Ultra High-speed High-precision Laser Displacement Sensor

HL-C2 SERIES

Related Information
■ General terms and conditions..... F-17
■ Glossary of terms / General precautions ..... P.1397 / P.1405
■ Sensor selection guide ..... P.967~
■ About laser beam..... P.1403~

CE Conforming to EMC Directive

FDA Conforming to FDA regulations

HL-C2 series are introduced to limited countries only, because some models falls under WA (Wassenaar Arrangement) 2.B.6.b.1.a, and NSG (Nuclear Suppliers Group) guidelines 1.B.3.b.1. Please contact our office for details.

This product is classified as a Class 1 / Class 2 / Class 3R Laser Product in IEC / JIS standards and a Class I / Class II / Class IIIa Laser Product in FDA regulations 21 CFR 1040.10. Never look at or touch the direct laser beam and its reflection.

Ultra high-speed, high-precision laser displacement sensors using a combination of new technology

Excellent basic performance

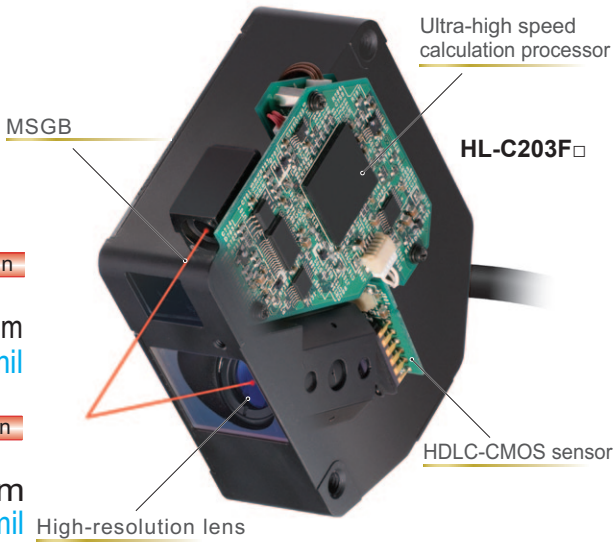
These sensors achieve an excellent level of performance in the three basic functions which are required of reflective type laser displacement sensors. They can provide “Surplus”, “Reliability” and “Confidence” to production sites which demand high speeds and high precision.

HL-C203F□

Sampling	Linearity	Resolution
100 kHz	±0.03 %	0.025 µm (0.001 mil)

HL-C201F□

Sampling	Linearity	Resolution
100 kHz	±0.02 %	0.01 µm (0.0004 mil)



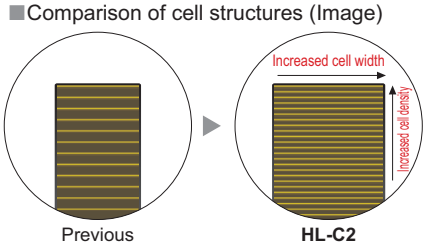
HDLC-CMOS sensors

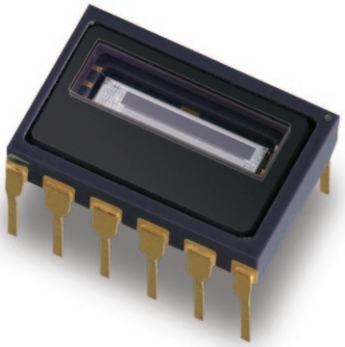
Resolution Sampling

The HDLC-CMOS sensors have been developed specially for the **HL-C2** series. High density light-receiving cells and a processing speed which is close to maximum limits 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)





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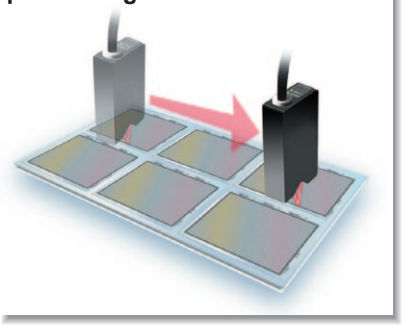
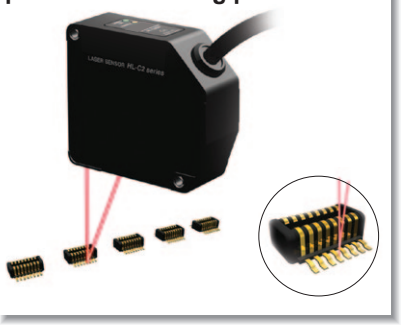
APPLICATIONS

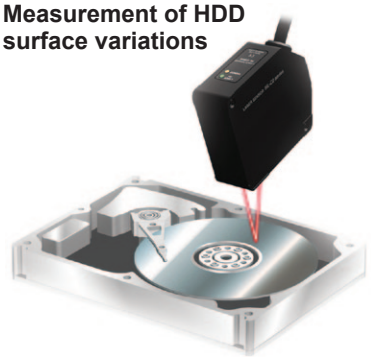
Measurement of the positions of patterned glass



Detection of deformed narrow pitch connector leg pins



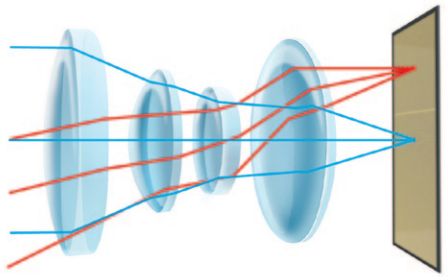
Measurement of HDD surface variations



High-resolution lens

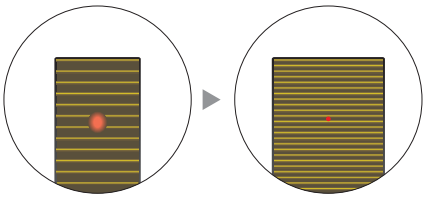
Resolution Linearity

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 light received from a variety of different angles to produce images with even greater precision.



Image

■Comparison of beam quality (Image)



Previous HL-C2

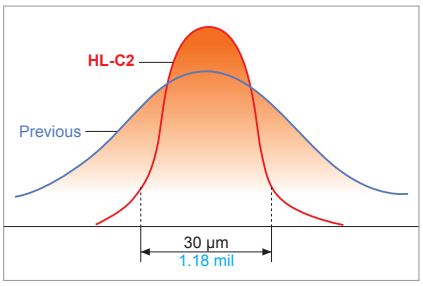
MSGB

Resolution Linearity

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

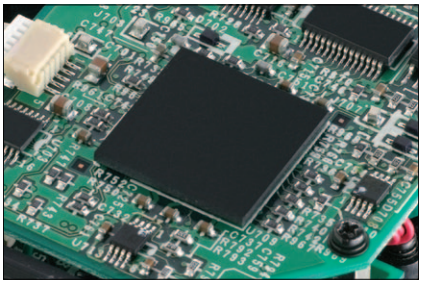


Image

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.



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SYSTEM LAYOUT

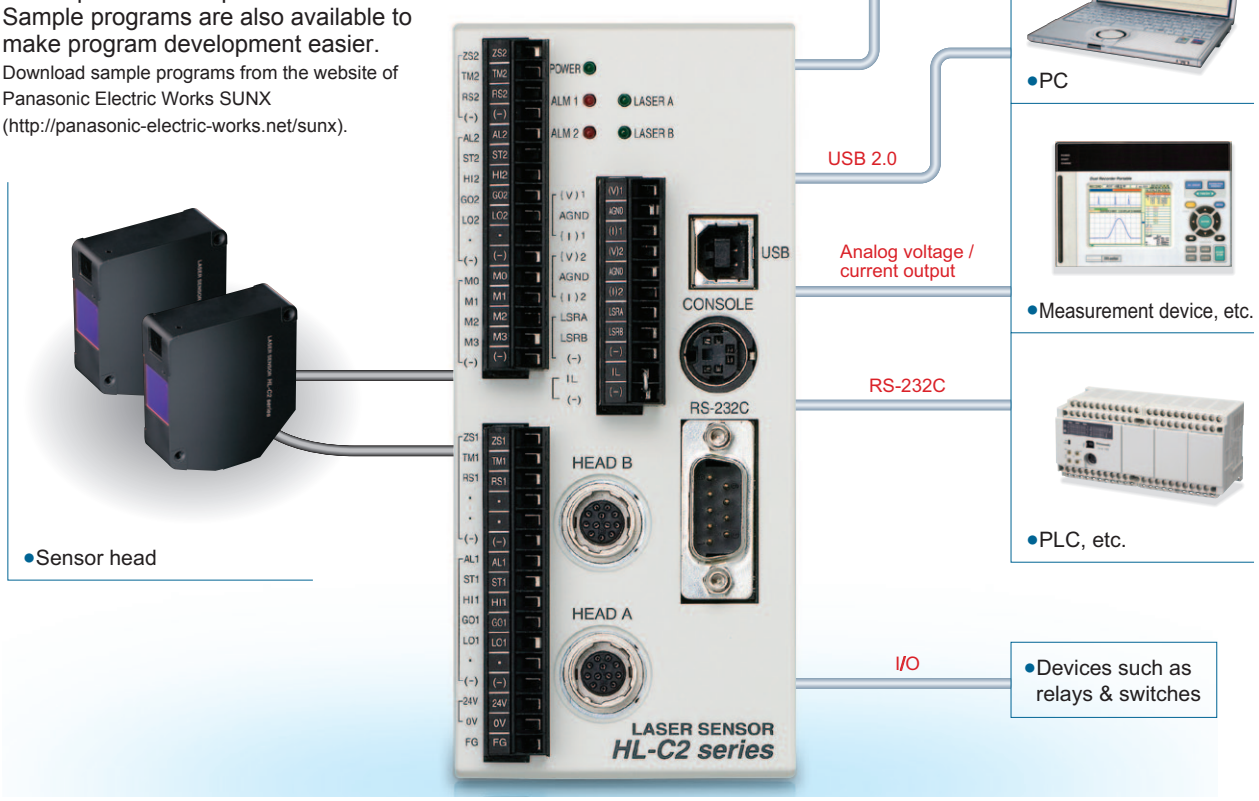
Controller

Data buffering function

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

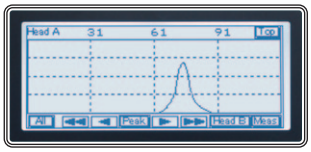
API provided free of charge
(Application Programming Interface)

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).



Console

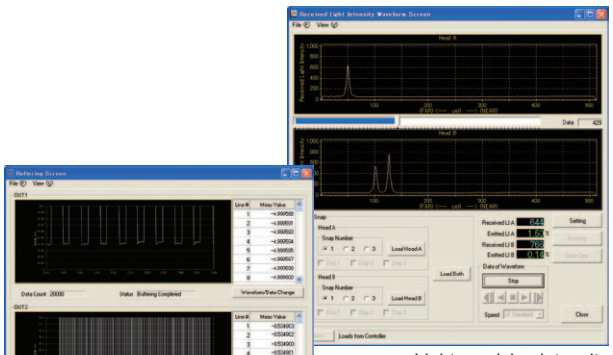
Easy to operate using the touch panel and simple display.



Not only measurement values, but also the wavelength of the amount of light received can be displayed.

Intelligent Monitor

Waveform monitoring and function setting by computer at great convenience



Light receiving intensity in waveform display

Buffering display

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ORDER GUIDE

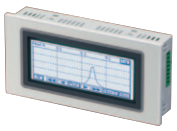
Sensor heads

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
			0.25 µm 0.010 mil		**HL-C201FE**	
Linear beam spot type			0.01 µm 0.0004 mil	20 × 700 µm 0.787 × 27.559 mil approx.	**HL-C201F-MK**	
			0.25 µm 0.010 mil		**HL-C201FE-MK**	
Small beam spot type		30 ±5 mm 1.181 ±0.197 in	0.025 µm 0.001 mil	ø30 µm ø1.181 mil approx.	**HL-C203F**	FDA: Class II IEC: Class 2
			0.25 µm 0.010 mil		**HL-C203FE**	
Linear beam spot type			0.025 µm 0.001 mil	30 × 1,200 µm 1.181 × 47.244 mil approx.	**HL-C203F-MK**	
			0.25 µm 0.010 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 0.010 mil		**HL-C211FE**	
			0.1 µm 0.004 mil		**HL-C211F5**	FDA: Class IIIa IEC: Class 3R
			0.25 µm 0.010 mil		**HL-C211F5E**	
Linear beam spot type			0.1 µm 0.004 mil	80 × 1,700 µm 3.150 × 66.929 mil approx.	**HL-C211F-MK**	FDA: Class II IEC: Class 2
			0.25 µm 0.010 mil		**HL-C211FE-MK**	
			0.1 µm 0.004 mil		**HL-C211F5-MK**	FDA: Class IIIa IEC: Class 3R
			0.25 µm 0.010 mil		**HL-C211F5E-MK**	

Controllers

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

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: 2 m 6.562 ft, Weight: 0.2 kg approx.	Cabtyre 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.
		HL-C2CCJ5	Length: 5 m 16.404 ft, Weight: 0.4 kg approx.	
		HL-C2CCJ10	Length: 10 m 32.808 ft, Weight: 0.7 kg approx.	
		HL-C2CCJ20	Length: 20 m 65.617 ft, Weight: 1.4 kg approx.	
		HL-C2CCJ30	Length: 30 m 98.425 ft, Weight: 2.0 kg approx.	

SPECIFICATIONS

Sensor heads

Item \ Model No.		HL-C201F(E)	HL-C203F(E)		HL-C211F(E)		HL-C211F5(E)	
Type		Small beam spot type						
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 0.0016 mil [256] 0.01 µm 0.0004 mil [4,096] (**HL-C201FE**: 0.25 µm 0.010 mil [256])	0.1 µm 0.004 mil [256] 0.025 µm 0.001 mil [4,096] (**HL-C203FE**: 0.25 µm 0.010 mil [256])		0.4 µm 0.016 mil [256] 0.1 µm 0.004 mil [4,096] (**HL-C211FE** and **HL-C211F5E**: 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 / 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 ø0.787 mil approx.	ø30 µm ø1.181 mil approx.		ø80 µm ø3.150 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		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**'.

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, object measured at measurement center distance 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 +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 $1/e^2$ (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 / 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 0.0016 mil [256] 0.01 µm 0.0004 mil [4,096] (**HL-C201FE-MK**: 0.25 µm 0.010 mil [256])	0.1 µm 0.004 mil [256] 0.025 µm 0.001 mil [4,096] (**HL-C203FE-MK**: 0.25 µm 0.010 mil [256])		0.4 µm 0.016 mil [256] 0.1 µm 0.004 mil [4,096] (**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.					
Tempreratures characteristics		0.01 % F.S./°C						
Light source		Red semiconductor laser (Peak emission wavelength: 658 nm 0.026 mil)						
		Class 1 (IEC / JIS / 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 × 27.559 mil approx.	30 × 1,200 µm 1.181 × 47.244 mil approx.		80 × 1,700 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		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**'.

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, object measured at measurement center distance 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 $1/e^2$ (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
Model No.		**HL-C2C(E)**	**HL-C2C(E)-P**
Connectale sensor head		Number of connectable units: Max. 2 units.	
Supply voltage		24 V DC ±10 % including ripple 0.5 V (P-P)	
Current consumption		500 mA approx. at 2 sensor heads connected 350 mA approx. at 1 sensor head connected (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 2)	Voltage output scale: –5 to +5 V/F.S (initial value) Output range during normal status: –10.0 to +10.0 V Output at abnormal status: –10.8 V or +10.8 V Resolution: 2 mV, Linearity: ±0.05 % F.S. Max. 2 mA, output impedance 50 Ω, Response delay time: 1.5 µs/V approx.	
	Current (Note 3)	Current output scale: 4 to 20 mA/F.S (initial value) Output range during normal status: 2 to 24 mA Output at abnormal status: 1 mA or 25 mA Resolution: 3 µA, Linearity ±0.05% F.S. Load impedance: 250 Ωmax., Response delay time: 10 µs approx.	
Alarm output		NPN 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
Item \ 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 +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.	
Accessories		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**'.
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.

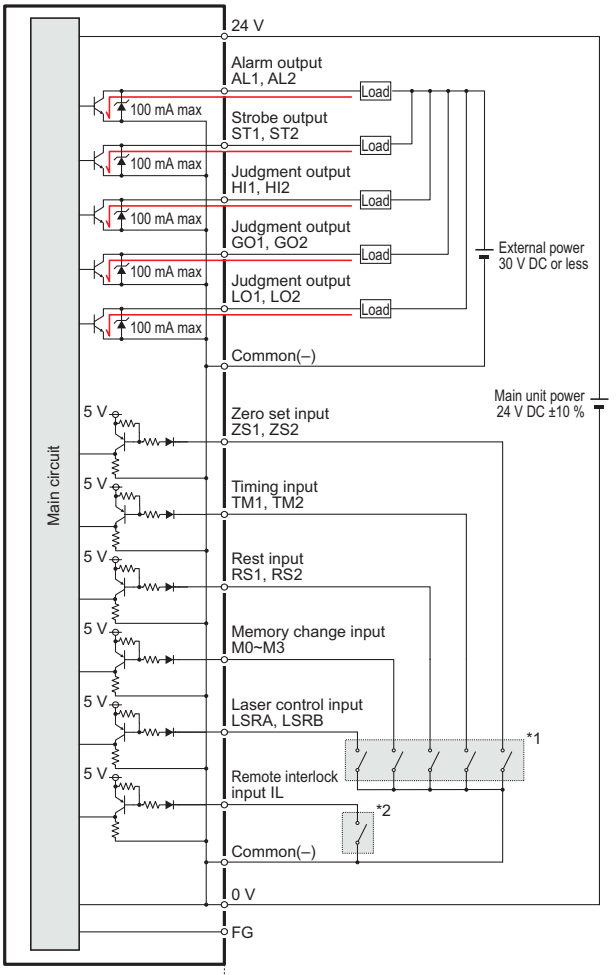
Compact console

Item \ Type		English display	Japanese display	Chinese display	Korean display
Item \ 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 +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.			
Accessories		Connector cable for connecting the controller to the console : 1 pc., Mounting bracket: 1 set			

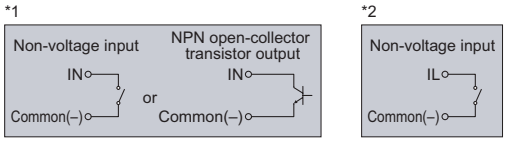
Notes: 1) This value indicates the average lifetime of the unit when used under a normal temperature of +25 °C +77 °F.
2) When reinstalling the console, replace the water proof packing. (Part No: AIGT181, 10 packs included)

I/O CIRCUIT AND WIRING DIAGRAMS (CONTROLLERS)

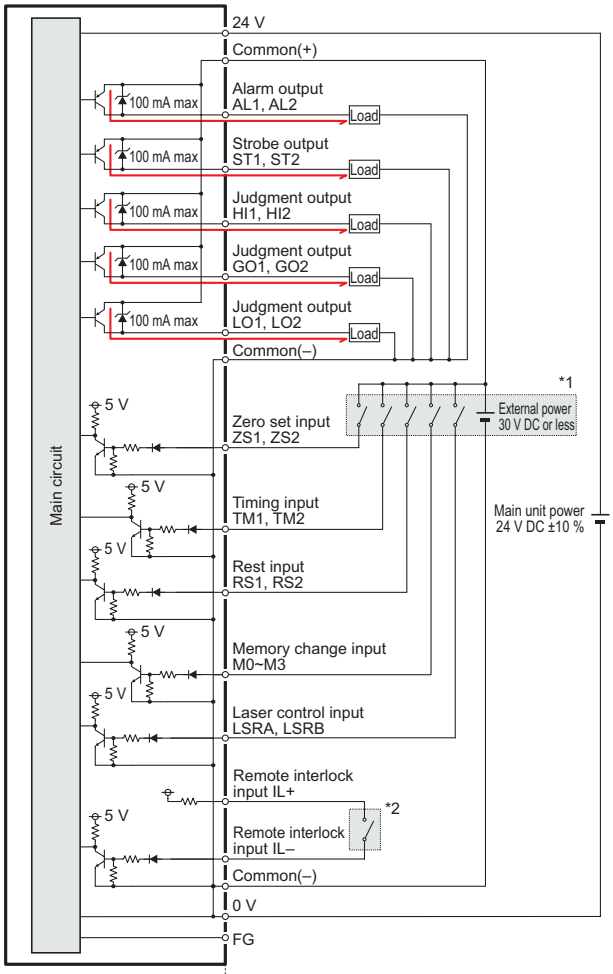
NPN output type



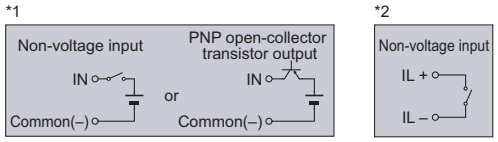
Controller intemal circuit ◄—○—► Extemal connection example



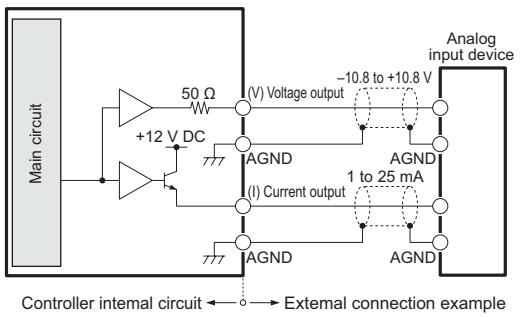
PNP output type



Controller intemal circuit ◄—○—► Extemal connection example



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

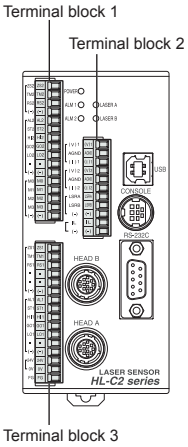


Controller intemal circuit ◄—○—► Extemal connection example

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

Notes: 1) Turn off the terminal in case short circuit lasts for more than one second.
2) Do not connect anything to the reserved terminals; 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 (Note 1)
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 2)
(–)	(+)	Common (–) / Common (+)
24V		24 V DC input for power supply
0V		Power supply ground 0 V
FG		Frame ground

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

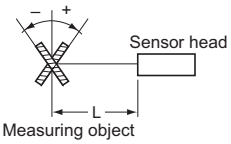
SENSING CHARACTERISTICS (TYPICAL)

HL-C201F(E)

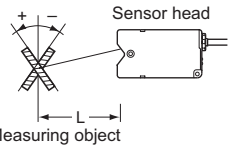
Correlation between measuring distance and error characteristics

Setup mode: Specular reflective

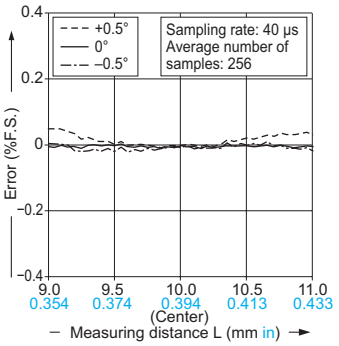
Aluminum vapor deposition surface reflection mirror (0°, ±0.5°)
Vertical orientation



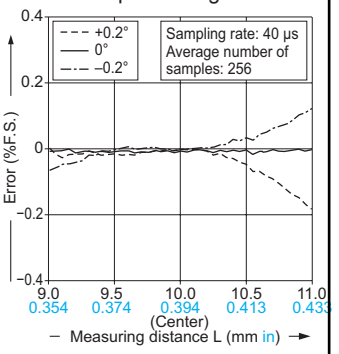
Aluminum vapor deposition surface reflection mirror (0°, ±0.2°)
Horizontal orientation



• Vertical positioning



• Horizontal positioning



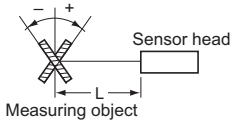
SENSING CHARACTERISTICS (TYPICAL)

HL-C203F(E)

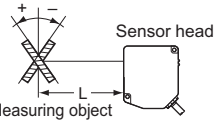
Correlation between measuring distance and error characteristics

Setup mode: Diffuse reflective

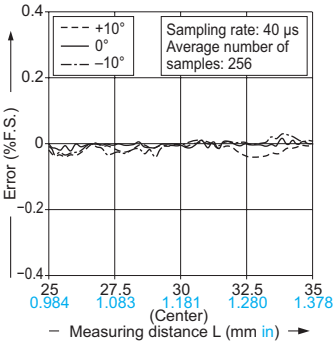
White ceramic (0°, ±10°)
Vertical orientation



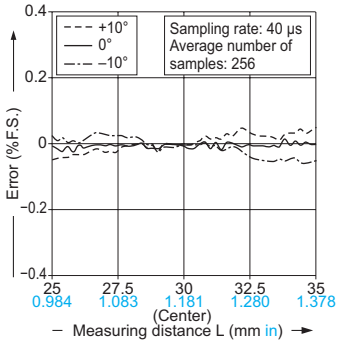
White ceramic (0°, ±10°)
Horizontal orientation



• Vertical positioning

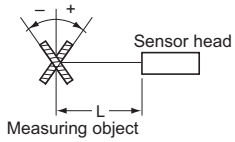


• Horizontal positioning

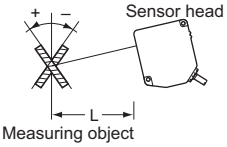


Setup mode: Specular reflective

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



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



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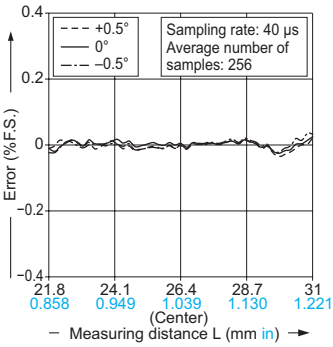
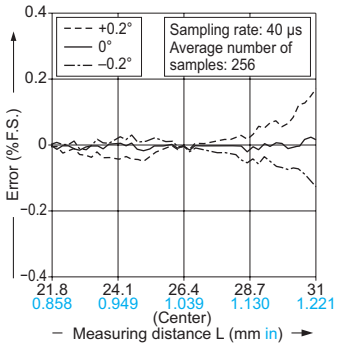


• Horizontal positioning

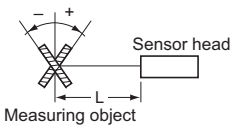


HL-C211F(E) HL-C211F5(E)

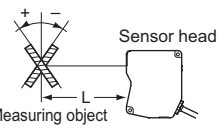
Correlation between measuring distance and error characteristics

Setup mode: Diffuse reflective

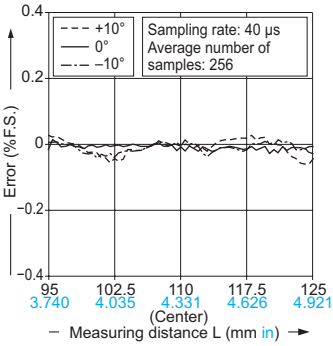
White ceramic (0°, ±10°)
Vertical orientation



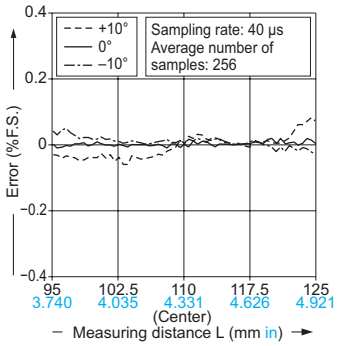
White ceramic (0°, ±10°)
Horizontal orientation



• Vertical positioning

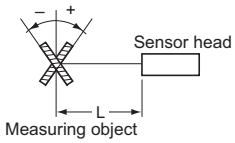


• Horizontal positioning

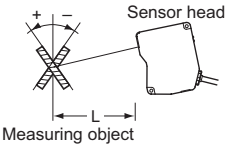


Setup mode: Specular reflective

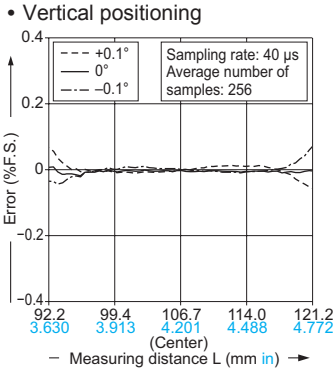
Aluminum vapor deposition surface reflection mirror (0°, ±0.1°)
Vertical orientation



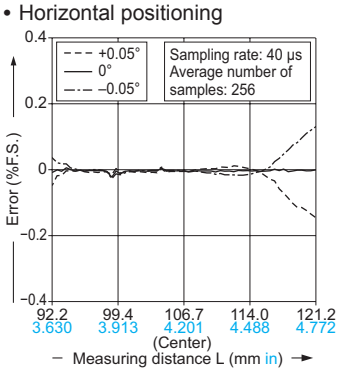
Aluminum vapor deposition surface reflection mirror (0°, ±0.05°)
Horizontal orientation



• Vertical positioning



• Horizontal positioning



PRECAUTIONS FOR PROPER USE

Refer to General precautions and About laser beam.

- 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.

PRECAUTIONS FOR PROPER USE

Refer to General precautions and About laser beam.

- 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.

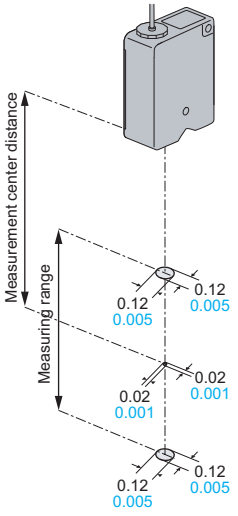
Products subject to control

- 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**

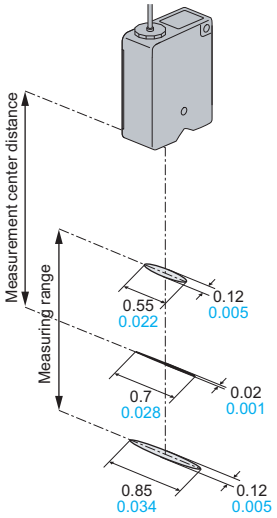
Note: These products are introduced to limited countries only. Please contact our office for details.

Beam size (Unit: mm in)

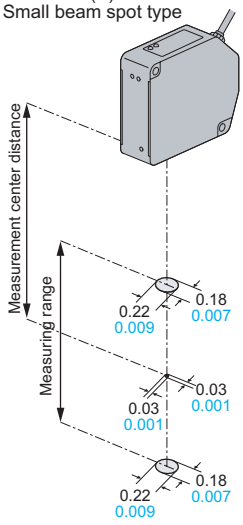
HL-C201F(E)
Small beam spot type



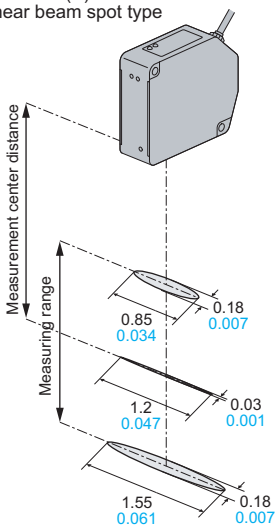
HL-C201F(E)-MK
Linear beam spot type



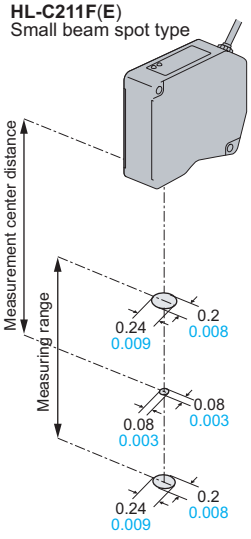
HL-C203F(E)
Small beam spot type



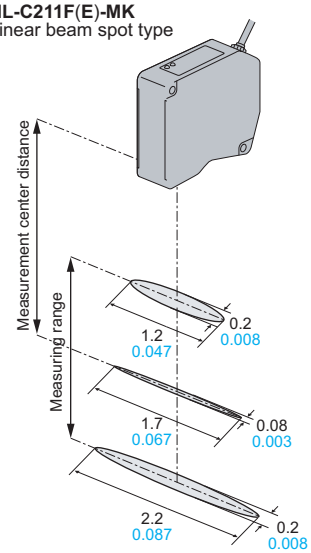
HL-C203F(E)-MK
Linear beam spot type



HL-C211F(E)
Small beam spot type



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



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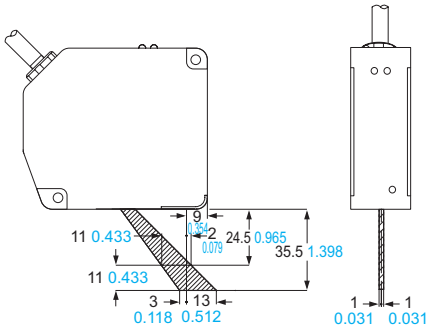
PRECAUTIONS FOR PROPER USE

Refer to General precautions and About laser beam.

Mutual interference

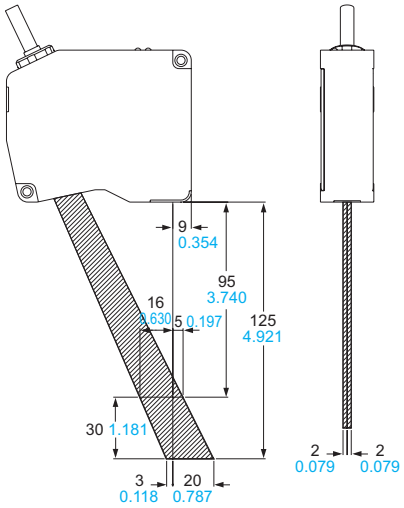
- When installing two or more sensor heads side by side, mutual interference will not occur if the laser spots from other sensor heads do not fall within the shaded areas of the sensor head in the figure below.
- When connecting two sensor heads to one controller, the mutual interference prevention function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

HL-C203F□



(Unit: mm in)

HL-C211F□

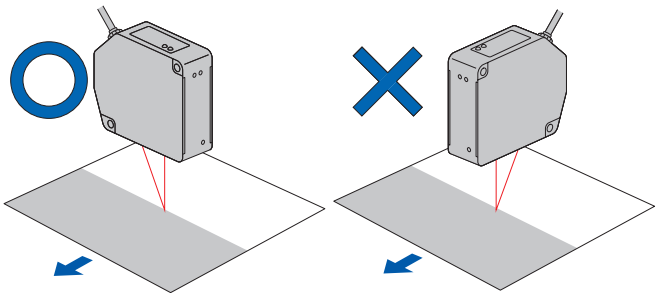


(Unit: mm in)

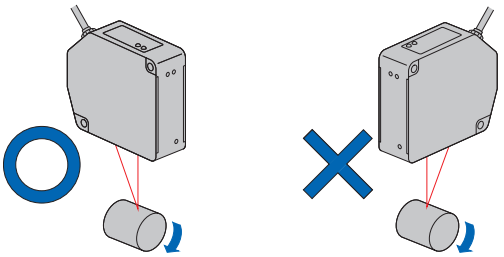
Sensor head mounting direction

- 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.

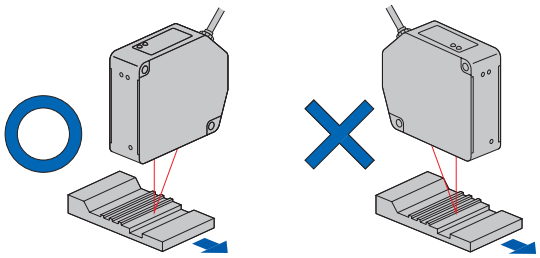
Object with variations in material or color



Rotating object



Object that has large differences in gaps, grooves and colors



Safety standards for laser beam products

- A laser beam can harm human being's eyes, skin, etc., because of its high energy density. IEC has classified laser products according to the degree of hazard and the stipulated safety requirements. The **HL-C2** series is classified as Class 1 / Class 2 / Class 3R laser. (Refer to About laser beam.)

Safe use of laser products

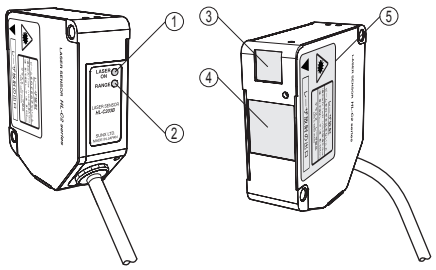
- For the purpose of preventing users from suffering injuries by laser products, IEC 60825-1(Safety of laser products). Kindly check the standards before use. (Refer to About laser beam.)

PRECAUTIONS FOR PROPER USE

Refer to General precautions and About laser beam.

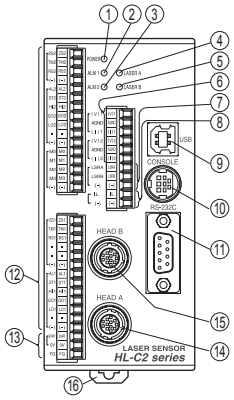
Fuctional description

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. 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.

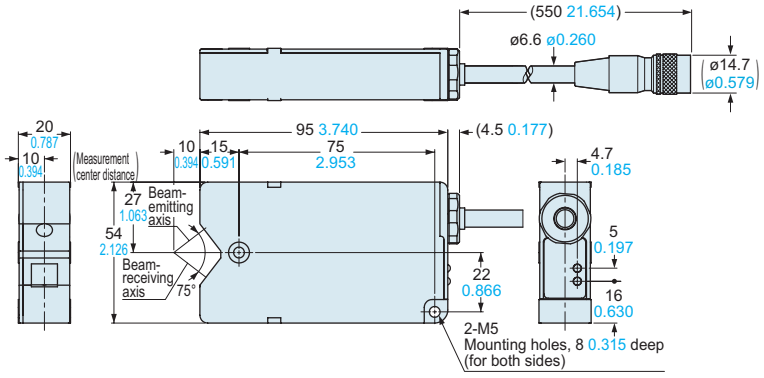
Note: In case of connecting one sensor head to the controller, be sure to connect the sensor head to ⑭ the sensor head A connection (HEAD A) side. If the sensor head is connected to ⑮ the sensor head B connection (HEAD B) side, the measurement cannot be performed.

DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from our website.

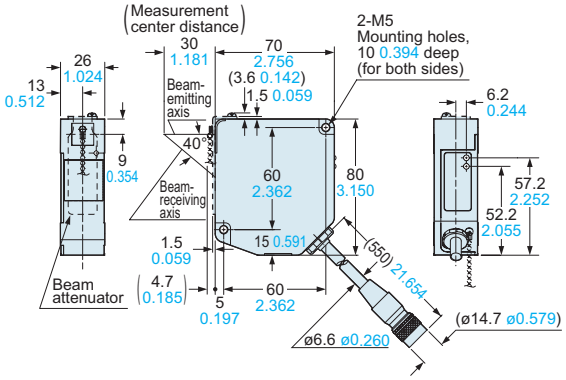
HL-C201F(E) HL-C201F(E)-MK — Sensor head

Set mode: Specular reflective type

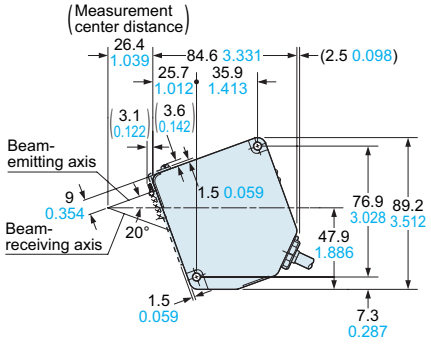


HL-C203F(E) HL-C203F(E)-MK — Sensor head

Set mode: Diffuse reflective type

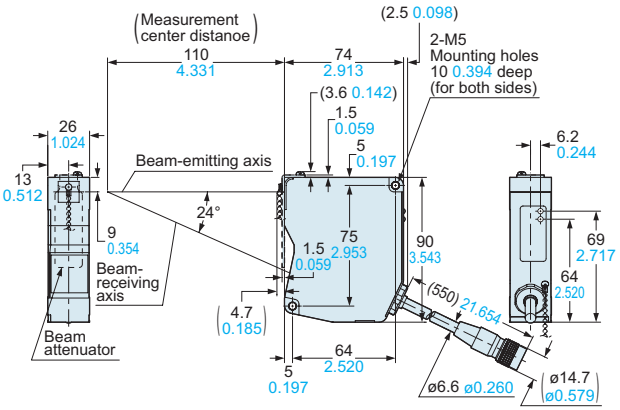


Set mode: Specular reflective type

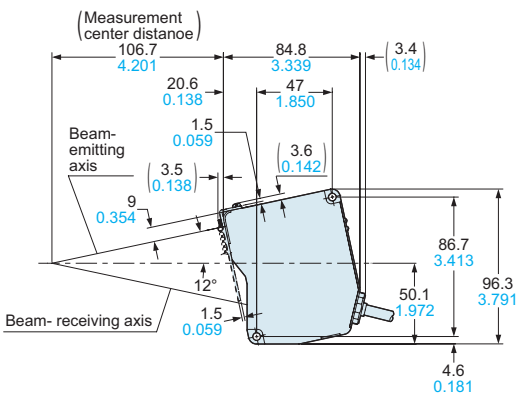


HL-C211F□(E) HL-C211F□(E)-MK — Sensor head

Set mode: Diffuse reflective type



Set mode: Specular reflective type



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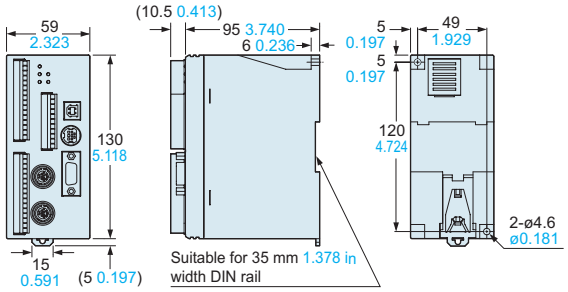
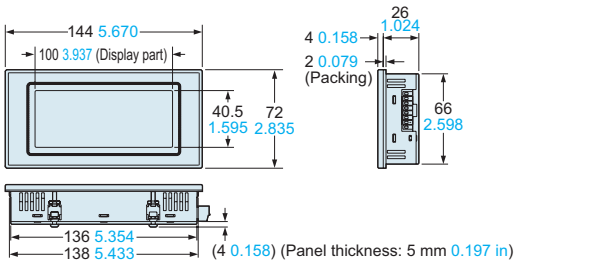
DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from our website.

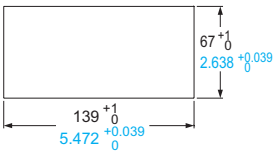
HL-C2C(E) HL-C2C(E)-P — Controller



HL-C2DP-EX — Compact console

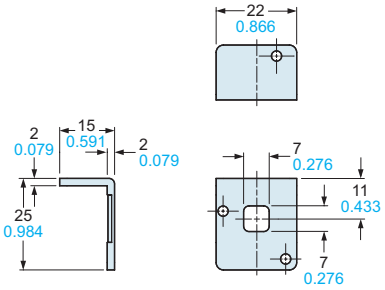


Panel cut-out dimensions



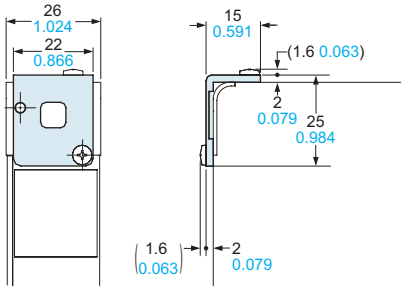
Note: The panel thickness should be 1 to 5 mm 0.039 to 0.197 in.

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□(-MK)** cannot be mounted.