SUNX

ULTRA HIGH-SPEED
LASER DISPLACEMENT SENSOR **CCD Style**

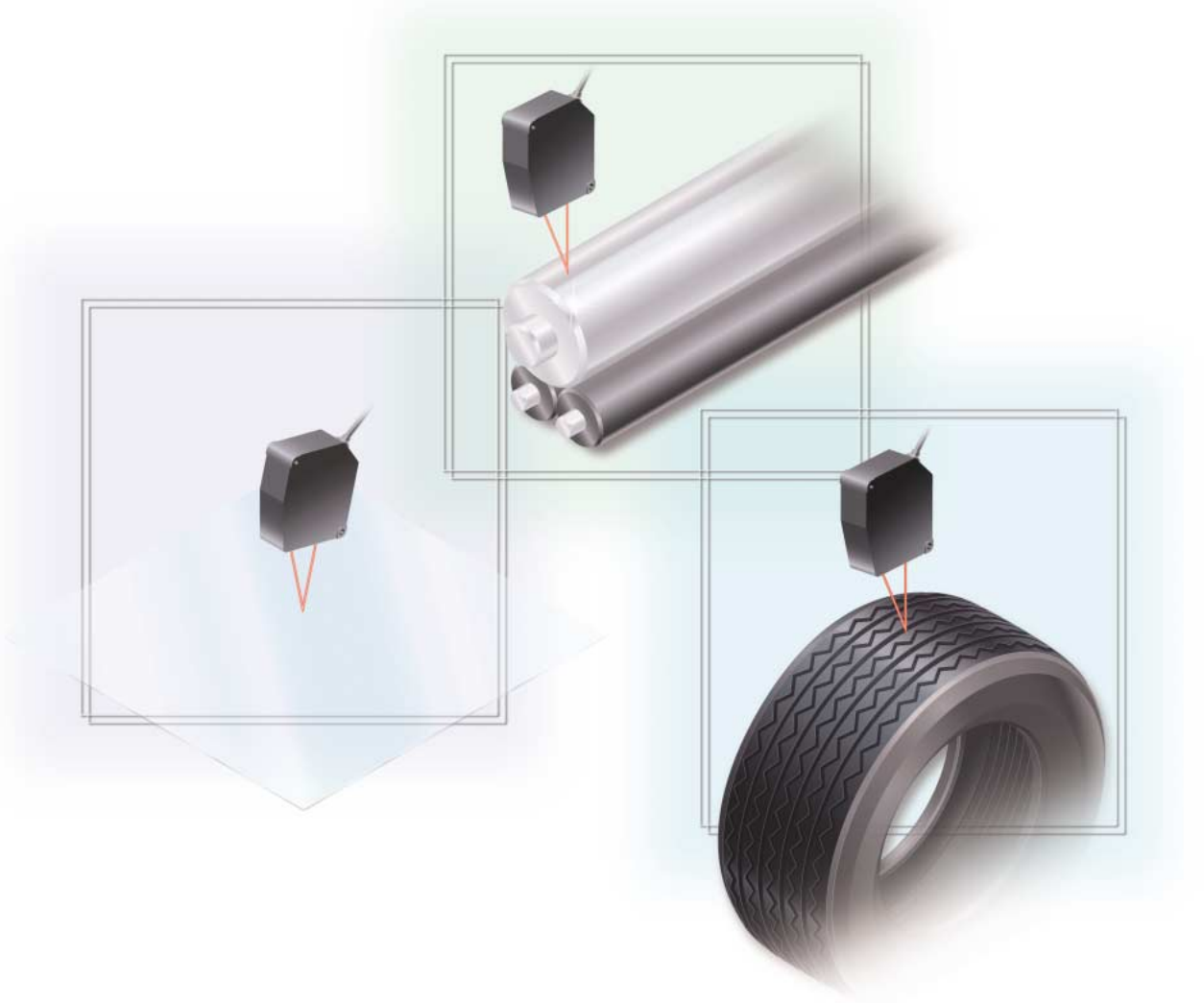
New

HL-C1 SERIES

CE
Conforming to
EMC Directive

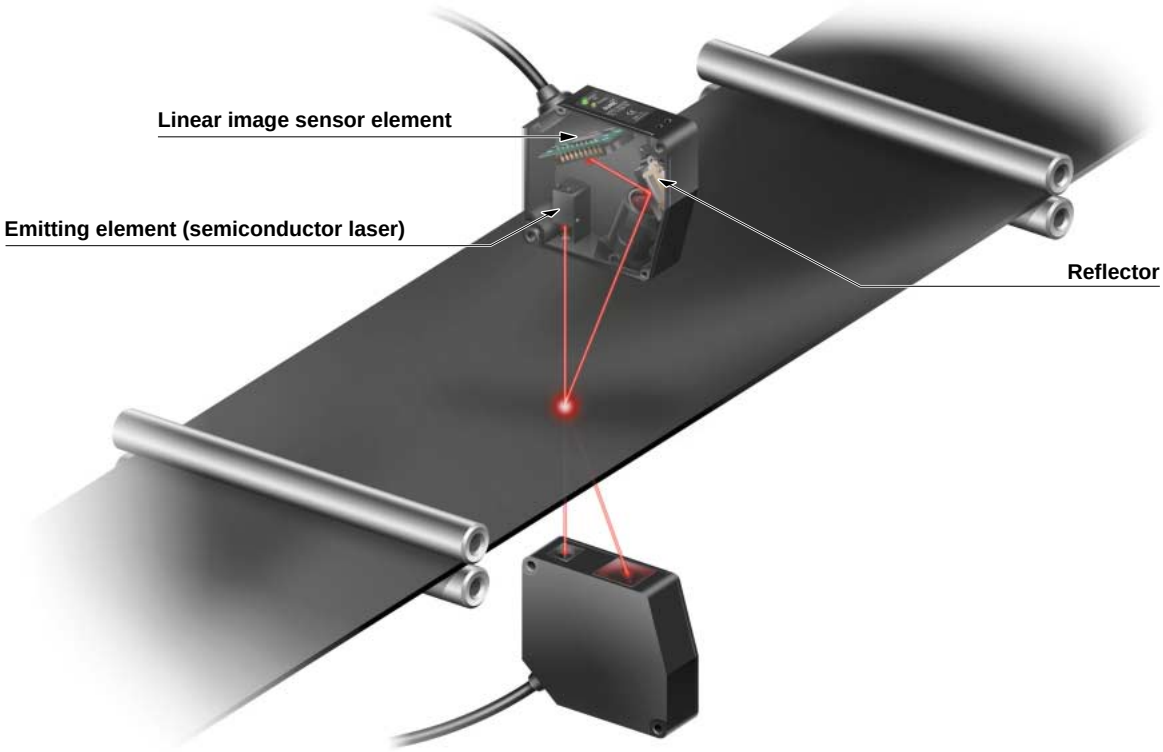
100µs, the Fastest Sampling Speed in the Industry

Ultra high speed & stable measurement for a variety of measurement workpieces



Stable high-speed measurement is now available for a variety of measurement workpieces, through the combination of SUNX's unique 100μs high-speed sampling optical system - the fastest of all products in its class - together with a linear image sensor.

Black rubber having a low reflected light intensity, objects with uneven surfaces, mirror-surfaced objects, such as wafers, and transparent objects, such as the glass used in liquid crystal displays.
SUNX has now integrated all the technologies required to enable stable and consistent measurement of these objects, which were previously considered as difficult objects to measure.
Through the fusion of our unique newly developed optical system, linear image sensor methodology and high-speed sampling technology, a wide variety of objects can now be stably measured with great precision at ultra high speeds.



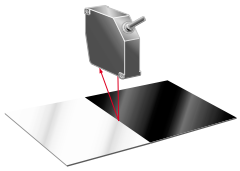
100 μs, the fastest sampling rate for this product class, is now available

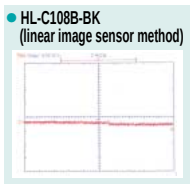
The most amazing, ultra high-speed sampling in the industry has now been achieved for displacement sensors utilizing linear image sensors, thus enabling ultra high-speed measurement of rotating, vibrating and moving objects.

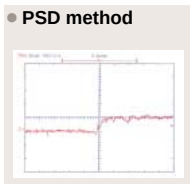
High accuracy measurement is now possible, unaffected by the surface condition of the detected workpiece.

All deficiencies inherent in the conventional PSD sensing method have now been completely solved. Whereas the PSD method measures position information from the center of gravity of the total light quantity distribution of the light spots connected along each light element, the linear image sensing method measures the peak position values for the light spots themselves. This advance now makes high-precision measurement possible, regardless of the surface condition of the workpiece - whether for metal hairline surface cracks or for surfaces non-reflective black rubber.

Change in measurement data due to color difference (White Ceramic / Black Rubber)







Resolution of 1 μm 0.039 mil, Linearity of ±0.1 % F.S.

Now available with ultra-precise 1μm 0.039 mil resolution measurement capability (**HL-C105B-BK**, **HL-C105F-BK**, **HL-C105B**, **HL-C105F**) and a linearity of ±0.1 % F.S. (for all models).

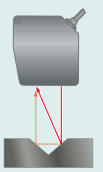
FDA standards conforming types are available

FDA standards conforming types, most suitable for equipment used in the USA, are now available.

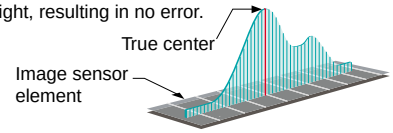
FDA : Class 2
IEC/JIS: Class 1

Operating Theory **For detection of a V-shaped groove**

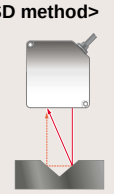
<Linear image sensor method>



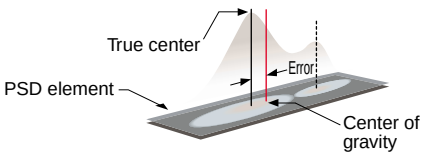
As the sensor measures the peak position of the light spot, it is not affected by secondary reflected light, resulting in no error.



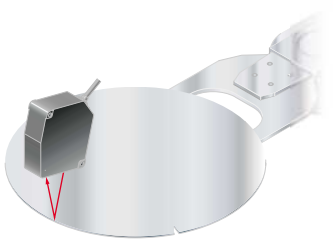
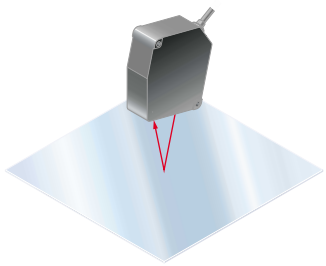
<PSD method>

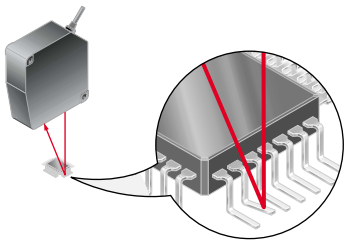
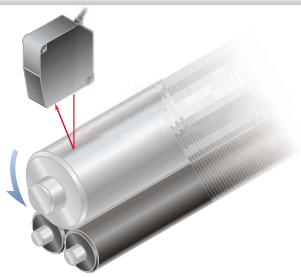
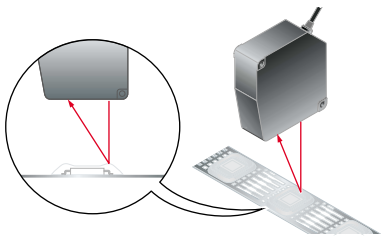


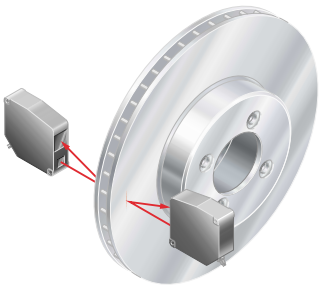
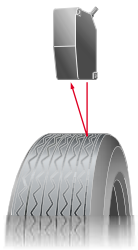
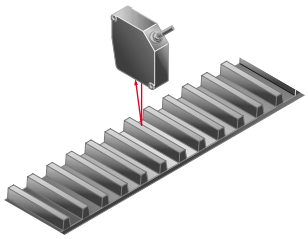
As the sensor measures the center of gravity for the light quantity distribution of the entire beam spot as position information, errors occur due to the presence of secondary reflected light.



APPLICATIONS

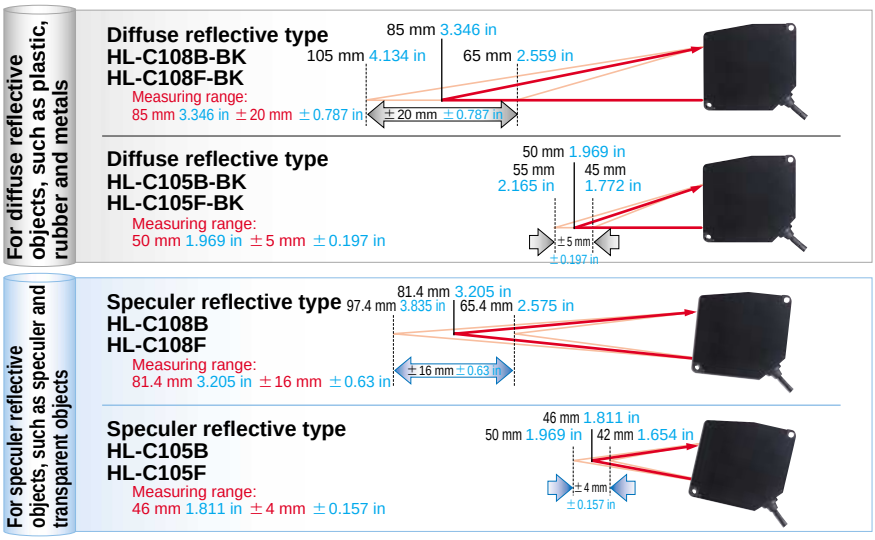
Positioning wafer	Measuring glass substrate thickness
	

Checking IC pins	Measuring the eccentricity of metal shaft	Detecting the presence of a resin coating
		

Measuring disk brake thickness	Inspecting tire tread patterns	Measuring gap spacing in rubber belt material
		

4 models are now available to suit a variety of different measurement tasks

The diffuse reflective type **HL-C108B-BK**, **HL-C108F-BK** (center of measuring distance: 85 mm 3.346 in) and **HL-C105B-BK**, **HL-C105F-BK** (center of measuring distance: 50 mm 1.969 in), the regular reflective type **HL-C108B**, **HL-C108F** (center of measuring distance: 81.4 mm 3.205 in) and **HL-C105B**, **HL-C105F** (center of measuring distance: 46 mm 1.811 in). In addition, a wider measuring range is also possible, thus facilitating various types of diverse measurement workpieces and installation conditions.



Waterproof sensor head construction, compliant with IP67 rated protection

The **HL-C1** series can withstand water splashes.

Note: Accurate measurement cannot be performed if water is present on the sensing window of the sensor head itself.

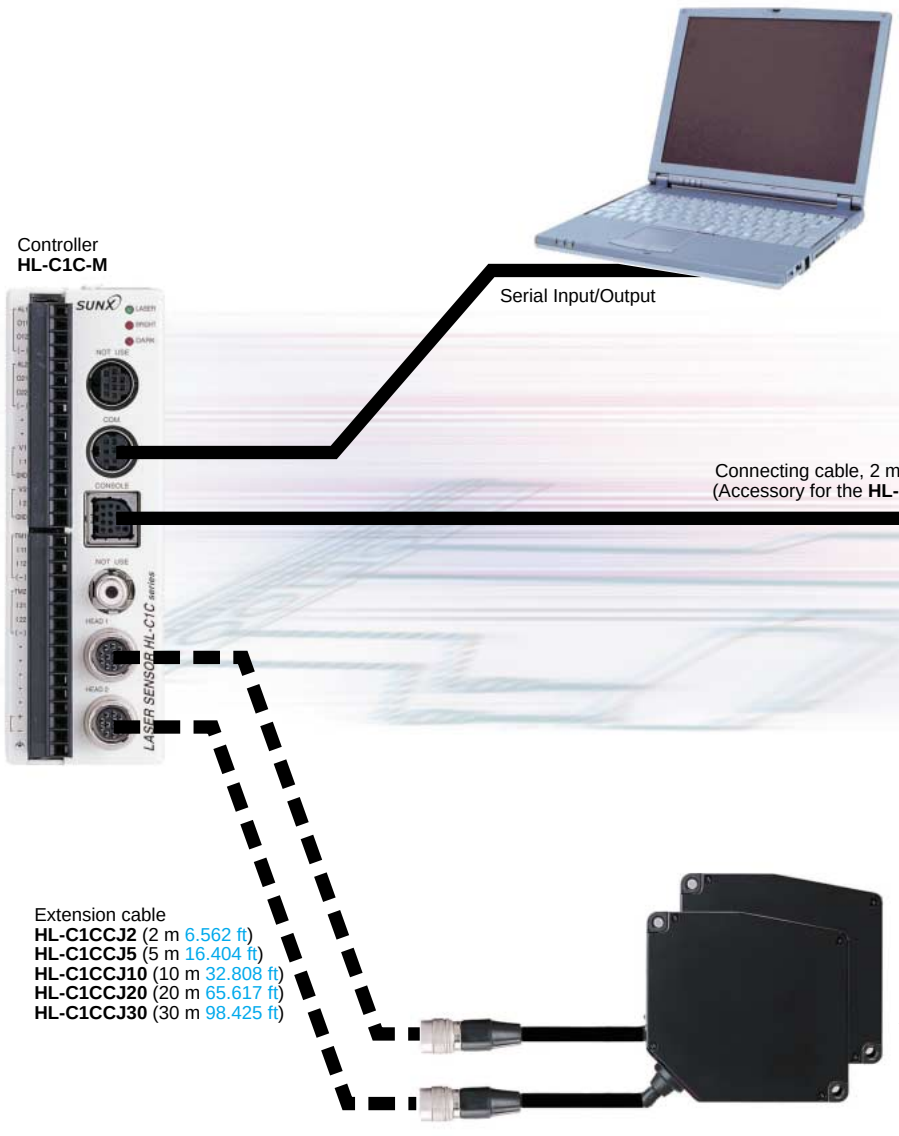
Easy maintenance with sensor head compatibility

Maintainability has been significantly improved. Compatibility has been achieved through the incorporation of correction data into the sensor heads themselves. This new sensor series no longer needs the amount of maintenance usually required for conventional displacement sensors of this class. The same controller can be utilized, even if the sensor head must be replaced with a different model. As well, dedicated connection ports are not required when connecting 2 sensor heads.

AUDIN - 8, avenue de la malle - 51370 Saint Brice Courcelles - Tel : 03.26.04.20.21 - Fax : 03.26.04.28.20 - Web : http: www.audin.fr - Email : info@audin.fr

Another industry first! Compact console with touch panel and thin, ultra-compact controller integrate high functionality to provide a comfortable operating environment!

The compact design significantly reduces the installation space required for the controller and console.
The controller allows multiple sensor head connections, reducing costs and saving space, yet incorporating a tremendous variety of convenient functions.
The HL-C1 series integrates outstanding measurement performance and signal processing technology into a truly comfortable operating environment.



Equipped with serial input/output

An RS-232C interface for serial input and output is provided so that settings can be retrieved and saved.
Measurement values can also be retrieved.

Industry First

Touch panel operation, easy and compact

A variety of setting and measurement data can be displayed easily. (Option)

2 sensor heads can be connected! Reduces costs and saves space

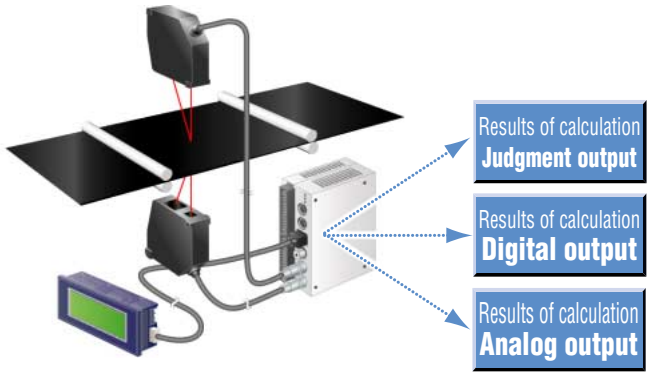
The controller, to which 2 sensor heads can be connected, incorporates 2 separate input / output channels.
This feature saves the expense and space usually required by a second controller, whenever 2 sensor heads are used.

Sensors

IEC / JIS standards-compliant type	FDA standards-compliant type
HL-C108B-BK	**HL-C108F-BK**
HL-C105B-BK	**HL-C105F-BK**
HL-C108B	**HL-C108F**
HL-C105B	**HL-C105F**

Calculations can be performed when 2 sensor heads are used

The built-in calculation function allows for the measurement of gaps and thicknesses without requiring a digital panel controller, thus saving further on costs and space.



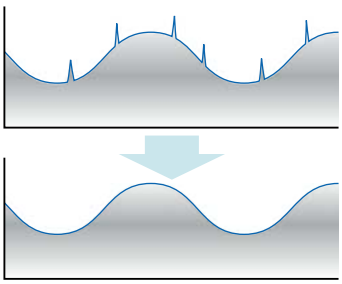
Enhanced functionality

The **HL-C1** series incorporates myriad useful functions, including hold functions, calculation functions, filter functions and a hysteresis-setting function, that facilitate convenient usage in a variety of diverse applications.

Low-pass / High-pass Filter Functions

<Low-pass filter function>

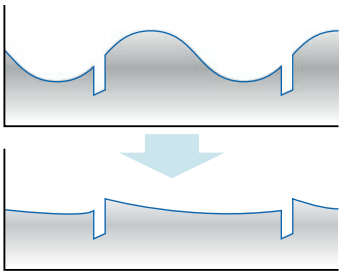
For example, if the surface conditions of a metal object cause noise that interferes with accurate measurement, the use of the low-pass filter function will reduce the effects of noise and allow for the stable measurement of displacement.



Measuring the eccentricity of a metal shaft

<High-pass filter function>

When measuring seams and gaps in objects that undergo large displacement changes due to vibration or tilting, such as measuring the eccentricity of a rotating object, this function will minimize the effects of these undulations and enable the accurate measurement of seams and gaps.

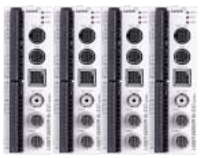


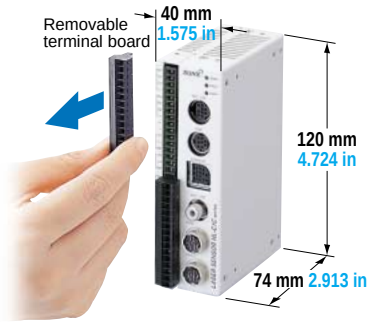
Detecting the seams of a metal drum

Controller compact and front connection reduces setup space

The ultra-compact controller with dimensions of W40 × H120 × D74 mm W1.575 × H4.724 × D2.913 in requires much less space for installation. Adhesive installation is also possible. Furthermore, the cables can be connected directly or to a removable terminal board, so that all connections come from the same direction in order to further save space.

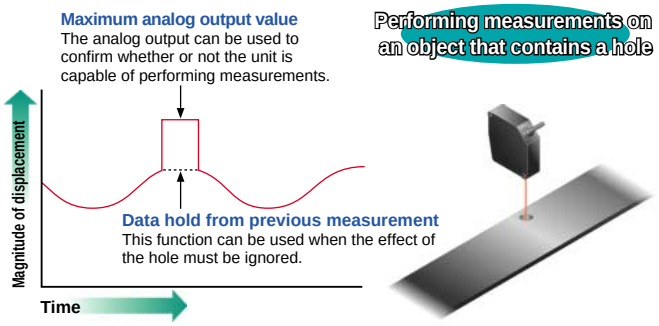
Side-by-side installation OK!





Analog Output Switching Function During Alarm Output

During measurement, if the unit becomes incapable of performing measurements due to excessive or insufficient incident light intensity (during alarm output), this function allows the analog output to be switched to either hold the data sensed just previously, or to output a fixed value. If the fixed value is selected, one of two options can be chosen for the analog output, during alarm output: the output of the maximum value (voltage output: +10.9V, current output: 29.5mA) or the output of the minimum value (voltage output: −10.9V, current output: 0mA).



Hold Functions

The **HL-C1** series incorporates 4 hold modes.

NORM (no hold)	This mode outputs the magnitude of displacement from the center of measuring distance, in real time. This mode is utilized for general-purpose operation.
P-P	This mode holds the output at the difference between the maximum and minimum measured values. This mode is utilized for vibration or eccentricity measurements.
PEAK	This mode holds the output at the maximum measured value.
VALLEY	This mode holds the output at the minimum measured value.

SPECIFICATIONS

Sensor heads

Item \ Type		Diffuse reflective type		Specular reflective type	
		General purpose	High precision	General purpose	High precision
Model No.	IEC/JIS standards-conforming type	**HL-C108B-BK**	**HL-C105B-BK**	**HL-C108B**	**HL-C105B**
	FDA standards-conforming type	**HL-C108F-BK**	**HL-C105F-BK**	**HL-C108F**	**HL-C105F**
Measurement center distance		85 mm 3.346 in	50 mm 1.969 in	81.4 mm 3.205 in	46 mm 1.811 in
Measuring range		±20 mm ±0.787 in	±5 mm ±0.197 in	±16 mm ±0.63 in	±4 mm ±0.157 in
Resolution (Note 2, 3)		6 μm 0.236 mil	1 μm 0.039 mil	3 μm 0.118 mil	1 μm 0.039 mil
Linearity (Note 4)		±0.1 % F.S.			
Temperature characteristics		±0.01 % F.S./°C			
Laser emission indicator		Green LED (lights up during laser emission and immediately before laser emission)			
Measuring range indicator		Yellow LED [blinks within the measuring range and lights up when near the measuring range center (measuring center ±0.5 mm ±0.02 in)]			
Environmental resistance	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			
	Voltage withstandability	500 V AC for 1 min. between the exclusive controller power input and the sensor head case			
	Insulation resistance	20 MΩ, or more, with 500 V DC megger between the exclusive controller power input and the sensor head case			
	Vibration resistance	10 to 55 Hz (Period: one minute) 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			
Emitting element		Red semiconductor laser, class 2 (IEC/JIS standards-conforming type: IEC/JIS, FDA standards-conforming type: JIS/IEC/FDA) (Max. output: 1 mW, Peak wave length: 685 nm 0.027 mil)			
Beam diameter (Note 5)		100×140 μm 3.937×5.512 mil approx.	70×120 μm 2.756×4.724 mil approx.	100×140 μm 3.937×5.512 mil approx.	70×120 μm 2.756×4.724 mil approx.
Receiving element		Linear image sensor			
Enclosure earthing		Floating			
Material		Enclosure: Die-cast aluminum, Case cover: Die-cast aluminum, Front cover: Glass			
Cable		Cabtyre cable, 0.5 m 1.64 ft long with connector			
Cable extension		Extension up to total 30 m 98.425 ft is possible, with optional cable			
Weight		500 g 17.637 oz approx.			
Accessories		English warning label			

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were as follows: power supply voltage 24 V DC, ambient temperature +20 °C +68 °F, sampling rate 100 μs (144 μs for **HL-C108B-BK**, **HL-C108F-BK**), average number of samples: 256 (64 samples for **HL-C108B-BK**, **HL-C108F-BK**), measurement center distance, object measured is made of white ceramic (an aluminum vapor deposition surface reflection mirror was used with specular reflective type). Linearity also depends upon the characteristics of the object being measured.
2) These values were obtained by converting P-P values into a distance. The P-P values indicate the distribution of measured values throughout the center of measuring distance.
3) These values were obtained with an average number of samples: 256 (64 samples for **HL-C108B-BK**, **HL-C108F-BK**), when using an object made of our company's standard white ceramic for measurement (an aluminum vapor deposition surface reflection mirror was used with specular reflective types).
4) This value indicates the range of errors for an ideal linear displacement output, when using an object made of our company's standard white ceramic for measurement (an aluminum vapor deposition mirror reflective surface was used with speculer reflective types). This value may fluctuate depending on the characteristics of the object measured.
5) These values were defined by using 1/e² (13.5 %) of the center light intensity. If there is a slight leakage of light outside the normal spot diameter and if the periphery surrounding the sensing point has a higher reflectivity than the sensing point itself, then the results may be affected.

Compact console

Item \ Designation		**HL-C1DP-E**
Supply voltage		24 V DC ±10 % including ripple 0.5 V (P-P)
Current consumption		200 mA or less
Display	Display element	STN monochrome LCD
	Back light	Green LED
	Life of LCD	Average 50,000 hours (Note 1)
	Display range	−99.9999 to 99.9999
Touch panel	Operation force	0.98 N or less
	Life	1,000,000 times or more
Environmental resistance	Protection	IP65 (IEC)(in initial state)(Note 2) Dust proof and drip proof only at front face of panel. (Waterproof packing is used for surfaces in contact with panel.)
	Ambient temperature	0 to +40 °C 32 to +104 °F (No dew condensation), Storage: −20 to +60 °C −4 to +140 °F
	Ambient humidity	20 to 85 % RH, Storage: 10 to 85 % RH
	Superimposed noise resistance	1,000 V (P-P) or more, pulse width 50 ns and 1 μs between power terminals
	Electrostatic noise resistance	5,000 V or more (surface of panel)
	Vibration resistance	10 to 55 Hz frequency, 0.75 mm 0.03 in amplitude in X,Y and Z directions for 10 min. each
	Shock resistance	98 m/s² acceleration (10 G approx.) in X,Y and Z directions for four times each
Weight		260 g 9.171 oz approx.
Accessory		Connecting cable for connecting the controller to the console: 1 piece

Notes: 1) This value indicates the average lifespan of the unit when used under a normal temperature of 25 °C 77 °F.
2) When reinstalling the console, replace the waterproof packing

SPECIFICATIONS

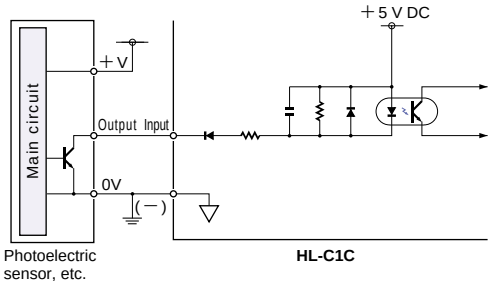
Controller

Item \ Model No.		HL-C1C-M
Connection sensor heads		Maximum 2 sensor heads
Supply voltage		24 V DC ± 10 % Including ripple 0.5 V (P-P)
Current consumption		When 1 sensor is connected: Approx. 430 mA, When 2 sensors are connected: Approx. 550 mA
Sampling rate		Selectable from 100 μs / 144 μs / 200 μs / 255 μs / 332 μs / 498 μs / 1,000 μs
Temperature characteristics		± 0.01 % F.S./°C
Analog output	Voltage	Output voltage: ± 5 V/F.S. [default setting when diffuse reflective mode is selected (Note 2)] Output range: − 10.9 to + 10.9 V Output current: Maximum 2 mA, Output impedance: 50 Ω
	Current (Note 3)	Output current: 4 to 20 mA/F.S. [default setting when diffuse reflective mode is selected (Note 4)] Output range: 0 to 29.5 mA (maximum of 25 mA at MAX. load impedance.) Load impedance: 250 Ω or less
Alarm output		Photo-MOS relay • Maximum load current: 50 mA • Applied voltage: 30 V DC or less (between alarm output and 0 V) • ON impedance: 35 Ω or less • Operation time: max. 2 ms
	Output operation	ON when the amount of light is excessive or insufficient.
	Short circuit protection	Incorporated
Judgment output (O1, O2)		Photo-MOS relay • Maximum load current: 50 mA • Applied Voltage: 30 V DC or less (between judgment output and 0 V) • ON impedance: 35 Ω or less • Operation time: max. 2 ms
	Output operation	Opened or closed when the threshold value is reached. Determined based on judgment output mode selection. (The threshold value varies with the hysteresis setting.)
	Short circuit protection	Incorporated
Serial input / output		RS-232C
Timing input (Laser emission stop)		Laser emission stops or continues when voltage (working input voltage: 12 to 24 V DC, maximum input voltage: 30 V DC) is input or there is an open circuit: determined based on input mode selection.
Zero set ON input		Zero set: ON when voltage (working input voltage: 12 to 24 V DC, maximum input voltage: 30 V DC) is input
Zero set OFF input		Zero set: OFF when voltage (working input voltage: 12 to 24 V DC, maximum input voltage: 30 V DC) is input
Indicators	Laser emission	Green LED (lights up during laser emission from sensor head 1 or sensor head 2, or immediately before laser emission)
	BRIGHT	Red LED (lights up upon disabled measurement due to excessive light at sensor head 1 or 2)
	DARK	Red LED (lights up upon disabled measurement due to poor light at sensor head 1 or 2)
Setting / Data display		Compact console (optional)
Calibration (Note 5)	Shift	± 20.0000 mm ± 0.787 in
	Span	0.9000 to 1.1000
Average number of samples (Note 5)		OFF, 2 to 32,768 times (16 steps)
Digital filters (Note 5)		High pass: OFF, 10 to 2,000 Hz (9 steps) Low pass: OFF, 10 to 2,000 Hz (9 steps)
Calculation functions (Note 5)		L ± KA, L ± KB, L ± K (A ± B) A, B: Sensor head 1, Sensor head 2 measurement values L = ± 999.9999, K = 0.0001 to 99.9999
Hold functions (Note 5)		Selectable from NORMAL / P-P / PEAK / VALLEY
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, Storage: 35 to 85 % RH
	Withstand voltage	500 V AC for one min. (between live part and enclosure)
	Insulation resistance	20 MΩ or more with a 500 V DC mega (between power input part and enclosure)
	Vibration resistance	10 to 55 Hz frequency (Period: 1 minute) 0.75 mm 0.03 in amplitude in X,Y and Z directions for 30 minutes each
	Shock resistance	196 m/s^2 (20 G approx.) X, Y and Z directions for 3 times each
Tatal cable lengths		Power supply line: less than 10 m 32.808 ft, Signal line: less than 30 m 98.425 ft
Weight		300 g 10.582 oz approx.

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were as follows: power supply voltage 24 V DC, ambient temperature + 20 °C + 68 °F, sampling rate 100 μs, average number of samples: 256, and measurement center distance.
2) If specular reflective mode is selected, then the default setting is ± 4 V/F.S.
3) The maximum analog output current will vary with load impedance.
4) If specular reflective mode is selected, then the default setting is 5.6 to 18.4 mA/F.S.
5) These values can be set using the command input from external equipment via the compact console and RS-232C interface.

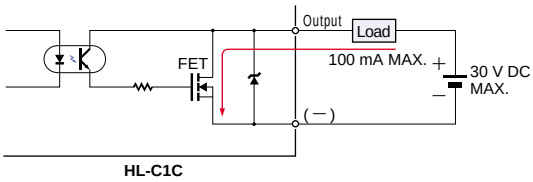
I/O CIRCUIT AND WIRING DIAGRAMS

Input circuit

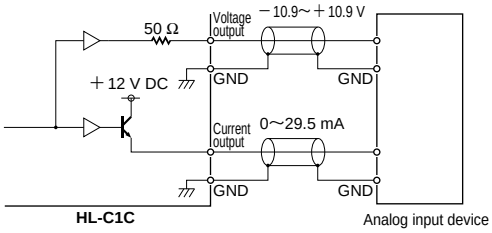


Output circuit

Alarm output, Judgment output



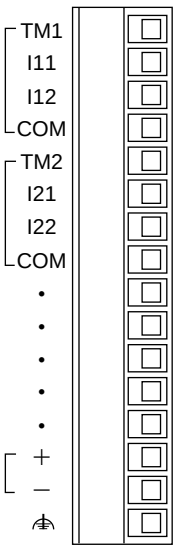
Analog output



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

Terminal arrangement

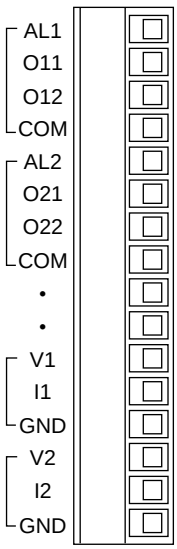
Input terminals



Symbol	Description
TM1	Timing Input (Sensor Head 1)
I11	Zero Set ON Input (Sensor Head 1)
I12	Zero Set OFF Input (Sensor Head 1)
COM	Input Common
TM2	Timing Input (Sensor Head 2)
I21	Zero Set ON Input (Sensor Head 2)
I22	Zero Set OFF Input (Sensor Head 2)
COM	Input Common
•	Not Used
•	Not Used
•	Not Used
•	Not Used
•	Not Used
+	24 V DC Input for Power Supply
−	Power Supply Ground
⏚	Function Ground

Note: Terminals marked with "•" are not used. Some are connected to internal circuitry, and cannot be used as relay terminals in wiring, etc.

Output terminals



Symbol	Description
AL1	Alarm Output (Sensor Head 1)
O11	Judgment Output 1 (Sensor Head 1)
O12	Judgment Output 2 (Sensor Head 1)
COM	Output Common
AL2	Alarm Output (Sensor Head 2)
O21	Judgment Output 1 (Sensor Head 2)
O22	Judgment Output 2 (Sensor Head 2)
COM	Output Common
•	Not used
•	Not used
V1	Analog Voltage Output (Sensor Head 1)
I1	Analog Current Output (Sensor Head 1)
GND	Analog Output Ground
V2	Analog Voltage Output (Sensor Head 2)
I2	Analog Current Output (Sensor Head 2)
GND	Analog Output Ground

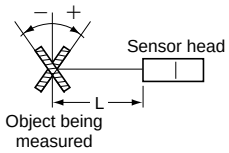
Note: Terminals marked with "•" are not used. Some are connected to internal circuitry, and cannot be used as relay terminals in wiring, etc.

SENSING CHARACTERISTICS (TYPICAL)

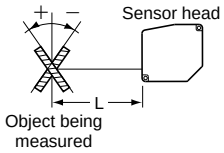
HL-C108B-BK
HL-C108F-BK

Measuring distance – error characteristics

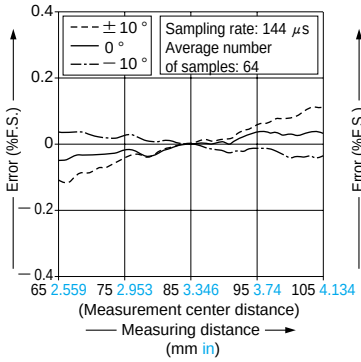
White ceramic (0 °, ±10 °)
vertical positioning



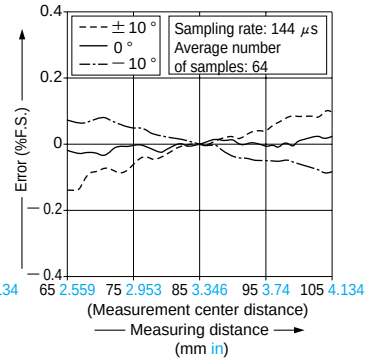
White ceramic (0 °, ±10 °)
horizontal positioning



Vertical positioning



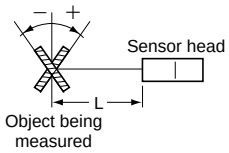
Horizontal positioning



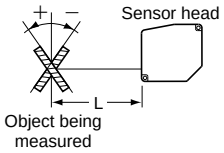
HL-C105B-BK
HL-C105F-BK

Measuring distance – error characteristics

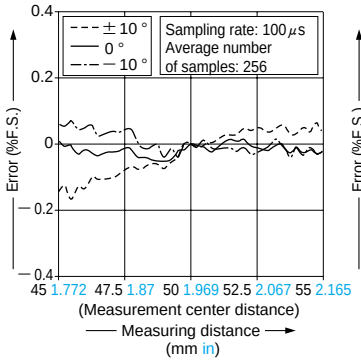
White ceramic (0 °, ±10 °)
vertical positioning



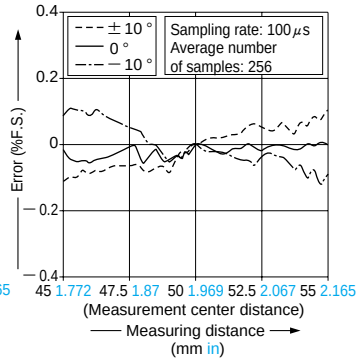
White ceramic (0 °, ±10 °)
horizontal positioning



Vertical positioning



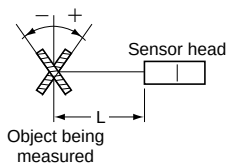
Horizontal positioning



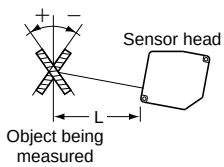
HL-C108B
HL-C108F

Measuring distance – error characteristics

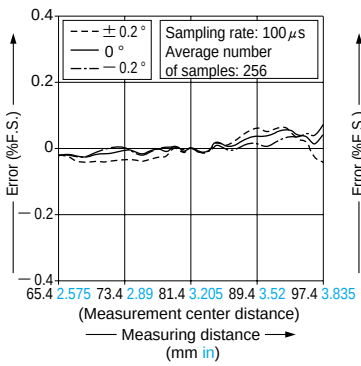
Aluminum vapor deposition
surface reflection mirror
(0 °, ±0.2 °) vertical positioning



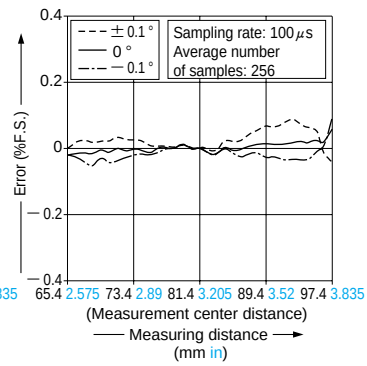
Aluminum vapor deposition
surface reflection mirror
(0 °, ±0.1 °) horizontal positioning



Vertical positioning



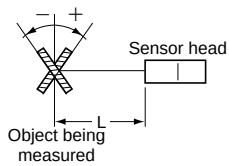
Horizontal positioning



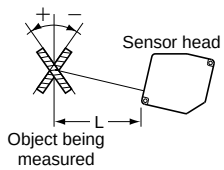
HL-C105B
HL-C105F

Measuring distance – error characteristics

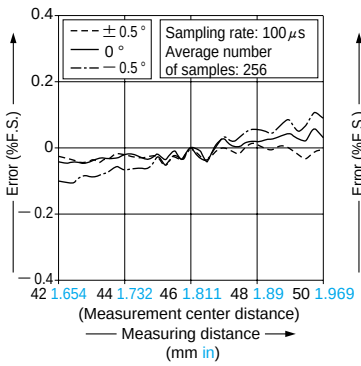
Aluminum vapor deposition
surface reflection mirror
(0 °, ±0.5 °) vertical positioning



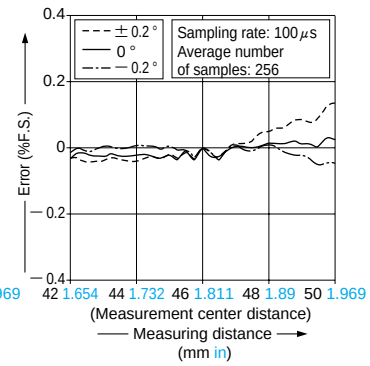
Aluminum vapor deposition
surface reflection mirror
(0 °, ±0.2 °) horizontal positioning



Vertical positioning



Horizontal positioning



PRECAUTIONS FOR PROPER USE

- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet standards, such as OSHA, ANSI or IEC etc., for personnel applicable in each region or country.

Laser radiation

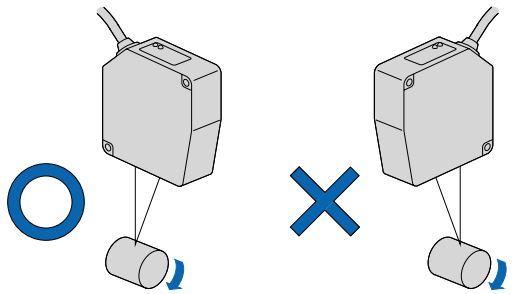
- The laser used in this product corresponds to class 2 laser IEC/FDA standards. Do not see or touch the laser radiation either directly or after reflection, and handle the product by following the instructions given on the warning labels. The right label is pasted on the head.
- The English warning label based on FDA standards is pasted on the FDA standards conforming type.

The English warning label is packed with the sensor.

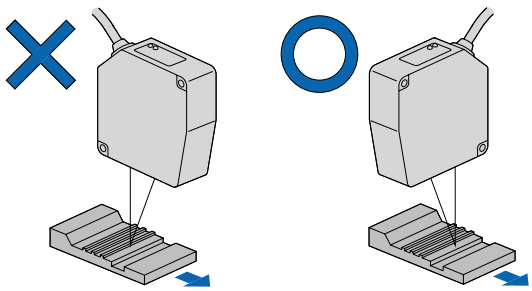
Sensor head mounting direction

- 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.

Rotating object



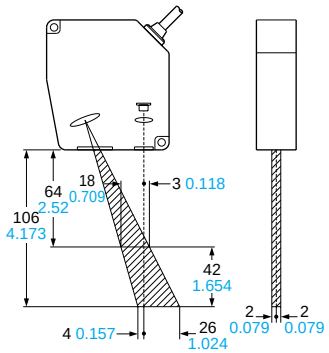
Object that has large differences in gaps, grooves and colors



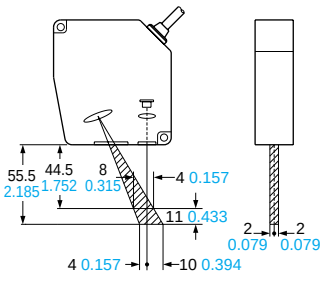
Mutual interference

- When installing 2 or more sensor heads side by side, mutual interference will not occur if the laser spots from other sensor heads do not fall within the shaded areas of the sensor head in the figure below. Multiple sensor heads must be installed in a manner such that laser spots from other sensor heads will be prevented from falling within these shaded areas.

HL-C108B-BK, HL-C108F-BK
HL-C108B, HL-C108F

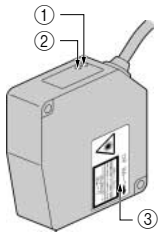


HL-C105B-BK, HL-C105F-BK
HL-C105B, HL-C105F



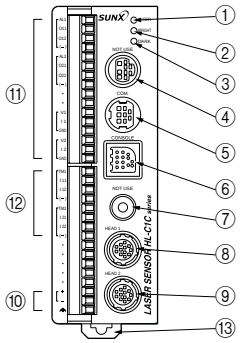
Functional description

Sensor head



	Description	Function
①	Laser emission indicator (Green LED)	Green LED (lights up during laser emission and immediately before laser emission)
②	Measuring range indicator (Yellow LED)	Yellow LED [blinks within the measuring range and lights up when near the measuring range center (measuring center ± 0.5 mm ± 0.02 in)]
③	Warning label	Shows the laser emission position.

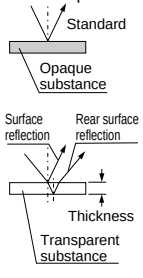
Controller

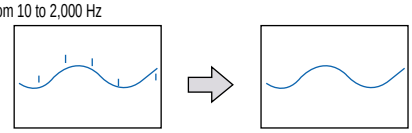
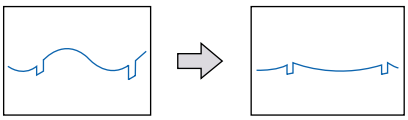
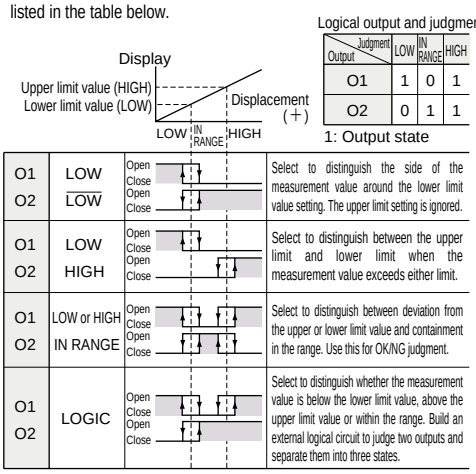


	Description	Function
①	Laser emission indicator (Green LED)	Green LED (lights up when the laser beam is being emitted at sensor head 1 or 2, or immediately before it is emitted)
②	BRIGHT indicator (Red LED)	Red LED (lights up upon disabled measurement due to excessive light at sensor head 1 or 2)
③	DARK indicator (Red LED)	Red LED (lights up upon disabled measurement due to poor light at sensor head 1 or 2)
④	————	Cannot be used. This port is for adjustment at the factory before shipping.
⑤	COM. port	Used for RS-232C communications with a personal computer.
⑥	Connector for compact console	This enables measurement values to be displayed using the compact console and connection of the compact console exclusive connection cable when setting each setting.
⑦	————	Cannot be used. This port is for adjustment at the factory before shipping.
⑧	Sensor head 1 connector	The controller operates the sensor head connected to this connector as sensor head 1.
⑨	Sensor head 2 connector	The controller operates the sensor head connected to this connector as sensor head 2.
⑩	Power supply terminal	Supplies 24V DC. There are power supply terminals on input terminal block
⑪	External output terminal	————
⑫	External input terminal	————
⑬	DIN rail mounting hook	Can be mounted on a 35mm width DIN rail quickly.

PRECAUTIONS FOR PROPER USE

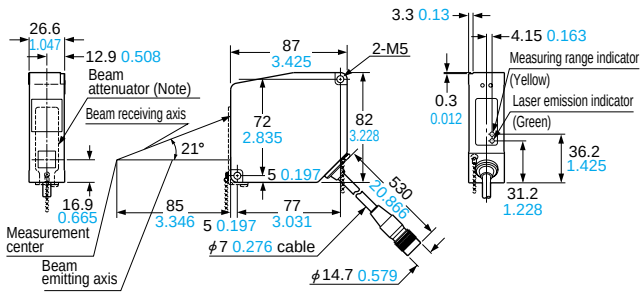
Functions at a glance

Function	Details
Hold function	• NORM. (no hold): Outputs the amount of displacement from the measurement center distance in real time. Ordinarily, this mode is used. • P-P: This mode holds and outputs the difference between the maximum value and the minimum value. It is used for vibration measurements or eccentricity. • PEAK: Holds and outputs the maximum measurement value. VALLEY : Holds and outputs the minimum measurement value.
Zero set function	• The measurement value and analog output at the timing of zero setting are forcibly reset to zero. Use this function to reset the measurement value of the reference workpiece to zero and measure the displacement amount or make judgment of the upper or lower limit.
Timing function	• The judgment output (O1 and O2) immediately before the mode selection, measurement value and analog output are held in the timing input mode. Laser emission can be halted or continued according to a setting. Add the input in other than the measurement or judgment state to eliminate unnecessary output changes or laser radiation.
Display hold function	• Only the measurement value displayed on the compact console is held. Use this function to read a momentary measurement value.
Switching functions for sampling period	• In cases where work pieces with a low reflected light amount, such as black rubber, are measured, stable measurements can be taken by extending the sampling period and enabling a sufficient amount of light to be picked up by the sensor. If the sampling period is short and not enough light can be picked up, the sensor enters the alarm state, so switch the sampling period to a longer duration setting. The sampling period can be switched among 7 different rates. (100 μs / 144 μs / 200 μs / 255 μs / 332 μs / 498 μs / 1,000 μs)
Calculation function	• This function enables the unit to perform the following calculations: <Calculation formulas when performing individual measurements> L1＋K1A: normal output state L2＋K2B: normal output state L1－K1A: reverses the polarity of the measured value L2－K2B: reverses the polarity of the measured value <Calculation formulas when performing calculation measurements> L＋K (A＋B): addition L－K (A＋B): used when measuring thickness L＋K (A－B): subtraction, used when level differences L－K (A－B): used when reversing the polarity of a subtraction operation A: the value measured by sensor head 1 B: the value measured by sensor head 2 L: the amount of offset for the measured value K: the coefficient used to adjust the ratio of displacement changes
Switching functions for measurement mode	• The measurement mode (diffuse reflective / specular reflective) can be switched between these two modes, in accordance with the sensor head selected, based on the measurement object. Diffuse reflective mode: used measuring without a mirror surface or not transparent. Specular reflective mode: used when measuring a substance with a mirror surface or that is transparent. When in specular reflective mode, the measurement object can be selected from the following options: Standard: used when measuring the mirror surfaces of opaque substance such as metal, etc. Front: used when measuring the surface of transparent substance such as glass, etc. Rear: used when measuring the rear surface of transparent substance such as glass, etc. The measurement center distance is shifted. Thickness: used when measuring the thickness of transparent substance, such as glass. The refraction angle is compensated to 1.55. There is a limitation in measurable thickness. Thickness measurement guidelines for common glass sheets: General-purpose model – thicknesses more than 1.2 mm 0.047 in. High precision model – thicknesses more than 0.5 mm 0.02 in. 
Switching function for average number of samples	• If the measured values are subject to rapid fluctuation, then increasing the average number of samples will allow the unit to compensate for these fluctuations, enabling stable measurements to be obtained. The average number of samples can be selected from among 16 levels, ranging from OFF to 32,768 times.

Function	Details
Low pass filter function	• For example, if the surface conditions of a metal object cause noise that interferes with accurate measurement, the use of the low pass filter function will reduce the effects of noise and allow for the stable measurement of displacement. 9 independent cutoff frequencies can be selected, OFF or ranging from 10 to 2,000 Hz 
High pass filter function	• If joints or grooves are being measured in the midst of great changes such as runout or inclination in an eccentric rotating object etc., this setting minimizes the effects of gradual changes and makes it possible to detect the joints or grooves. 9 independent cutoff frequencies can be selected, OFF or ranging from 10 to 2,000 Hz. 
Judgment output selection function	• The judgment output O_1, O_2 (N.C.) can be selected from the four types listed in the table below.  : Output state (excluding hysteresis area) ※The output state is the state in which the terminal is open (NC)
Hysteresis setting function	• Optional hysteresis settings can be selected for both the upper and lower limits.
Analog output setting function	• This function causes the output to correspond to the wanted measurement value at an analog output of +5 V (20 mA) and at −5 V (4 mA). It can be used for scaling of the analog output or for making the output greater or smaller, etc. When this function is used, the analog output corresponding to measurement values ranging between, for example, 70 and 90 mm 2.756 and 3.543 in, can be assigned to outputs ranging from −5 V (for 70 mm 2.756 in) to +5 V (for 90 mm 3.543 in).
Analog Output switching function during alarm	• You can switch between the data having been output immediately before and a fixed value as an analog output issued when measurement is disabled (with an alarm output) due to an excessive or poor amount of light or deviation from the range. When the fixed value setting is selected, either the maximum value (voltage output: +10.9 V, current output: max. 29.5 mA) or minimum value (voltage output: −10.9 V, current output: 0mA) of the analog output is issued upon an alarm.
Input selection function	• The timing signal at the input terminal functions as an input upon a short circuit by default setting. Use this function to activate the input upon an open circuit.
Calibration function	• Measurement errors may occur due to the color, material or surface condition of the object being measured. These differences can be compensated for through calibration. The calibration function allows the span and shift to be set for each sensor head. There are two ways to set these values. One is to conduct auto setting by moving a piece of work piece past sensers and the other is to input previously measured values directly.
Display Light Received Function	• This function displays the peak level of light received at the measuring point. The usage of this function when installing sensor heads allows the optimum marginal increment to be used as the level of light received for measurement.
Save function	• This function saves all setting data except for the timing input state and display hold state.

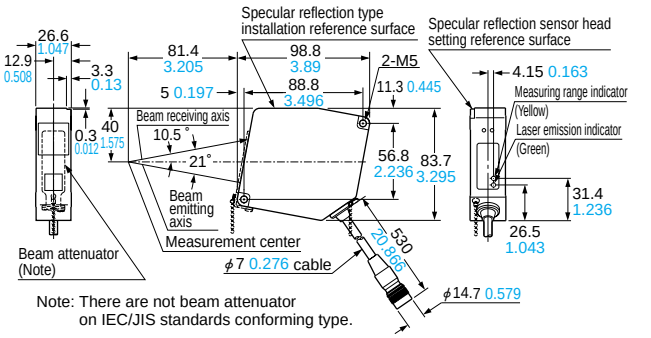
DIMENSIONS (Unit: mm in)

HL-C108B-BK HL-C108F-BK Sensor head



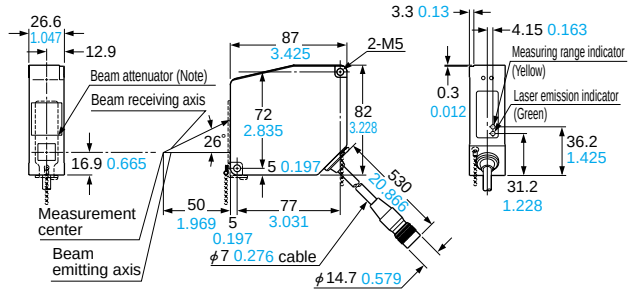
Note: There are not beam attenuator on IEC/JIS standards conforming type.

HL-C108B HL-C108F Sensor head



Note: There are not beam attenuator on IEC/JIS standards conforming type.

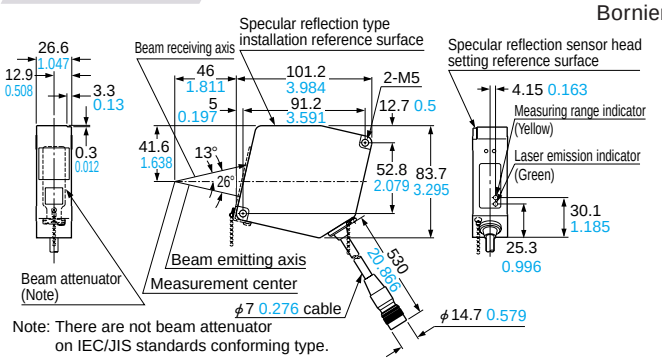
HL-C105B-BK HL-C105F-BK Sensor head



Note: There are not beam attenuator on IEC/JIS standards conforming type.

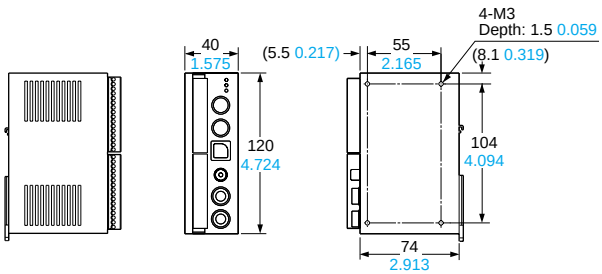
HL-C105B HL-C105F Sensor head

Bornier : IP 20

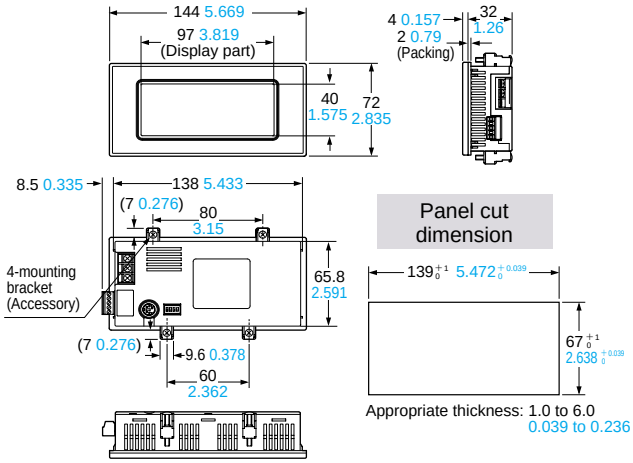


Note: There are not beam attenuator on IEC/JIS standards conforming type.

HL-C1C-M Controller



HL-C1DP-E Compact console



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