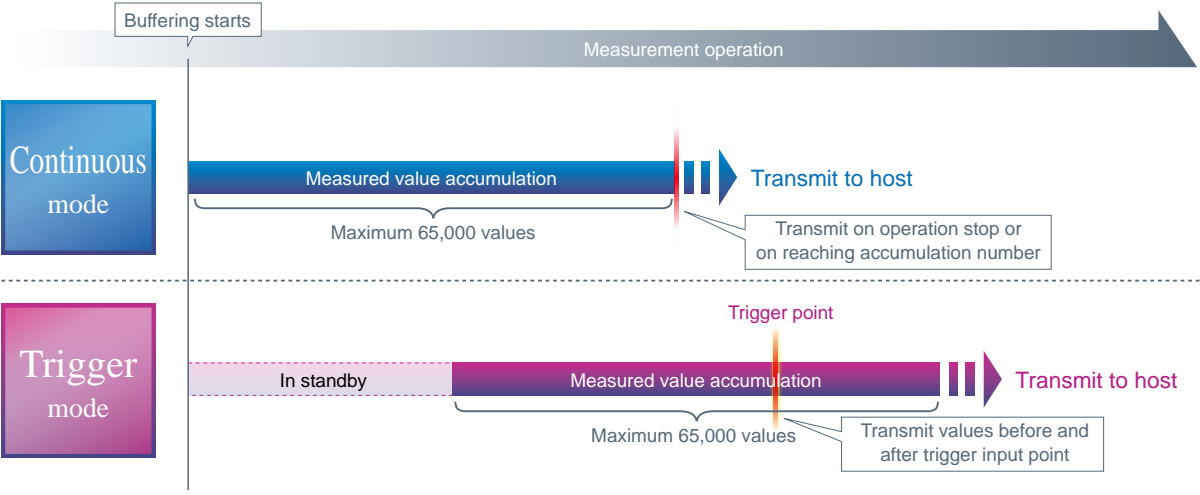
- Outputs, including calculation results, are assignable.
- Output (2) is also independent, and the same settings are possible.

| | | o: Available | |
|----------------|------------------------|--------------|------------|
| | | Output (1) | Output (2) |
| Output circuit | Analog voltage | o | o |
| | Analog current | o | o |
| | Hi / Go / Low judgment | o | o |
| | Alarm | o | o |
| | Strobe | o | o |
| Input circuit | Zero set | o | o |
| | Timing | o | o |
| | Reset | o | o |

*Other functions such as laser control (emission stop) input and memory change are also on-board.

Buffering function allows for temporary accumulation of measured values

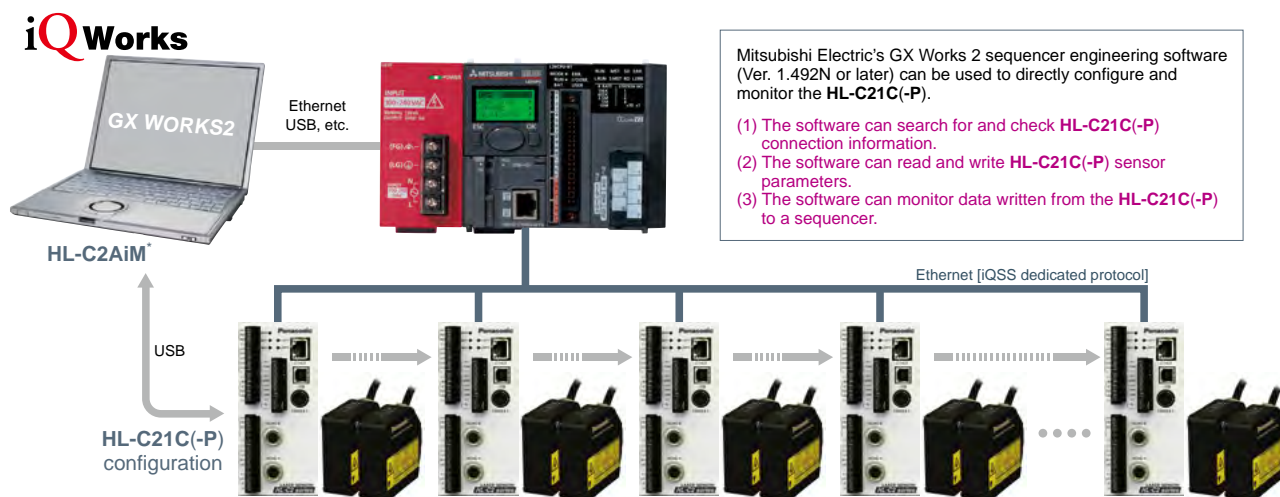
The buffering function allows measurement values acquired from high-speed sampling (10 μ s) to temporarily accumulate in the controller, which are then transmitted to the host. A maximum of 65,000 values can be accumulated. The accumulation of shape data can contribute to traceability and other activities. Furthermore, in trigger mode, by sending a trigger input when there is an error, measured values before and after the error can be acquired to help determine the cause of the error.



Providing Increased Connectivity and Compatibility with Host Devices

Measurement status can be acquired with a programmable controller easily and without any need for programming!

The **HL-C21C(-P)** supports the MEWTOCOL protocol (used by our programmable controllers), the MC protocol (used by Mitsubishi Electric's MELSEC-Q and MELSEC-L series) as well as the iQSS dedicated protocol (used by Mitsubishi Electric's MELSEC-L series), allowing measured values and other information to be written automatically to the data registers of programmable controllers without any need for programming. * iQSS is an abbreviation for Mitsubishi Electric's iQ Sensor Solution. * iQSS and iQ Works are registered trademarks of Mitsubishi Electric Corporation.

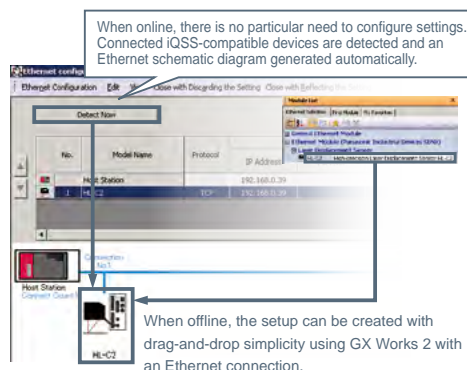


*HL-C2AiM: HL-C2 dedicated intelligent monitor (available for download free of charge on our website)

Easy setup

HL-C21C(-P) connection settings can be set up using automatic detection of connected devices and drag-and-drop simplicity.

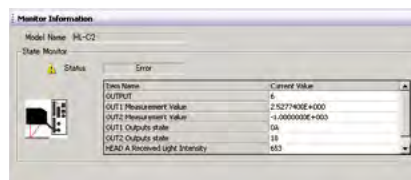
➔ Reduces development man-hours.



*Use Mitsubishi Electric's GX Works 2 sequencer engineering software (Ver. 1.492N or later).

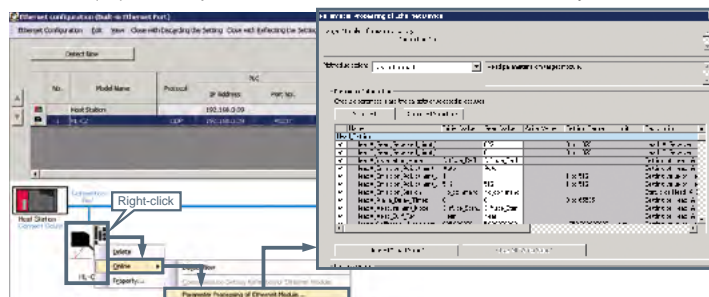
Sensor monitoring

The **HL-C21C(-P)**'s measurement status can be easily monitored.



Reading and writing of sensor parameters

HL-C21C(-P) sensor parameters can be read and written easily.



*The HL-C21C(-P)'s Ethernet communications settings must be configured using **Configurator WD** (Ver. 1.62 or later of our Ethernet communications configuration tool).

(This software is available for download free of charge from our website.)

*The MC protocol is supported for the MELSEC-Q series, and sensors can be monitored.

We offer a full range of communication interfaces for connecting to various networks along with user interfaces that allow for easy setting of high-precision operation. This allows for program-less connectivity with our own programmable controllers as well as with Mitsubishi Electric Corp. sequencers.



Interfaces for convenient setup and setting changes

By combining the **GT12** programmable display with our software tools accessed from a PC (**HL-C2AiM** Intelligent Monitor), received light intensity waveforms and other information can be displayed in addition to the display of measured-value data.

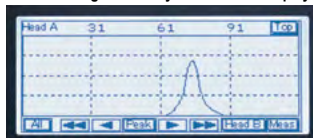
GT12 Programmable Display

Simple touch panel operation and easy-to-read display

By installing screen application (provided free of charge) onto the **GT12** programmable display, it can be used as a dedicated console for viewing waveforms and setting operation conditions. (A proprietary connection cable is required.)



• Received light intensity in waveform display



• Condition setting function



• Measurement value data display function



Intelligent Monitor

HL-C2AiM

Waveform monitoring and function setting by computer is easy to do

*This software is available for download free of charge from our website.

| | |
|----------------|--|
| OS (Note 1) | : Microsoft® Windows® 7 Professional 32 bit / 64 bit Microsoft® Windows® 8 Pro 32 bit / 64 bit Microsoft® Windows® 10 Pro 32 bit / 64 bit (Japanese / English / Korean / Chinese) |
| CPU | : Pentium compatible CPU 1 GHz or above (Note 2) |
| Memory | : 2 GB or more (Note) |
| Hard disk | : 50 MB or more of usable space |
| Display screen | : SXGA (1280 × 1024 full color) or above |
| Serial port | : RS-232C compliant, transmission speed 115.2 kbps |
| USB port | : USB 2.0 full speed (USB 1.1 compatible) |

Notes: 1) Windows 7 / 8 / 10 are trademarks or registered trademarks of Microsoft Corporation in the United State and other countries.
2) Depends on the OS operation environment.

• Measurement value display







• Light receiving intensity in waveform display



• Buffering display



Sensor heads



| Type | Appearance | Measurement center distance and measuring range | Resolution (Note 1) | Beam size | Model No. (Note) | | |
|--------------------------|---|--|--|---------------------------------------|-----------------------------------|---------------------------------|--|
| | | | | | IEC/JIS conformed type | FDA conformed type | |
| Small beam spot type |  | 10 ±1 mm 0.394 ±0.039 in | 0.01 μm 0.0004 mil (0.25 μm 0.01 mil) | ø20 μm ø0.787 mil approx. | HL-C201A * (HL-C201AE *) | HL-C201F (HL-C201FE) | |
| Linear beam spot type | | | | 20 × 700 μm 27.559 mil approx. | HL-C201A-MK * (HL-C201AE-MK *) | HL-C201F-MK (HL-C201FE-MK) | |
| Small beam spot type |  | 8 ±0.8 mm 0.315 ±0.031 in | 0.01 μm 0.0004 mil (0.25 μm 0.01 mil) | ø20 μm ø0.787 mil approx. | HL-C201A-SP2 (HL-C201AE-SP2) | — | |
| Linear beam spot type | | | | 20 × 700 μm 27.559 mil approx. | HL-C201A-SP2M (HL-C201AE-SP2M) | — | |
| Small beam spot type |  | 15 ±1 mm 0.591 ±0.039 in | 0.01 μm 0.0004 mil (0.25 μm 0.01 mil) | ø30 μm ø1.181 mil approx. | HL-C201A-SP3 (HL-C201AE-SP3) | — | |
| Linear beam spot type | | | | 30 × 1,400 μm 55.118 mil approx. | HL-C201A-SP3M (HL-C201AE-SP3M) | — | |
| Small beam spot type |  | At diffuse reflection mode 30 ±5 mm 1.181 ±0.197 in | 0.025 μm 0.001 mil (0.25 μm 0.01 mil) | ø30 μm ø1.181 mil approx. | HL-C203B * (HL-C203BE*) | HL-C203F (HL-C203FE) | |
| Linear beam spot type | | | | 30 × 1,200 μm 47.244 mil approx. | HL-C203B-MK * (HL-C203BE-MK *) | HL-C203F-MK (HL-C203FE-MK) | |
| Small beam spot type |  | At diffuse reflection mode 50 ±5 mm 1.969 ±0.197 in | 0.05 μm 0.002 mil (0.25 μm 0.01 mil) | ø70 μm ø2.756 mil approx. | HL-C205B (HL-C205BE) | | |
| Linear beam spot type | | | | 70 × 1,000 μm 39.370 mil approx. | HL-C205B-MK (HL-C205BE-MK) | | |
| Small beam spot type | | | | ø70 μm ø2.756 mil approx. | HL-C205C (HL-C205CE) | | |
| Linear beam spot type | | | | 70 × 1,000 μm 39.370 mil approx. | HL-C205C-MK (HL-C205CE-MK) | | |
| Small beam spot type |  | At diffuse reflection mode 85 ±20 mm 3.346 ±0.787 in | 0.15 μm 0.006 mil (0.25 μm 0.01 mil) | ø100 μm ø3.937 mil approx. | HL-C208B (HL-C208BE) | | |
| Linear beam spot type | | | | 100 × 1,200 μm 47.244 mil approx. | HL-C208B-MK (HL-C208BE-MK) | | |
| Small beam spot type | | | | ø100 μm ø3.937 mil approx. | HL-C208C (HL-C208CE) | | |
| Linear beam spot type | | | | 100 × 1,200 μm 47.244 mil approx. | HL-C208C-MK (HL-C208CE-MK) | | |
| Small beam spot type |  | At diffuse reflection mode 110 ±15 mm 4.331 ±0.591 in | 0.1 μm 0.004 mil (0.25 μm 0.01 mil) | ø80 μm ø3.150 mil approx. | HL-C211B * (HL-C211BE *) | HL-C211F (HL-C211FE) | |
| Linear beam spot type | | | | | HL-C211C * (HL-C211CE *) | HL-C211F5 (HL-C211F5E) | |
| Linear beam spot type | | | | 80 × 1,700 μm 66.929 mil approx. | HL-C211B-MK * (HL-C211BE-MK *) | HL-C211F-MK (HL-C211FE-MK) | |
| | | | | | HL-C211C-MK * (HL-C211CE-MK *) | HL-C211F5-MK (HL-C211F5E-MK) | |
| Small beam spot type |  | At diffuse reflection mode 350 ±50 mm 13.780 ±1.969 in | 0.5 μm 0.02 mil | ø250 μm ø9.843 mil approx. | HL-C235BE * | — | |
| Linear beam spot type | | | | | HL-C235CE * | — | |
| Linear beam spot type | | | | 250 × 3,500 μm 137.795 mil approx. | HL-C235BE-MK * | — | |
| | | | | | HL-C235CE-MK * | — | |
| Small beam spot type |  | At diffuse reflection mode 350 ±200 mm 13.780 ±7.874 in | 2 μm 0.079 mil | ø400 μm ø15.748 mil approx. | HL-C235CE-W | | |
| Linear beam spot type | | | | 400 × 6,500 μm 255.905 mil approx. | HL-C235CE-WMK | | |

Note: Exports of models with a minimum resolution of under 0.25 µm 0.010 mil fall under Japanese Export Control defined by "Foreign Exchange and Foreign Trade Act." However, export control does not apply to the models shown in parentheses on the condition that they are used in combination with a controller (e.g. **HL-C2CE**) to which the export control defined by "Foreign Exchange and Foreign Trade Act" does not apply. In such cases, the minimum resolution is 0.25 µm 0.010 mil. Please contact us for further details.

*The product has acquired Korean S Mark certification.

ORDER GUIDE

Controllers

| Type | | Appearance | Model No. (Note) |
|---------------------|------------|---|------------------------------------|
| RS-232C compatible | NPN output |  | HL-C2C * (HL-C2CE *) |
| | PNP output | | HL-C2C-P * (HL-C2CE-P *) |
| Ethernet compatible | NPN output |  | HL-C21C (HL-C21CE) |
| | PNP output | | HL-C21C-P (HL-C21CE-P) |



Note: These products have been restricted for export in accordance with the "Foreign Exchange and Foreign Trade Act". However, by combining the parts listed in parentheses with sensor heads which are not restricted for export under the "Foreign Exchange and Foreign Trade Act", products for which the act does not restrict export can be provided. Please contact us for further details.

*The product has acquired Korean S Mark certification.

OPTIONS

Programmable display

It is possible to use the programmable display as an exclusive console which enables waveform display and condition setting by installing it in the screen data (free of charge) for **HL-C2**.

| Designation | | Appearance | Model No. | LCD | Screen size | Power source | Communication port | Front panel color | SD memory card slot |
|-------------|-------|---|--|--|-------------|--------------|--------------------|-------------------|---------------------|
| GT12 | GT12M |  | <div>Recommended</div> AIG12MQ02D | TFT monochrome LCD (white backlight) (Note 4) | 4.6 inch | 24 V DC | RS-232C | Pure black | — |
| | | | AIG12MQ03D | | | | | Hairline silver | — |
| | GT12G |  | AIG12GQ02D | TFT monochrome LCD (green backlight) (Note 4) | | | | Pure black | — |
| | | | AIG12GQ03D | | | | | Hairline silver | — |

Notes: 1) The screen data differs depending on the language. Please download as necessary.




2) To install the screen data in the display, prepare a PC and a USB cable (A ↔ mini-B connector type) separately.

3) The provided console screen application has no function to write the data into or download the data from an SD memory card.

4) The backlight color becomes fixed upon the installation of provided screen application.

5) Please refer to our website for more details about programmable display **GT12**.

Others

| Designation | Appearance | Model No. | Description | |
|--|---|-------------------|--|---|
| ND filter |  | HL-C2F01 | When the amount of reflected light is large at the time that a specular reflective sensor is installed, reducing the amount of laser light to an appropriate level enables a higher precision measurement. (Light detection rate: 98 %) (Cannot be used with HL-C201 .) | |
| Sensor head extension cable |  | HL-C2CCJ2 | Length: 2 m 6.562 ft , Weight: 0.2 kg approx. | Cabletyre cable with connector on both ends Cable outer diameter: $\phi 6.6$ mm $\phi 0.260$ in Connector outer diameter: $\phi 14.7$ mm $\phi 0.579$ in max. |
| | | HL-C2CCJ5 | Length: 5 m 16.404 ft , Weight: 0.4 kg approx. | |
| | | HL-C2CCJ10 | Length: 10 m 32.808 ft , Weight: 0.7 kg approx. | |
| | | HL-C2CCJ20 | Length: 20 m 65.617 ft , Weight: 1.4 kg approx. | |
| | | HL-C2CCJ30 | Length: 30 m 98.425 ft , Weight: 2.0 kg approx. | |
| GT series connector cable for HL-C2 |  | HL-C2GT-C3 | Length: 3 m 9.843 ft | Cable to connect the programmable display GT12 and HL-C2 series controller |

Sensor heads

| Item | Model No. | Type | Small beam spot type | | | | | | | | | | | | |
|--|------------------------|--|---|----------------------|-------------------------------------|---|---|---|---|--|--|--|---|---------------------|---------------------|
| | | IEC/JIS conformed type | HL-C201A(E) | HL-C201A(E)-SP2 | HL-C201A(E)-SP3 | HL-C203B(E) | HL-C205B(E) | HL-C205C(E) | HL-C208B(E) | HL-C208C(E) | | | | | |
| | | FDA conformed type | HL-C201F(E) | — | — | HL-C203F(E) | — | — | — | — | | | | | |
| CE marking directive compliance | | | EMC Directive, RoHS Directive | | | | | | | | | | | | |
| Setup mode (Note 2) | | | Specular reflection | | | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | | |
| Measurement center distance | | | 10 mm 0.394 in | 8 mm 0.315 in | 15 mm 0.591 in | 30 mm 1.181 in | 26.4 mm 1.039 in | 50 mm 1.969 in | 46 mm 1.811 in | 50 mm 1.969 in | 46 mm 1.811 in | 85 mm 3.346 in | 81.4 mm 3.205 in | 85 mm 3.346 in | 81.4 mm 3.205 in |
| Measuring range (Note 3) | | | ±1 mm ±0.039 in | ±0.8 mm ±0.031 in | ±1 mm ±0.039 in | ±5 mm ±0.197 in | ±4.6 mm ±0.181 in | ±5 mm ±0.197 in | ±5 mm ±0.197 in | ±5 mm ±0.197 in | ±5 mm ±0.197 in | ±20 mm ±0.787 in | ±6 mm ±0.236 in | ±20 mm ±0.787 in | ±6 mm ±0.236 in |
| Resolution [Average number of samples] (Note 4, 5) | | | •HL-C201A / HL-C201A-SP2 / HL-C201A-SP3 / HL-C201F: 0.04 μm 0.002 mil [256], 0.01 μm 0.0004 mil [4,096] •HL-C201AE / HL-C201AE-SP2 / HL-C201AE-SP3 / HL-C201FE: 0.25 μm 0.010 mil [256] | | | •HL-C203B / HL-C203F: 0.1 μm 0.004 mil [256] 0.025 μm 0.001 mil [4,096] •HL-C203BE / HL-C203FE: 0.25 μm 0.010 mil [256] | | •HL-C205B / HL-C205C: 0.2 μm 0.008 mil [256], 0.05 μm 0.002 mil [4,096] •HL-C205BE / HL-C205CE: 0.25 μm 0.010 mil [256] | | | •HL-C208B / HL-C208C: 0.6 μm 0.024 mil [256], 0.15 μm 0.006 mil [4,096] •HL-C208BE / HL-C208CE: 0.6 μm 0.024 mil [256], 0.25 μm 0.010 mil [4,096] | | | | |
| Linearity (Note 6) | | | ±0.02 % F.S. (HL-201FE: ±0.025 % F.S.) | | | ±0.03 % F.S. | | | ±0.03 % F.S. | | | ±0.03 % F.S. | ±0.1 % F.S. | ±0.03 % F.S. | ±0.1 % F.S. |
| Temperature characteristics | | | 0.01 % F.S./°C (HL-201FE: 0.013 % F.S./°C) | 0.02 % F.S./°C | | 0.01 % F.S./°C | | | | | | | | | |
| Light source | | | Red semiconductor laser (Peak emission wavelength: 658 nm 0.026 mil) | | | | | | | | | | | | |
| | | Max. output: 0.1 mW | Max. output: 0.3 mW | Max. output: 1 mW | Max. output: 1 mW | Max. output: 1 mW | Max. output: 5 mW | Max. output: 1 mW | Max. output: 5 mW | Max. output: 1 mW | Max. output: 5 mW | Max. output: 1 mW | Max. output: 5 mW | | |
| | IEC/JIS conformed type | Class 1 (IEC / JIS) | | | Class 2 (IEC / JIS) | Class 2 (IEC / JIS) | Class 3R (IEC / JIS) | Class 2 (IEC / JIS) | Class 3R (IEC / JIS) | Class 2 (IEC / JIS) | Class 3R (IEC / JIS) | Class 2 (IEC / JIS) | Class 3R (IEC / JIS) | | |
| | FDA conformed type | Class 1 [IEC / JIS / FDA (Note 7)] | — | — | Class 2 (IEC / JIS), Class II (FDA) | Class 2 [IEC / JIS / FDA (Note 7)] | Class 3R [IEC / JIS / FDA (Note 7)] | Class 2 [IEC / JIS / FDA (Note 7)] | Class 3R [IEC / JIS / FDA (Note 7)] | Class 2 [IEC / JIS / FDA (Note 7)] | Class 3R [IEC / JIS / FDA (Note 7)] | Class 2 [IEC / JIS / FDA (Note 7)] | Class 3R [IEC / JIS / FDA (Note 7)] | | |
| Beam size (Note 8) | | | ø20 μm ø0.787 mil approx. | | ø30 μm ø1.181 mil approx. | | ø70 μm ø2.756 mil approx. | | | ø100 μm ø3.937 mil approx. | | | | | |
| Receiving element | | | Linear image sensor | | | | | | | | | | | | |
| Indicator | Laser emission | Green LED (lights up during laser emission) | | | | | | | | | | | | | |
| | Measuring range | Yellow LED (lights up when near the measurement center distance, blinks when within the measuring range, and lights out when outside of the measuring range.) | | | | | | | | | | | | | |
| Environmental resistance | Protection | IP67 (IEC) (excluding the connector) | | | | | | | | | | | | | |
| | Ambient temperature | 0 to +45 °C +32 to +113 °F (No dew condensation or icing allowed), Storage: -20 to +70 °C -4 to +158 °F | | | | | | | | | | | | | |
| | Ambient humidity | 35 to 85 % RH, Storage: 35 to 85 % RH | | | | | | | | | | | | | |
| | Ambient illuminance | Incandescent light: 3,000 lx or less at the light-receiving face (Note 9) | | | | | | | | | | | | | |
| | Vibration resistance | 10 to 55 Hz (period: 1 min.) frequency, 1.5 mm 0.059 in double amplitude in X,Y and Z directions for two hours each | | | | | | | | | | | | | |
| | Shock resistance | 196 m/s ² acceleration (20 G approx.) in X,Y and Z directions three times each | | | | | | | | | | | | | |
| Cable | | | Cabtyre cable, 0.5 m 1.640 ft long with connector | | | | | | | | | | | | |
| Cable extension | | | Extension up to total 30 m 98.425 ft is possible, with optional cable. | | | | | | | | | | | | |
| Material | | | Enclosure: Die-cast aluminum, Case cover: Die-cast aluminum, Front cover: Glass | | | | | | | | | | | | |
| Weight | | | 250 g approx. (including cable) | | | | | | 300 g approx. (including cable) | | | | | | |
| Accessory | | | Laser warning labels (for applicable standards and regulations): 1 set | | | | | | | | | | | | |

Notes: 1) Measuring conditions are as follows unless otherwise specified: connection with controller, supply voltage: 24V DC, ambient temperature: +20 °C **+68 °F**, sampling cycle: 40 µs, average number of samples: 256 times, measurement center distance, measurement object: white ceramic [aluminum vapor deposition surface reflection mirror for **HL-C201A(E)** / **HL-C201A(E)-SP2** / **HL-C201F(E)**, clear glass for **HL-C201A(E)-SP3**], and digital measurement value.

2) Use the external ND filter (optional) **HL-C2F01** in case the amount of reflected beam is too large on Specular Reflection installation. (Cannot be used with **HL-C201□**.)

3) Measuring range at sampling periods of 20 µs and 10 µs is as follows.

| Model No. | | HL-C201□ | HL-C201□-SP2 | HL-C201□-SP3 | HL-C203□ | | HL-C205□ | | HL-C208□ | |
|------------|-------|--|--|--|--|--|--|--|--------------------------------------|--------------------------------|
| Setup mode | | Specular reflection | Specular reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection |
| Sampling | 20 µs | +0.1 to +1.0 mm +0.004 to +0.039 in | +0.1 to +0.8 mm +0.004 to +0.031 in | +0.1 to +1.0 mm +0.004 to +0.039 in | 0 to +5.0 mm 0 to +0.197 in | 0 to +4.6 mm 0 to +0.181 in | +0.5 to +5.0 mm +0.020 to +0.197 in | +0.5 to +5.0 mm +0.020 to +0.197 in | 0 to +20 mm 0 to +0.787 in | 0 to +6.0 mm 0 to +0.236 in |
| | 10 µs | +0.8 to +1.0 mm +0.031 to +0.039 in | +0.7 to +0.8 mm +0.028 to +0.031 in | +0.8 to +1.0 mm +0.031 to +0.039 in | +3.8 to +5.0 mm +0.150 to +0.197 in | +3.6 to +4.6 mm +0.142 to +0.181 in | +4.7 to +5.0 mm +0.185 to +0.197 in | +4.6 to +5.0 mm +0.181 to +0.197 in | +18 to +20 mm +0.709 to +0.787 in | Measurement not possible |

4) The P-P value for the deviation in the digital measurement values at the measurement center distance has been converted for the measurement center distance.

5) Exports of models with a minimum resolution of under 0.25 µm **0.010 mil** fall under Japanese Export Control defined by "Foreign Exchange and Foreign Trade Act." These products are introduced to limited countries only. Please refer to '**PRECAUTIONS FOR PROPER USE**' on p. 24.

6) Indicates error with respect to the ideal linear values for digital displacement output when standard objects were measured by our company. It may vary depending on the types of objects being measured.

7) FDA regulatory compliance is attained following the stipulations of Laser Notice No. 50 of FDA regulations.

8) This beam diameter is the size at the measurement center distance. These values were defined by using 1/e² (13.5 %) of the center light intensity. If there is a slight leakage of light outside the normal spot diameter and if the periphery surrounding the sensing point has a higher reflectivity than the sensing point itself, then the results may be affected.

9) Variance is ±0.03% F.S. or less depending on the ambient illuminance.

SPECIFICATIONS

Sensor heads

| Item | Model No. | Type | Small beam spot type | | | | | | | |
|--|------------------------|--|--|-----------------------|----------------------|---------------------------------|--|---|---|--|
| | | IEC/JIS conformed type | HL-C211B(E) | HL-C211C(E) | HL-C235BE | HL-C235CE | HL-C235CE-W | | | |
| | | FDA conformed type | HL-C211F(E) | HL-C211F5(E) | — | — | — | | | |
| CE marking directive compliance | | | EMC Directive, RoHS Directive | | | | | | | |
| Setup mode (Note 2) | | | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | |
| Measurement center distance | | | 110 mm 4.331 in | 106.7 mm 4.201 in | 110 mm 4.331 in | 106.7 mm 4.201 in | 350 mm 13.780 in | 348 mm 13.701 in | 350 mm 13.780 in | |
| Measuring range (Note 3) | | | ±15 mm ±0.591 in | ±14.5 mm ±0.571 in | ±15 mm ±0.591 in | ±14.5 mm ±0.571 in | ±50 mm ±1.969 in | ±42 mm ±1.654 in | ±50 mm ±1.969 in | |
| Resolution [Average number of samples] (Note 4, 5) | | | •HL-C211B / HL-C211C / HL-C211F / HL-C211F5: 0.4 μm 0.016 mil [256], 0.1 μm 0.004 mil [4,096] •HL-C211BE / HL-C211CE / HL-C211FE / HL-C211F5E: 0.4 μm 0.016 mil [256], 0.25 μm 0.01 mil [4,096] | | | | 2.0 μm 0.079 mil [256], 0.5 μm 0.020 mil [4,096] | | 8 μm 0.315 mil [256], 2 μm 0.079 mil [4,096] | |
| Linearity (Note 6) | | | ±0.03 % F.S. | | | | | | | ±0.04 % F.S. (-200 to 0 mm -7.874 to 0 in), ±0.08 % F.S. (0 to +200 mm 0 to +7.874 in), (F.S. = ±200 mm ±7.874 in) |
| Temperature characteristics | | | 0.01 % F.S./°C | | | | | | | |
| Light source | | | Red semiconductor laser (Peak emission wavelength: 658 nm 0.026 mil) | | | | | | | |
| | | | Max. output: 1 mW | | Max. output: 5 mW | | Max. output: 1 mW | | Max. output: 5 mW | |
| | | | Max. output: 5 mW | | Max. output: 5 mW | | Max. output: 5 mW | | | |
| | IEC/JIS conformed type | Class 2 (IEC / JIS) | Class 3R (IEC / JIS) | Class 2 (IEC / JIS) | Class 3R (IEC / JIS) | Class 2 (IEC / JIS) | Class 3R (IEC / JIS) | Class 3R (IEC / JIS) | | |
| | FDA conformed type | Class 2 (IEC / JIS), Class II (FDA) | Class 3R (IEC / JIS), Class IIIa (FDA) | — | | — | | Class 3R 〔 IEC / JIS / FDA (Note 7) 〕 | | |
| Beam size (Note 8) | | | ø80 μm ø3.15 mil approx. | | | ø250 μm ø9.843 mil approx. | | | ø400 μm ø15.748 mil approx. | |
| Receiving element | | | Linear image sensor | | | | | | | |
| Indicator | Laser emission | | Green LED (lights up during laser emission) | | | | | | | |
| | Measuring range | | Yellow LED (lights up when near the measurement center distance, blinks when within the measuring range, and lights out when outside of the measuring range.) | | | | | | | |
| Environmental resistance | Protection | | IP67 (IEC) (excluding the connector) | | | | | | | |
| | Ambient temperature | | 0 to +45 °C +32 to +113 °F (No dew condensation or icing allowed), Storage: -20 to +70 °C -4 to +158 °F | | | | | | | |
| | Ambient humidity | | 35 to 85 % RH, Storage: 35 to 85 % RH | | | | | | | |
| | Ambient illuminance | | Incandescent light: 3,000 lx or less at the light-receiving face (Note 9) | | | | | | | |
| | Vibration resistance | | 10 to 55 Hz (period: 1 min.) frequency, 1.5 mm 0.059 in double amplitude in X,Y and Z directions for two hours each | | | | | | | |
| | Shock resistance | | 196 m/s ² acceleration (20 G approx.) in X,Y and Z directions three times each | | | | | | | |
| Cable | | | Cabletyre cable, 0.5 m 1.640 ft long with connector | | | | | | | |
| Cable extension | | | Extension up to total 30 m 98.425 ft is possible, with optional cable. | | | | | | | |
| Material | | | Enclosure: Die-cast aluminum, Case cover: Die-cast aluminum, Front cover: Glass | | | | | | | |
| Weight | | | 300 g approx. (including cable) | | | 450 g approx. (including cable) | | | 300 g approx. (including cable) | |
| Accessory | | | Laser warning label: 1 set | | | | | | | |

- Notes: 1) Measuring conditions are as follows unless otherwise specified: connection with controller, supply voltage: 24V DC, ambient temperature: +20 °C **+68 °F**, sampling cycle: 40 μs, average number of samples: 256 times, measurement center distance, measurement object: white ceramic, and digital measurement value.
- 2) Use the external ND filter (optional) **HL-C2F01** in case the amount of reflected beam is too large on Specular Reflection installation.
- 3) Measuring range at sampling periods of 20 μs and 10 μs is as follows.

| Model No. | | HL-C211□ | | HL-C235□ | | HL-C235CE-W |
|------------|-------|---|---|---|---|---|
| Setup mode | | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection |
| Sampling | 20 μs | +0.5 to +15.0 mm +0.020 to +0.591 in | +0.5 to +14.5 mm +0.020 to +0.571 in | 0 to +50 mm 0 to +1.969 in | 0 to +42 mm 0 to +1.654 in | -70 to +200 mm -2.756 to +7.874 in |
| | 10 μs | +12.5 to +15.0 mm +0.492 to +0.591 in | +12.5 to +14.5 mm +0.492 to +0.571 in | +36 to +50 mm +1.417 to +1.969 in | +36 to +42 mm +1.417 to +1.654 in | +100 to +200 mm +3.937 to +7.874 in |

- 4) The P-P value for the deviation in the digital measurement values at the measurement center distance has been converted for the measurement center distance.
- 5) Exports of models with a minimum resolution of under 0.25 μm **0.010 mil** fall under Japanese Export Control defined by "Foreign Exchange and Foreign Trade Act." These products are introduced to limited countries only. Please refer to '**PRECAUTIONS FOR PROPER USE**' on p. 24.
- 6) Indicates error with respect to the ideal linear values for digital displacement output when standard objects were measured by our company. It may vary depending on the types of objects being measured.
- 7) FDA regulatory compliance is attained following the stipulations of Laser Notice No. 50 of FDA regulations.
- 8) This beam diameter is the size at the measurement center distance. These values were defined by using 1/e² (13.5 %) of the center light intensity. If there is a slight leakage of light outside the normal spot diameter and if the periphery surrounding the sensing point has a higher reflectivity than the sensing point itself, then the results may be affected.
- 9) Variance is ±0.03% F.S. or less (±0.08% F.S. or less for **HL-C235CE-W**) depending on the ambient illuminance.

Sensor heads

| Item | Model No. | Type | Linear beam spot type | | | | | | | | | | | |
|--|----------------------|------------------------|---|----------------------|---|---|---|---|--|--|---------------------|---------------------|---------------------|----------------|
| | | IEC/JIS conformed type | HL-C201A(E)-MK | HL-C201A(E)-SP2M | HL-C201A(E)-SP3M | HL-C203B(E)-MK | HL-C205B(E)-MK | HL-C205C(E)-MK | HL-C208B(E)-MK | HL-C208C(E)-MK | | | | |
| | | FDA conformed type | HL-C201F(E)-MK | — | — | HL-C203F(E)-MK | — | — | — | — | | | | |
| CE marking directive compliance | | | EMC Directive, RoHS Directive | | | | | | | | | | | |
| Setup mode (Note 2) | | | Specular reflection | | | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | |
| Measurement center distance | | | 10 mm 0.394 in | 8 mm 0.315 in | 15 mm 0.591 in | 30 mm 1.181 in | 26.4 mm 1.039 in | 50 mm 1.969 in | 46 mm 1.811 in | 50 mm 1.969 in | 46 mm 1.811 in | 85 mm 3.346 in | 81.4 mm 3.205 in | |
| Measuring range (Note 3) | | | ±1 mm ±0.039 in | ±0.8 mm ±0.031 in | ±1 mm ±0.039 in | ±5 mm ±0.197 in | ±4.6 mm ±0.181 in | ±5 mm ±0.197 in | ±5 mm ±0.197 in | ±5 mm ±0.197 in | ±5 mm ±0.197 in | ±20 mm ±0.787 in | ±6 mm ±0.236 in | |
| Resolution [Average number of samples] (Note 4, 5) | | | •HL-C201A-MK / HL-C201A-SP2M / HL-C201A-SP3M / HL-C201F-MK: 0.04 μm 0.002 mil [256], 0.01 μm 0.0004 mil [4,096] •HL-C201AE-MK / HL-C201AE-SP2M / HL-C201AE-SP3M / HL-C201FE-MK: 0.25 μm 0.010 mil [256] | | | •HL-C203B-MK / HL-C203F-MK: 0.1 μm 0.004 mil [256] 0.025 μm 0.001 mil [4,096] •HL-C203BE-MK / HL-C203FE-MK: 0.25 μm 0.010 mil [256] | | •HL-C205B-MK / HL-C205C-MK: 0.2 μm 0.008 mil [256], 0.05 μm 0.002 mil [4,096] •HL-C205BE-MK / HL-C205CE-MK: 0.25 μm 0.010 mil [256] | | •HL-C208B-MK / HL-C208C-MK: 0.6 μm 0.024 mil [256], 0.15 μm 0.006 mil [4,096] •HL-C208BE-MK / HL-C208CE-MK: 0.6 μm 0.024 mil [256], 0.25 μm 0.010 mil [4,096] | | | | |
| Linearity (Note 6) | | | ±0.02 % F.S. (HL-201FE-MK: ±0.025 % F.S.) | | | ±0.03 % F.S. | | | | | ±0.03 % F.S. | ±0.1 % F.S. | ±0.03 % F.S. | ±0.1 % F.S. |
| Temperature characteristics | | | 0.01 % F.S./°C (HL-201FE-MK: 0.013 % F.S./°C) | 0.02 % F.S./°C | | 0.01 % F.S./°C | | | | | | | | |
| Light source | | | Red semiconductor laser (Peak emission wavelength: 658 nm 0.026 mil) | | | | | | | | | | | |
| | | | Max. output: 0.1 mW | | Max. output: 0.3 mW | Max. output: 1 mW | Max. output: 1 mW | Max. output: 5 mW | Max. output: 1 mW | Max. output: 5 mW | | | | |
| | | IEC/JIS conformed type | Class 1 (IEC / JIS) | | | Class 2 (IEC / JIS) | Class 2 (IEC / JIS) | Class 3R (IEC / JIS) | Class 2 (IEC / JIS) | Class 3R (IEC / JIS) | | | | |
| | | FDA conformed type | Class 1 IEC / JIS / FDA (Note 7) | — | — | Class 2 (IEC / JIS), Class II (FDA) | Class 2 IEC / JIS / FDA (Note 7) | Class 3R IEC / JIS / FDA (Note 7) | Class 2 IEC / JIS / FDA (Note 7) | Class 3R IEC / JIS / FDA (Note 7) | | | | |
| Beam size (Note 8) | | | 20 × 700 μm 0.787 × 27.559 mil approx. | | 30 × 1,400 μm 1.181 × 55.118 mil approx. | 30 × 1,200 μm 1.181 × 47.244 mil approx. | 70 × 1,000 μm 2.756 × 39.370 mil approx. | | | 100 × 1,200 μm 3.937 × 47.244 mil approx. | | | | |
| Receiving element | | | Linear image sensor | | | | | | | | | | | |
| Indicator | Laser emission | | Green LED (lights up during laser emission) | | | | | | | | | | | |
| | Measuring range | | Yellow LED (lights up when near the measurement center distance, blinks when within the measuring range, and lights out when outside of the measuring range.) | | | | | | | | | | | |
| Environmental resistance | Protection | | IP67 (IEC) (excluding the connector) | | | | | | | | | | | |
| | Ambient temperature | | 0 to +45 °C +32 to +113 °F (No dew condensation or icing allowed), Storage: −20 to +70 °C −4 to +158 °F | | | | | | | | | | | |
| | Ambient humidity | | 35 to 85 % RH, Storage: 35 to 85 % RH | | | | | | | | | | | |
| | Ambient illuminance | | Incandescent light: 3,000 lx or less at the light-receiving face (Note 9) | | | | | | | | | | | |
| | Vibration resistance | | 10 to 55 Hz (period: 1 min.) frequency, 1.5 mm 0.059 in double amplitude in X,Y and Z directions for two hours each | | | | | | | | | | | |
| | Shock resistance | | 196 m/s ² acceleration (20 G approx.) in X,Y and Z directions three times each | | | | | | | | | | | |
| Cable | | | Cable type cable, 0.5 m 1.640 ft long with connector | | | | | | | | | | | |
| Cable extension | | | Extension up to total 30 m 98.425 ft is possible, with optional cable. | | | | | | | | | | | |
| Material | | | Enclosure: Die-cast aluminum, Case cover: Die-cast aluminum, Front cover: Glass | | | | | | | | | | | |
| Weight | | | 250 g approx. (including cable) | | | | | | 300 g approx. (including cable) | | | | | |
| Accessory | | | Laser warning labels (for applicable standards and regulations): 1 set | | | | | | | | | | | |

Notes: 1) Measuring conditions are as follows unless otherwise specified: connection with controller, supply voltage: 24V DC, ambient temperature: +20 °C +68 °F, sampling cycle: 40 µs, average number of samples: 256 times, measurement center distance, measurement object: white ceramic [aluminum vapor deposition surface reflection mirror for HL-C201A(E)-MK / HL-C201A(E)-SP2M / HL-C201F(E)-MK, clear glass for HL-C201A(E)-SP3M], and digital measurement value.

2) Use the external ND filter (optional) HL-C2F01 in case the amount of reflected beam is too large on Specular Reflection installation. (Cannot be used with HL-C201□.)

3) Measuring range at sampling periods of 20 µs and 10 µs is as follows.

| Model No. | HL-C201□-MK | HL-C201□-SP2M | HL-C201□-SP3M | HL-C203□-MK | | HL-C205□-MK | | HL-C208□-MK | |
|------------|---------------------|--|--|--|--|--|--|--|--------------------------------------|
| Setup mode | Specular reflection | Specular reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection |
| Sampling | 20 µs | +0.1 to +1.0 mm +0.004 to +0.039 in | +0.1 to +0.8 mm +0.004 to +0.031 in | +0.1 to +1.0 mm +0.004 to +0.039 in | 0 to +5.0 mm 0 to +0.197 in | 0 to +4.6 mm 0 to +0.181 in | +0.5 to +5.0 mm +0.020 to +0.197 in | +0.5 to +5.0 mm +0.020 to +0.197 in | 0 to +20 mm 0 to +0.787 in |
| | 10 µs | +0.8 to +1.0 mm +0.031 to +0.039 in | +0.7 to +0.8 mm +0.028 to +0.031 in | +0.8 to +1.0 mm +0.031 to +0.039 in | +3.8 to +5.0 mm +0.150 to +0.197 in | +3.6 to +4.6 mm +0.142 to +0.181 in | +4.7 to +5.0 mm +0.185 to +0.197 in | +4.6 to +5.0 mm +0.181 to +0.197 in | +18 to +20 mm +0.709 to +0.787 in |

4) The P-P value for the deviation in the digital measurement values at the measurement center distance has been converted for the measurement center distance.

5) Exports of models with a minimum resolution of under 0.25 µm 0.010 mil fall under Japanese Export Control defined by "Foreign Exchange and Foreign Trade Act." These products are introduced to limited countries only. Please refer to 'PRECAUTIONS FOR PROPER USE' on p. 24.

6) Indicates error with respect to the ideal linear values for digital displacement output when standard objects were measured by our company. It may vary depending on the types of objects being measured.

7) FDA regulatory compliance is attained following the stipulations of Laser Notice No. 50 of FDA regulations.

8) This beam diameter is the size at the measurement center distance. These values were defined by using 1/e² (13.5 %) of the center light intensity. If there is a slight leakage of light outside the normal spot diameter and if the periphery surrounding the sensing point has a higher reflectivity than the sensing point itself, then the results may be affected.

9) Variance is ±0.03% F.S. or less depending on the ambient illuminance.

SPECIFICATIONS

Sensor heads

| Item | Model No. | Type | Linear beam spot type | | | | | | | |
|--|----------------------|--|--|---|---------------------|--|---------------------|---|--|--|
| | | IEC/JIS conformed type | HL-C211B(E)-MK | HL-C211C(E)-MK | HL-C235BE-MK | HL-C235CE-MK | HL-C235CE-WMK | | | |
| | | FDA conformed type | HL-C211F(E)-MK | HL-C211F5(E)-MK | — | — | — | | | |
| CE marking directive compliance | | | EMC Directive, RoHS Directive | | | | | | | |
| Setup mode (Note 2) | | | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection | |
| Measurement center distance | | | 110 mm 4.331 in | 106.7 mm 4.201 in | 110 mm 4.331 in | 106.7 mm 4.201 in | 350 mm 13.780 in | 348 mm 13.701 in | 350 mm 13.780 in | |
| Measuring range (Note 3) | | | ±15 mm ±0.591 in | ±14.5 mm ±0.571 in | ±15 mm ±0.591 in | ±14.5 mm ±0.571 in | ±50 mm ±1.969 in | ±42 mm ±1.654 in | ±50 mm ±1.969 in | |
| Resolution [Average number of samples] (Note 4, 5) | | | •HL-C211B-MK / HL-C211C-MK / HL-C211F-MK / HL-C211F5-MK: 0.4 μm 0.016 mil [256], 0.1 μm 0.004 mil [4,096] •HL-C211BE-MK / HL-C211CE-MK / HL-C211FE-MK / HL-C211F5E-MK: 0.4 μm 0.016 mil [256], 0.25 μm 0.01 mil [4,096] | | | 2.0 μm 0.079 mil [256], 0.5 μm 0.020 mil [4,096] | | 8 μm 0.315 mil [256], 2 μm 0.079 mil [4,096] | | |
| Linearity (Note 6) | | | ±0.03 % F.S. | | | | | | ±0.04 % F.S. (-200 to 0 mm -7.874 to 0 in), ±0.08 % F.S. (0 to +200 mm 0 to +7.874 in), (F.S. = ±200 mm ±7.874 in) | |
| Temperature characteristics | | | 0.01 % F.S./°C | | | | | | | |
| Light source | | | Red semiconductor laser (Peak emission wavelength: 658 nm 0.026 mil) | | | | | | | |
| | | | Max. output: 1 mW | | Max. output: 5 mW | | Max. output: 1 mW | | Max. output: 5 mW | |
| | | | Max. output: 5 mW | | Max. output: 5 mW | | Max. output: 5 mW | | | |
| IEC/JIS conformed type | | Class 2 (IEC / JIS) | | Class 3R (IEC / JIS) | | Class 2 (IEC / JIS) | | Class 3R (IEC / JIS) | | |
| FDA conformed type | | Class 2 (IEC / JIS), Class II (FDA) | | Class 3R (IEC / JIS), Class IIIa (FDA) | | — | | — | | |
| Beam size (Note 8) | | | 80 × 1,700 μm 3.150 × 66.929 mil approx. | | | 250 × 3,500 μm 9.843 × 137.795 mil approx. | | | 400 × 6,500 μm 15.748 × 255.905 mil approx. | |
| Receiving element | | | Linear image sensor | | | | | | | |
| Indicator | Laser emission | | Green LED (lights up during laser emission) | | | | | | | |
| | Measuring range | | (lights up when near the measurement center distance, blinks when within the measuring range, and lights out when outside of the measuring range.) | | | | | | | |
| Environmental resistance | Protection | | IP67 (IEC) (excluding the connector) | | | | | | | |
| | Ambient temperature | | 0 to +45 °C +32 to +113 °F (No dew condensation or icing allowed), Storage: -20 to +70 °C -4 to +158 °F | | | | | | | |
| | Ambient humidity | | 35 to 85 % RH, Storage: 35 to 85 % RH | | | | | | | |
| | Ambient illuminance | | Incandescent light: 3,000 lx or less at the light-receiving face (Note 9) | | | | | | | |
| | Vibration resistance | | 10 to 55 Hz (period: 1 min.) frequency, 1.5 mm 0.059 in double amplitude in X,Y and Z directions for two hours each | | | | | | | |
| | Shock resistance | | 196 m/s ² acceleration (20 G approx.) in X,Y and Z directions three times each | | | | | | | |
| Cable | | | Cable type, 0.5 m 1.640 ft long with connector | | | | | | | |
| Cable extension | | | Extension up to total 30 m 98.425 ft is possible, with optional cable. | | | | | | | |
| Material | | | Enclosure: Die-cast aluminum, Case cover: Die-cast aluminum, Front cover: Glass | | | | | | | |
| Weight | | | 300 g approx. (including cable) | | | 450 g approx. (including cable) | | | 300 g approx. (including cable) | |
| Accessory | | | Laser warning labels (for applicable standards and regulations): 1 set | | | | | | | |

Notes: 1) Measuring conditions are as follows unless otherwise specified: connection with controller, supply voltage: 24V DC, ambient temperature: +20 °C **+68 °F**, sampling cycle: 40 μs, average number of samples: 256 times, measurement center distance, measurement object: white ceramic, and digital measurement value.

2) Use the external ND filter (optional) **HL-C2F01** in case the amount of reflected beam is too large on Specular Reflection installation.

3) Measuring range at sampling periods of 20 μs and 10 μs is as follows.

| Model No. | | HL-C211□-MK | | HL-C235□-MK | | HL-C235CE-WMK |
|------------|-------|---|---|---|---|---|
| Setup mode | | Diffuse reflection | Specular reflection | Diffuse reflection | Specular reflection | Diffuse reflection |
| Sampling | 20 μs | +0.5 to +15.0 mm +0.020 to +0.591 in | +0.5 to +14.5 mm +0.020 to +0.571 in | 0 to +50 mm 0 to +1.969 in | 0 to +42 mm 0 to +1.654 in | -70 to +200 mm -2.756 to +7.874 in |
| | 10 μs | +12.5 to +15.0 mm +0.492 to +0.591 in | +12.5 to +14.5 mm +0.492 to +0.571 in | +36 to +50 mm +1.417 to +1.969 in | +36 to +42 mm +1.417 to +1.654 in | +100 to +200 mm +3.937 to +7.874 in |

4) The P-P value for the deviation in the digital measurement values at the measurement center distance has been converted for the measurement center distance.

5) Exports of models with a minimum resolution of under 0.25 μm **0.010 mil** fall under Japanese Export Control defined by "Foreign Exchange and Foreign Trade Act." These products are introduced to limited countries only. Please refer to **'PRECAUTIONS FOR PROPER USE'** on p. 24.

6) Indicates error with respect to the ideal linear values for digital displacement output when standard objects were measured by our company. It may vary depending on the types of objects being measured.

7) FDA regulatory compliance is attained following the stipulations of Laser Notice No. 50 of FDA regulations.

8) This beam diameter is the size at the measurement center distance. These values were defined by using $1/e^2$ (13.5 %) of the center light intensity.

If there is a slight leakage of light outside the normal spot diameter and if the periphery surrounding the sensing point has a higher reflectivity than the sensing point itself, then the results may be affected.

9) Variance is ±0.03% F.S. or less (±0.08% F.S. or less for **HL-C235CE-WMK**) depending on the ambient illuminance.

SPECIFICATIONS

Controllers

| Item | Model No. | Type | RS-232C compatible | Ethernet compatible |
|---------------------------------|--|-----------------|---|--|
| | | NPN output type | HL-C2C(E) | HL-C21C(E) |
| | | PNP output type | HL-C2C(E)-P | HL-C21C(E)-P |
| CE marking directive compliance | | | EMC Directive, RoHS Directive | |
| Connectable sensor head | | | Number of connectable units: Max. 2 units | |
| Supply voltage | | | 24 V DC ±10 % including ripple 0.5 V (P-P) | |
| Current consumption | | | 500 mA approx. at 2 sensor heads connected, 350 mA approx. at 1 sensor head connected | |
| Sampling cycle | | | 10 μs, 20 μs, 40 μs, 100 μs, 200 μs, 400 μs, 1 ms, 2 ms | |
| Analog output | Voltage (Note 2) | | Voltage output scale: −5 to +5 V/F.S. (initial value) Output range during normal status: −10.0 to +10.0 V Output at abnormal status: −10.8 V or +10.8 V Resolution: 2 mV, Linearity: ±0.05 % F.S. Max. 2 mA, output impedance 50 Ω, Response delay time: 1.5 μs/V approx. | |
| | Current (Note 3) | | Current output scale: 4 to 20 mA/F.S. (initial value) Output range during normal status: 2 to 24 mA Output at abnormal status: 1 mA or 25 mA Resolution: 3 μA, Linearity: ±0.05% F.S. Load impedance: 250 Ωmax., Response delay time: 10 μs approx. | |
| Alarm output | <NPN output type> NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less [between alarm output and Common(−)] • Residual voltage: 1 V or less (at 100 mA sink current) | | <PNP output type> PNP open-collector transistor • Maximum source current: 100 mA • Applied voltage: 30 V DC or less (between alarm output and +V) • Residual voltage: 1 V or less (at 100 mA source current) | |
| | Output operation | | Opened when the amount of light is insufficient | |
| | Short-circuit protection | | Incorporated | |
| Judgment output (HI, GO, LO) | <NPN output type> NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less [between judgment output to Common(−)] • Residual voltage: 1 V or less (at 100 mA sink current) | | <PNP output type> PNP open-collector transistor • Maximum source current: 100 mA • Applied voltage: 30 V DC or less (between judgment output to +V) • Residual voltage: 1 V or less (at 100 mA source current) | |
| | Output operation | | Opened at output operation | |
| | Short-circuit protection | | Incorporated | |
| Strobe output | <NPN output type> NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less [between strobe output to Common(−)] • Residual voltage: 1 V or less (at 100 mA sink current) | | <PNP output type> PNP open-collector transistor • Maximum source current: 100 mA • Applied voltage: 30 V DC or less (between strobe output to +V) • Residual voltage: 1 V or less (at 100 mA source current) | |
| | Output operation | | Opened at data determination | |
| | Short-circuit protection | | Incorporated | |
| Remote interlock input | <NPN output type> Laser emission is delayed when connected to Common (−). Laser emission stop at open Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | | <PNP output type> Laser emission is delayed when connected to IL (+). Laser emission stop at open Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | |
| | <NPN output type> Laser emission is stopped when connected to Common (−). Laser is emitted immediately after opened. Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | | <PNP output type> Laser emission is stopped when connected to external power (+). Laser is emitted immediately after opened. Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | |
| Zero set input | <NPN output type> Zero set is ON when connected with Common (−). Zero set turns to OFF after continuously connected to Common (−) for one second. Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | | <PNP output type> Zero set is ON when connected with external power (+). Zero set turns to OFF after continuously connected to external power (+) for one second. Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | |
| | <NPN output type> ON at/during connection to Common (−) (depending on analysis mode) Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | | <PNP output type> ON at/during connection to external power (+) (depending on analysis mode) Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | |
| Reset input | <NPN output type> Reset is done when connected to Common (−). Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | | <PNP output type> Reset is done when connected to external power (+). Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | |
| Memory change input | <NPN output type> Memory is specified when connected to Common (−). Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | | <PNP output type> Memory is specified when connected to external power (+). Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | |
| RS-232C interface | | | Baud rate 9,600, 19,200, 38,400, 115,200 bit/s | — |
| Ethernet interface (Note 4) | | | — | IEEE802.3u, 10BASE-T/100BASE-TX RJ45 Compatible protocols: iQSS-compatible proprietary protocol, MC protocol, MEWTOCOL |
| USB interface | | | USB 2.0 full speed (USB 1.1 compatible) compliant | |
| Setting/Data Display | | | GT12 Programmable Display (optional) | |

SPECIFICATIONS

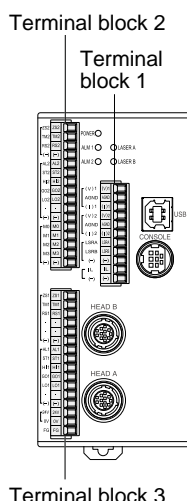
Controllers

| Item | | Type | RS-232C compatible | Ethernet compatible | |
|--------------------------|----------------------------------|--|--|---------------------|------------|
| | | Model No. | NPN output type | HL-C2C(E) | HL-C21C(E) |
| | | PNP output type | HL-C2C(E)-P | HL-C21C(E)-P | |
| Indicator | Power | Green LED (lights up at power on) | | | |
| | Sensor head A Laser radiation | Green LED (lights up during or immediately before laser emission of sensor head A) | | | |
| | Sensor head B Laser radiation | Green LED (lights up during or immediately before laser emission of sensor head B) | | | |
| | Alarm 1 | Red LED (lights up when OUT1 can not be measured due to insufficient amount of light) | | | |
| | Alarm 2 | Red LED (lights up when OUT2 can not be measured due to insufficient amount of light) | | | |
| Environmental resistance | Ambient temperature | 0 to +50 °C +32 to +122 °F (No dew condensation or icing allowed), Storage: -20 to +70 °C -4 to +158 °F | | | |
| | Ambient humidity | 35 to 85 %RH | | | |
| | Vibration resistance | 10 to 55 Hz frequency (period: 1 min.), 0.75 mm 0.030 in double amplitude in X, Y and Z directions for 30 min. each | | | |
| | Shock resistance | 196 m/s ² acceleration (20G approx.) in X, Y, and Z directions three times each | | | |
| Material | | Case: Polycarbonate | | | |
| Weight | | 450 g approx. | | | |
| Accessory | | CD-ROM: 1 pc., USB cable (2 m 6.562 ft long): 1 pc., Short bracket: 1 pc. | CD-ROM: 1 pc., USB cable (2 m 6.562 ft long): 1 pc., Short bracket: 1 pc. Ferrite core (E04SR200935A made by Seiwa Electric Mfg. Co.): 3 cores | | |

- Notes: 1) **HL-C2C(-P) / HL-C21C(-P)** are restricted for export in accordance with the "Foreign Exchange and Foreign Trade Law". These products are introduced to limited countries only. Please refer to '**PRECAUTIONS FOR PROPER USE**' on p. 24.
- 2) The linearity is F.S.=20 V to digital measurement value. Response delay time is the period after update of measurement value.
- 3) The linearity is F.S.=16 mA to digital measurement value. Response delay time is the period after update of measurement value.
- 4) For Ethernet communication settings of **HL-C21C(E) (-P)**, **Configurator WD** (Ethernet communication setting tool, Ver. 1.62 or later) is required. Please download it from our website for use.

I/O CIRCUIT AND WIRING DIAGRAMS

Terminal arrangement



Terminal block 1

| Terminal | Function |
|----------|---|
| (V)1 | Analog voltage output (for OUT1) |
| AGND | Analog ground |
| (I)1 | Analog current output (for OUT1) |
| (V)2 | Analog voltage output (for OUT2) |
| AGND | Analog ground |
| (I)2 | Analog current output (for OUT2) |
| LSRA | Laser control input (for Head A) Laser stop during short circuit |
| LSRB | Laser control input (for Head B) Laser stop during short circuit |
| (-) | Common (-) |
| IL IL- | Remote interlock Laser stop when opened. |
| (-) IL+ | Remote interlock common |

Terminal block 2

| Terminal | Function |
|----------|---|
| ZS2 | Zero set input (for OUT2) ON during short circuit (Note 1) |
| TM2 | Timing input (for OUT2) ON during short circuit |
| RS2 | Reset input (for OUT2) ON during short circuit |
| (-) | Common (-) |
| AL2 | Alarm output (for OUT2) |
| ST2 | Strobe output (for OUT2) |
| HI2 | Judgment HI output (for OUT2) |
| GO2 | Judgment GO output (for OUT2) |
| LO2 | Judgment LO output (for OUT2) |
| (-) | Reserved terminal (Note 2) |
| (-) (+) | Common (-) / Common (+) |
| M0 | Memory change (16 ways) |
| M1 | |
| M2 | |
| M3 | |
| (-) | Common (-) |

- Notes: 1) Turn off the terminal in case short circuit lasts for more than one second.
- 2) Do not connect anything to the reserved terminals.

Terminal block 3

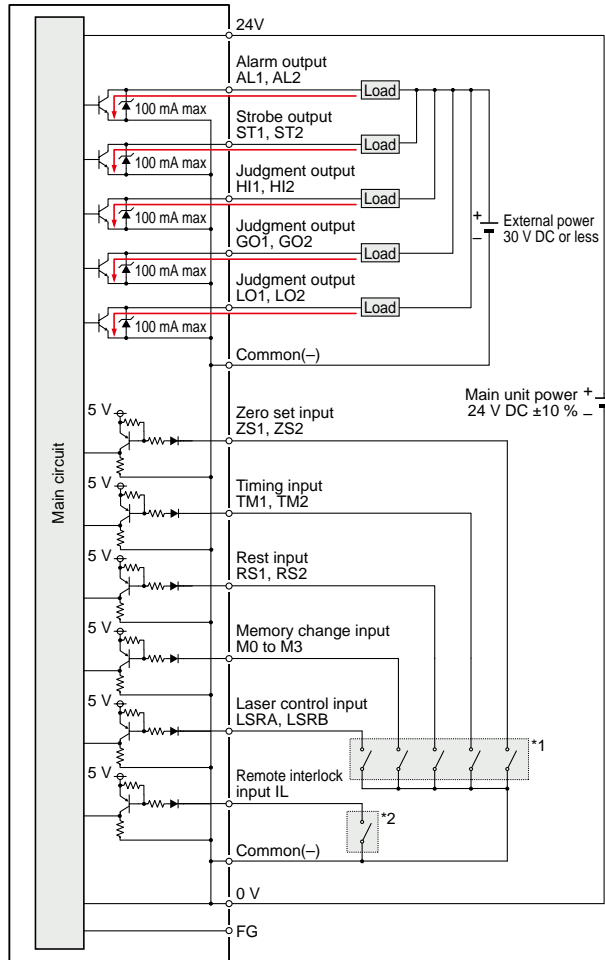
| Terminal | Function |
|----------|---|
| ZS1 | Zero set input (for OUT1) ON during short circuit (Note 1) |
| TM1 | Timing input (for OUT1) ON during short circuit |
| RS1 | Reset input (for OUT1) ON during short circuit |
| (-) | Reserved terminal (Note 2) |
| (-) | Reserved terminal (Note 2) |
| (-) | Common (-) |
| AL1 | Alarm output (for OUT1) |
| ST1 | Strobe output (for OUT1) |
| HI1 | Judgment HI output (for OUT1) |
| GO1 | Judgment GO output (for OUT1) |
| LO1 | Judgment LO output (for OUT1) |
| (-) | Reserved terminal (Note 2) |
| (-) (+) | Common (-) / Common (+) |
| 24V | 24 V DC input for power supply |
| 0V | Power supply ground 0 V |
| FG | Frame ground |

- Notes: 1) Turn off the terminal in case short circuit lasts for more than one second.
- 2) Do not connect anything to the reserved terminals.

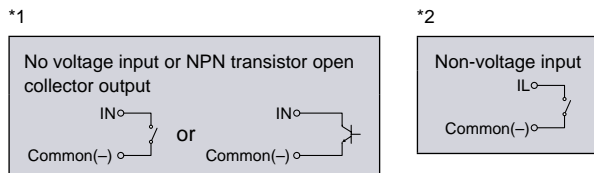
I/O CIRCUIT AND WIRING DIAGRAMS

NPN output type

I/O circuit diagrams

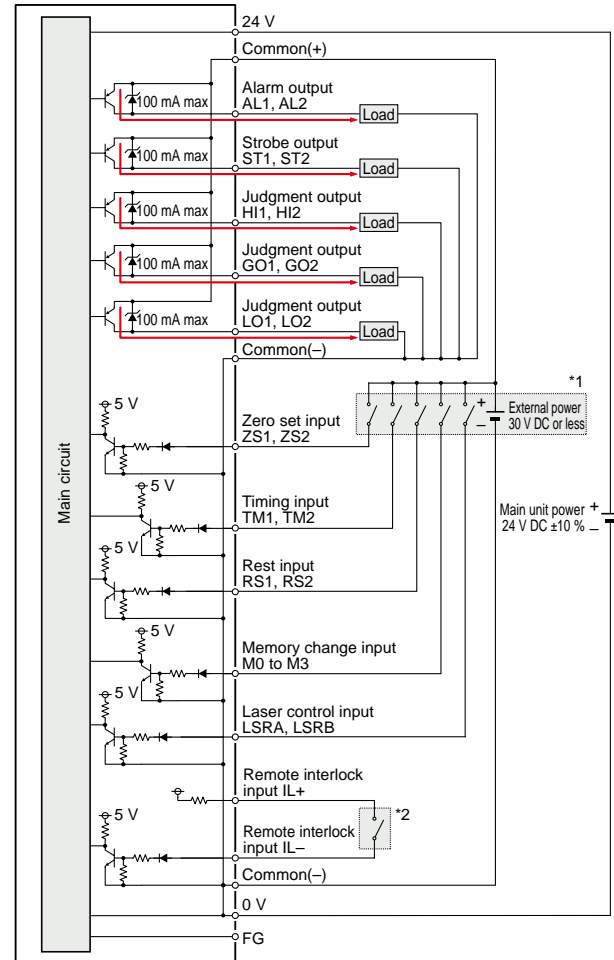


Controller internal circuit → External connection example

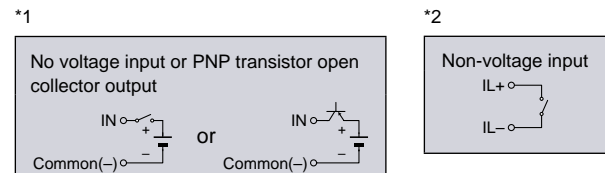


PNP output type

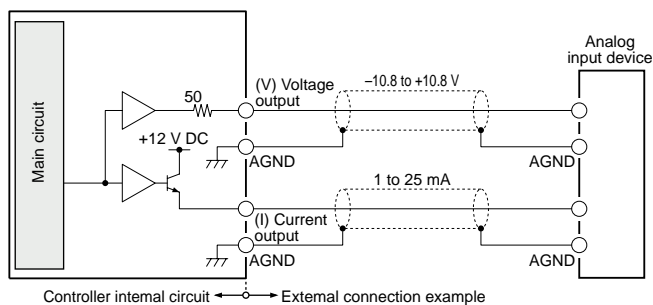
I/O circuit diagrams



Controller internal circuit → External connection example



Analog output (Common in NPN output type and PNP output type)



Controller internal circuit → External connection example

Notes: 1) Do not short-circuit analog output terminals or apply voltage to them.
2) Use shielded wires for analog outputs.

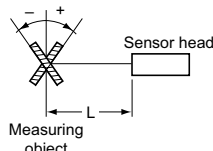
SENSING CHARACTERISTICS (TYPICAL)

HL-C201A HL-C201F

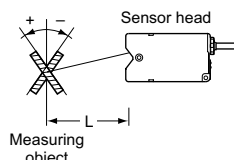
Correlation between measuring distance and error characteristics

Setup mode: Specular reflection

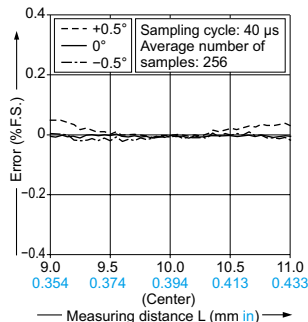
Aluminum vapor deposition
surface reflection mirror
($0^\circ, \pm 0.5^\circ$)
Vertical orientation



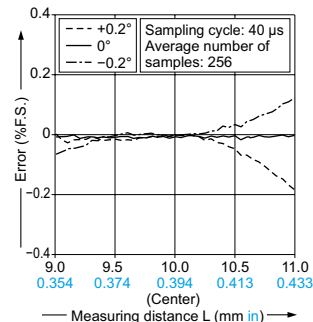
Aluminum vapor deposition
surface reflection mirror
($0^\circ, \pm 0.2^\circ$)
Horizontal orientation



• Vertical orientation



• Horizontal orientation

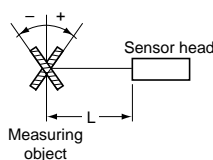


HL-C201A-SP2

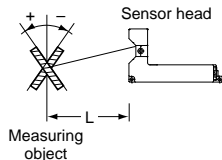
Correlation between measuring distance and error characteristics

Setup mode: Specular reflection

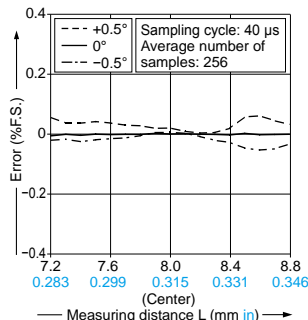
Aluminum vapor deposition
surface reflection mirror
($0^\circ, \pm 0.5^\circ$)
Vertical orientation



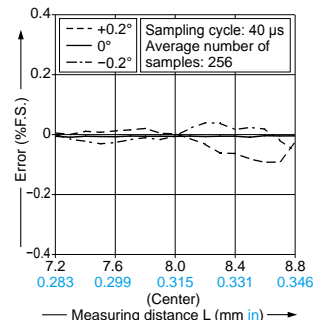
Aluminum vapor deposition
surface reflection mirror
($0^\circ, \pm 0.2^\circ$)
Horizontal orientation



• Vertical orientation



• Horizontal orientation

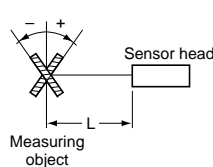


HL-C201A-SP3

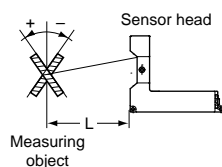
Correlation between measuring distance and error characteristics

Setup mode: Specular reflection

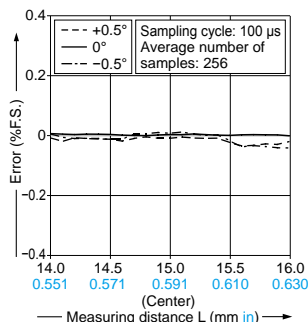
Glass ($0^\circ, \pm 0.5^\circ$)
Vertical orientation



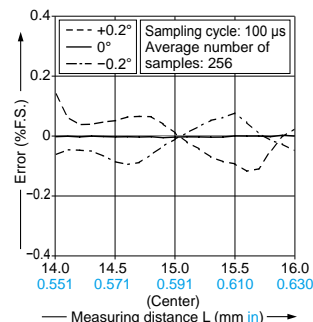
Glass ($0^\circ, \pm 0.2^\circ$)
Horizontal orientation



• Vertical orientation



• Horizontal orientation

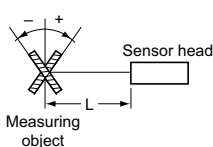


HL-C203B HL-C203F

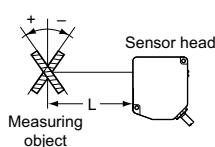
Correlation between measuring distance and error characteristics

Setup mode: Diffuse reflection

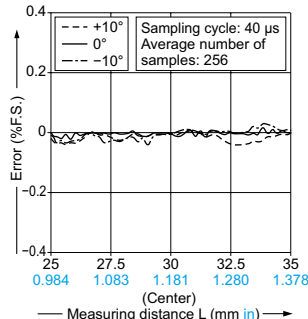
White ceramic ($0^\circ, \pm 10^\circ$)
Vertical orientation



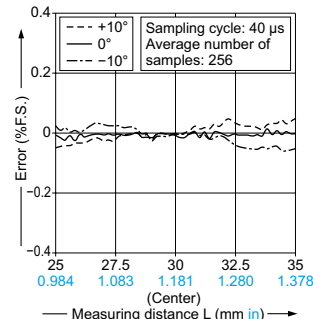
White ceramic ($0^\circ, \pm 10^\circ$)
Horizontal orientation



• Vertical orientation

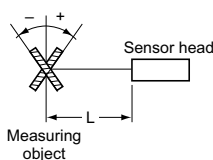


• Horizontal orientation

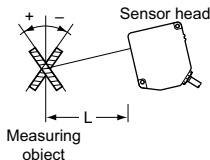


Setup mode: Specular reflection

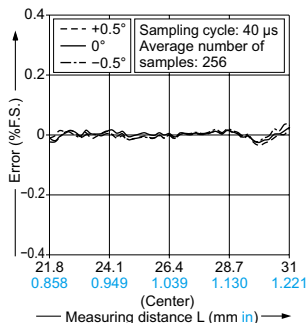
Aluminum vapor deposition
surface reflection mirror
($0^\circ, \pm 0.5^\circ$)
Vertical orientation



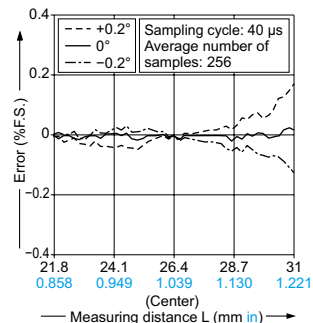
Aluminum vapor deposition
surface reflection mirror
($0^\circ, \pm 0.2^\circ$)
Horizontal orientation



• Vertical orientation



• Horizontal orientation



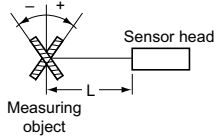
SENSING CHARACTERISTICS (TYPICAL)

HL-C205B HL-C205C

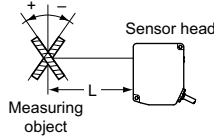
Correlation between measuring distance and error characteristics

Setup mode: Diffuse reflection

White ceramic ($0^\circ, \pm 10^\circ$)
Vertical orientation

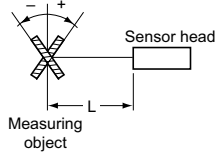


White ceramic ($0^\circ, \pm 10^\circ$)
Horizontal orientation

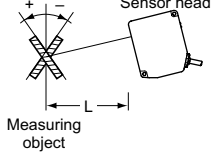


Setup mode: Specular reflection

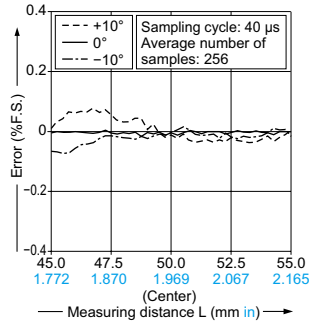
Glass ($0^\circ, \pm 0.5^\circ$)
Vertical orientation



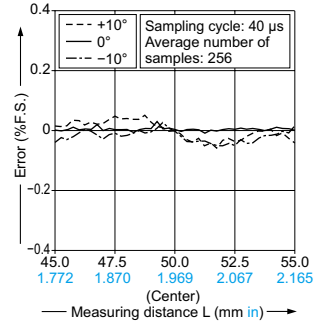
Glass ($0^\circ, \pm 0.2^\circ$)
Horizontal orientation



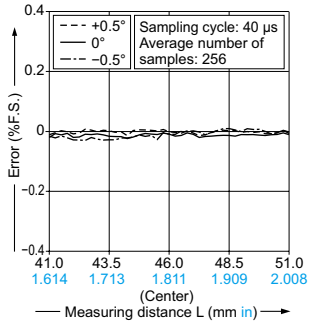
• Vertical orientation



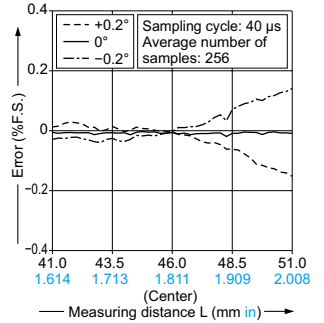
• Horizontal orientation



• Vertical orientation



• Horizontal orientation

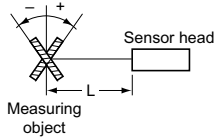


HL-C208B HL-C208C

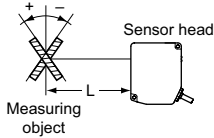
Correlation between measuring distance and error characteristics

Setup mode: Diffuse reflection

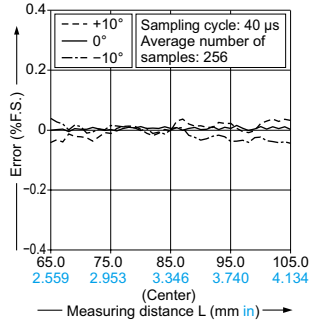
White ceramic ($0^\circ, \pm 10^\circ$)
Vertical orientation



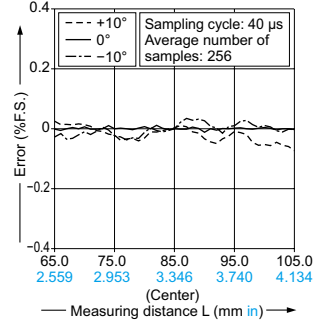
White ceramic ($0^\circ, \pm 10^\circ$)
Horizontal orientation



• Vertical orientation

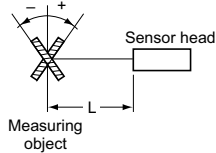


• Horizontal orientation

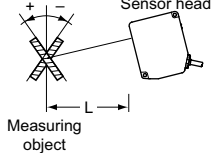


Setup mode: Specular reflection

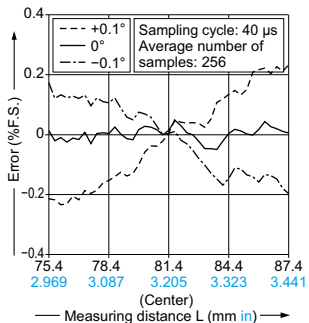
Glass ($0^\circ, \pm 0.1^\circ$)
Vertical orientation



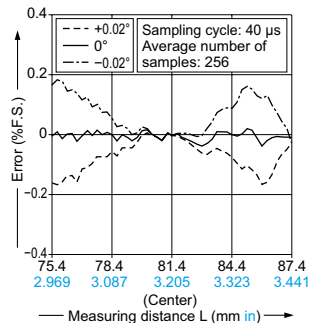
Glass ($0^\circ, \pm 0.02^\circ$)
Horizontal orientation



• Vertical orientation



• Horizontal orientation



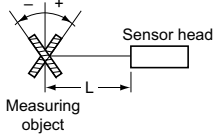
SENSING CHARACTERISTICS (TYPICAL)

HL-C211B HL-C211C HL-C211F HL-C211F5

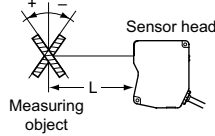
Correlation between measuring distance and error characteristics

Setup mode: Diffuse reflection

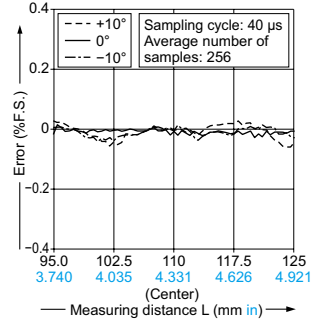
White ceramic ($0^\circ, \pm 10^\circ$)
Vertical orientation



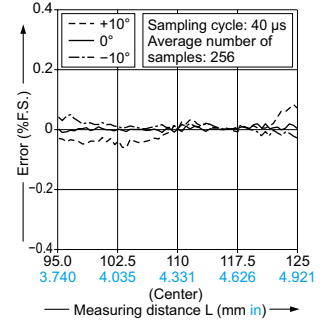
White ceramic ($0^\circ, \pm 10^\circ$)
Horizontal orientation



• Vertical orientation

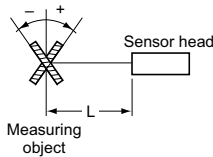


• Horizontal orientation

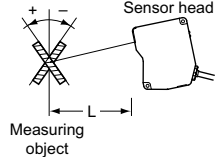


Setup mode: Specular reflection

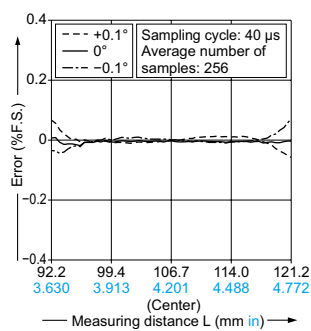
Aluminum vapor deposition
surface reflection mirror
($0^\circ, \pm 0.1^\circ$)
Vertical orientation



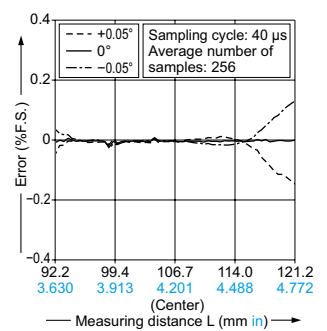
Aluminum vapor deposition
surface reflection mirror
($0^\circ, \pm 0.05^\circ$)
Horizontal orientation



• Vertical orientation



• Horizontal orientation

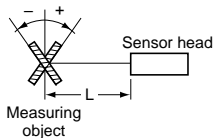


HL-C235BE HL-C235CE

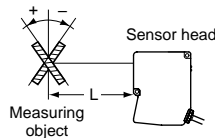
Correlation between measuring distance and error characteristics

Setup mode: Diffuse reflection

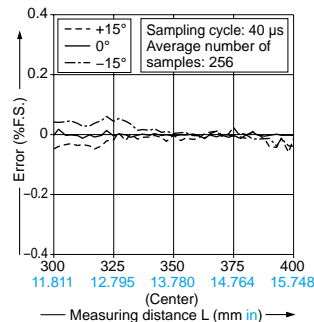
White ceramic ($0^\circ, \pm 15^\circ$)
Vertical orientation



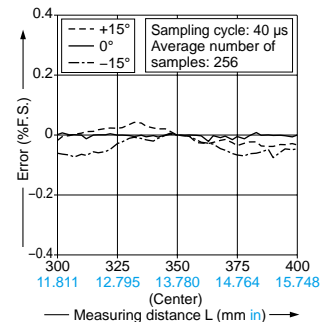
White ceramic ($0^\circ, \pm 15^\circ$)
Horizontal orientation



• Vertical orientation



• Horizontal orientation

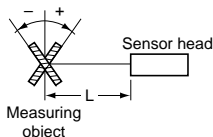


HL-C235CE-W

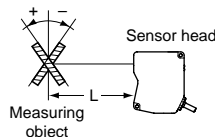
Correlation between measuring distance and error characteristics

Setup mode: Diffuse reflection

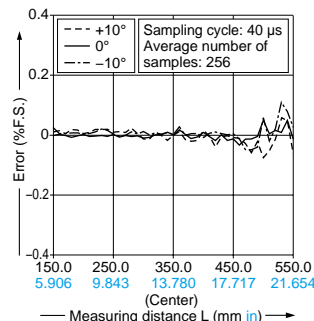
White ceramic ($0^\circ, \pm 10^\circ$)
Vertical orientation



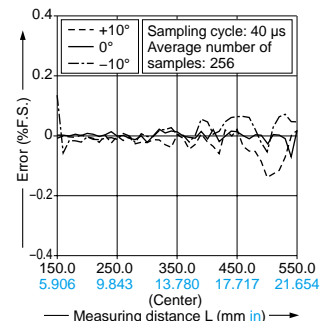
White ceramic ($0^\circ, \pm 10^\circ$)
Horizontal orientation



• Vertical orientation



• Horizontal orientation



PRECAUTIONS FOR PROPER USE

Refer to the instruction manual for details.

The instruction manual can be download from our website.

- This catalog is a guide to select a suitable product. Be sure to read instruction manual attached to the product prior to its use.



- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.
- Do not use in environments with flammable gases. Usage may cause an explosion.



- Do not operate products using methods other than those described in the instruction manual included with each product. Control or adjustment through procedures other than those specified may cause hazardous laser radiation exposure.
- The following labels are attached to the products. Handle each product according to the instruction given on the warning label.
- Types which comply with FDA regulations have an English label applied based on those FDA regulations.

HL-C201A(E)(-MK) / HL-C201A(E)-SP2(M) / HL-C201A(E)-SP3(M)

- This product is classified as a Class 1 Laser Product in IEC / JIS standards. Do not look at the laser beam through optical devices such as a lens.



HL-C203B(E)(-MK) / HL-C205B(E)(-MK) / HL-C208B(E)(-MK) / HL-C211B(E)(-MK) / HL-C235BE(-MK)

- This product is classified as a Class 2 Laser Product in IEC / JIS standards. Do not look at the laser beam directly or through optical devices such as a lens.



HL-C205C(E)(-MK) / HL-C208C(E)(-MK) / HL-C211C(E)(-MK) / HL-C235CE(-MK) / HL-C235CE-W(-MK)

- This product is classified as a Class 3R Laser Product in IEC / JIS standards. Never directly look at or touch the laser beam or its reflection.



- Do not use outside of specification ranges for ratings, environmental conditions, etc. Abnormal heat or smoke generation may occur.
- Do not disassemble or modify these products. Electrical shock or smoke generation may occur.
- Connect electrical wires securely with terminal screws. Imperfect connections may cause abnormal heat or smoke generation.
- Do not touch the terminal while power is being supplied to the product. Electrical shock may occur.

- Exports of models with a minimum resolution of under 0.25 μm 0.010 mil fall under Japanese Export Control, which is defined by "Foreign Exchange and Foreign Trade Act".

Therefore, anyone who wishes to export or transfer these products outside of Japan is required to obtain the necessary license from the Ministry of Economy, Trade and Industry of Japan.

Also, these products fall under international export control regulations, such as Nuclear Suppliers Group (NSG) guidelines 1.B.3.b.1 and Wassenaar Arrangement (WA) 2.B.6.b.1.a, and are objects of the regulation. Please comply with the export control in each country.

Note: These products are introduced to limited countries only. Please contact our office for details.

Warming up time

- To ensure the performance of the product, before use allow at least 30 minutes of warming up after turning on the power.

Safety standards for laser beam products

- A laser beam can harm human being's eyes, skin, etc., because of its high energy density. IEC and JIS have classified laser products according to the degree of hazard and the stipulated safety requirements.

Safe use of laser products

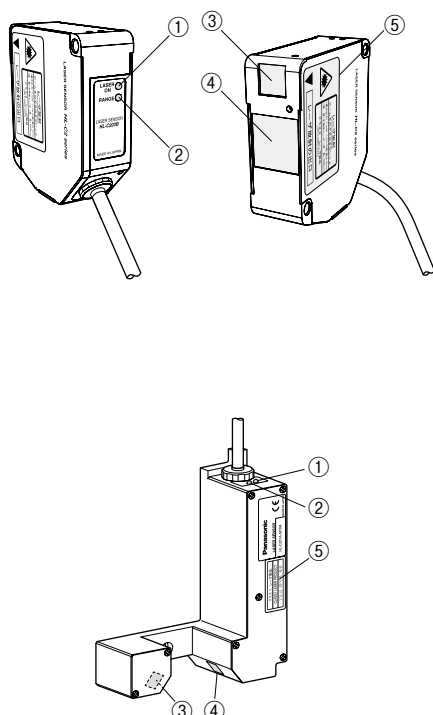
- For the purpose of preventing users from suffering injuries by laser products, IEC 60825-1(Safety of laser products). Please check the standards before use.

PRECAUTIONS FOR PROPER USE

Refer to the instruction manual for details.
The instruction manual can be download from our website.

Functional description

Sensor head

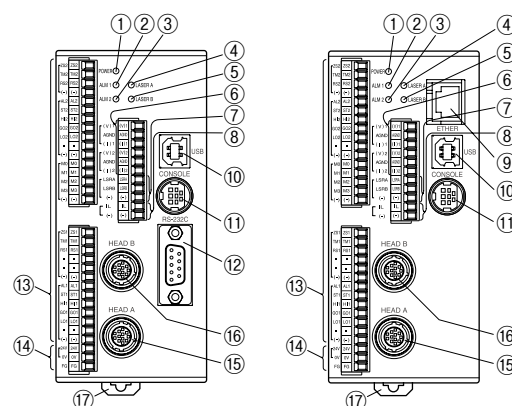


| | Description | Function |
|---|--|---|
| ① | Laser emission indicator (Green LED) | Lights up during laser emission. |
| ② | Measurement range indicator (Yellow LED) | Lights up when the target reaches the approximate center of the measurement. Blinks when the target enters within the measurement range. Turns off the light when the target goes out of the measurement range. |
| ③ | Light emitter | Emits the laser light. |
| ④ | Light receiver | Receives the laser specular light from a measurement target. |
| ⑤ | Warning label | Shows the laser emission position. Please read carefully before use. |

Controller

<RS-232C compatible>
HL-C2C□

<Ethernet compatible>
HL-C21C□



| | Description | Function |
|---|------------------------------------|--|
| ① | POWER indicator | Lights up in green when electricity is provided to the controller. |
| ② | ALM1 (Alarm) indicator | Abnormal condition indicator for OUT1. Lights up in red during dark status (poor light intensity) of OUT1 or the sensor head is in unconnected status. |
| ③ | ALM2 (Alarm) indicator | Abnormal condition indicator for OUT2. Lights up in red during dark status (poor light intensity) of OUT2 or the sensor head is in unconnected status. |
| ④ | LASER A indicator | Lights up in green during the laser radiation of Head A. |
| ⑤ | LASER B indicator | Lights up in green during the laser radiation of Head B. |
| ⑥ | Analog output terminal | Terminal for analog data output. |
| ⑦ | Laser control terminal | Stops laser emission in case of short-circuiting. |
| ⑧ | Remote interlock terminal | Stops laser emission when it's opened. |
| ⑨ | Ethernet connector | Equipped on HL-C21C□ models. Used for Ethernet communication with controllers. |
| ⑩ | USB connector | Used for communication with PC using USB. |
| ⑪ | Console connection connector | Used for connecting the console. |
| ⑫ | RS-232C connector | Equipped on HL-C2C□ models. Used for RS-232C communication with controllers. |
| ⑬ | I/O terminal | Terminal for various I/O and memory change. |
| ⑭ | Power terminal | Terminal for power supply to the controller. |
| ⑮ | Sensor head A connection connector | Controller recognizes a sensor head which is connected to this connector as "Sensor head A" and starts operation. |
| ⑯ | Sensor head B connection connector | Controller recognizes a sensor head which is connected to this connector as "Sensor head B" and starts operation. |
| ⑰ | DIN rail mounting hook | Used for hooking / removing the sensor heads to / from the 35 mm 1.378 in width DIN rail with one-touch simple operation. |

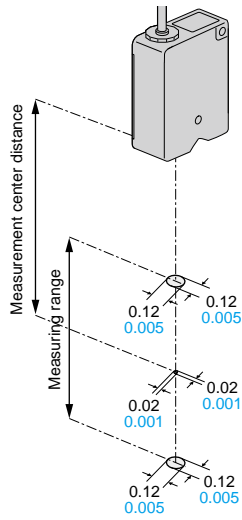
Note: In case of connecting one sensor head to the controller, be sure to connect the sensor head to ⑮ the sensor head A connection (HEAD A) side. If the sensor head is connected to ⑯ the sensor head B connection (HEAD B) side, the measurement cannot be performed.

PRECAUTIONS FOR PROPER USE

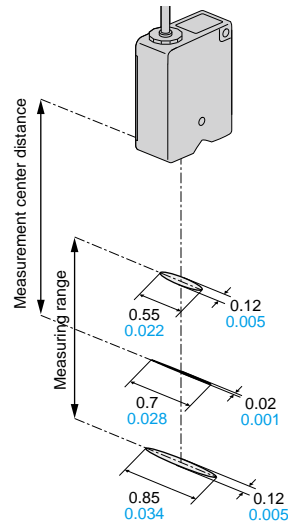
Refer to the instruction manual for details.
The instruction manual can be download from our website.

Beam size (Unit: mm in)

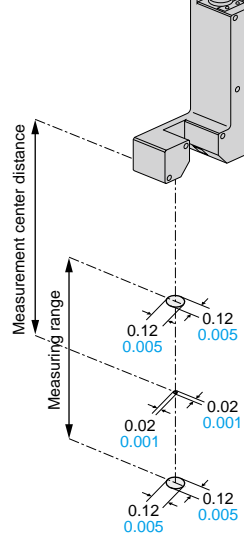
HL-C201□
Small beam spot type



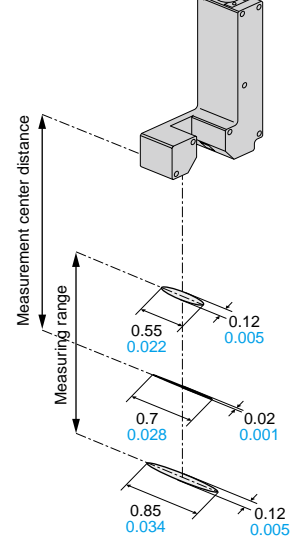
HL-C201□-MK
Linear beam spot type



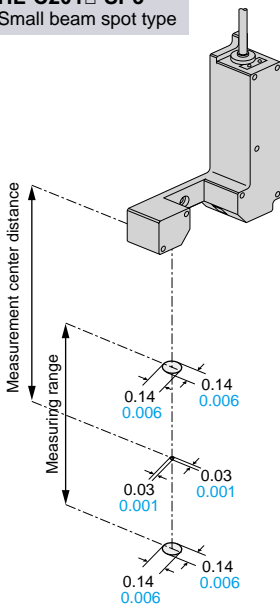
HL-C201□-SP2
Small beam spot type



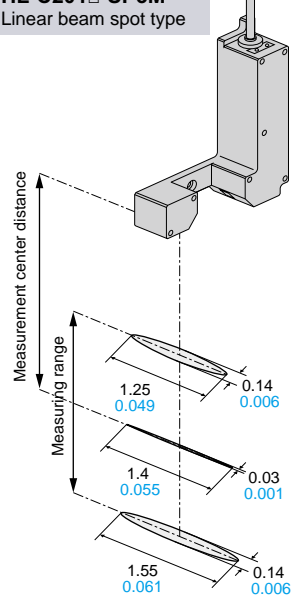
HL-C201□-SP2M
Linear beam spot type



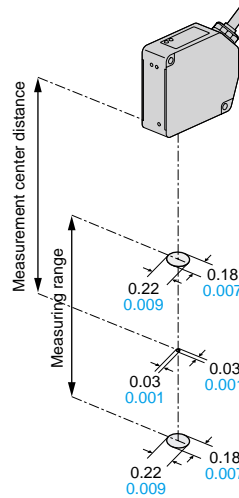
HL-C201□-SP3
Small beam spot type



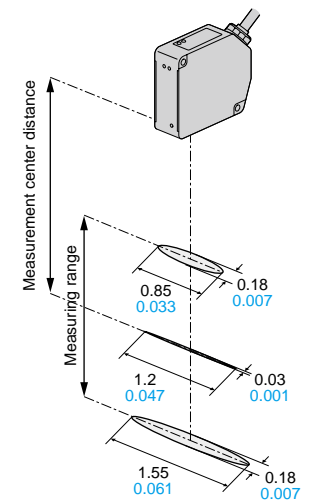
HL-C201□-SP3M
Linear beam spot type



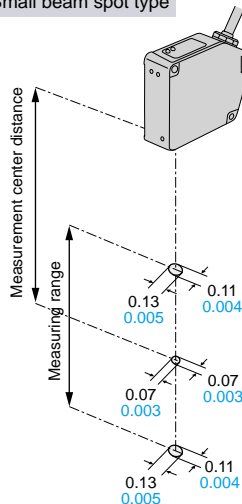
HL-C203□
Small beam spot type



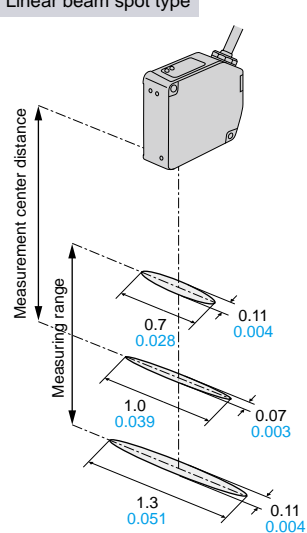
HL-C203□-MK
Linear beam spot type



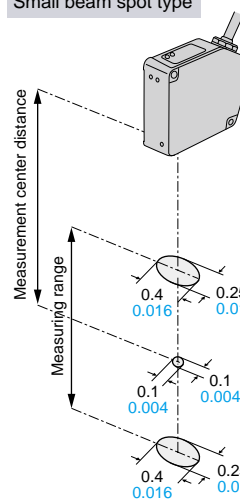
HL-C205□
Small beam spot type



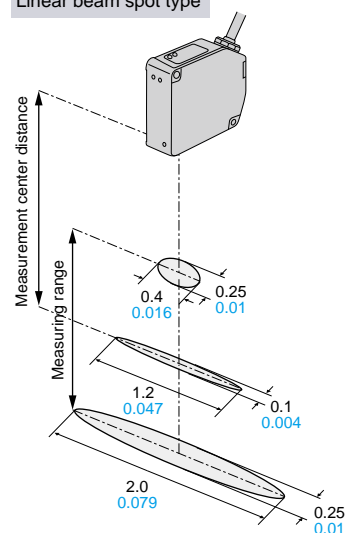
HL-C205□-MK
Linear beam spot type



HL-C208□
Small beam spot type



HL-C208□-MK
Linear beam spot type

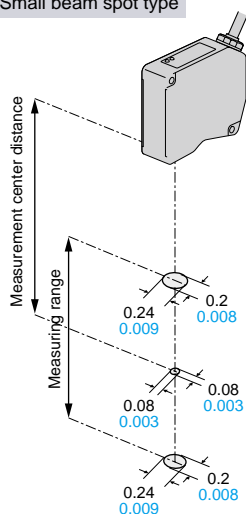


PRECAUTIONS FOR PROPER USE

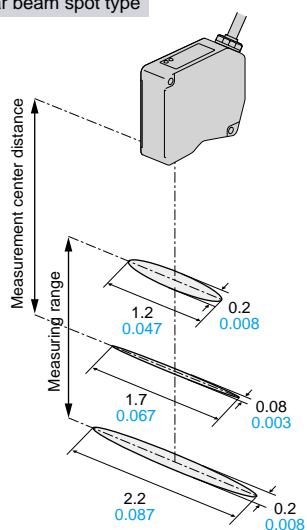
Refer to the instruction manual for details.
The instruction manual can be download from our website.

Beam size (Unit: mm in)

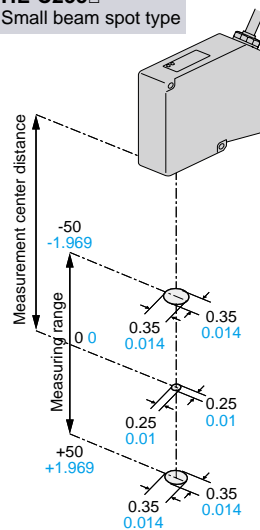
HL-C211□
Small beam spot type



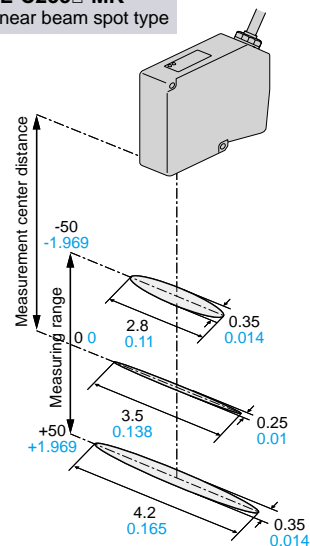
HL-C211□-MK
Linear beam spot type



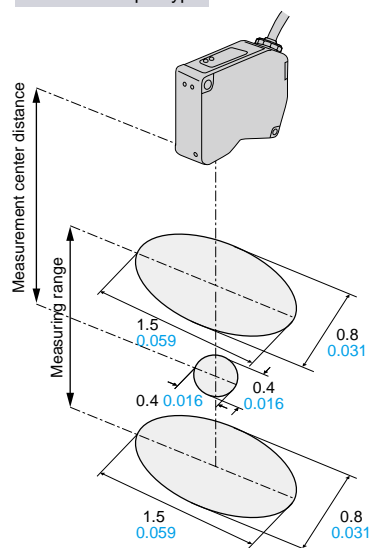
HL-C235□
Small beam spot type



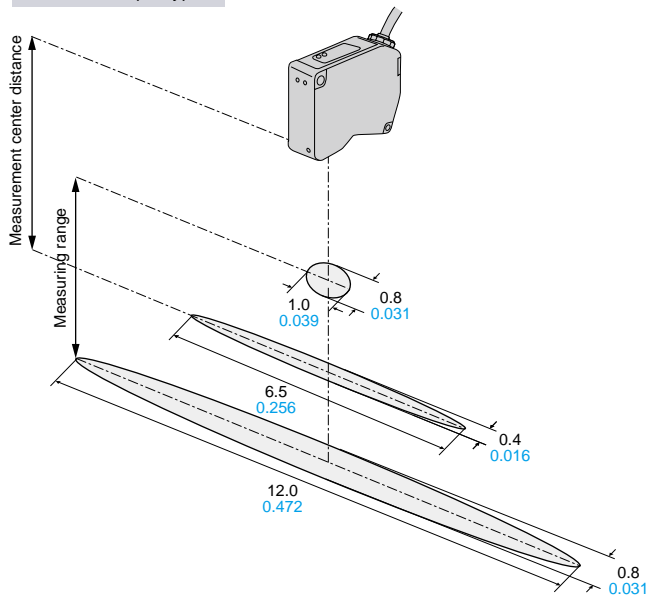
HL-C235□-MK
Linear beam spot type



HL-C235CE-W
Small beam spot type



HL-C235CE-WMK
Linear beam spot type



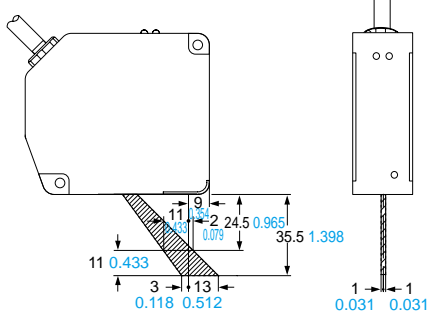
PRECAUTIONS FOR PROPER USE

Refer to the instruction manual for details.
The instruction manual can be download from our website.

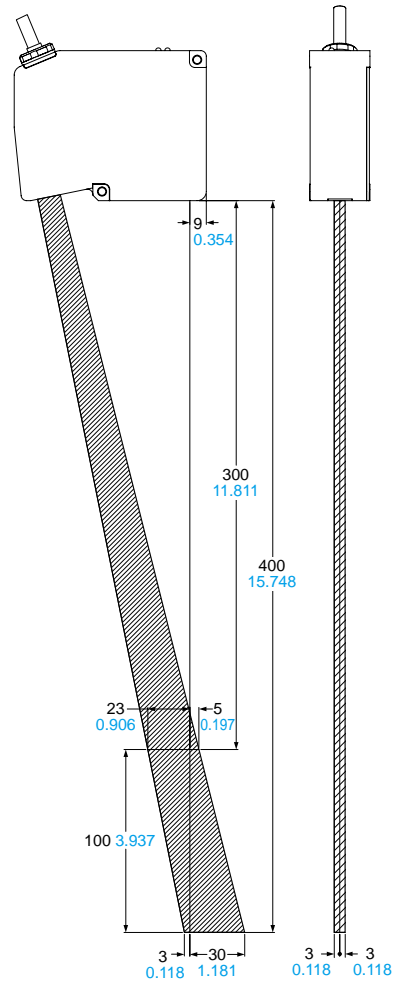
Mutual interference (Unit: mm in)

- When installing two or more sensor heads side by side, mutual interference will not occur if the laser spots from other sensor heads do not fall within the shaded areas in the figure below. When connecting two sensor heads to one controller, the mutual interference prevention function can be used. Therefore the measures shown below are not necessary in that case.

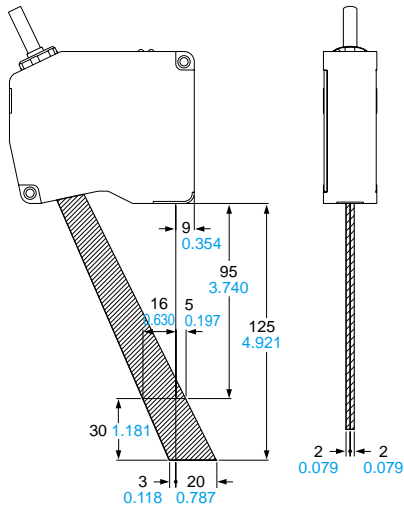
HL-C203□



HL-C235□



HL-C211□

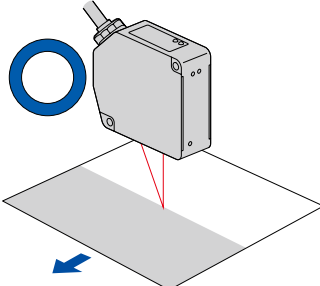


Sensor head mounting direction

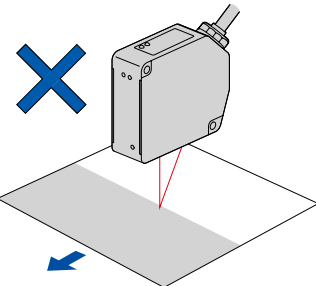
- To obtain the greatest precision, the sensor head should be oriented facing the direction of movement of the object's surface, as shown in the figure below.

Object with variations in material or color

<Correct>

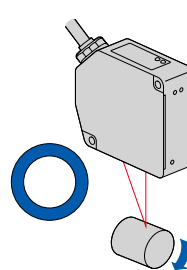


<Incorrect>

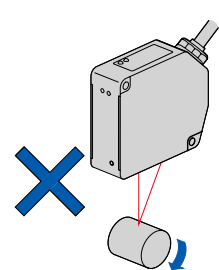


Rotating object

<Correct>

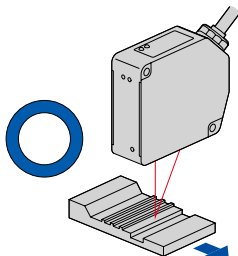


<Incorrect>

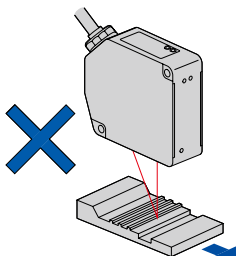


Object that has large differences in gaps and grooves

<Correct>



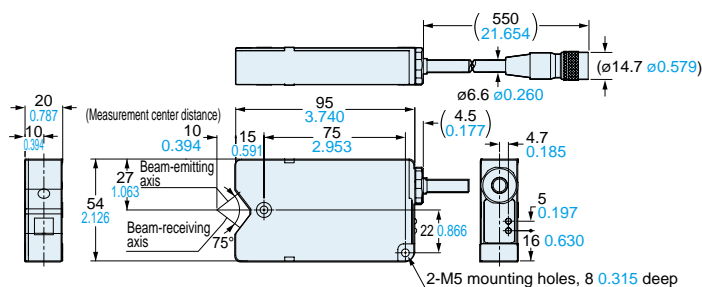
<Incorrect>



HL-C201□ HL-C201□-MK

Sensor head

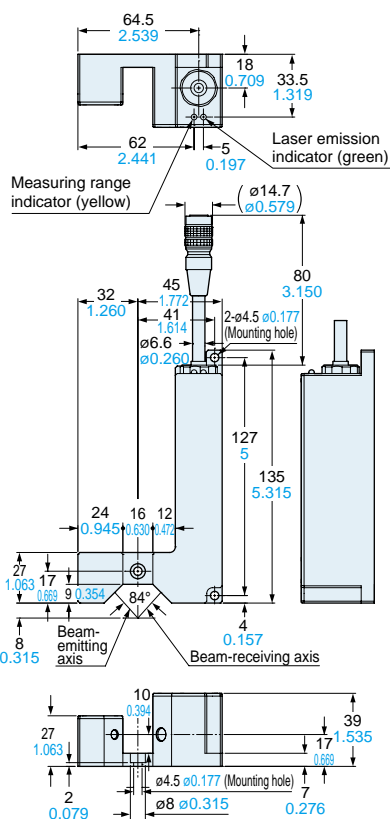
Setup mode: Specular reflection type



HL-C201□-SP2 HL-C201□-SP2M

Sensor head

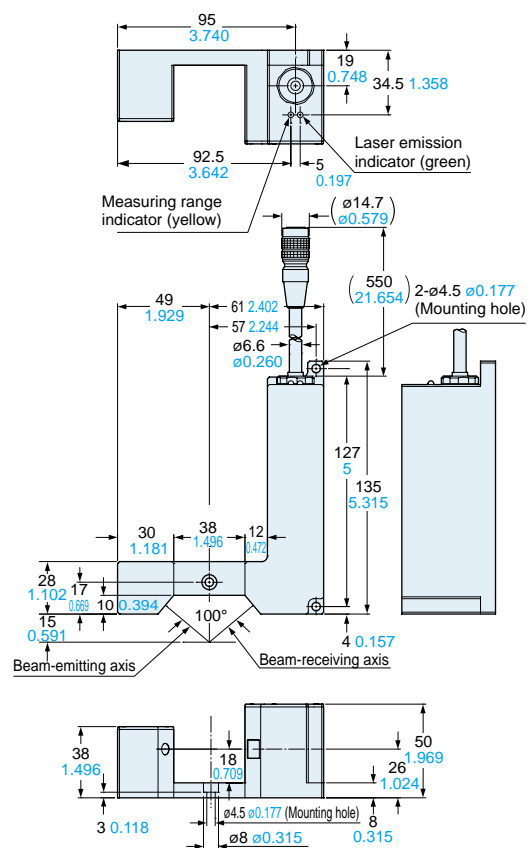
Setup mode: Specular reflection type



HL-C201□-SP3 HL-C201□-SP3M

Sensor head

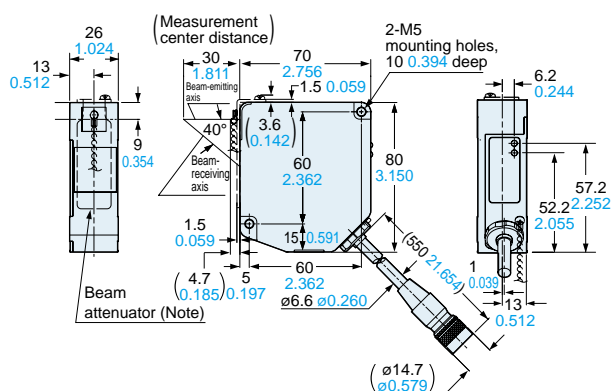
Setup mode: Specular reflection type



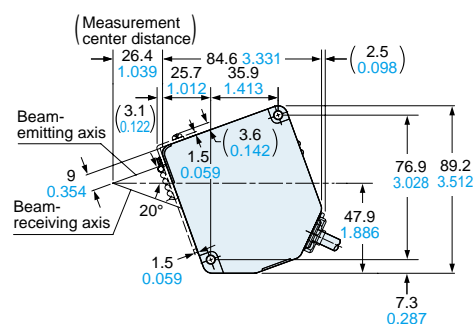
HL-C203□ HL-C203□-MK

Sensor head

Setup mode: Diffuse reflection type



Setup mode: Specular reflection type

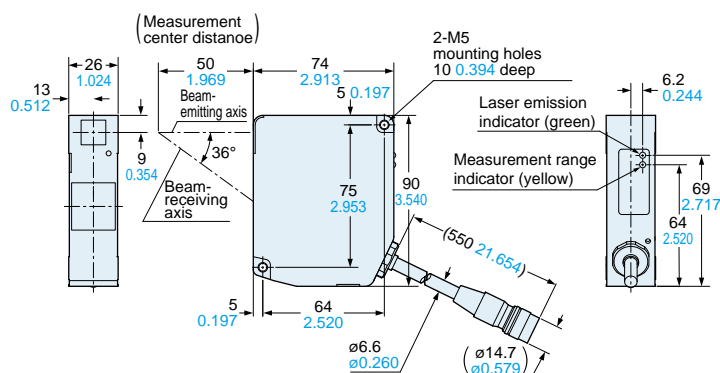


Note: A beam attenuator is not available for JIS / IEC conformed types.

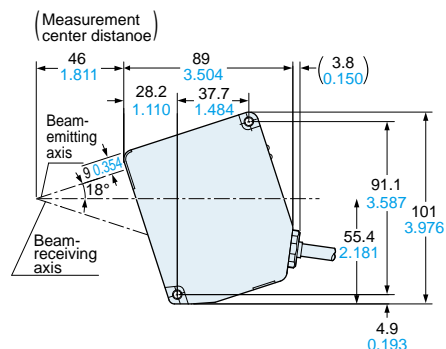
HL-C205□ HL-C205□-MK

Sensor head

Setup mode: Diffuse reflection type



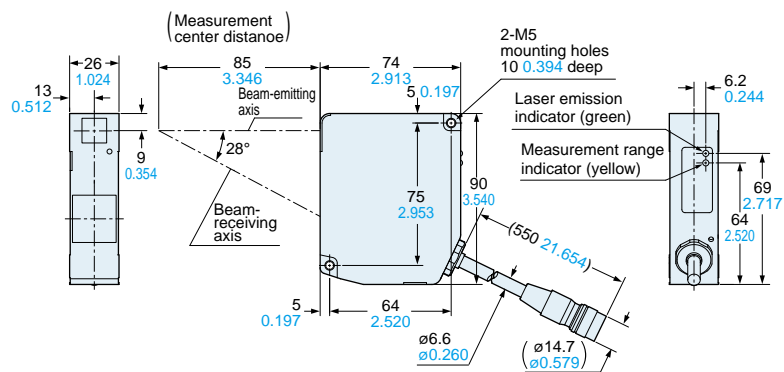
Setup mode: Specular reflection type



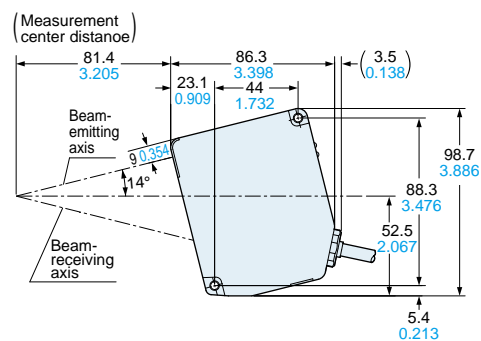
HL-C208 **HL-C208** **-MK**

Sensor head

Setup mode: Diffuse reflection type



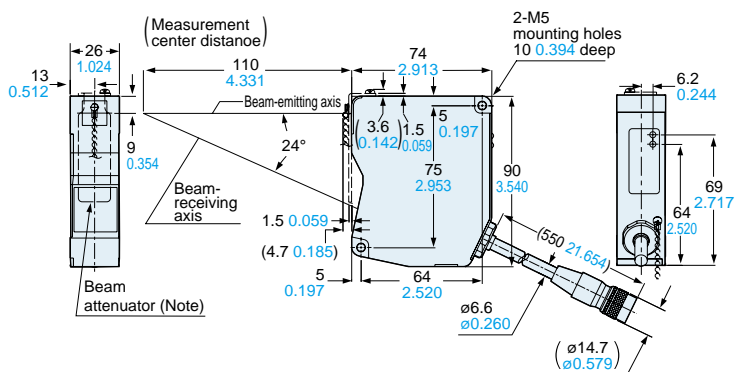
Setup mode: Specular reflection type



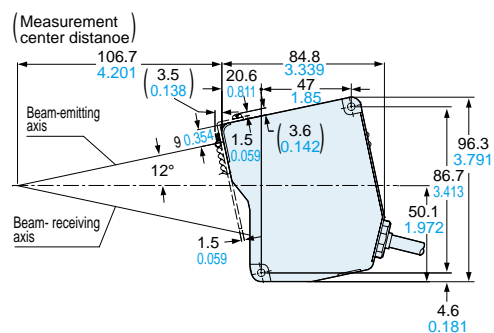
HL-C211□ HL-C211□-MK

Sensor head

Setup mode: Diffuse reflection type



Setup mode: Specular reflection type

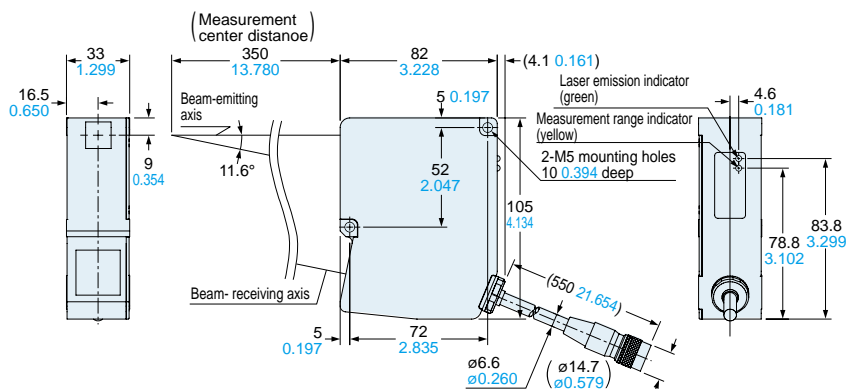


Note: A beam attenuator is not available for JIS / IEC conformed types.

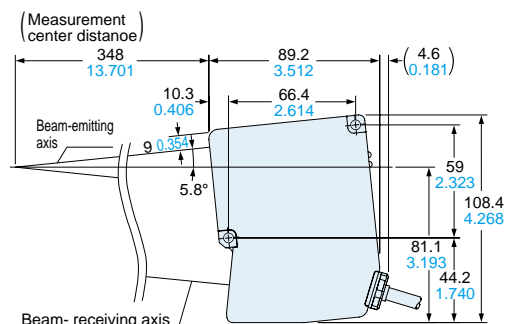
HL-C235□ HL-C235□-MK

Sensor head

Setup mode: Diffuse reflection type

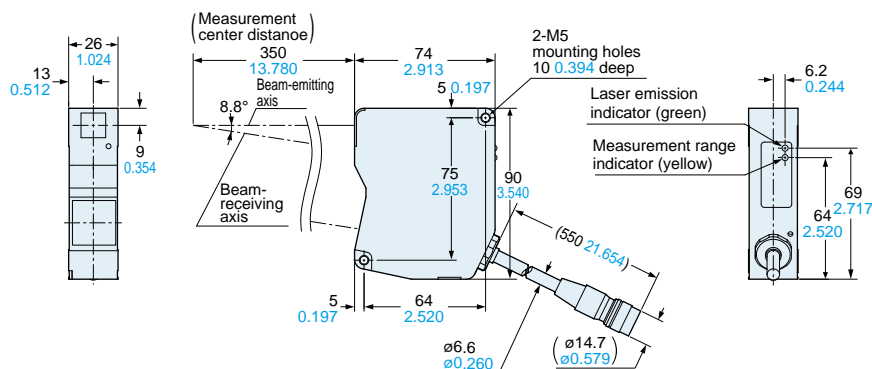


Setup mode: Specular reflection type



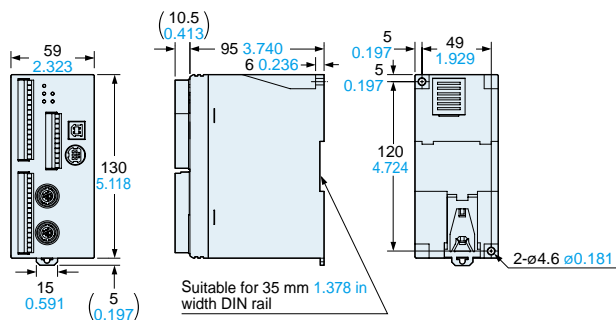
HL-C235CE-W HL-C235CE-WMK

Sensor head



HL-C2C **HL-C21C**

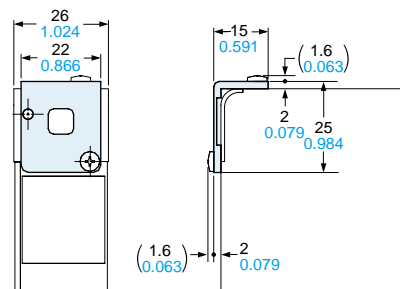
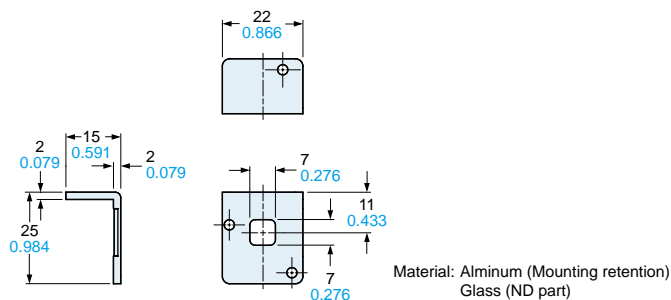
Controller



HL-C2F01

ND filter

Mounting drawing with a sensor head



Notes: 1) **HL-C201**□ cannot be mounted.

2) For **HL-C235□(-MK)** models, mounting is on 2 places on the front panel.

3) Cannot be attached to FDA conformed types when a beam attenuator is in use.

Introduction to our Laser Displacement Sensors and Micro Laser Distance Sensors

Laser Displacement Sensor **Compact**

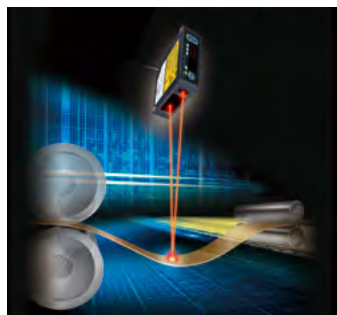


FDA
Conforming to FDA
regulations

HL-G1 SERIES

Precision measurement with a resolution of $0.5\ \mu\text{m}$ **0.02 mil** (HL-G103□). On-board controller for easy integration with other devices and production lines

A full range of models are available! We offer 10 diffuse reflection type models (Class 2) and 6 specular reflection type models (Class 1). These products excel in a variety of applications.



Micro Laser Distance Sensor **CMOS type**



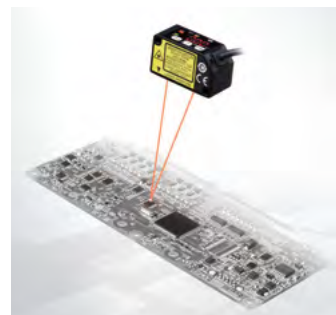
FDA
Conforming to FDA
regulations

HG-C SERIES

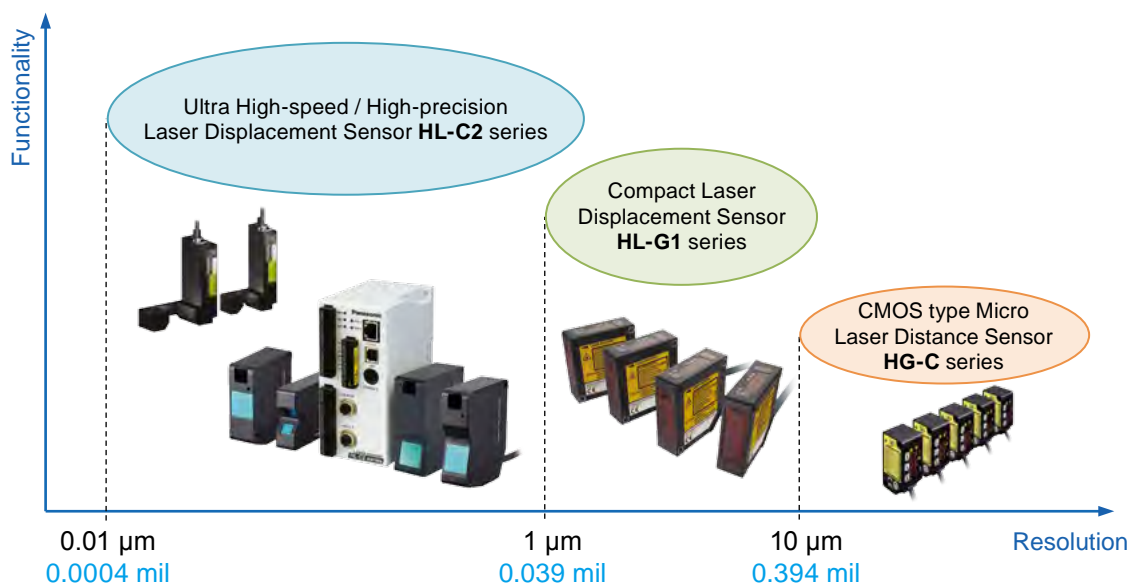
We have created CMOS laser sensor with a repeatable precision of $10\ \mu\text{m}$ **0.394 mil** for stable detection operation.

This product offers high-precision detection comparable to more expensive displacement sensors. It has an even smaller form-factor design, greater ease of installation, and a low price for competitive cost-performance. It can be used in equipment for working with circuit boards, in automobile assembly, and in various assembly and inspection processes.

- Repeatable precision of $10\ \mu\text{m}$ **0.394 mil** (HG-C1030□)
- Compact size of W20 x H44 x D25 mm **W0.787 x H1.732 x D0.984 in**
- Uses an inflection resistant cable



Selection Guide



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