

## Going Above and Beyond

HL-C201F

10 mm  
0.394 in  
0.01  $\mu$ m  
0.0004 mil



HL-C203F

30 mm  
1.181 in  
0.025  $\mu$ m  
0.001 mil



HL-C211F5

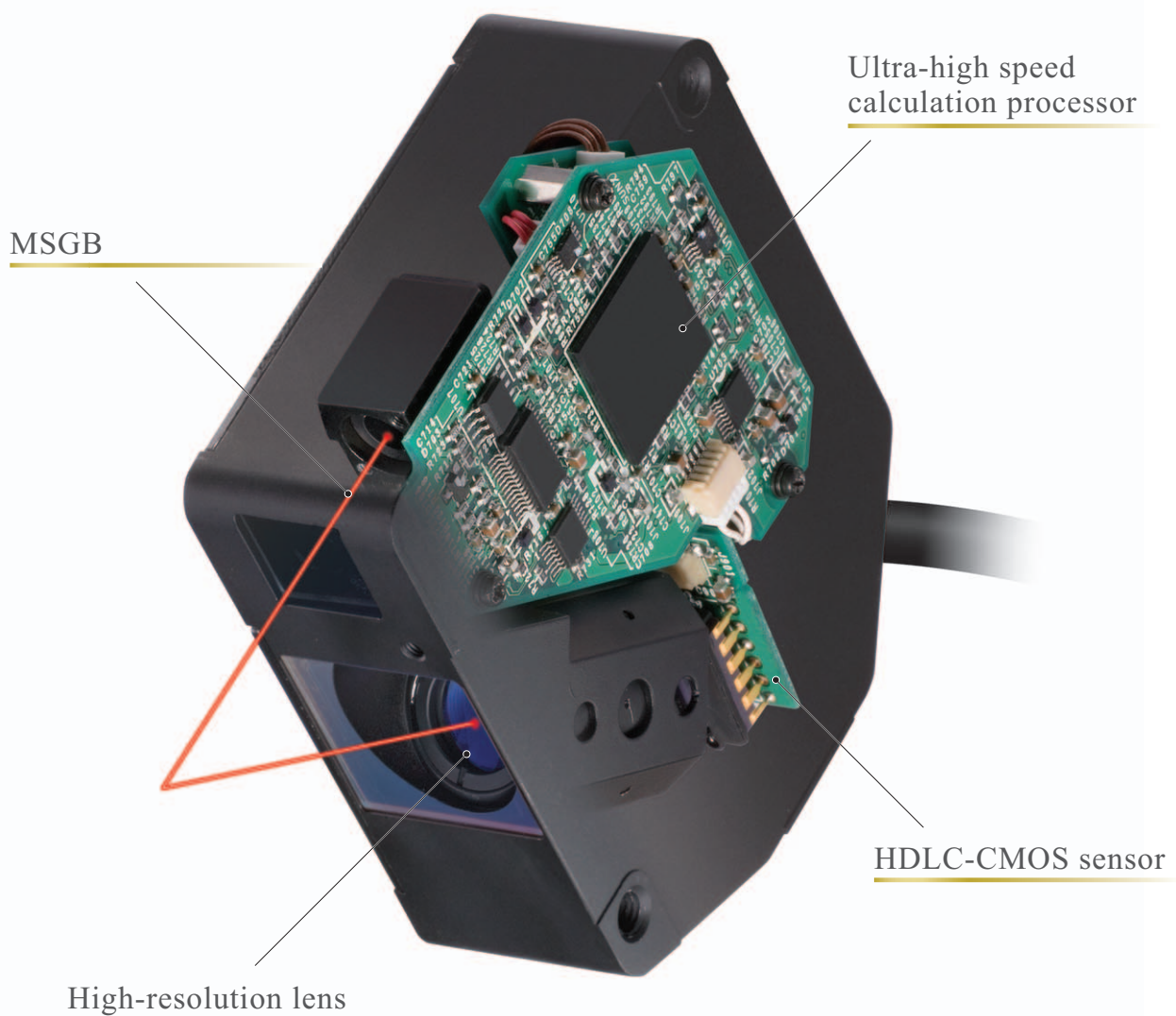
110 mm  
4.331 in  
0.1  $\mu$ m  
0.004 mil



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

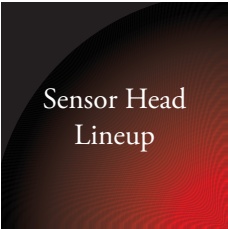
100kHz

Linearity

$\pm 0.03\%$

Resolution

0.025 $\mu\text{m}$



# 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



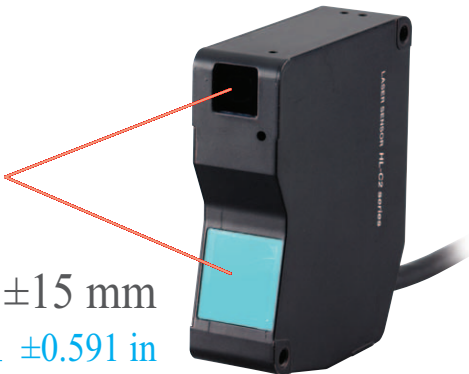
Mid-range · High precision

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

### HL-C211F5

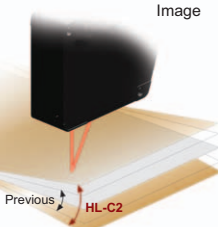
Sampling	Linearity	Resolution
100kHz	±0.03%	0.1μm

110 ±15 mm  
4.331 ±0.591 in



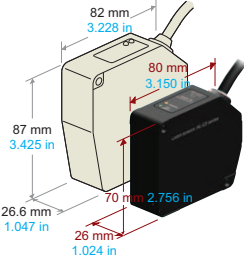
### Additional detection even under tilted object

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□)



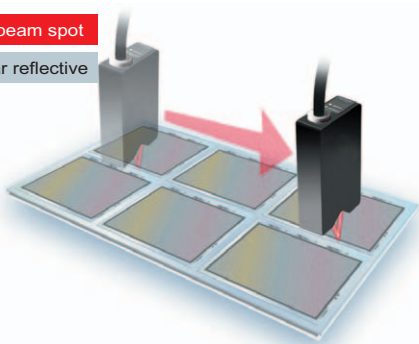
### Compact sensor head to save space

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□)



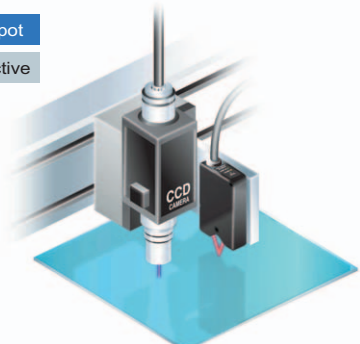
With the accumulated know-how in measurement technology together with the newest digital technology, we have developed the industry's cutting edge **HL-C2** series to attend to every need from short to mid sensing range.

Linear beam spot  
Specular reflective



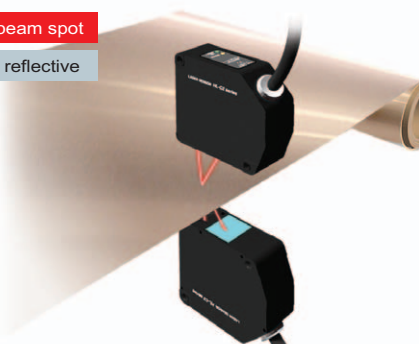
Measurement of the position of patterned glass

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



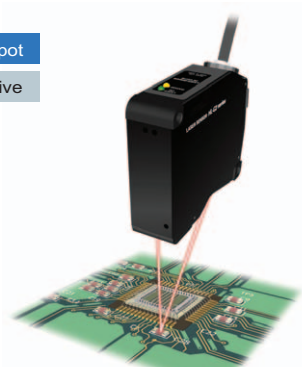
Measurement of HDD surface variations

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.

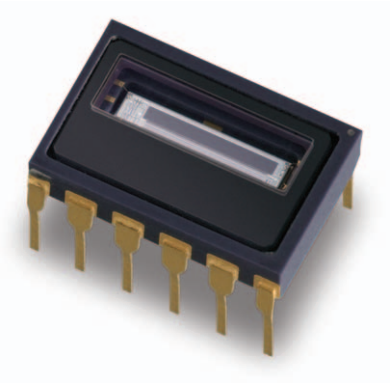
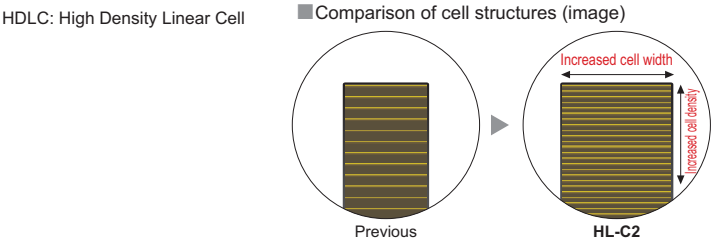
(HL-C201F□ is compatible with specular reflective only)



# HDLC-CMOS sensors

Resolution   Sampling

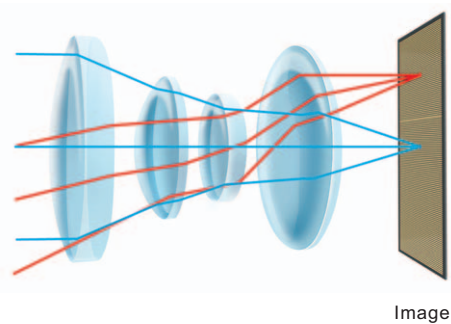
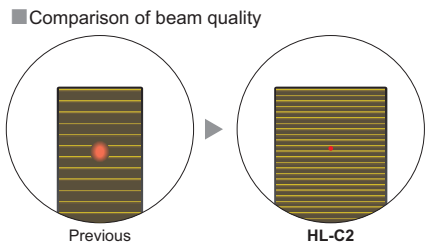
The HDLC-CMOS sensors have been developed specially for the **HL-C2** series. High density light-receiving cells and a processing speed close to the maximum limit result in high resolutions and high speeds which exceed all expectations for laser displacement sensors.



# 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.

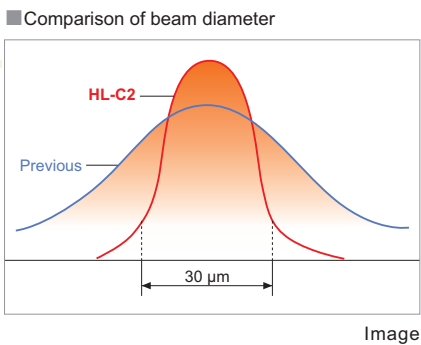


# MSGB

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.

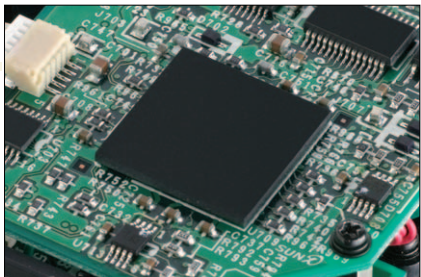
MSGB: Micro Spot Gaussian Beam



# 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.



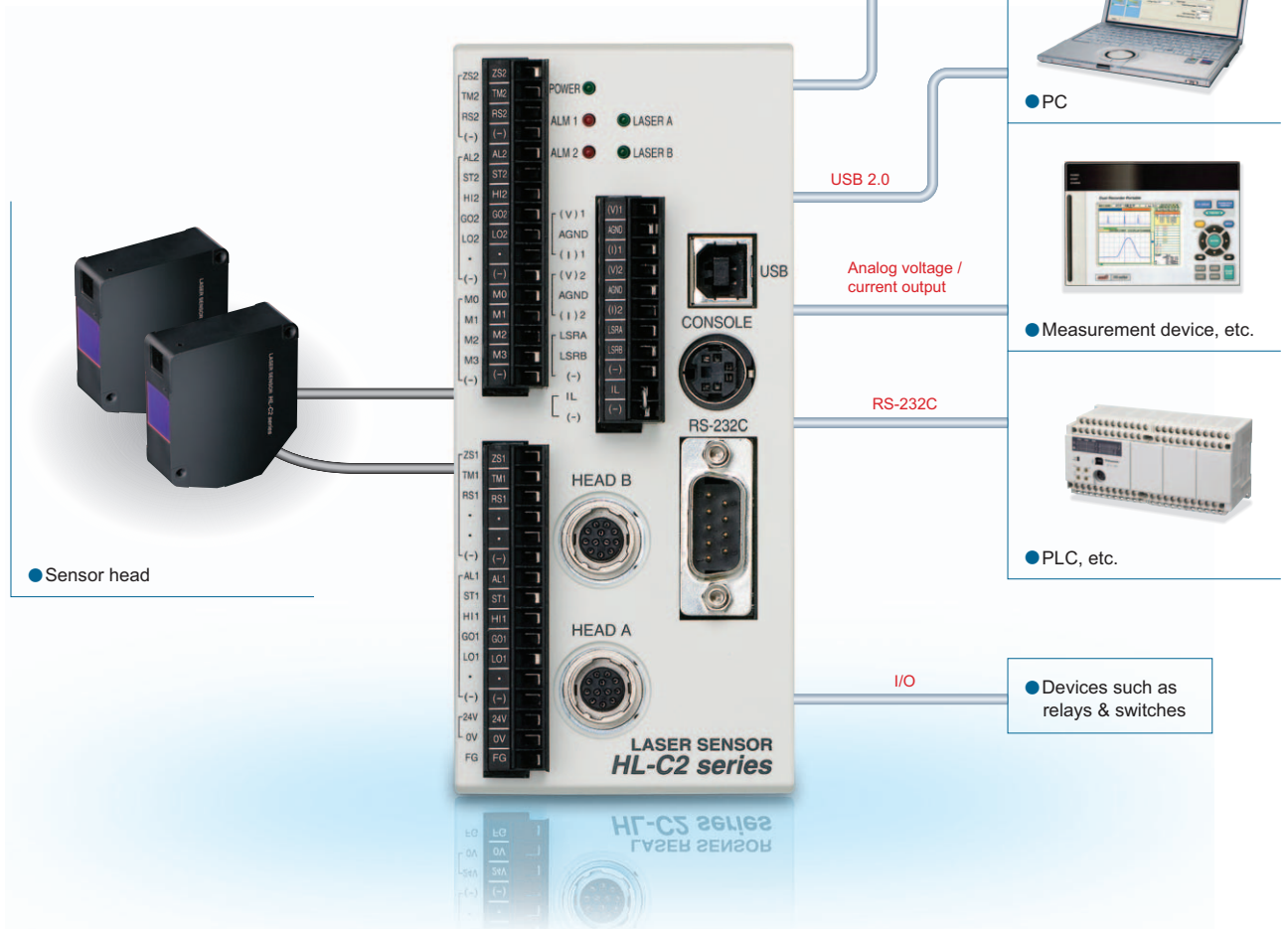
## Compact with a wide array of functions

### Two 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.



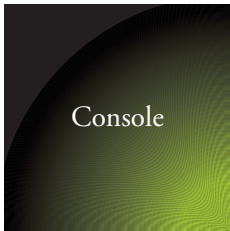
### Data buffering function

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.

### API provided free of charge (Application Programming Interface)

The API can be used to control the HL-C2 from a personal computer connected via USB. Sample programs are also available to make program development easier.

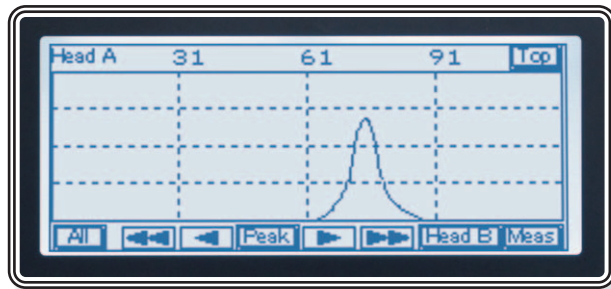
Download sample programs from the website of Panasonic Electric Works SUNX (<http://panasonic-electric-works.net/sunx>).



## Easy operation and simple display by a touch panel

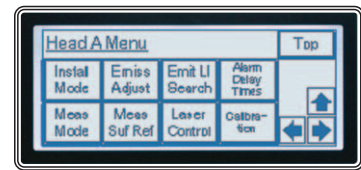
### Light receiving intensity in waveform display

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



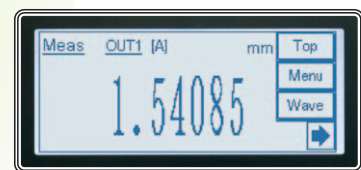
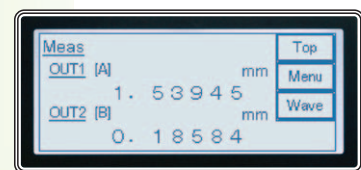
### Condition setting function

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

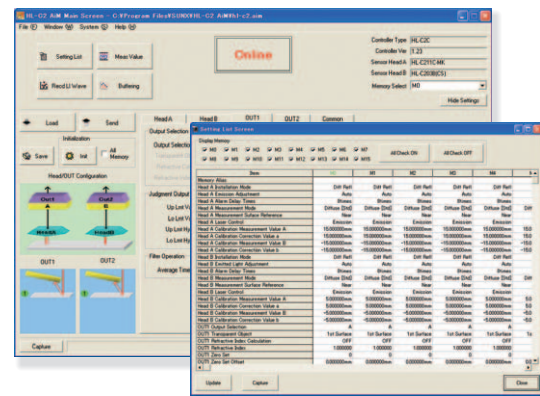
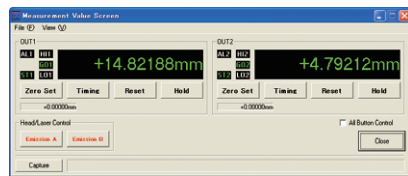
OS	: Microsoft Windows XP / Windows 2000
CPU	: Pentium Adapting CPU 1GHz or above
Memory	: 256MB or more
Hard disk	: 50MB or more of usable space
CD-ROM drive	: Required for installation
Display screen	: 1024 × 768 dot, 256 colors or above
Serial board	: RS-232C compliant, transmission speed 115.2kbps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

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



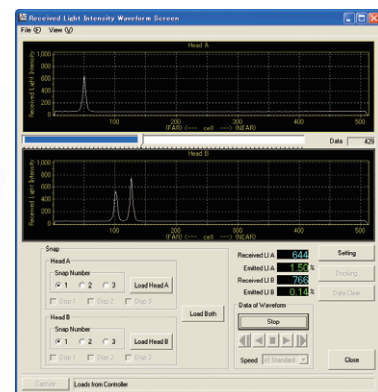
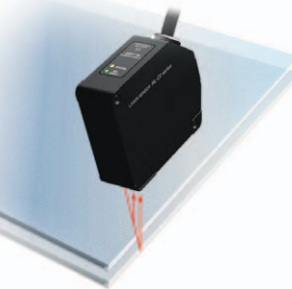
## Measurement value display

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



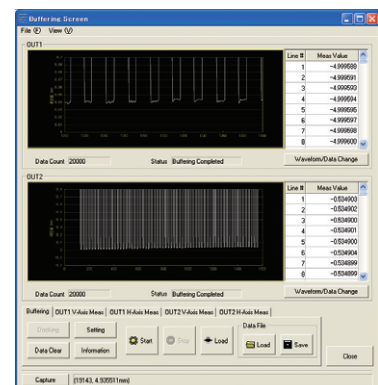
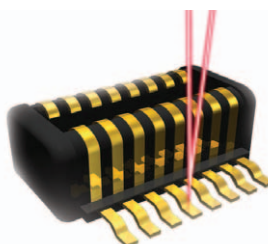
## Light receiving intensity in waveform display

Received light 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


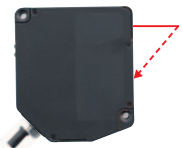

Data stored in the controller by data buffering function can be loaded, and then waveform and data are displayed. Furthermore, procedures on how to store data, storage period, and storage amount can be set by the display.






## ORDER GUIDE

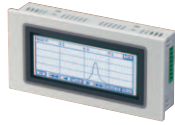
### Sensor heads

Type	Appearance	Measurement center distance and measuring range	Resolution	Beam size	Model No.	Laser class
Small beam spot type		10 ±1 mm 0.394 ±0.039 in	0.01 μm 0.0004 mil	ø20 μm ø0.787 mil approx.	HL-C201F	FDA: Class I IEC: Class 1
Linear beam spot type			0.25 μm 0.01 mil		HL-C201FE	
			0.01 μm 0.0004 mil	20 × 700 μm ø27.559 mil approx.	HL-C201F-MK	
			0.25 μm 0.01 mil		HL-C201FE-MK	
Small beam spot type		30 ±5 mm 1.811 ±0.170 in	0.025 μm 0.001 mil	ø30 μm ø1.181 mil approx.	HL-C203F	FDA: Class II IEC: Class 2
Linear beam spot type			0.25 μm 0.01 mil		HL-C203FE	
			0.025 μm 0.001 mil	30 × 1,200 μm ø47.244 mil approx.	HL-C203F-MK	
			0.25 μm 0.01 mil		HL-C203FE-MK	
Small beam spot type		110 ±15 mm 4.331 ±0.591 in	0.1 μm 0.004 mil	ø80 μm ø3.150 mil approx.	HL-C211F	FDA: Class II IEC: Class 2
			0.25 μm 0.01 mil		HL-C211FE	
			0.1 μm 0.004 mil		HL-C211F5	FDA: Class IIIa IEC: Class 3R
			0.25 μm 0.01 mil		HL-C211F5E	
Linear beam spot type			0.1 μm 0.004 mil	80 × 1,700 μm ø66.929 mil approx.	HL-C211F-MK	FDA: Class II IEC: Class 2
			0.25 μm 0.01 mil		HL-C211FE-MK	
			0.1 μm 0.004 mil		HL-C211F5-MK	FDA: Class IIIa IEC: Class 3R
			0.25 μm 0.01 mil		HL-C211F5E-MK	




### Controllers

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

### Compact consoles

Type	Appearance	Model No.
English display		HL-C2DP-EX
Japanese display		HL-C2DP
Chinese display		HL-C2DP-CH
Korean display		HL-C2DP-KR

### 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 received light 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.
		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.

Cabletyre cable with connector on both ends  
Cable outer diameter: ø6.6 mm ø0.260 in  
Connector outer diameter: ø14.7 mm ø0.579 in max.

## SPECIFICATIONS

## Sensor heads

Type		Small beam spot type						
Item	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 <b>0.394 in</b>	30 mm <b>1.181 in</b>	26.4 mm <b>1.039 in</b>	110 mm <b>4.331 in</b>	106.7 mm <b>4.201 in</b>	110 mm <b>4.331 in</b>	106.7 mm <b>4.201 in</b>
Measuring range (Note 3)		±1 mm <b>±0.039 in</b>	±5 mm <b>±0.197 in</b>	±4.6 mm <b>±0.181 in</b>	±15 mm <b>±0.591 in</b>	±14.5 mm <b>±0.571 in</b>	±15 mm <b>±0.591 in</b>	±14.5 mm <b>±0.571 in</b>
Resolution [Average number of samples] (Note 4)		0.04 μm <b>0.002 mil</b> [256] 0.01 μm <b>0.0004 mil</b> [4096] (HL-C201FE: 0.25 μm <b>0.010 mil</b> [256])	0.1 μm <b>0.0004 mil</b> [256] 0.025 μm <b>0.001 mil</b> [4096] (HL-C203FE: 0.25 μm <b>0.010 mil</b> [256])		0.4 μm <b>0.0002 mil</b> [256] 0.1 μm <b>0.0004 mil</b> [4096] (HL-C211FE and HL-C211F5E: 0.25 μm <b>0.010 mil</b> [256])			
Linearity (Note 5)		±0.02 % F.S.	±0.03 % F.S.					
Temperature characteristics		0.01 % F.S./°C						
Light source		Red semiconductor laser (Peak emission wavelength: 658 nm <b>0.026 mil</b> )						
		Class 1 (IEC / JIS), Class I (FDA,Laser Notice No.50) Max. output: 0.1 mW	Class 2 (IEC / JIS), Class II (FDA) Max. output: 1 mW				Class 3R (IEC / JIS), Class IIIa (FDA) Max. output: 5 mW	
Beam size (Note 6)		ø20 μm <b>ø0.787 mil</b> approx.	ø30 μm <b>ø1.181 mil</b> approx.		ø80 μm <b>ø3.150 mil</b> 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	Pollution degree	3 (Industrial environment)						
	Protection	IP67 (IEC) (excluding the connector)						
	Ambient temperature	0 to +45 °C <b>+32 to +113 °F</b> (No dew condensation), Storage: -20 to +70 °C <b>-4 to +158 °F</b>						
	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 <b>0.059 in</b> amplitude in X,Y and Z directions for two hours each						
	Shock resistance	196 m/s <sup>2</sup> acceleration (20 G approx.) in X,Y and Z directions for three times each						
Cable		Cabletyre cable, 0.5 m <b>1.640 ft</b> long with connector						
Cable extension		Extension up to total 30 m <b>98.425 ft</b> 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 <b>+0.004 to +0.039 in</b>	0 to +5.0 mm <b>0 to +0.197 in</b>	0 to +4.6 mm <b>0 to +0.181 in</b>	+0.5 to +15.0 mm <b>+0.020 to +0.591 in</b>	+0.5 to +14.5 mm <b>+0.020 to +0.571 in</b>
	10 µs	+0.8 to +1.0 mm <b>+0.032 to +0.039 in</b>	+3.8 to +5.0 mm <b>+0.150 to +0.197 in</b>	+3.6 to +4.6 mm <b>+0.142 to +0.181 in</b>	+12.5 to +15.0 mm <b>+0.492 to +0.591 in</b>	+12.5 to +14.5 mm <b>+0.492 to +0.571 in</b>

- 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 our company. 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<sup>2</sup> (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

Type		Linear beam spot type						
Item	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	110 mm 4.331 in	106.7 mm 4.201 in	110 mm 4.331 in	106.7 mm 4.201 in
Measuring range (Note 3)		±1 mm ±0.039 in	±5 mm ±0.197 in	±4.6 mm ±0.181 in	±15 mm ±0.591 in	±14.5 mm ±0.571 in	±15 mm ±0.591 in	±14.5 mm ±0.571 in
Resolution [Average number of samples] (Note 4)		0.04 μm 0.002 mil [256] 0.01 μm 0.0004 mil [4096] (HL-C201FE-MK: 0.25 μm 0.010 mil [256])	0.1 μm 0.0004 mil [256] 0.025 μm 0.001 mil [4096] (HL-C203FE-MK: 0.25 μm 0.010 mil [256])		0.4 μm 0.0002 mil [256] 0.1 μm 0.0004 mil [4096] (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.					
Temperature characteristics		0.01 % F.S./°C						
Light source		Red semiconductor laser (Peak emission wavelength: 658 nm 0.026 mil)						
		Class 1 (IEC / JIS), Class I (FDA, Laser Notice No.50) Max. output: 0.1 mW	Class 2 (IEC / JIS), Class II (FDA) Max. output: 1 mW				Class 3R (IEC / JIS), Class IIIa (FDA) Max. output: 5 mW	
Beam size (Note 6)		20 × 700 μm 0.787 × 27.560 mil approx.	30 × 1200 μm 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 (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		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		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 +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 +15.0 mm +0.020 to +0.591 in	+0.5 to +14.5 mm +0.020 to +0.571 in
	10 µs	+0.8 to +1.0 mm +0.032 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	+12.5 to +15.0 mm +0.492 to +0.591 in	+12.5 to +14.5 mm +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 our company. 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<sup>2</sup> (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
	Model No.	HL-C2C(E)	HL-C2C(E)-P
Connectable sensor head		Number of connectable units: Max. 2 units.	
Supply voltage		24 V DC $\pm 10\%$ 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 (100 mA approx. is additionally required when the mini console is connected)	
Sampling cycle		10 $\mu$ s, 20 $\mu$ s, 40 $\mu$ s, 100 $\mu$ s, 200 $\mu$ s, 400 $\mu$ s, 1 ms, 2 ms	
Analog output	Voltage (Note 1)	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: $\pm 0.05\%$ F.S. Max. 2 mA, output impedance 50 $\Omega$ , Response delay time: 1.5 $\mu$ s/V approx.	
	Current (Note 2)	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 $\mu$ A, Linearity $\pm 0.05\%$ F.S. Load impedance: 250 $\Omega$ max., Response delay time: 10 $\mu$ s approx.	
Alarm output		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 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 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 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 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 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		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)	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)
Laser control input		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)	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		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)	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)
Timing input		ON at/during connection to Common (-) (depending on analysis mode) Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less)	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		Reset is done when connected to Common (-). Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less)	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		Memory is specified when connected to Common (-). Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less)	Memory is specified when connected to external power (+). Applied voltage: 30 V DC or less (Leak current: 0.1 mA or less)



## SPECIFICATIONS

### Controllers

Item	Type	NPN output type	PNP output type
	Model 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 <b>+32 to +122 °F</b> (No dew condensation or icing allowed), Storage: -20 to +70 °C <b>-4 to +158 °F</b>	
	Ambient humidity	35 to 85 %RH	
	Vibration resistance	10 to 55 Hz frequency (period: 1 min.), 0.75 mm <b>0.030 in</b> amplitude in X, Y and Z directions for 30 min. each	
	Shock resistance	196 m/s <sup>2</sup> 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 <b>6.562 ft</b> 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

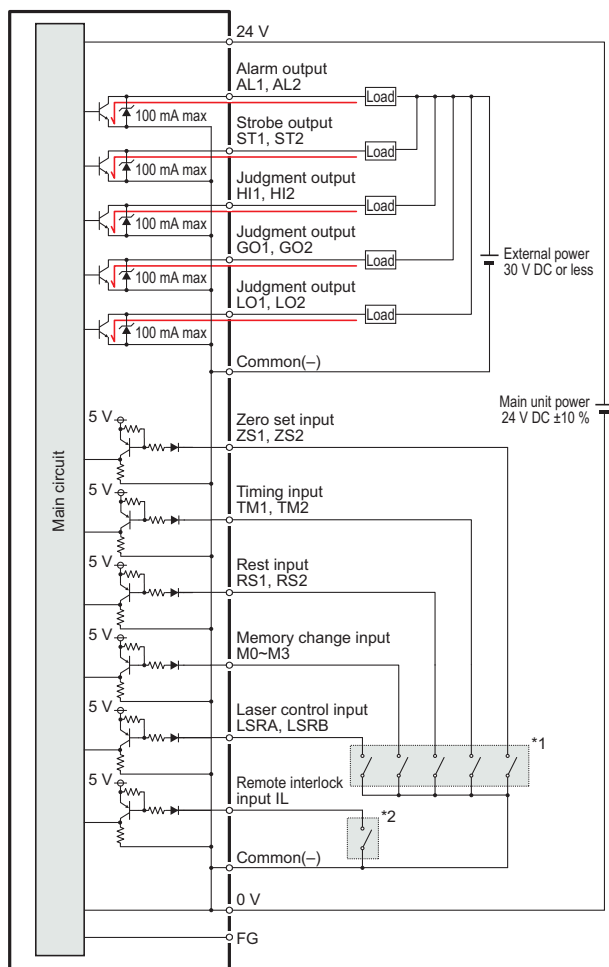
Item	Type	English display	Japanese display	Chinese display	Korean display
	Model No.	HL-C2DP-EX	HL-C2DP	HL-C2DP-CH	HL-C2DP-KR
Power		Supplied by controller			
Display	Display element	STN monochrome LCD			
	Back light	White LED			
	Display range	-999.999999 to 999.999999			
	Language	English	Japanese	Chinese	Korean
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) 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 <b>+32 to +122 °F</b> (No dew condensation or icing allowed), Storage: -20 to +60 °C <b>-4 to +140 °F</b>			
	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 <b>0.030 in</b> amplitude in X, Y and Z directions for 10 min. each			
	Shock resistance	98 m/s <sup>2</sup> 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**.

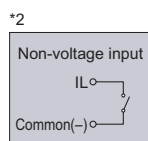
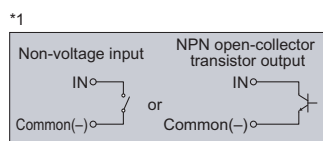
2) When reinstalling the console, replace the water proof packing. (Panasonic Electric Works, SUNX, Part No: AIGT181, 10 packs included)

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

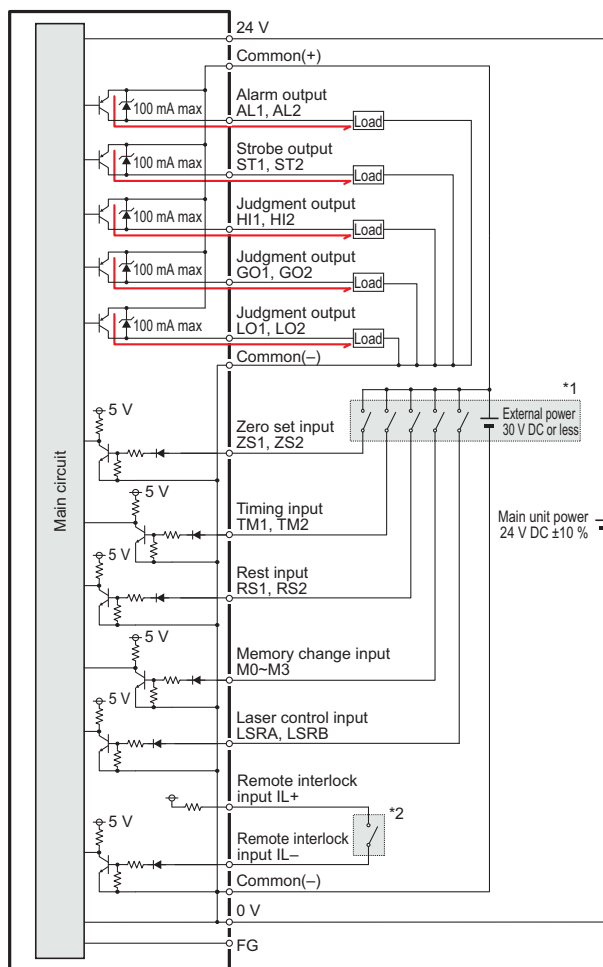
### NPN output type



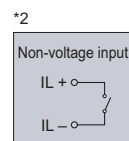
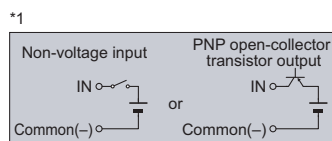
Controller internal circuit ← External connection example



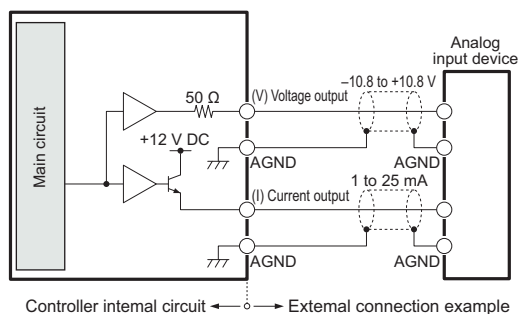
### PNP output type



Controller internal circuit ← External connection example



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

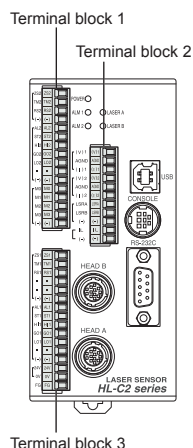


Controller internal circuit ← External connection example

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

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

### 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*
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	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.

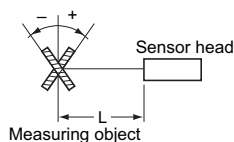
## SENSING CHARACTERISTICS (TYPICAL)

### HL-C201F(E)

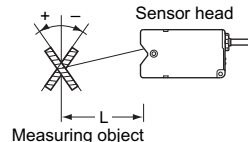
#### Correlation between measuring distance and error characteristics

##### Setup mode: Specular reflective

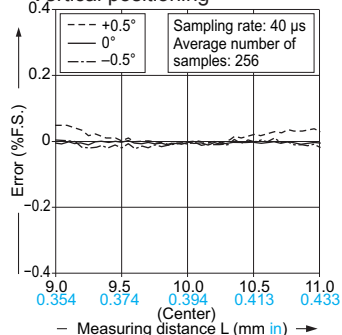
Aluminum vapor deposition  
surface reflection mirror  
(0°, ±0.5°)  
Vertical orientation



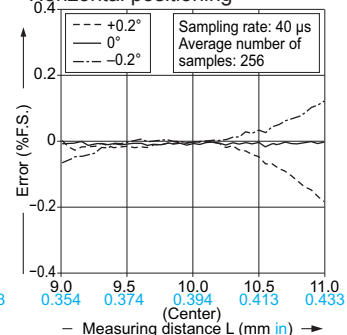
Aluminum vapor deposition  
surface reflection mirror  
(0°, ±0.2°)  
Horizontal orientation



#### • Vertical positioning



#### • Horizontal positioning



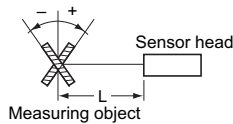
## SENSING CHARACTERISTICS (TYPICAL)

### HL-C203F(E)

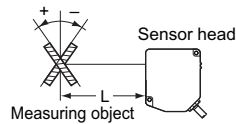
Correlation between measuring distance and error characteristics

#### Setup mode: Diffuse reflective

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

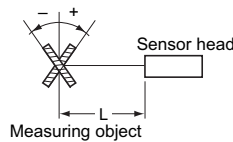


White ceramic ( $0^\circ, \pm 10^\circ$ )  
Horizontal orientation

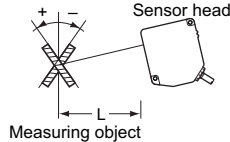


#### Setup mode: Specular reflective

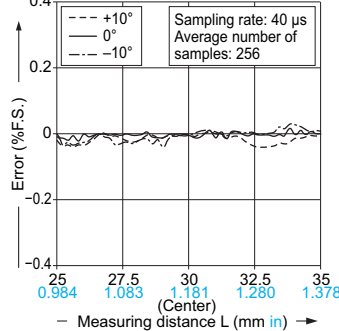
Aluminum vapor deposition  
surface reflection mirror  
( $0^\circ, \pm 0.5^\circ$ )  
Vertical orientation



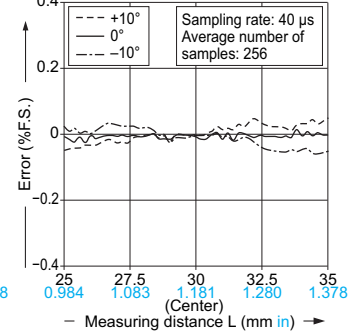
Aluminum vapor deposition  
surface reflection mirror  
( $0^\circ, \pm 0.2^\circ$ )  
Horizontal orientation



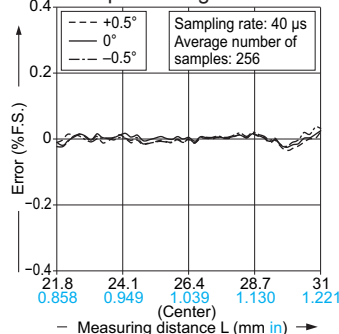
#### Vertical positioning



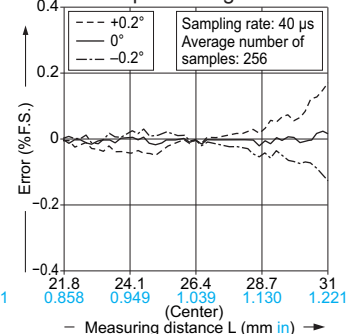
#### Horizontal positioning



#### Vertical positioning



#### Horizontal positioning

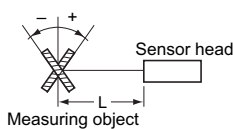


### HL-C211F(E) HL-C211F5(E)

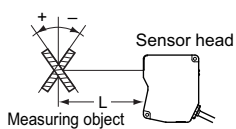
Correlation between measuring distance and error characteristics

#### Setup mode: Diffuse reflective

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

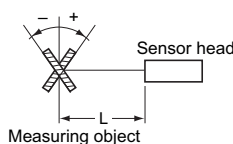


White ceramic ( $0^\circ, \pm 10^\circ$ )  
Horizontal orientation

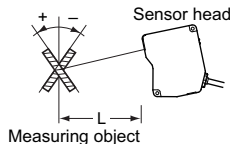


#### Setup mode: Specular reflective

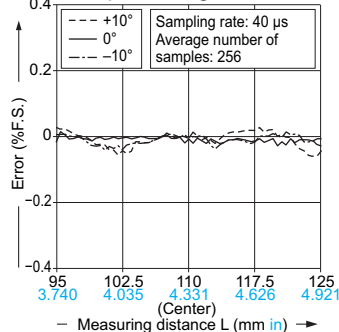
Aluminum vapor deposition  
surface reflection mirror  
( $0^\circ, \pm 0.1^\circ$ )  
Vertical orientation



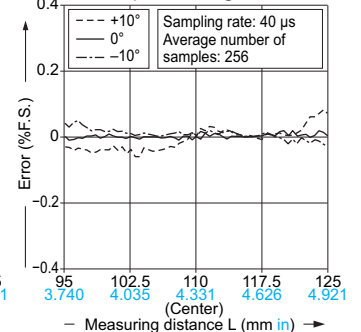
Aluminum vapor deposition  
surface reflection mirror  
( $0^\circ, \pm 0.05^\circ$ )  
Horizontal orientation



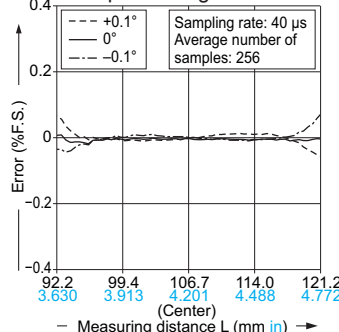
#### Vertical positioning



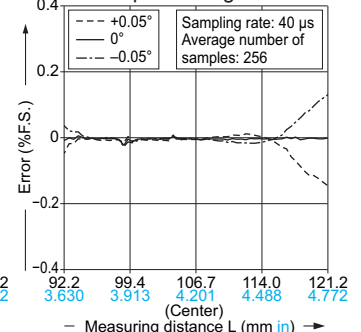
#### Horizontal positioning



#### 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.



- For CE marking compliance, a sensor head, controller and console with the 'CE' mark attached must be used together. Check that the 'CE' mark is attached to each device to be connected.



- 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.



## PRECAUTIONS FOR PROPER USE



- 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.

### HL-C201F□



- This product is classified as a Class 1 Laser Product in IEC / JIS standards and a Class I Laser Product in FDA regulations 21 CFR 1040.10. Do not look at the laser beam through optical devices such as a lens.

### HL-C203F□, HL-C211F□



- This product is classified as a Class 2 Laser Product in IEC / JIS standards and a Class II Laser Product in FDA regulations 21 CFR 1040.10. Do not look at the laser beam directly or through optical devices such as a lens.

### HL-C211F5□



- This product is classified as a Class 3R Laser Product in IEC/JIS standards and a Class IIIa Laser Product in FDA regulations 21 CFR 1040.10. Never directly look at or touch the laser beam or its reflection.

- Below mentioned products 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.

#### 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**

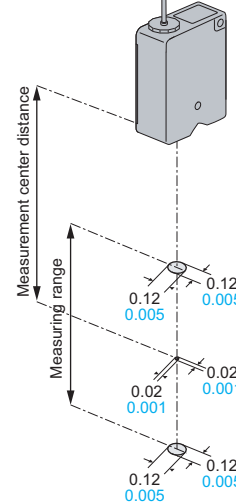
- Controller: **HL-C2C, HL-C2C-P**

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

#### Beam size (Unit: mm in)

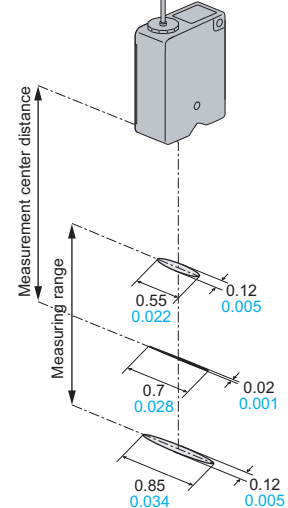
##### HL-C201F(E)

Small beam spot type



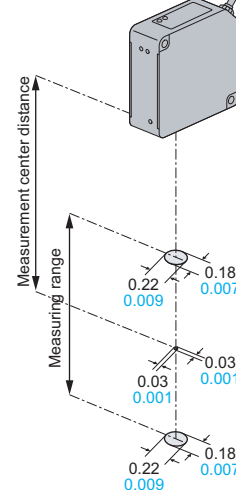
##### HL-C201F(E)-MK

Linear beam spot type



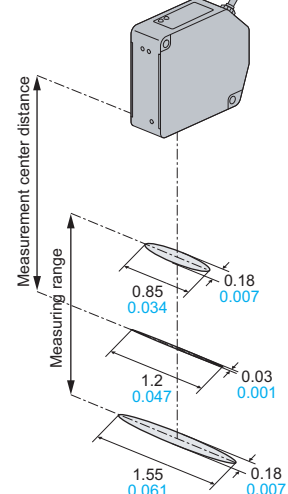
##### HL-C203F(E)

Small beam spot type



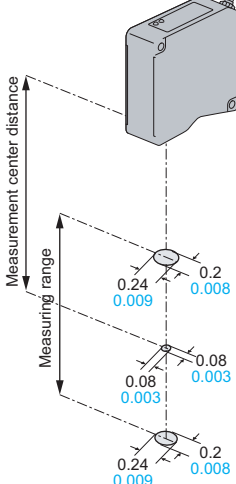
##### HL-C203F(E)-MK

Linear beam spot type



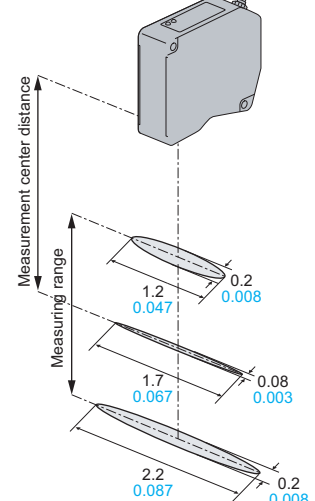
##### HL-C211F(E)

Small beam spot type



##### HL-C211F(E)-MK

Linear beam spot type

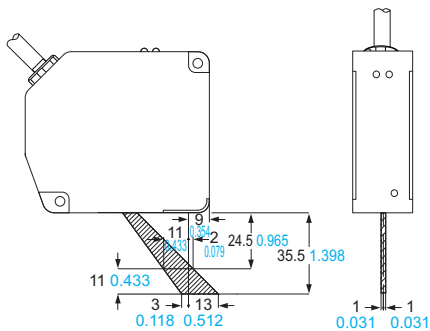


## PRECAUTIONS FOR PROPER USE

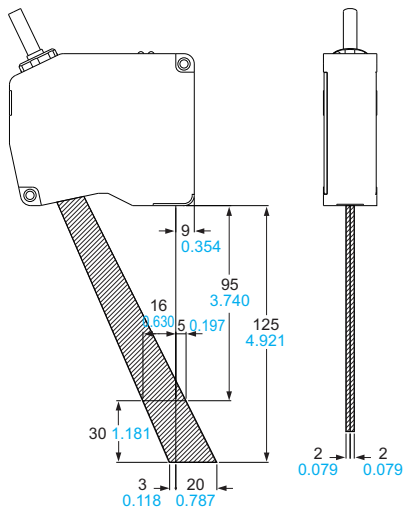
### Mutual interference (Unit: mm in)

- When installing 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 of the sensor head 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.

#### HL-C203F



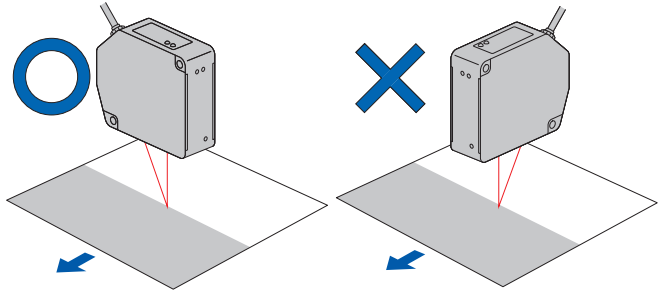
#### HL-C211F



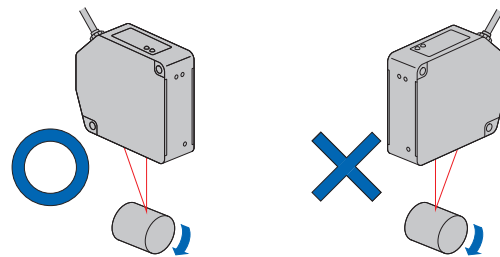
### Sensor head mounting direction

- 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.

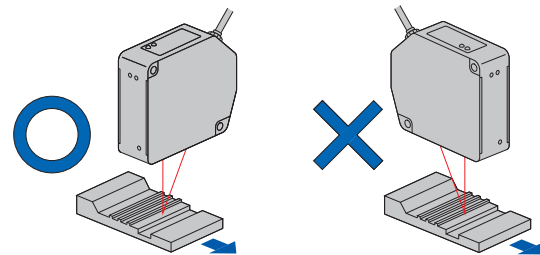
#### Object with variations in material or color



#### Rotating object



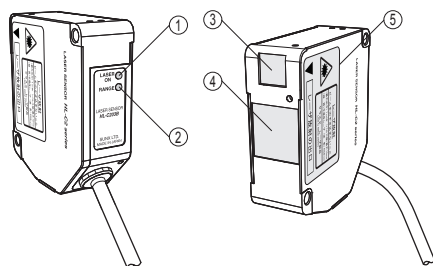
#### Object that has large differences in gaps, grooves and colors



## PRECAUTIONS FOR PROPER USE

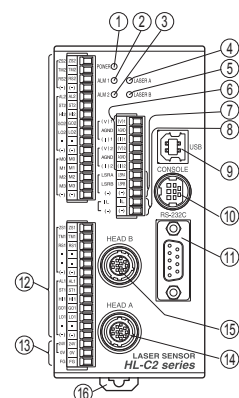
### Functional description

#### 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 at approximately 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



	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 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.

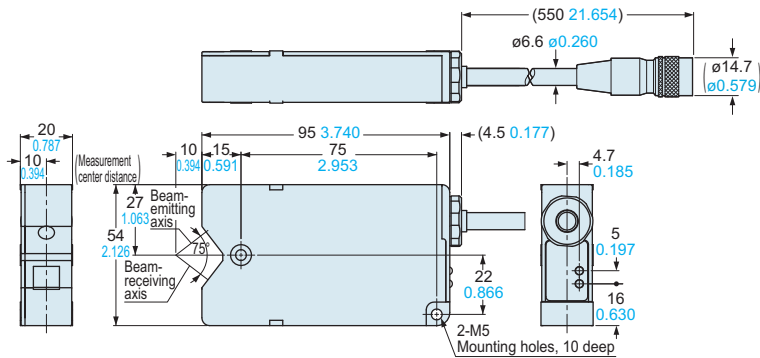
Note: In case of connecting one sensor head to the controller, be sure to connect the sensor head to ⑭ the sensor head A connection (HEAD A) side. If the sensor head is connected to ⑮ the sensor head B connection (HEAD B) side, the measurement cannot be performed.

## DIMENSIONS (Unit: mm in)

HL-C201F(E) HL-C201F(E)-MK

Sensor head

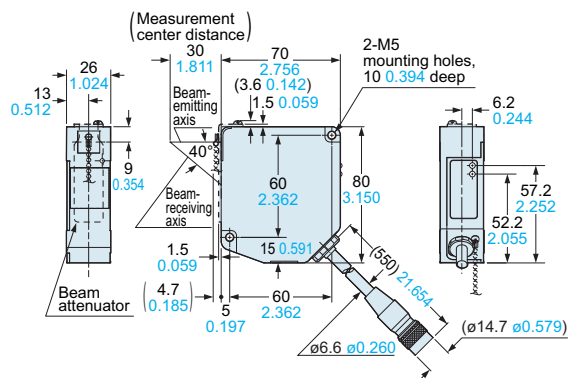
Set mode: Specular reflective type



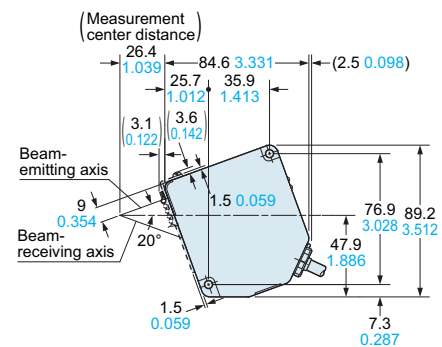
HL-C203F(E) HL-C203F(E)-MK

Sensor head

Set mode: Diffuse reflective type



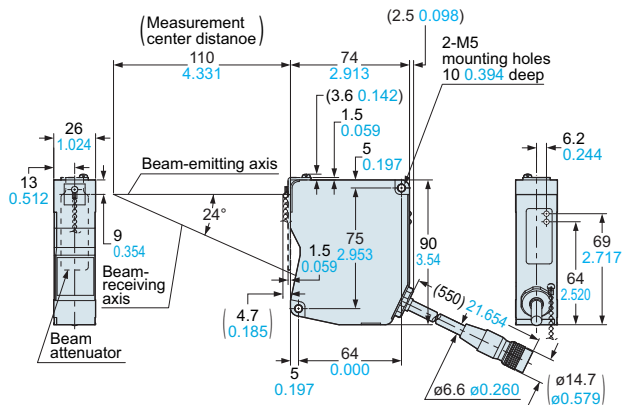
Set mode: Specular reflective type



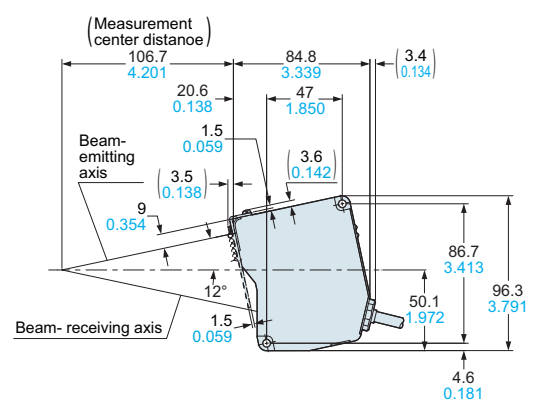
HL-C211F(E) HL-C211F(E)-MK

Sensor head

Set mode: Diffuse reflective type



Set mode: Specular reflective type

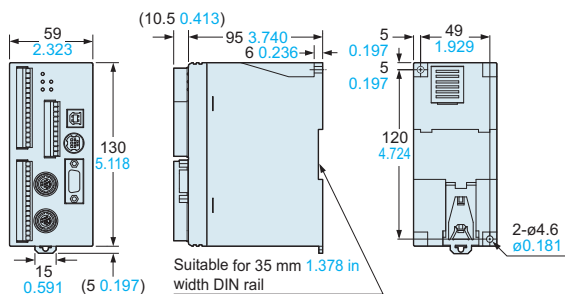




## DIMENSIONS (Unit: mm in)

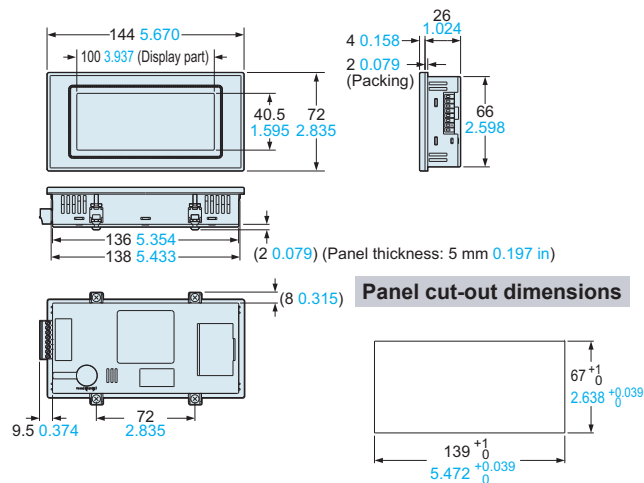
### HL-C2C(E) HL-C2C(E)-P

Controller



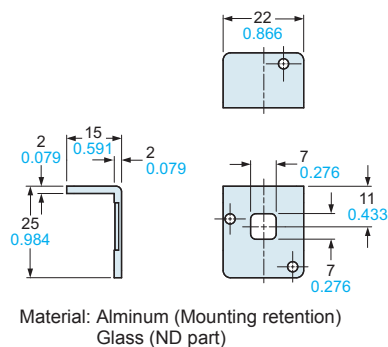
### HL-C2DP-EX

Compact console

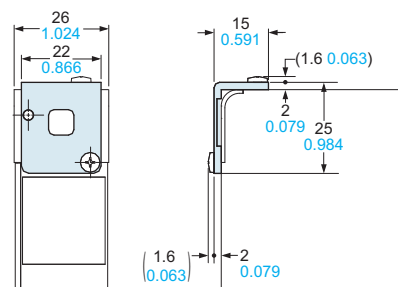


### HL-C2F01

ND filter



### 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.

Please contact .....

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