SUNX

*Advanced intelligent Sensors*

NEW Ultra High-speed · High-precision Laser Displacement Sensor

HL-C2 SERIES

CE Conforming to EMC Directive

FDA Conforming to FDA regulations

# Going Above and Beyond


**HL-C201F**

10 mm
0.394 in
0.01 µm
0.0004 mil

**HL-C203F**

30 mm
1.181 in
0.025 µm
0.001 mil

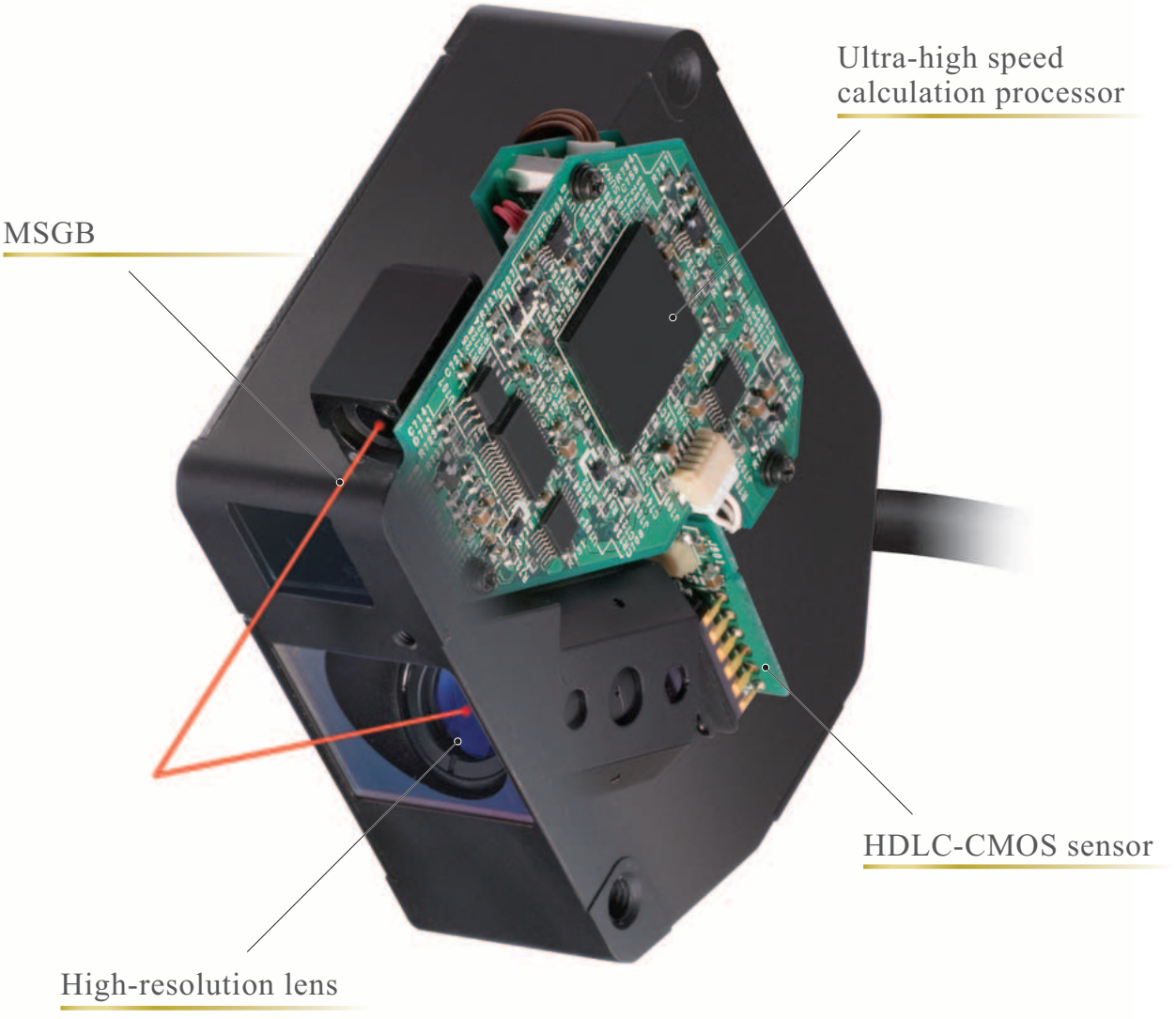
**HL-C211F5**

110 mm
4.331 in
0.1 µm
0.004 mil

At the industry's leading edge,
basic performance to
attend every need

# Fusion of basis and innovation

With the accumulated know-how in measurement technology together with the newest digital technology, we have created an excellent level of three basic performances at the industry's lead. The functionality and operability that underlie these technologies provide the highest satisfaction to our customers.




| Sampling | Linearity | Resolution |
|---|---|---|
| 100kHz | ±0.03% | 0.025μm |

Sensor Head Lineup

# The Industry's leading edge of basic performance Three Lineups

Compact · Ultra high-precision

Particularly for specular reflection use, best suited for high precise measurement of the thickness and spacing of FPD glass

**HL-C201F**

| Sampling | Linearity | Resolution |
|---|---|---|
| 100kHz | ±0.02% | 0.01μm |

10 ±1 mm
0.394 ±0.039 in


Ultra high-precision

Flagship model combined with high-speed and high-precision by our exclusive technology

**HL-C203F**

| Sampling | Linearity | Resolution |
|---|---|---|
| 100kHz | ±0.03% | 0.025μm |

30 ±5 mm
1.181 ±0.170 in

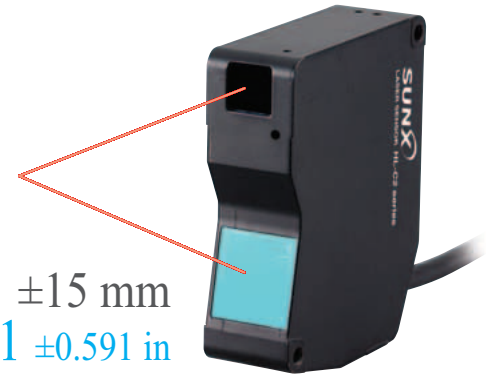

Mid-range · High precision

Applicable from metal to rubber, range and precision achieved at a high usability

**HL-C211F5**

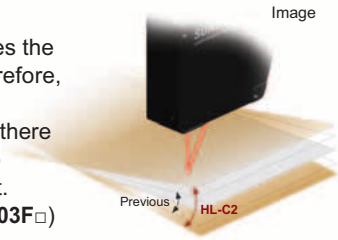
| Sampling | Linearity | Resolution |
|---|---|---|
| 100kHz | ±0.03% | 0.1μm |

110 ±15 mm
4.331 ±0.591 in



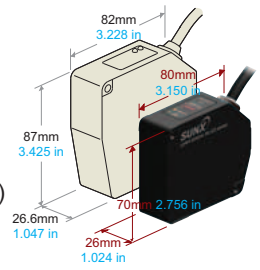

## Additional detection even under tilted object

Tilt tolerance has increased to 1.5 times the previous model; therefore, further detection is possible even when there is a fluctuation in the position of the object. (Applicable to **HL-C203F**□)



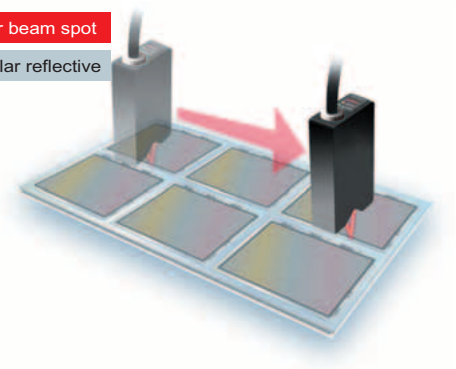

## Compact sensor head to save space

The volume ratio has reduced by 23% (from previous model) producing a compact sensor head to enable installation space down to the minimum. (Applicable to **HL-C203F**□)



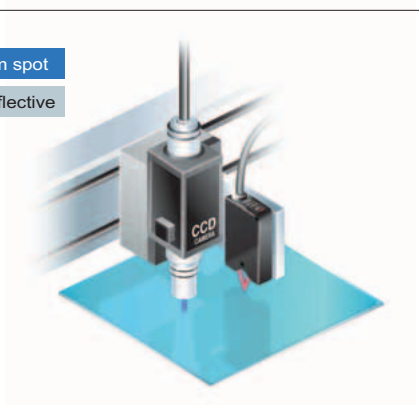
With the accumulated know-how in measurement technology together with the newest digital technology, SUNX has developed the industry's cutting edge **HL-C2** series to attend to every need from short to mid sensing range.

Linear beam spot
Specular reflective



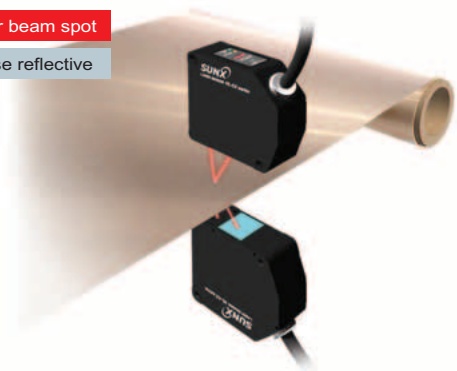
Measurement of the position of patterned glass

Small beam spot
Specular reflective



Control of the camera focus

Linear beam spot
Diffuse reflective

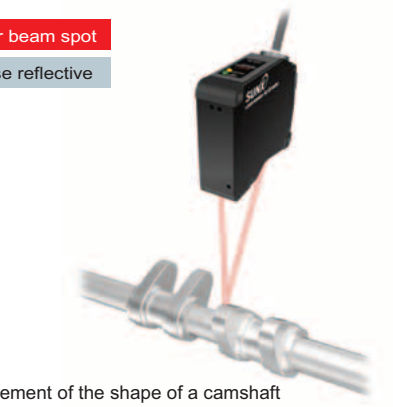


Measurement of the thickness of copper clad laminate

Small beam spot
Specular reflective

Measurement of HDD surface variations

Linear beam spot
Diffuse reflective



Measurement of the shape of a camshaft

Small beam spot
Diffuse reflective

Measurement of the heights of chip parts

## Linear beam spot and small beam spot

Small beam spot works best for minuscule sensing objects such as connector leg pins or limited measuring positions. Linear beam spot is best suited for metal's cutting surface or surface that has patterns which may cause diffuse reflection.

## Compatible with diffuse reflective and specular reflective

Selecting a suitable sensor may be difficult depending on the surface of the object. Even under such conditions, with just one sensor head setup mode can be selected while assuring stable sensing operation.
(**HL-C201F**□ is compatible with specular reflective only)

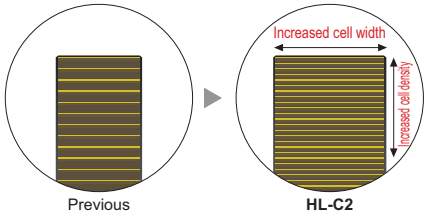
# HDLC-CMOS sensors

Resolution Sampling

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

■Comparison of cell structures (image)

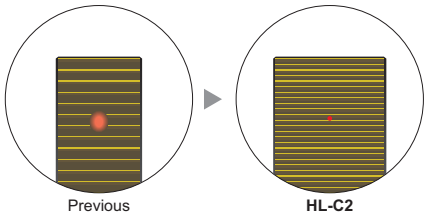


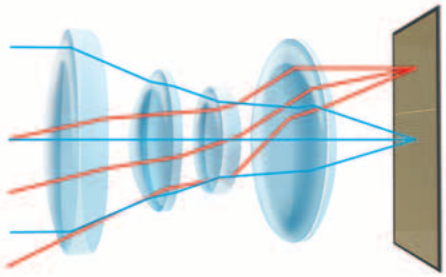

# High-resolution lens

Resolution Linearity

High-resolution lens has been newly designed to perfectly suit HDLC-CMOS sensors. The light-receiving part can create images at a minimum point from lights received from various angles to produce images with even greater precision.

■Comparison of beam quality



Image

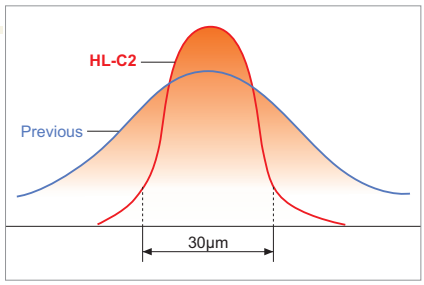
# MSGB

Linearity Resolution

Exclusive optical equipment and diaphragm structure sustain laser beam of high quality at a radiant density that is close to ideal in the Gaussian distribution. Emission intensity adjustment function, using the newest algorithm, is able to follow any deviation of the light receiving intensity instantaneously maintaining the best emitting condition at all times.

MSGB: Micro Spot Gaussian Beam

■Comparison of beam diameter

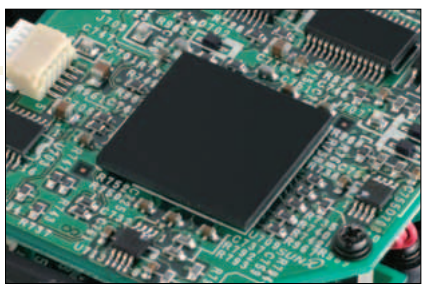



Image

# Ultra high-speed calculation processor

Sampling

All signals are digitalized by a high speed processor while achieving high precision and high speed with its exclusive algorithm.



Controller

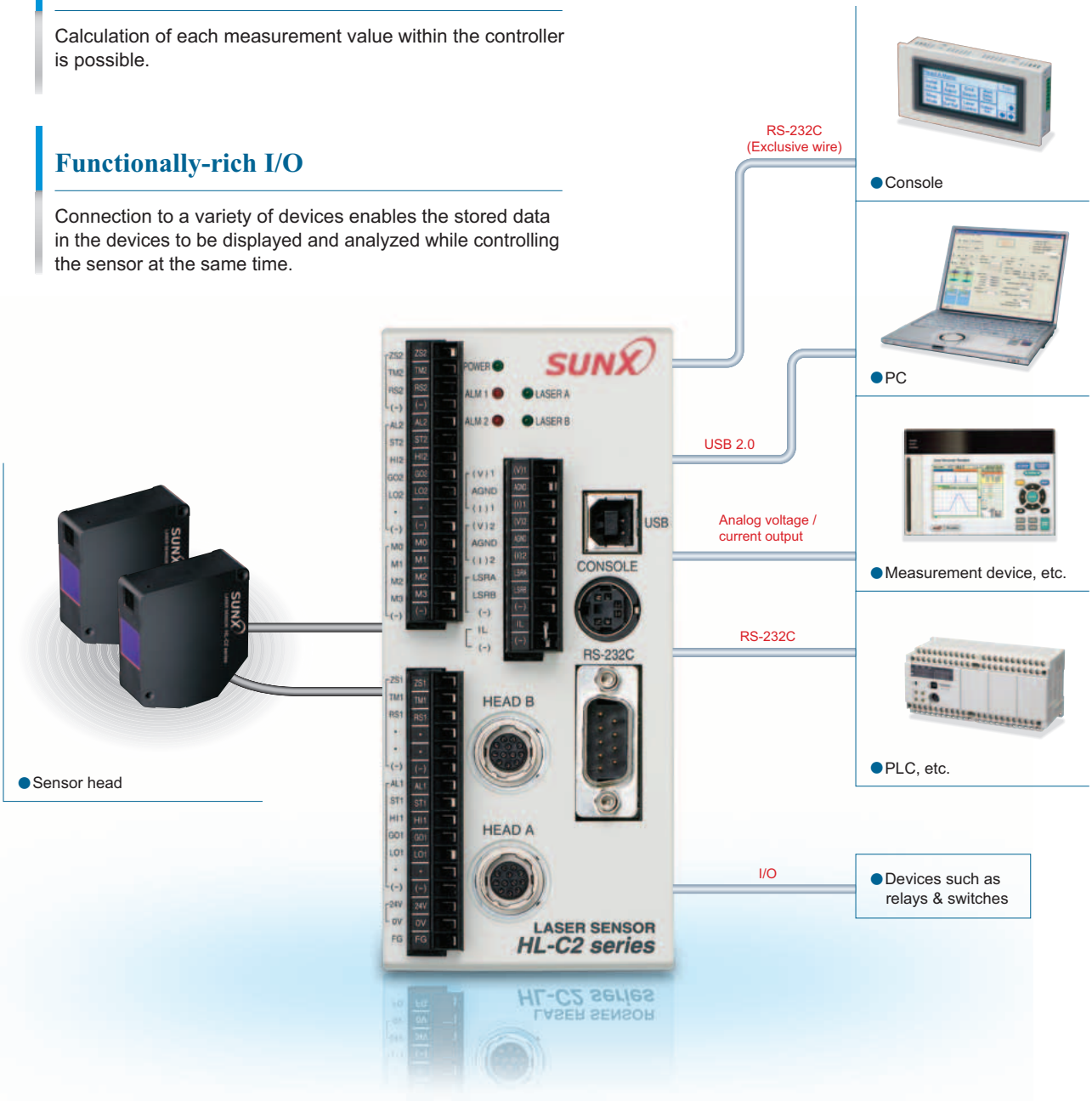
# Compact with a wide array of functions

## 2 sensor heads connection

Calculation of each measurement value within the controller is possible.

## Functionally-rich I/O

Connection to a variety of devices enables the stored data in the devices to be displayed and analyzed while controlling the sensor at the same time.




## Data buffering function

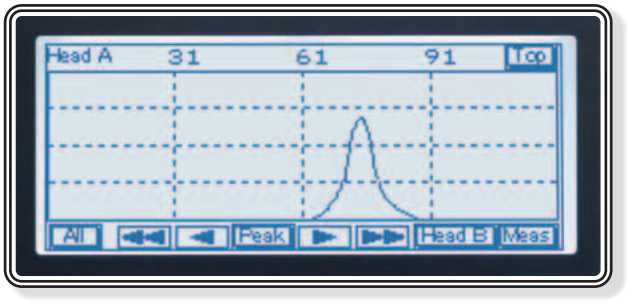
Using this function, about 65,000 pieces of measurement value data can be temporarily stored. All of these stored data can be utilized for comparison or analysis by loading them into computers.

Console

# Easy operation and simple display by a touch panel

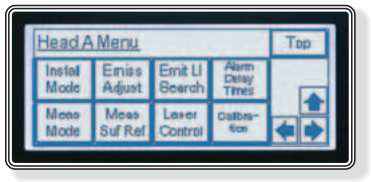
## Light receiving intensity in waveform display

Measurement values as well as wavelength of the light intensity are displayed.




## Condition setting function

Sensor head function and output conditions are displayed on the menu for which the order can be set easily.




## Measurement value data display function

Optimization of the setup of the sensor or light emitting intensity can be easily carried out. Functions such as hold and timer can also be inputted on the panel. White backlight enhances the overall visibility.




Intelligent Monitor

# Waveform monitoring and function setting by computer at great convenience

| | |
|---|---|
| OS | : Microsoft Windows XP / Windows 2000 |
| CPU | : Pentium Adapting CPU 1GHz or above |
| Memory | : 256MB or more |
| Hard disk | : 50MB or more of usable space |
| CD-ROM drive | : Required for installation |
| Display screen | : 1024 × 768 dot, 256 colors or above |
| Serial board | : RS-232C compliant, transmission speed 115.2kbps |
| USB board | : USB2.0 (USB1.1 compliant) |

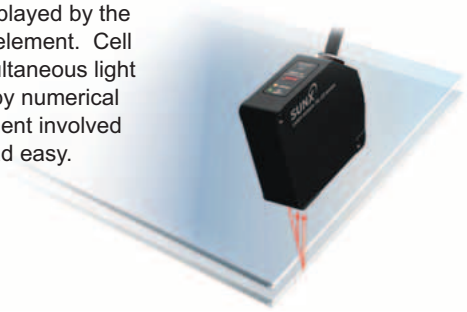
* System operation capabilities confirmed on English OS and Japanese OS.

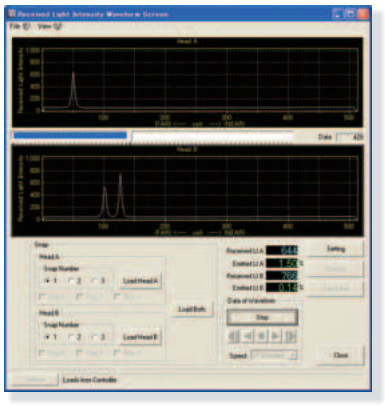
## Measurement value display

Measurement value and output status are displayed. 16 condition settings stored in the controller can be displayed on a list.


## Light receiving intensity in waveform display

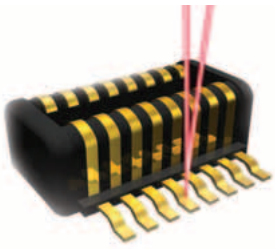
Light receiving intensity is displayed by the cell unit of the light receiving element. Cell position of the maximum simultaneous light receiving intensity displayed by numerical values helps to make adjustment involved in the setup of the sensor head easy.

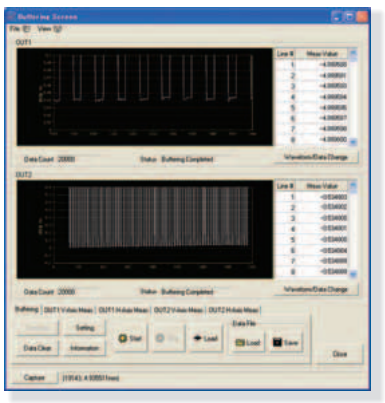




## Buffering display

Data stored in the controller by data buffering function can be loaded, and then waveform and data are displayed. Furthermore, procedures on how to store data, storage period, and storage amount can be set by the display.



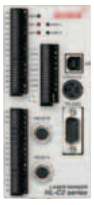


## ORDER GUIDE

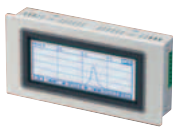
### Sensor heads

| Type | Appearance | Measurement center distance and measuring range | Resolution | Beam size | Model No. | Laser class |
|---|---|---|---|---|---|---|
| Small beam spot type |  | 10 ±1 mm<br>0.394 ±0.039 in | 0.01 µm<br>0.0004 mil | ø20 µm<br>0.787 mil approx. | **HL-C201F** | FDA: Class I<br>IEC: Class 1 |
| | | | 0.25 µm<br>0.01 mil | | **HL-C201FE** | |
| Linear beam spot type | | | 0.01 µm<br>0.0004 mil | 20 × 700 µm<br>27.559 mil approx. | **HL-C201F-MK** | |
| | | | 0.25 µm<br>0.01 mil | | **HL-C201FE-MK** | |
| Small beam spot type |  | 30 ±5 mm<br>1.811 ±0.170 in | 0.025 µm<br>0.001 mil | ø30 µm<br>1.181 mil approx. | **HL-C203F** | FDA: Class II<br>IEC: Class 2 |
| | | | 0.25 µm<br>0.01 mil | | **HL-C203FE** | |
| Linear beam spot type | | | 0.025 µm<br>0.001 mil | 30 × 1,200 µm<br>47.244 mil approx. | **HL-C203F-MK** | |
| | | | 0.25 µm<br>0.01 mil | | **HL-C203FE-MK** | |
| Small beam spot type |  | 110 ±15 mm<br>0.000 ±0.591 in | 0.1 µm<br>0.004 mil | ø80 µm<br>3.150 mil approx. | **HL-C211F** | FDA: Class II<br>IEC: Class 2 |
| | | | 0.25 µm<br>0.01 mil | | **HL-C211FE** | |
| | | | 0.1 µm<br>0.004 mil | | **HL-C211F5** | FDA: Class IIIa<br>IEC: Class 3R |
| | | | 0.25 µm<br>0.01 mil | | **HL-C211F5E** | |
| Linear beam spot type | | | 0.1 µm<br>0.004 mil | 80 × 1,700 µm<br>66.929 mil approx. | **HL-C211F-MK** | FDA: Class II<br>IEC: Class 2 |
| | | | 0.25 µm<br>0.01 mil | | **HL-C211FE-MK** | |
| | | | 0.1 µm<br>0.004 mil | | **HL-C211F5-MK** | FDA: Class IIIa<br>IEC: Class 3R |
| | | | 0.25 µm<br>0.01 mil | | **HL-C211F5E-MK** | |

### Controllers

| Type | | Appearance | Model No. | Applicable sensor head |
|---|---|---|---|---|
| High-resolution | NPN output |  | **HL-C2C** | **HL-C201F**(**-MK**)<br>**HL-C203F**(**-MK**)<br>**HL-C211F**(**-MK**)<br>**HL-C211F5**(**-MK**) |
| | PNP output | | **HL-C2C-P** | |
| Low-resolution | NPN output | | **HL-C2CE** | **HL-C201FE**(**-MK**)<br>**HL-C203FE**(**-MK**)<br>**HL-C211FE**(**-MK**)<br>**HL-C211F5E**(**-MK**) |
| | PNP output | | **HL-C2CE-P** | |

### Compact console

| Appearance | Model No. |
|---|---|
|  | **HL-C2DP-EX** |

### Options

| Designation | Appearance | Model No. | Description | |
|---|---|---|---|---|
| Intelligent monitor |  | **HL-C2AiM** | Enables the waveform display of each measurement condition setting and of measurement values as well as monitoring of measurement data and light receiving intensity data. | |
| 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 %) | |
| Sensor head extension cable |  | **HL-C2CCJ2** | Length: 2m 6.562 ft, Weight: 0.2 kg approx. | Cabtyre cable with connector on both ends<br>Cable outer diameter: ø6.6 mm ø0.260 in<br>Connector outer diameter: ø14.7 mm ø0.579 in max. |
| | | **HL-C2CCJ5** | Length: 5m 16.404 ft, Weight: 0.4 kg approx. | |
| | | **HL-C2CCJ10** | Length: 10m 32.808 ft, Weight: 0.7 kg approx. | |
| | | **HL-C2CCJ20** | Length: 20m 65.617 ft, Weight: 1.4 kg approx. | |
| | | **HL-C2CCJ30** | Length: 30m 98.425 ft, Weight: 2.0 kg approx. | |

## SPECIFICATIONS

### Sensor heads

| Item \ Type | Small beam spot type | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model No. | HL-C201F(E) | HL-C203F(E) | | HL-C211F(E) | | HL-C211F5(E) | |
| Setup mode | Specular reflective | Diffuse reflective | Specular reflective | Diffuse reflective | Specular reflective | Diffuse reflective | Specular reflective |
| Measurement center distance | 10 mm 0.394 in | 30 mm 1.181 in | 26.4 mm 1.039 in | 110mm 4.331 in | 106.7mm 4.201 in | 110mm 4.331 in | 106.7mm 4.201 in |
| Measuring range (Note 3) | ±1 mm ±0.039 in | ±5 mm ±0.197 in | ±4.6 mm ±0.181 in | ±15mm ±0.591 in | ±14.5mm ±0.571 in | ±15mm ±0.591 in | ±14.5mm ±0.571 in |
| Resolution [Average number of samples] (Note 4) | 0.04 µm 0.002 mil [256]<br>0.01 µm 0.0004 mil [4096]<br>(**HL-C201FE**: 0.25 µm 0.010 mil [256]) | 0.1 µm 0.0004 mil [256]<br>0.025 µm 0.001 mil [4096]<br>(**HL-C203FE**: 0.25 µm 0.010 mil [256]) | | 0.4 µm 0.0002 mil [256]<br>0.1 µm 0.0004 mil [4096]<br>(**HL-C211FE** and **HL-C211F5E**: 0.25 µm 0.010 mil [256]) | | | |
| Linearity (Note 5) | ±0.02% F.S. | ±0.03% F.S. | | | | | |
| Temprerature characteristics | 0.01% F.S./°C | | | | | | |
| Light source | Red semiconductor laser (Peak emission wavelength: 658 nm 0.026 mil) | | | | | | |
| | Class 1 (IEC / JIS),<br>Class I (FDA,Laser Notice No.50)<br>Max. output: 0.1 mW | Class 2 (IEC / JIS), Class II (FDA)<br>Max. output: 1 mW | | | | Class 3R (IEC / JIS), Class IIIa (FDA)<br>Max. output: 5 mW | |
| Beam size (Note 6) | ø20 µm 0.787 mil approx. | ø30 µm 1.181 mil approx. | | ø80 µm 3.150 mil approx. | | | |
| Receiving element | Linear image sensor | | | | | | |
| Indicator: Laser emission | Green LED (lights up during laser emission) | | | | | | |
| Indicator: Measuring range | Yellow LED<br>(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: Pollution degree | 3 (Industrial environment) | | | | | | |
| Environmental resistance: Protection | IP67 (IEC) (excluding the connector) | | | | | | |
| Environmental resistance: Ambient temperature | 0 to +45 °C +32 to +113 °F (No dew condensation), Storage: –20 to +70 °C –4 to +158 °F | | | | | | |
| Environmental resistance: Ambient humidity | 35 to 85 % RH, Storage: 35 to 85 % RH | | | | | | |
| Environmental resistance: Ambient illuminance | Incandescent light: 3,000 ℓx at the light-receiving face | | | | | | |
| Environmental resistance: Vibration resistance | 10 to 55 Hz (period: 1 min.) frequency, 1.5 mm 0.059 in amplitude in X,Y and Z directions for two hours each | | | | | | |
| Environmental resistance: Shock resistance | 196 m/s² acceleration (20 G approx.) in X,Y and Z directions for 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 | English warning label: 1 set [The FDA regulations conforming type includes a set of both the IEC label (written in English) and JIS label (written in Japanese)]. | | | | | | |

Notes: 1) **HL-C201F**, **HL-C203F**, **HL-C211F**, **HL-C211F5** fall under the Japanese Export Control. These products are introduced to limited countries only. Please refer to 'PRECAUTIONS FOR PROPER USE' on P.16.

2) Where measurement conditions have not been specified precisely, the conditions used were as follows: supply voltage 24 V DC, ambient temperature +20 °C +68 °F, sampling rate 40 µs, average number of samples: 256, measurement center distance, object measured is made of white ceramic [an aluminum vapor deposition surface reflection mirror was used **HL-C201F**(**E**)] and digital measurement values.

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

| Model No. | | HL-C201F(E) | HL-C203F(E) | | HL-C211F(E), HL-C211F5(E) | |
|---|---|---|---|---|---|---|
| Setup mode | | Specular reflective | Diffuse reflective | Specular reflective | Diffuse reflective | Specular reflective |
| Sampling | 20 µs | +0.1 to +1.0 mm<br>+0.004 to +0.039 in | 0 to +5.0 mm<br>0 to +0.197 in | 0 to +4.6 mm<br>0 to +0.181 in | +0.5 to +15.0 mm<br>+0.020 to +0.591 in | +0.5 to +14.5 mm<br>+0.020 to +0.571 in |
| | 10 µs | +0.8 to +1.0 mm<br>+0.032 to +0.039 in | +3.8 to +5.0 mm<br>+0.150 to +0.197 in | +3.6 to +4.6 mm<br>+0.142 to +0.181 in | +12.5 to +15.0 mm<br>+0.492 to +0.591 in | +12.5 to +14.5 mm<br>+0.492 to +0.571 in |

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

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

6) 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.

## SPECIFICATIONS

### Sensor heads

| Item \ Type | | Linear beam spot type | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model No. | | HL-C201F(E)-MK | HL-C203F(E)-MK | | HL-C211F(E)-MK | | HL-C211F5(E)-MK | |
| Setup mode | | Specular reflective | Diffuse reflective | Specular reflective | Diffuse reflective | Specular reflective | Diffuse reflective | Specular reflective |
| Measurement center distance | | 10 mm 0.394 in | 30 mm 1.181 in | 26.4 mm 1.039 in | 110mm 4.331 in | 106.7mm 4.201 in | 110mm 4.331 in | 106.7mm 4.201 in |
| Measuring range (Note 3) | | ±1 mm ±0.039 in | ±5 mm ±0.197 in | ±4.6 mm ±0.181 in | ±15mm ±0.591 in | ±14.5mm ±0.571 in | ±15mm ±0.591 in | ±14.5mm ±0.571 in |
| Resolution [Average number of samples] (Note 4) | | 0.04 µm 0.002 mil [256]<br>0.01 µm 0.0004 mil [4096]<br>(**HL-C201FE-MK**: 0.25 µm 0.010 mil [256]) | 0.1 µm 0.0004 mil [256]<br>0.025 µm 0.001 mil [4096]<br>(**HL-C203FE-MK**: 0.25 µm 0.010 mil [256]) | | 0.4 µm 0.0002 mil [256]<br>0.1 µm 0.0004 mil [4096]<br>(**HL-C211FE-MK** and **HL-C211F5E-MK**: 0.25 µm 0.010 mil [256]) | | | |
| Linearity (Note 5) | | ±0.02% F.S. | ±0.03% F.S. | | | | | |
| Tempreature characteristics | | 0.01% F.S./°C | | | | | | |
| Light source | | Red semiconductor laser (Peak emission wavelength: 658 nm 0.026 mil) | | | | | | |
| | | Class 1 (IEC / JIS),<br>Class I (FDA,Laser Notice No.50)<br>Max. output: 0.1 mW | Class 2 (IEC / JIS), Class II (FDA)<br>Max. output: 1 mW | | | | Class 3R (IEC / JIS), Class IIIa (FDA)<br>Max. output: 5 mW | |
| Beam size (Note 6) | | 20 × 700 µm<br>0.787 × 27.560 mil approx. | 30 × 1200 µm<br>1.181 × 47.244 mil approx. | | 80 × 1700 µm 3.150 × 66.929 mil approx. | | | |
| Receiving element | | Linear image sensor | | | | | | |
| Indicator | Laser emission | Green LED (lights up during laser emission) | | | | | | |
| | Measuring range | Yellow LED<br>(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 | Pollution degree | 3 (Industrial environment) | | | | | | |
| | Protection | IP67 (IEC) (excluding the connector) | | | | | | |
| | Ambient temperature | 0 to +45 °C +32 to +113 °F (No dew condensation), 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 at the light-receiving face | | | | | | |
| | Vibration resistance | 10 to 55 Hz (period: 1 min.) frequency, 1.5 mm 0.059 in amplitude in X,Y and Z directions for two hours each | | | | | | |
| | Shock resistance | 196 m/s² acceleration (20 G approx.) in X,Y and Z directions for 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 | | English warning label: 1 set [The FDA regulations conforming type includes a set of both the IEC label (written in English) and JIS label (written in Japanese)]. | | | | | | |

Notes: 1) **HL-C201F-MK**, **HL-C203F-MK**, **HL-C211F-MK**, **HL-C211F5-MK** fall under the Japanese Export Control. These products are introduced to limited countries only. Please refer to 'PRECAUTIONS FOR PROPER USE' on P.16.

2) Where measurement conditions have not been specified precisely, the conditions used were as follows: supply voltage 24 V DC, ambient temperature +20 °C +68 °F, sampling rate 40 µs, average number of samples: 256, measurement center distance, object measured is made of white ceramic [an aluminum vapor deposition surface reflection mirror was used **HL-C201F(E)-MK**] and digital measurement values.

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

| Model No. | | HL-C201F(E)-MK | HL-C203F(E)-MK | | HL-C211F(E)-MK, HL-C211F5(E)-MK | |
|---|---|---|---|---|---|---|
| Setup mode | | Specular reflective | Diffuse reflective | Specular reflective | Diffuse reflective | Specular reflective |
| Sampling | 20 µs | +0.1 to +1.0 mm<br>+0.004 to +0.039 in | 0 to +5.0 mm<br>0 to +0.197 in | 0 to +4.6 mm<br>0 to +0.181 in | +0.5 to +15.0 mm<br>+0.020 to +0.591 in | +0.5 to +14.5 mm<br>+0.020 to +0.571 in |
| | 10 µs | +0.8 to +1.0 mm<br>+0.032 to +0.039 in | +3.8 to +5.0 mm<br>+0.150 to +0.197 in | +3.6 to +4.6 mm<br>+0.142 to +0.181 in | +12.5 to +15.0 mm<br>+0.492 to +0.591 in | +12.5 to +14.5 mm<br>+0.492 to +0.571 in |

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

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

6) 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.

## SPECIFICATIONS

### Controllers

| Item \ Type | NPN output type | PNP output type |
|---|---|---|
| Mode No. | **HL-C2C(E)** | **HL-C2C(E)-P** |
| 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<br>350 mA approx. at 1 sensor head connected<br>(100 mA approx. is additionally required when the mini console is connected) | |
| Sampling cycle | 10 µs, 20 µs, 40 µs, 100 µs, 200 µs, 400 µs, 1 ms, 2 ms | |
| Analog output — Voltage (Note 1) | Voltage output scale: –5 to +5 V/F.S (initial value)<br>Output range during normal status: –10.0 to +10.0 V<br>Output at abnormal status: –10.8 V or +10.8 V<br>Resolution: 2 mV, Linearity: ±0.05 % F.S.<br>Max. 2 mA, output impedance 50 Ω, Response delay time: 1.5 µs/V approx. | |
| Analog output — Current (Note 2) | Current output scale: 4 to 20 mA/F.S (initial value)<br>Output range during normal status: 2 to 24 mA<br>Output at abnormal status: 1 mA or 25 mA<br>Resolution: 3 µA, Linearity ±0.05% F.S.<br>Load impedance: 250 Ωmax., Response delay time: 10 µs approx. | |
| Alarm output | NPN open-collector transistor<br>• Maximum sink current: 100 mA<br>• Applied voltage: 30 V DC or less (between alarm output and Common(–))<br>• Residual voltage: 1 V or less (at 100 mA sink current) | PNP open-collector transistor<br>• Maximum source current: 100 mA<br>• Applied voltage: 30 V DC or less (between alarm output and +V)<br>• Residual voltage: 1 V or less (at 100 mA source current) |
| Alarm output — Output operation | Opened when the amount of light is insufficient | |
| Alarm output — Short-circuit protection | Incorporated | |
| Judgment output (HI, GO, LO) | NPN open-collector transistor<br>• Maximum sink current: 100 mA<br>• Applied voltage: 30 V DC or less (between judgment output to Common(–))<br>• Residual voltage: 1 V or less (at 100 mA sink current) | PNP open-collector transistor<br>• Maximum source current: 100 mA<br>• Applied voltage: 30 V DC or less (between judgment output to +V)<br>• Residual voltage: 1 V or less (at 100 mA source current) |
| Judgment output — Output operation | Opened at output operation | |
| Judgment output — Short-circuit protection | Incorporated | |
| Strobe output | NPN open-collector transistor<br>• Maximum sink current: 100 mA<br>• Applied voltage: 30 V DC or less (between strobe output to Common(–))<br>• Residual voltage: 1 V or less (at 100 mA sink current) | PNP open-collector transistor<br>• Maximum source current: 100 mA<br>• Applied voltage: 30 V DC or less (between strobe output to +V)<br>• Residual voltage: 1 V or less (at 100 mA source current) |
| Strobe output — Output operation | Opened at data determination | |
| Strobe output — Short-circuit protection | Incorporated | |
| Remote interlock input | Laser emission is delayed when connected to Common (–).<br>Laser emission stop at open<br>Applied voltage: 30 V DC or less<br>(Leak current: 0.1 mA or less) | Laser emission is delayed when connected to IL (+).<br>Laser emission stop at open<br>Applied voltage: 30 V DC or less<br>(Leak current: 0.1 mA or less) |
| Laser control input | Laser emission is stopped when connected to Common (–).<br>Laser is emitted immediately after opened.<br>Applied voltage: 30 V DC or less<br>(Leak current: 0.1 mA or less) | Laser emission is stopped when connected to external power (+).<br>Laser is emitted immediately after opened.<br>Applied voltage: 30 V DC or less<br>(Leak current: 0.1 mA or less) |
| Zero set input | Zero set is ON when connected with Common (–).<br>Zero set turns to OFF after continuously connected to Common (–) for one second.<br>Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) | Zero set is ON when connected with external power (+).<br>Zero set turns to OFF after continuously connected to external power (+) for one second.<br>Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less) |
| Timing input | ON at/during connection to Common (–)<br>(depending on analysis mode)<br>Applied voltage: 30 V DC or less<br>(Leak current: 0.1 mA or less) | ON at/during connection to external power (+)<br>(depending on analysis mode)<br>Applied voltage: 30 V DC or less<br>(Leak current: 0.1 mA or less) |
| Reset input | Reset is done when connected to Common (–).<br>Applied voltage: 30 V DC or less<br>(Leak current: 0.1 mA or less) | Reset is done when connected to external power (+).<br>Applied voltage: 30 V DC or less<br>(Leak current: 0.1 mA or less) |
| Memory change input | Memory is specified when connected to Common (–).<br>Applied voltage: 30 V DC or less<br>(Leak current: 0.1 mA or less) | Memory is specified when connected to external power (+).<br>Applied voltage: 30 V DC or less<br>(Leak current: 0.1 mA or less) |

# SPECIFICATIONS

## Controllers

| Item \ Type | | NPN output type | PNP output type |
|---|---|---|---|
| Item \ Mode No. | | **HL-C2C(E)** | **HL-C2C(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) | |
| RS-232C interface | | Baud rate: 9,600, 19,200, 38,400, 115,200 bit/s | |
| USB interface | | USB 2.0 Full-speed (USB 1.1 compatible) compliant | |
| Setting / data display | | Compact console (optional) | |
| 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 amplitude in X, Y and Z directions for 30 min. each | |
| | Shock resistance | 196 m/s² acceleration (20G approx.) in X, Y, and Z directions for 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. | |

Notes: 1) **HL-C2C** and **HL-C2C-P** fall under the Japanese Export Control. These products are introduced to limited countries only. Please refer to 'PRECAUTIONS FOR PROPER USE' on P.16.
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.

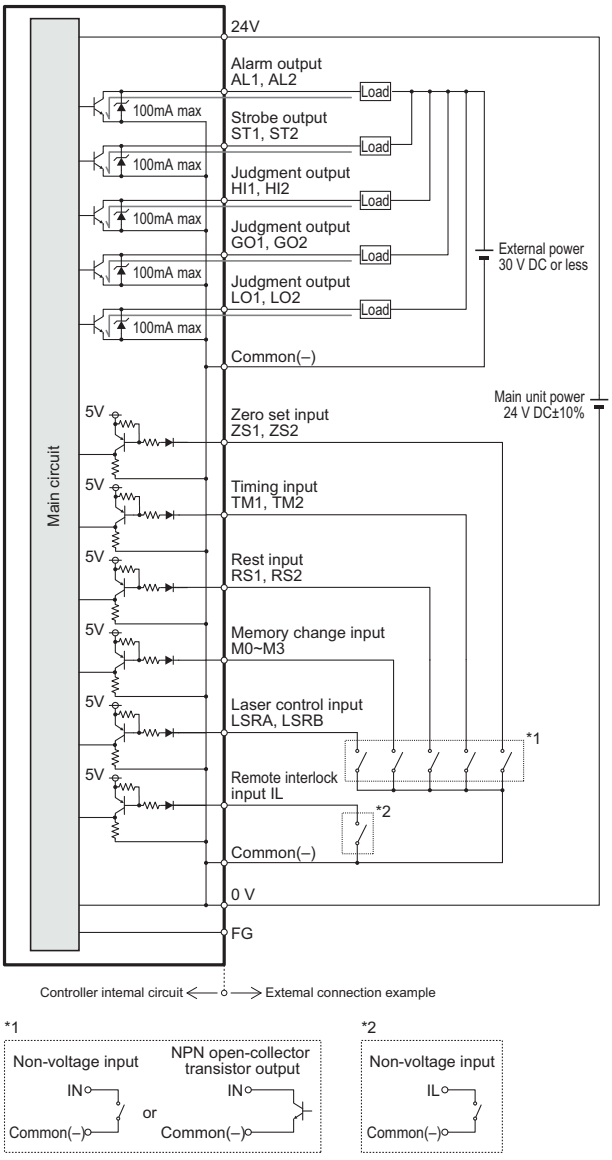
## Compact console

| Item \ Model No. | | **HL-C2DP-EX** |
|---|---|---|
| Power | | Supplied by controller |
| Display | Display element | STN monochrome LCD |
| | Back light | White LED |
| | Display range | –999.999999 to 999.999999 |
| | Language | English |
| Touch panel | Operational force | 0.5 N or less |
| | Lifetime | 1,000,000 times or more (Note 1) |
| Environmental resistance | Environment resistance | IP65 (at initial status) (Note 2)<br>Dust prevention and drip-proof at the front panel (waterproof packing is used at the contact surface to board) |
| | Ambient temperature | 0 to +50 °C +32 to +122 °F (No dew condensation or icing allowed), Storage: –20 to +60 °C –4 to +140 °F |
| | Ambient humidity | 20 to 85 %RH, Storage: 10 to 85 %RH |
| | Electrostatic noise resistance | 5,000 V or more (panel surface) |
| | Vibration resistance | 10 to 55 Hz frequency, 0.75 mm 0.030 in amplitude in X, Y, and Z directions for 10 min. each |
| | Shock resistance | 98 m/s² or more acceleration (10G approx.) in X, Y, and Z directions for four times each |
| Material | | Case: PPE, Front protective sheet: Polyester |
| Weight | | 230 g approx. |
| Accessory | | Connector cable for connecting the controller to the console : 1 pc., Mounting bracket: 1 set |

Notes: 1) This value indicates the average lifetime of the unit when used under a normal temperature of 25 °C +77 °F.
2) When reinstalling the console, replace the water proof packing. (Matsushita Electric Works, Ltd., Part No: AIGT181, 10 packs included)

## I/O CIRCUIT AND WIRING DIAGRAMS (CONTROLLERS)

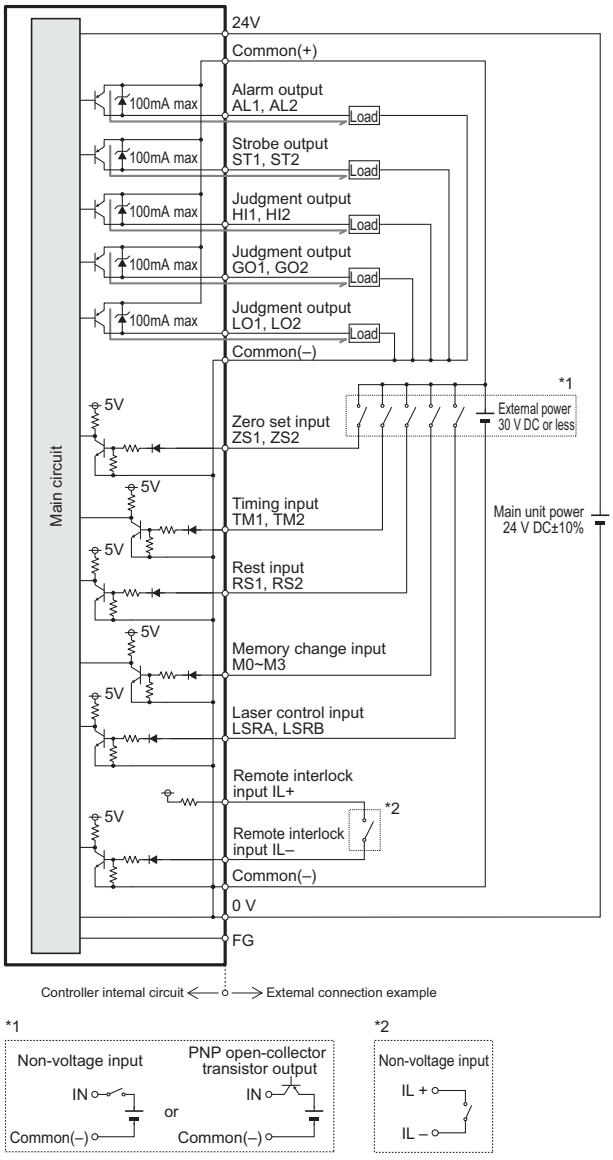
### NPN output type







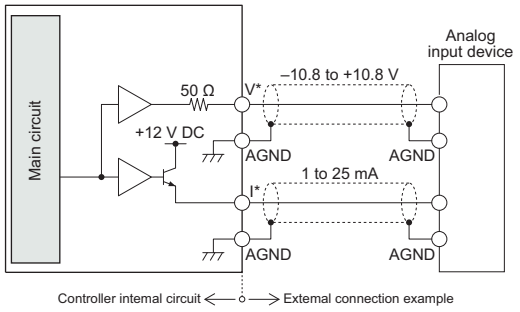
### PNP output type







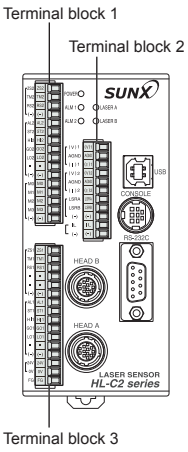
**Analog output** (Common in NPN output type and PNP output type)




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

## I/O CIRCUIT AND WIRING DIAGRAMS (CONTROLLERS)

### Terminal arrangement




**Terminal block 1**

| Terminal NPN | Terminal PNP | 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)<br>Laser stop during short circuit |
| LSRB | | Laser control input (for Head B)<br>Laser stop during short circuit |
| (–) | | Common (–) |
| IL | IL- | Remote interlock Laser stop when opened. |
| (–) | IL+ | Remote interlock common |

**Terminal block 2**

| Terminal NPN | Terminal PNP | Function |
|---|---|---|
| ZS2 | | Zero set input (for OUT2) ON during short circuit* |
| 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) |
| (–) | (+) | Common (–) / Common (+) |
| M0 | | Memory change (16 ways) |
| M1 | | |
| M2 | | |
| M3 | | |
| (–) | | Common (–) |

* Turn off the terminal in case short circuit lasts for more than one second.

Note: Do not connect anything to the reserved terminals; they are connected to the internal circuit.

**Terminal block 3**

| Terminal NPN | Terminal PNP | Function |
|---|---|---|
| ZS1 | | Zero set input (for OUT1) ON during short circuit* |
| TM1 | | Timing input (for OUT1) ON during short circuit |
| RS1 | | Reset input (for OUT1) ON during short circuit |
| • | | Reserved terminal |
| • | | Reserved terminal |
| (–) | | 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) |
| (–) | (+) | Common (–) / Common (+) |
| 24V | | 24 V DC input for power supply |
| 0V | | Power supply ground 0 V |
| FG | | Frame ground |

* Turn off the terminal in case short circuit lasts for more than one second.

Note: Do not connect anything to the reserved terminals; they are connected to the internal circuit.

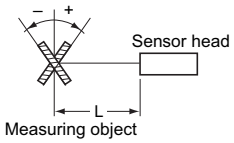
## SENSING CHARACTERISTICS (TYPICAL)

### HL-C201F(E)

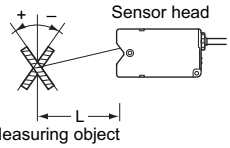
**Correlation between measuring distance and error characteristics**

**Setup mode: Specular reflective**

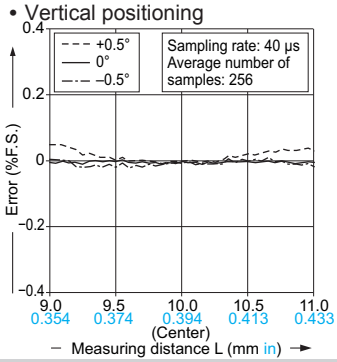
Aluminum vapor deposition surface reflection mirror (0°, ±0.5°) Vertical orientation



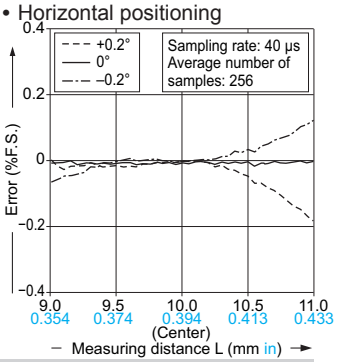

Aluminum vapor deposition surface reflection mirror (0°, ±0.2°) Horizontal orientation




• Vertical positioning




• Horizontal positioning

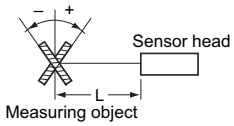



### HL-C203F(E)

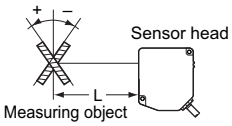
**Correlation between measuring distance and error characteristics**

**Setup mode: Diffuse reflective**

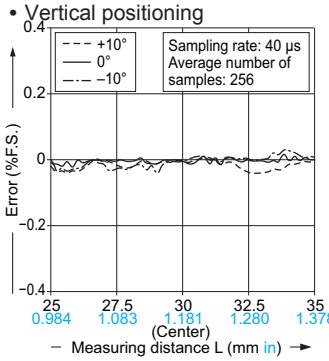
White ceramic (0°, ±10°) Vertical orientation



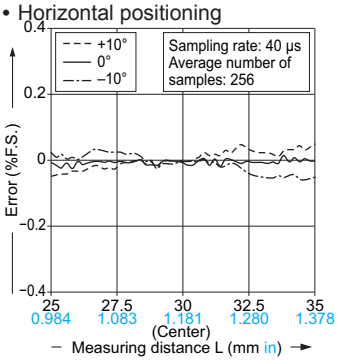

White ceramic (0°, ±10°) Horizontal orientation




• Vertical positioning

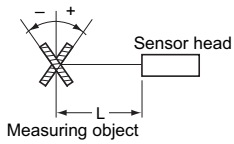



• Horizontal positioning

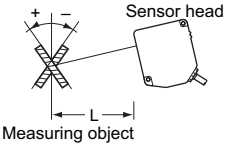



**Setup mode: Specular reflective**

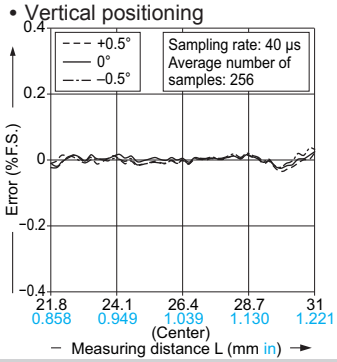
Aluminum vapor deposition surface reflection mirror (0°, ±0.5°) Vertical orientation



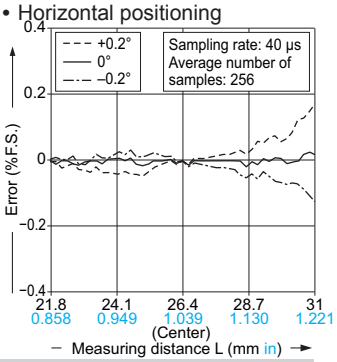

Aluminum vapor deposition surface reflection mirror (0°, ±0.2°) Horizontal orientation




• Vertical positioning




• Horizontal positioning

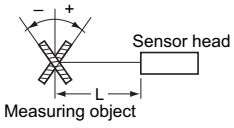



### HL-C211F(E) HL-C211F5(E)

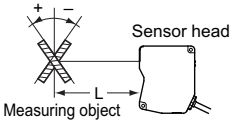
**Correlation between measuring distance and error characteristics**

**Setup mode: Diffuse reflective**

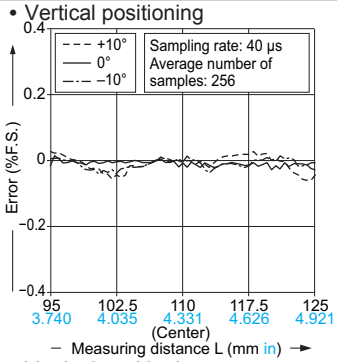
White ceramic (0°, ±10°) Vertical orientation



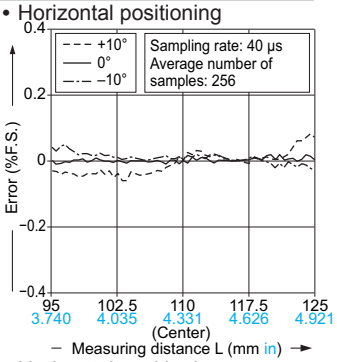

White ceramic (0°, ±10°) Horizontal orientation




• Vertical positioning

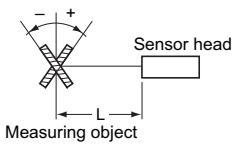



• Horizontal positioning

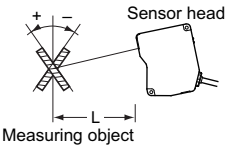



**Setup mode: Specular reflective**

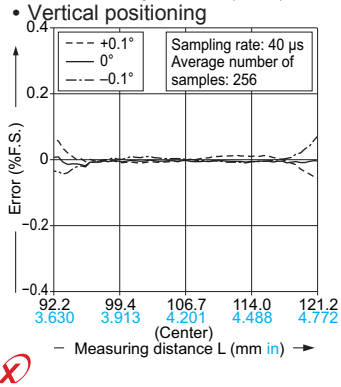
Aluminum vapor deposition surface reflection mirror (0°, ±0.1°) Vertical orientation



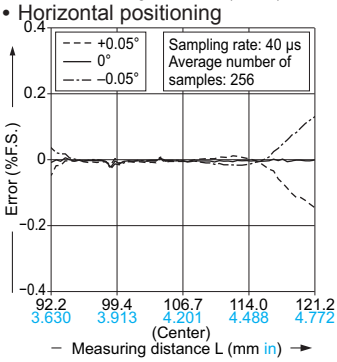

Aluminum vapor deposition surface reflection mirror (0°, ±0.05°) Horizontal orientation




• Vertical positioning




• Horizontal positioning



## PRECAUTIONS FOR PROPER USE

- 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.
- This product has been developed / produced for industrial use.

- Do not operate products using methods other than the ones described in the instruction manual included with each product. Control or adjustment through procedures other than the ones specified may cause hazardous laser radiation exposure.

**HL-C201F□**


(The English warning label is packed with the sensor head.)

- This product is classified as a Class 1 Laser Product in IEC / JIS standards and a Class I Laser Product in FDA regulations. Do not look at the laser beam through optical system such as a lens.
- The following label is attached to the product. Handle the product according to the instruction given on the warning label.

**HL-C203F□, HL-C211F□**


(The English warning label is packed with the sensor head.)

- This product is classified as a Class 2 Laser Product in IEC / JIS standards and a Class II Laser Product in FDA regulations. Do not look at the laser beam directly or through optical system such as a lens.
- The following label is attached to the product. Handle the product according to the instruction given on the warning label.

**HL-C211F5□**


(The English warning label is packed with the sensor head.)

- This product is classified as a Class 3R Laser Product in IEC/JIS standards and a Class IIIa Laser Product in FDA regulations. Never look at or touch the direct laser beam and its reflection.
- The following label is attached to the product. Handle the product according to the instruction given on the warning label.

- Below mentioned products fall under the 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 license from the Ministry of Economy, Trade and Industry of Japan.
  Also, these products fall under the international export control regime, such as NSG (Nuclear Suppliers Group) guidelines 1.B.3.b.1 and WA (Wassenaar Arrangement) 2.B.6.b.1.a, and are objects of the regulation. Please comply with the export control in each country.

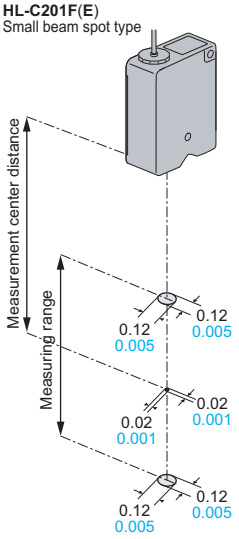
<Products subject to Control>

- Sensor head: **HL-C201F**, **HL-C201F-MK**, **HL-C203F**, **HL-C203F-MK**, **HL-C211F**, **HL-C211F-MK**, **HL-C211F5**, **HL-C211F5-MK**
- Controller: **HL-C2C**, **HL-C2C-P**

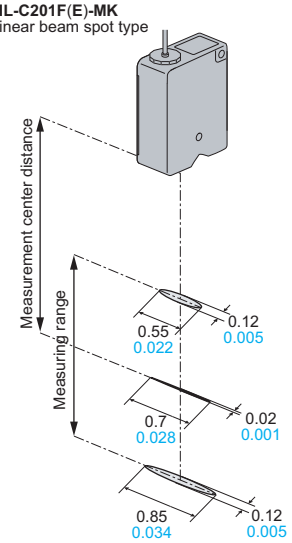
*These products are introduced to limited countries only. Please contact our office for details.

### Beam size (Unit: mm in)

**HL-C201F(E)**
Small beam spot type

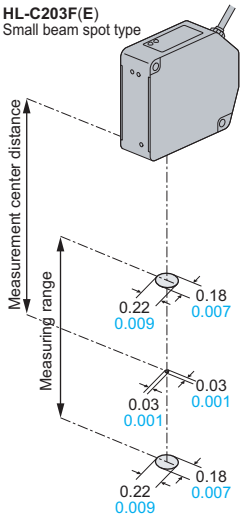



**HL-C201F(E)-MK**
Linear beam spot type

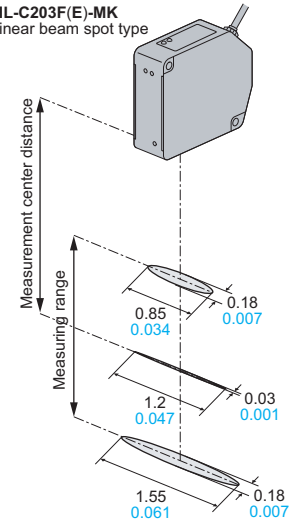



### Beam size (Unit: mm in)

**HL-C203F(E)**
Small beam spot type

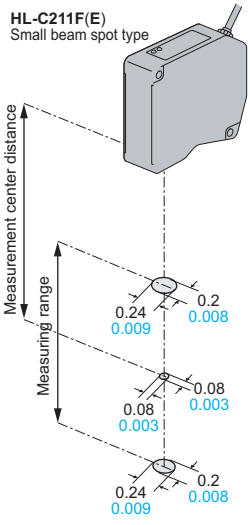



**HL-C203F(E)-MK**
Linear beam spot type

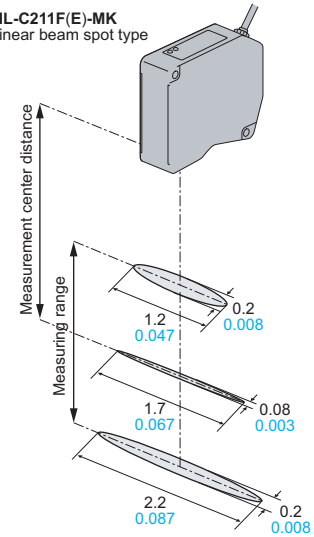



### Beam size (Unit: mm in)

**HL-C211F(E)**
Small beam spot type




**HL-C211F(E)-MK**
Linear beam spot type

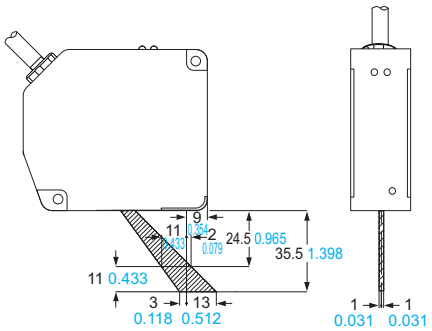


## PRECAUTIONS FOR PROPER USE

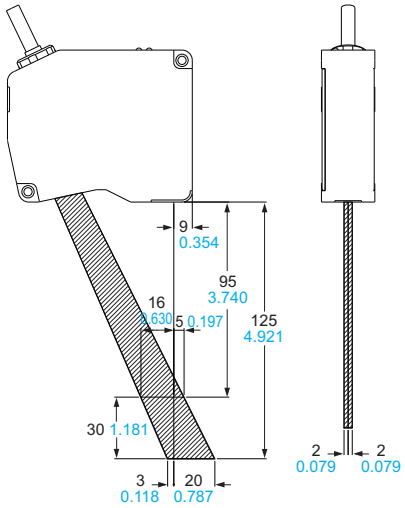
### Mutual interference (Unit: mm in)

- When installing 2 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 of the sensor head in the figure below.

**HL-C203F□**



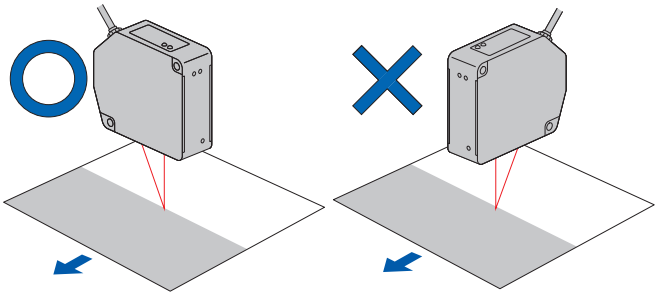

**HL-C211F□**



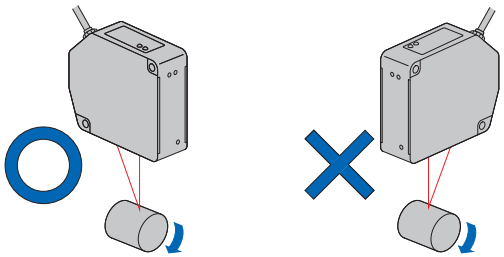

### Sensor head mounting direction

- 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.

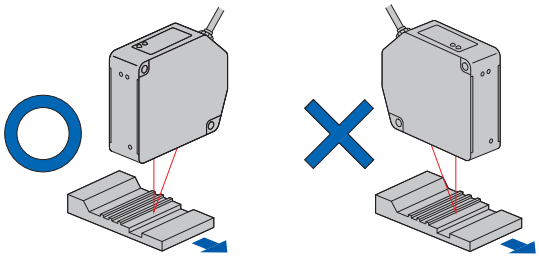
**Object with variations in material or color**



**Rotating object**



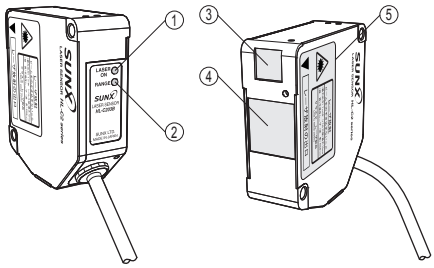
**Object that has large differences in gaps, grooves and colors**



## PRECAUTIONS FOR PROPER USE

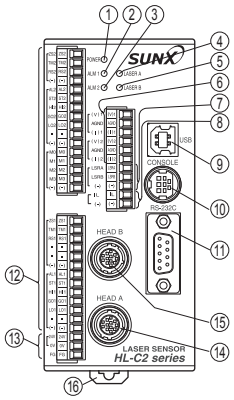
### Fuctional description

**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 at approximately center of the measurement.<br>Blinks when the target enters within the measurement range.<br>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.<br>Please read carefully before use. |

**Controller**



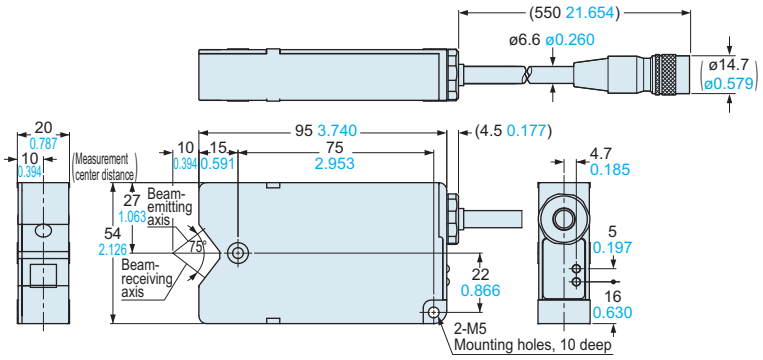

| | Description | Function |
|---|---|---|
| ① | POWER indicator | Lights up in green when electricity is provided to the controller. |
| ② | ALM1 (Alarm) indicator | Abnormal condition indicator for OUT1.<br>Lights up in red during dark status (poor light intensity) of OUT1 or the sensor head is in unconnected status. |
| ③ | ALM2 (Alarm) indicator | Abnormal condition indicator for OUT2.<br>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 its opened. |
| ⑨ | USB connector | Used for communication with PC using USB. |
| ⑩ | Console connection connector | Used for connecting the mini console. |
| ⑪ | RS-232C connector | Used for communication with the control devices using RS-232C. |
| ⑫ | I/O terminal | Terminal for various I/O (Zero set input, Timing input, Reset input, Alarm output, Strobe output, and Judgment output) and memory change. |
| ⑬ | Power terminal | Terminal for power supply to the controller. |
| ⑭ | Sensor head A connection connector | Controller recognizes a sensor head which is connected to this connector as “Sensor head A” and starts operation. |
| ⑮ | Sensor head B connection connector | Controller recognizes a sensor head which is connected to this connector as “Sensor head B” and starts operation. |
| ⑯ | DIN rail mounting hook | Used for hooking/removing the sensor heads to/from the 35mm 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 ⑭ the sensor head A connection (HEAD A) side. If the sensor head is connected to ⑮ the sensor head B connection (HEAD B) side, the measurement cannot be performed.

## DIMENSIONS (Unit: mm in)

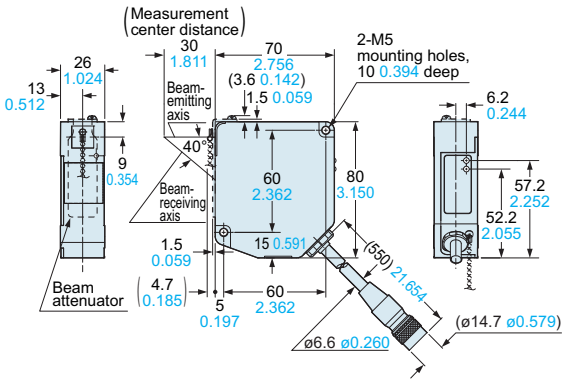
### HL-C201F(E) HL-C201F(E)-MK — Sensor head

**Set mode: Specular reflective type**

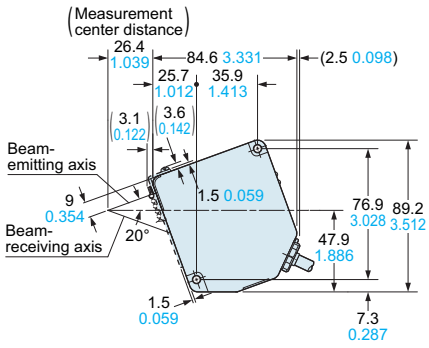



### HL-C203F(E) HL-C203F(E)-MK — Sensor head

**Set mode: Diffuse reflective type**

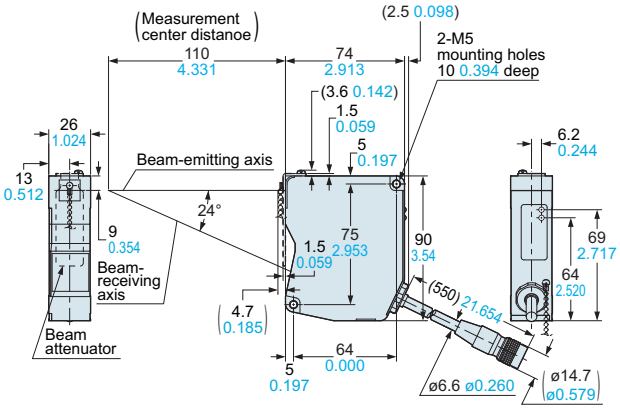



**Set mode: Specular reflective type**

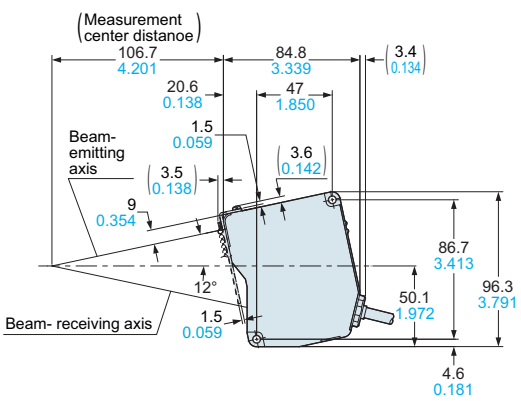



### HL-C211F□(E) HL-C211F□(E)-MK — Sensor head

**Set mode: Diffuse reflective type**

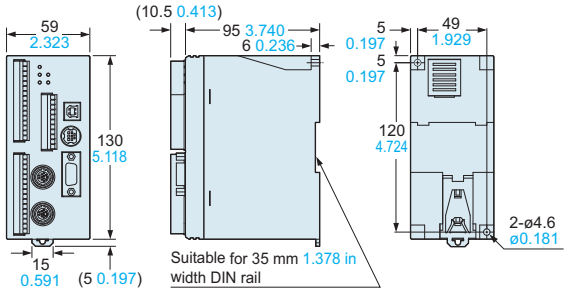



**Set mode: Specular reflective type**

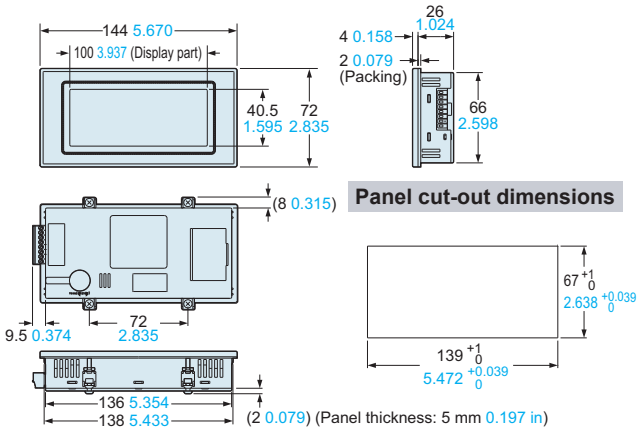


## DIMENSIONS (Unit: mm in)

### HL-C2C(E) HL-C2C(E)-P — Controller




### HL-C2DP-EX — Compact console

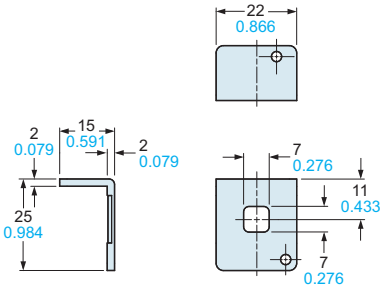



**Panel cut-out dimensions**



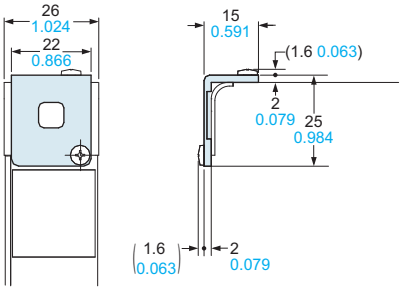

Note: The panel thickness should be
1 to 5mm 0.039 to 0.197 in.

### HL-C2F01 — ND filter




Material: Alminum (Mounting retention)
Glass (ND part)

**Mounting drawing with a sensor head**




Notes: 1) Mounting cannot be preformed when the beam attenuator of the sensor head is in use.
2) **HL-C201F**□ cannot be mounted.

**All information is subject to change without prior notice.**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