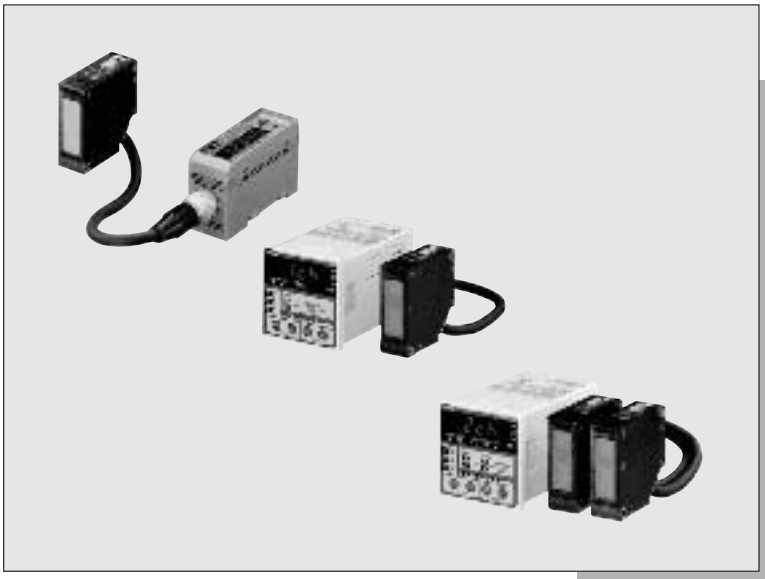
LH-50 SERIES
Minute Displacement Measurment Sensor



High Precision
LED Type

CE Conforming to EMC Directive

Applied for UL Recognition

SAFETY

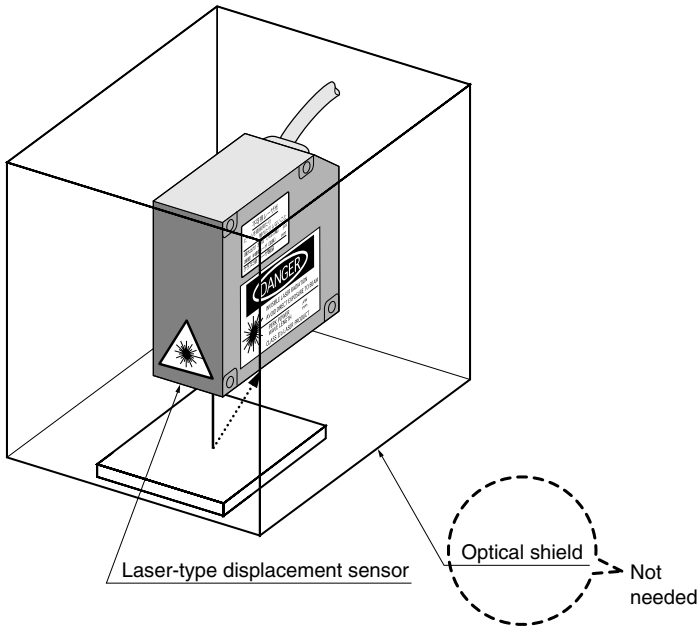
Red LED Used

Adoption of a red LED means ...

The light source uses a red LED for safety.
As a result, the complicated safety measures which are necessary when using laser light are completely unnecessary.

Even though a red LED is used ...

The degree of performance achieved is the same as for laser-type sensor class (Class 1 to 2), so that high-precision measurement is possible.



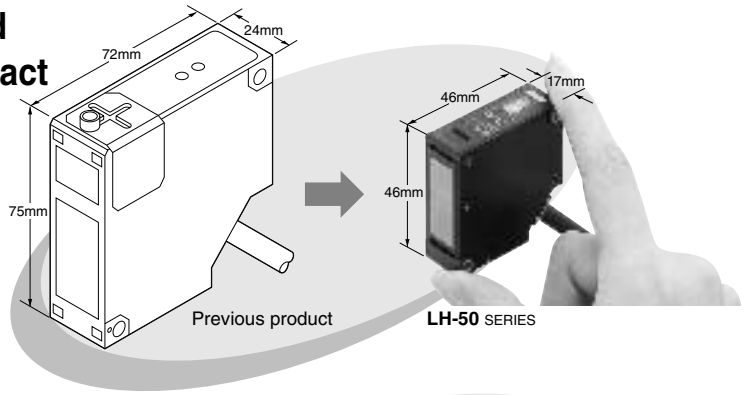
COMPACT

Compact And Lightweight

Both the sensor head and controller are more compact

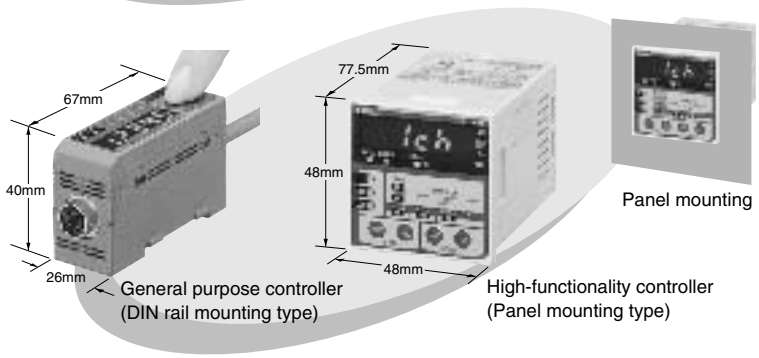
Sensor head

Compared to our previous sensors, the **LH-50** series sensors are much more compact and lightweight, so that they can easily be installed even in tight spaces.



Controller

The general purpose controller is the most compact in its class. Furthermore, the high-functionality controller is a □48mm panel mounting type which can be mounted on equipment panels.

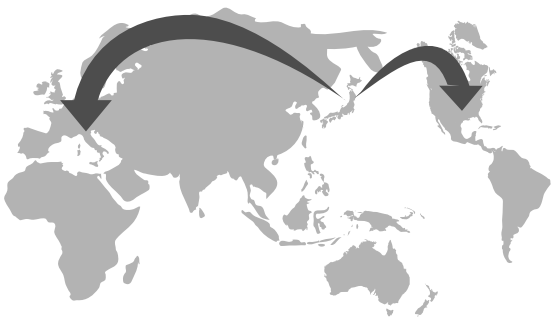


GLOBAL

Universal Use

Complies with EMC directive for CE marking

- The **LH-50** series complies with EMC directive for the CE marking.
- It uses an LED beam which is not subject to FDA restrictions.
  In addition, it is planned to obtain UL recognition.

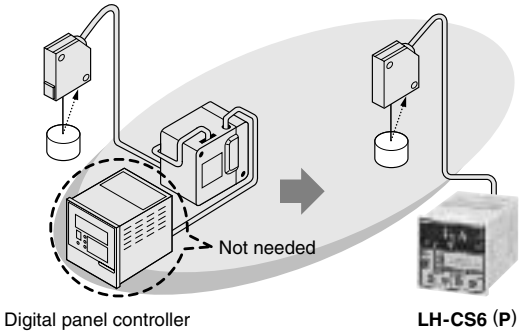


COST REDUCTION

Reducing Total Cost

No digital panel controller needed

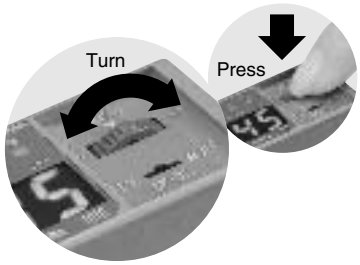
The high-functionality controller includes built-in calculation and measurement functions, so that the digital panel controller which was needed previously is no longer required, thus reducing costs.
In addition, it also helps to reduce wiring and space costs.



CONVENIENT Simple And Useful

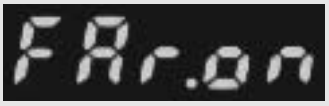
Uses an easy-to-operate jog switch – an industry first (general purpose controller)

Threshold value settings and other settings can be made easily using the extremely easy-to-operate jog switch.
Furthermore, the settings and measurement values are indicated in a 5-digit LED display.



5-digit LED display examples

(Example of measurement value)

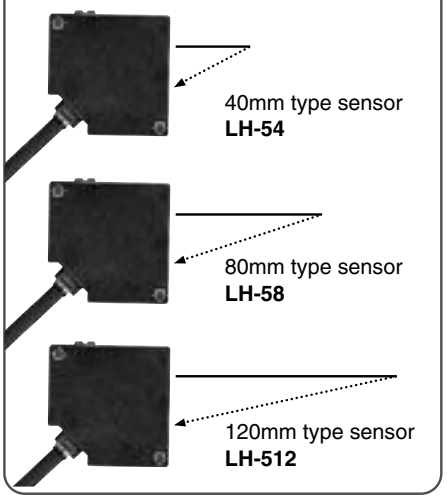


(Example of settings)

Flexible combinations (sensor head, general purpose controller, high-functionality controller)

The **LH-50** series can be used in any combination desired.
In addition, the sensor head and controller need not be managed as a pair.
Moreover, the **LH-CD6** (**P**) high-functionality controller can be connected to two sensor heads of different types.

Select by center measuring distance and measuring range ...



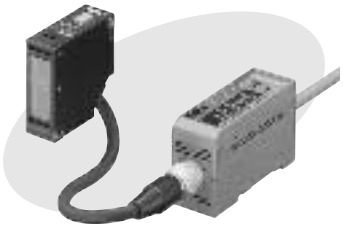
Select by function

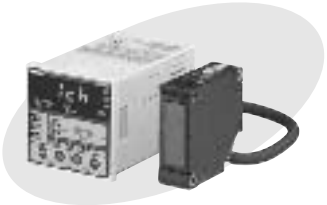

General purpose controller
LH-CL6 (**P**)

High-functionality controller (1ch)
LH-CS6 (**P**)

High-functionality controller (2ch)
LH-CD6 (**P**)

Combination examples


General purpose controller

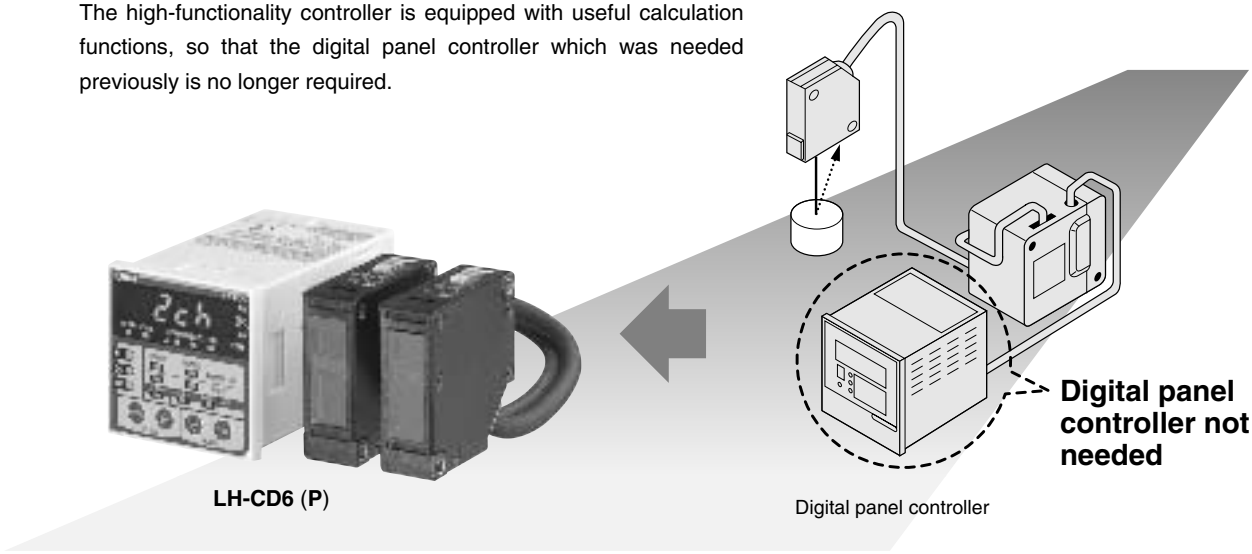


High-functionality controller (1ch)

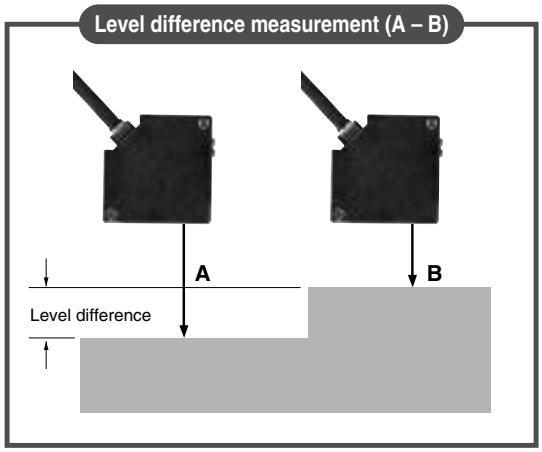
High-functionality controller (2ch)

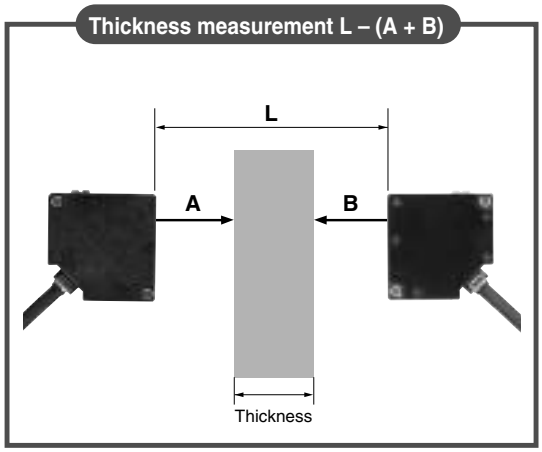
Full range of 'ready-to-use' and 'useful' functions (high-functionality controller)

The high-functionality controller is equipped with useful calculation functions, so that the digital panel controller which was needed previously is no longer required.



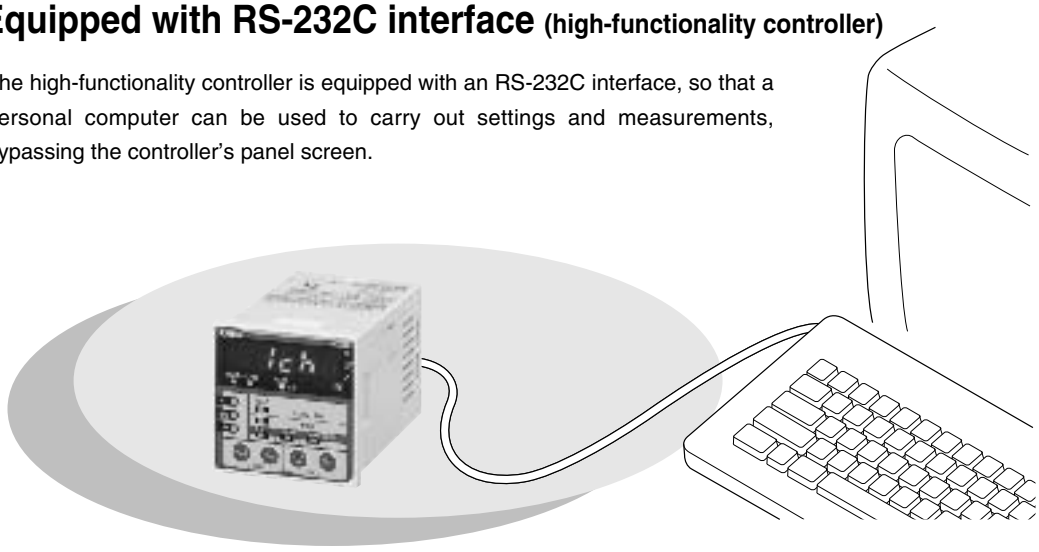
Calculation, level difference and thickness measurements and displacement from the measuring center when using a single sensor head are set to default settings, so that the unit can be used immediately.





Equipped with RS-232C interface (high-functionality controller)

The high-functionality controller is equipped with an RS-232C interface, so that a personal computer can be used to carry out settings and measurements, bypassing the controller's panel screen.

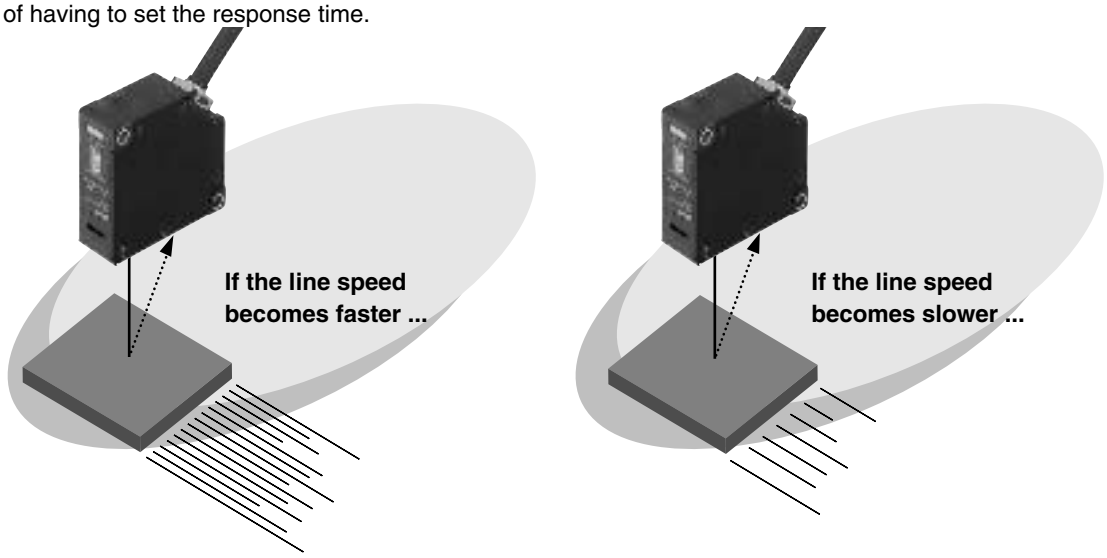


EXAMPLE OF USE

Automatic response time setting

High-functionality controller

The **LH-CS6** (**P**) and **LH-CD6** (**P**) high-functionality controllers are equipped with an automatic response time setting function. This function sets the response time automatically in accordance with the object's speed of movement. It ensures accurate measurement even for variable line speeds. In addition, it eliminates the burden of having to set the response time.

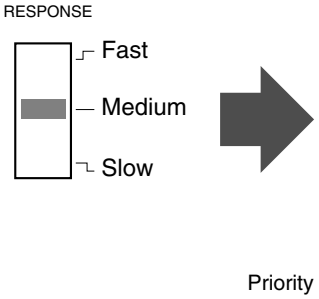


Response time & resolution settings to suit the application

High-functionality controller | General purpose controller

Both the general purpose controller and the high-functionality controller let you select the response time from one of eight settings. (The high-functionality controller also allows automatic response time setting.)
Conventional displacement sensors generally provided three settings, but the **LH-50** series (8 settings) provides much greater flexibility for response time and resolution.

Conventional (example)



LH-50 series

■**Response time/Resolution (2σ)**

Sensor head Model No. / Controller response time	LH-54	LH-58	LH-512
300ms	2 μm	4 μm	20 μm
100ms	4 μm	8 μm	40 μm
40ms	5 μm	14 μm	65 μm
30ms	6 μm	16 μm	75 μm
20ms	7 μm	28 μm	92 μm
10ms	10 μm	40 μm	130 μm
1ms	20 μm	120 μm	400 μm
0.5ms	40 μm	160 μm	580 μm

Priority to resolution

Priority to response

Note: The resolution values were obtained under the following measurement conditions.
24V DC supply voltage, SELECT gain setting, center measuring distance, interference prevention function not used and white ceramic board object.
In addition, the values are for analog output by the controller used.

EXAMPLE OF USE

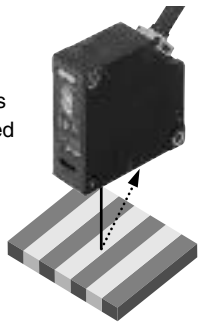
AUTO gain setting
SELECT gain setting

High-functionality controller | General purpose controller

Two types of gain control are provided: AUTO and SELECT (11 settings), to provide great flexibility for a variety of applications.
Furthermore, a 7-segment display is used to indicate whether the gain is set to the optimum level.

AUTO gain setting: For objects with highly variable color and materials

AUTO gain setting ensures accuracy even for patterned objects

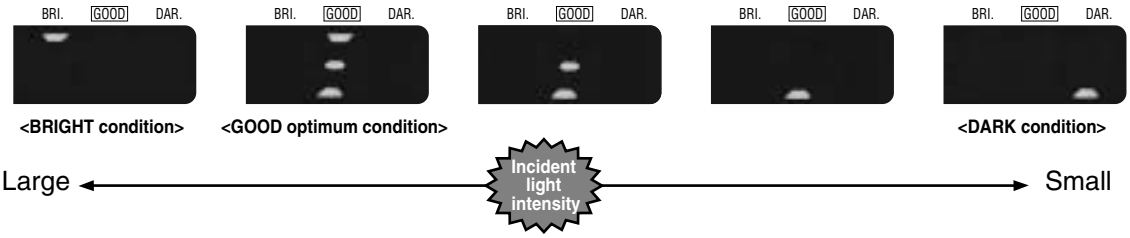


This setting automatically controls the gain so that the incident light intensity is optimized to handle variations in the reflection ratios (variations in the amount of light received) for the measured objects.
It is suitable for objects which produce large variations in reflection ratios.

Note: Some fluctuation in resolution and linearity may occur when this setting is used.

SELECT gain setting: For more accurate measurement using the optimum gain

This function lets you set the gain to match the reflection ratio for the measured object.
An incoming light status bar (general purpose controller) is provided to assist with setting the gain to the optimum level.

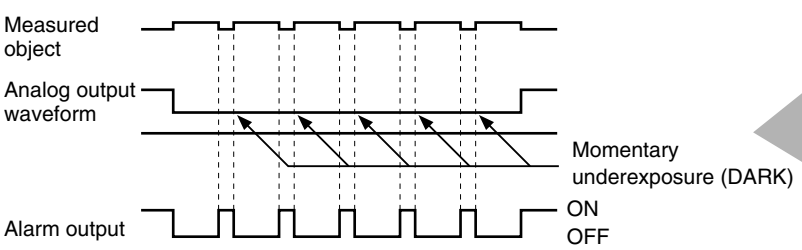


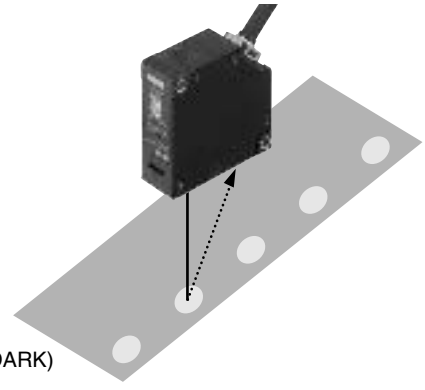
※ The illustrations show the display for general purpose controllers. High-functionality controllers are also provided with AUTO gain and SELECT gain settings.

Analog output hold function

High-functionality controller | General purpose controller

If momentary underexposure (DARK) or overexposure (BRIGHT) conditions occur, the value is held at the level immediately before this occurs.
It allows measurement to continue without any breaks in analog output.





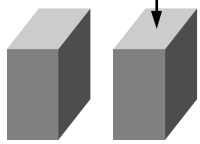
EXAMPLE OF USE

16 types of setting storage memory

High-functionality controller

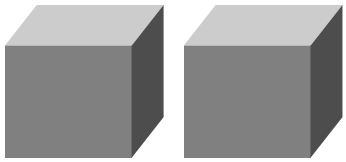
The **LH-CS6** (**P**) and **LH-CD6** (**P**) high-functionality controllers have 16 types of built-in setting storage memory to provide greater flexibility for production lines where the model variety frequently changes.

Example: Measurement of products with variable heights and good/bad judgement



Set value ①
30mm ± 0.5mm

Set value ②
25mm ± 0.3mm



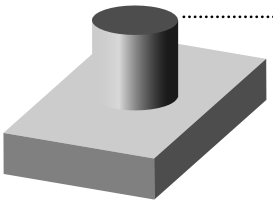
Set value ③
35mm ± 0.8mm

Two-in-one functionality

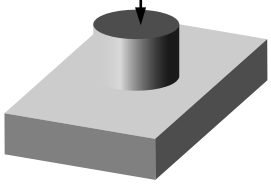
General purpose controller

The **LH-CL6** (**P**) general purpose controller has two independent comparison outputs, making it suitable for use in applications where two sensor units were previously required.

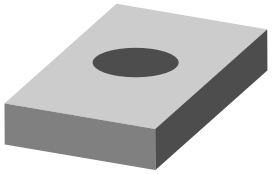
Example: Dimension checking after press-fitting, separation of defective items



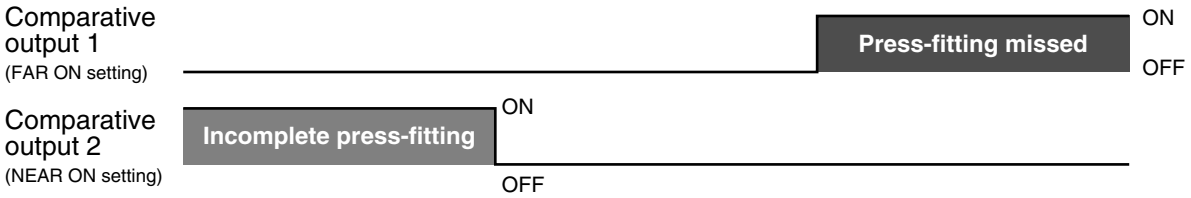
Incomplete press-fitting



OK

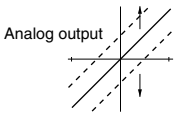
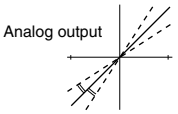
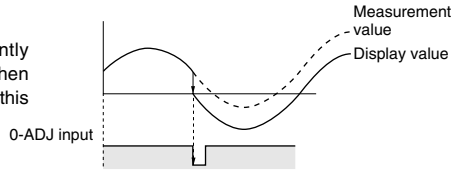
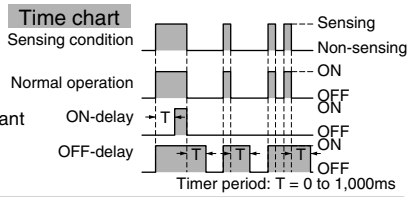


Press-fitting missed



LIST OF MAIN CONTROLLER FUNCTIONS

Common functions (common to general purpose controller and high-functionality controller)

Item	Function	Outline
Measuring condition	AUTO gain setting function	Automatically sets the gain to the optimum level to match changes in the reflection ratio for the measured objects.
	SELECT gain setting function	Lets the user select the gain to match changes in the reflection ratio for the measured objects.
	Response time setting function	Lets the user select the response time to match the line speed for the measured objects.
Adjustment	Shift adjustment function	Adjusts the analog output and the shift value for display values. 
	Span adjustment function	Adjusts the analog output and the span value for display values. 
	0-ADJ function	Forcibly resets the currently measured value to '0' and then caries out measurement with this '0' value as a reference. 
	0-ADJ function clear function	Returns the value which was forcibly set to '0' using the 0-ADJ function back to its original value.
	0-ADJ value memory function	Enables the 0-ADJ value to be stored in memory.
	Analog output off-set function	Applies a user-defined offset to the analog output.
Comparative output	Teaching function	Allow the measured value for the measured object to be used to set the threshold value.
	Timer function	ON-delay: Disables short-term detection. OFF-delay: Extends the output signal for a constant length of time. 
Display	Distance display/Displacement value display select function	Toggles the display between distance and displacement value display.
	Sleep function	Turns off value display.
Others	Analog output hold function	If measurement is not possible, this function maintains analog output at the level output immediately before this occurs.
	Interference prevention function	Prevents mutual interference when using two sensors in close proximity. [If using the **LH-CD6** (**P**) high-functionality controller, interference can be prevented for up to four sensors.]

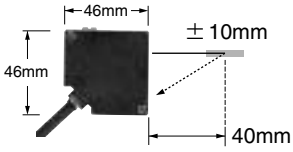
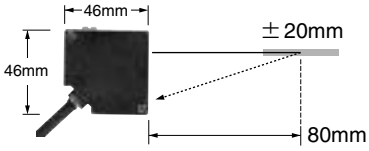
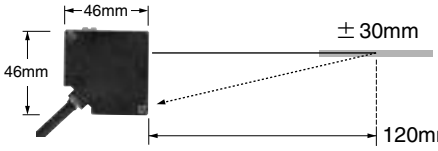
Additional functions (high-functionality controller)

Item	Function	Outline
Measuring condition	Automatic response time setting function	Automatically sets the response time to match the line speed of the measured objects in order to provide optimum resolution.
Calculation and measurement	Calculation function [**LH-CD6** (**P**) only]	Carries out arithmetical processing on the channel A input value and the channel B input value. A + B : Calculates the sum of the measured values for channel A and channel B. A − B : Calculates the difference between the measured values for channel A and channel B. L − (A + B) : Subtracts the sum of the measured values for channel A and channel B from a constant value L. L − (A − B) : Subtracts the measured value for channel B from the measured value for channel A, and subtracts the result from a constant value L. (A + B)/2 : Obtains the simple average of the measured values for channel A and channel B.
	Measurement function	Peak-to-peak hold: Holds and displays the difference between the maximum and minimum values obtained during the measuring period. Peak hold: Holds and displays the maximum value obtained during the measuring period. Bottom hold: Holds and displays the minimum value obtained during the measuring period.
Set value memory	Set value memory function	Allows setting details to be stored in up to 16 different memory locations.
Communication	RS-232C communication function	Allows measured values and setting values to be transmitted via an RS-232C interface.

LH-50

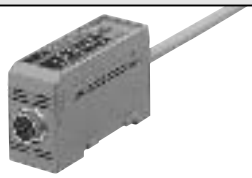
ORDER GUIDE

Sensor heads

Type	Appearance/Center measuring distance/Measuring range/Spot diameter	Model No.	Resolution
40mm type	 ● φ1.6mm or less	**LH-54**	2μm
80mm type	 ● φ2.0mm or less	**LH-58**	4μm
120mm type	 ● φ3.0mm or less	**LH-512**	20μm

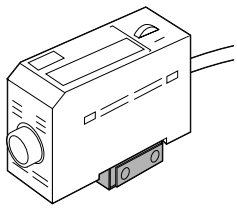
Notes: 1) The head dimensions, center measuring distance and center measuring length are shown to the same scale.
(The spot diameter is not shown to scale.)
2) The spot diameter is a typical value for the center measuring distance given, and is based on the definition of $1/e^2$ (13.5%) of the beam axis intensity.
3) The resolution values were obtained under the following measurement conditions.
24V DC supply voltage, +20°C ambient temperature, SELECT gain setting, 300ms response time setting, center measuring distance, interference prevention function not used and white ceramic board object, set to 2σ.

Controllers

Type	No. of sensor heads connected	Appearance	Model No.	Comparative output
General purpose	1 No.		**LH-CL6**	OUT1, OUT2 NPN open-collector transistor
			LH-CL6P	OUT1, OUT2 PNP open-collector transistor
High-functionality	1 No.	 The photo shows the **LH-CD6**.	**LH-CS6**	HI, GO, LO NPN open-collector transistor
			LH-CS6P	HI, GO, LO PNP open-collector transistor
	1 No. or 2 Nos.		**LH-CD6**	HI, GO, LO NPN open-collector transistor
			LH-CD6P	HI, GO, LO PNP open-collector transistor

Mounting bracket for general purpose controller (accessory)

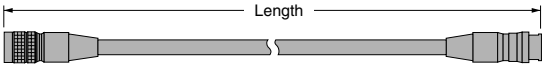
MS-DIN-3



OPTIONS

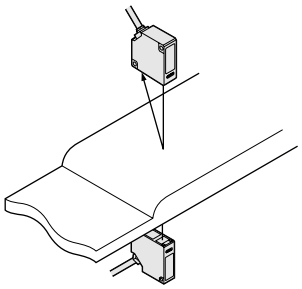
Designation	Model No.	Description	
Extension cable	**LH-CCJ2**	Length: 2m Weight: 130g approx.	0.22mm² cabtyre cable, with connector on both ends • Cable outer diameter: φ6mm • Connector outer diameter: φ14.7mm max.
	LH-CCJ5	Length: 5m Weight: 270g approx.	
	LH-CCJ10	Length: 10m Weight: 480g approx.	

Extension cable

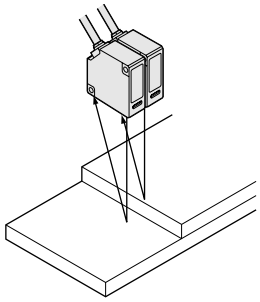


APPLICATIONS

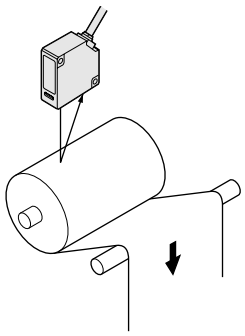
Thickness measurement



Level difference measurement



Winding length measurement



SPECIFICATIONS

Sensor heads

Item \ Designation / Model No.	LED type optical displacement sensor head		
	LH-54	**LH-58**	**LH-512**
Applicable controller	**LH-CL6, LH-CL6P, LH-CS6, LH-CS6P, LH-CD6, LH-CD6P**		
Center measuring distance	40mm	80mm	120mm
Measuring range	± 10mm (30 to 50mm)	± 20mm (60 to 100mm)	± 30mm (90 to 150mm)
Emitting element	Red LED (modulated) (Peak wavelength: 650nm)		
Spot diameter (Note 2)	ϕ1.6mm or less	ϕ2.0mm or less	ϕ3.0mm or less
Linearity	Within ± 0.2% F.S.		
Ambient temperature	0 to + 45°C (No dew condensation), Storage: − 20 to + 60°C		
Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH		
Protection (Except connector part)	IP67 (IEC)		
Cable	0.22mm^2 11-core composite cabtyre cable, 0.2m long, with a connector at the end		
Weight	70g approx. (with cable), 45g approx. (without cable)		

Notes: 1) Conditions which have not been specified are to be taken as: 24V DC supply voltage, + 20°C ambient temperature, SELECT gain setting, 300ms response time setting, center measuring distance, interference prevention function not used and white ceramic board object.
2) This is the value at the center measuring distance, and is based on the definition of 1/e^2 (13.5%) of the beam axis light intensity. Take care that some amount of light spreads out of the specified spot diameter and, depending on the conditions around the measured object, may affect the measurement accuracy.

LH-50

SPECIFICATIONS

Controllers

Item \ Type	General purpose		High-functionality			
	NPN output type	PNP output type	NPN output type		PNP output type	
Model No.	**LH-CL6**	**LH-CL6P**	**LH-CS6**	**LH-CD6**	**LH-CS6P**	**LH-CD6P**
Applicable sensor head	**LH-54, LH-58, LH-512**					
Connectable sensor heads (Max.)	1 No.		1 No.	2 Nos.	1 No.	2 Nos.
Supply voltage	24V DC ± 10% Ripple P-P 10% or less					
Current consumption (Note 2)	250mA or less		300mA or less	350mA or less	300mA or less	350mA or less
Analog output	Analog voltage • Output voltage: − 5 to + 5V/F.S. • Output impedance: 100 Ω		Analog current • Output current: 4 to 20mA/F.S. • Load resistance: 300 Ω or less			
Response time (10 to 90%)	0.5ms/1ms/10ms/20ms/30ms/40ms/100ms/300ms selectable by jog switch		0.5ms/1ms/10ms/20ms/30ms/40ms/100ms/300ms selectable by key (Automatic response time setting is possible.)			
Temp. characteristics	Within ± 0.04% F.S./°C					
Span adjustment/Shift adjustment	Within ± 10% F.S. (Note 3)		Within ± 30% F.S. (Note 3)			
Comparative output	Independence two outputs (OUT1, OUT2) NPN open-collector transistor • Maximum sink current: 100mA • Applied voltage: 30V DC or less (between comparative output and 0V) • Residual voltage: 1.5V or less (at 100mA sink current) 0.4V or less (at 16mA sink current)	Independence two outputs (OUT1, OUT2) PNP open-collector transistor • Maximum source current: 100mA • Applied voltage: 30V DC or less (between comparative output and + V) • Residual voltage: 1.5V or less (at 100mA source current) 0.4V or less (at 16mA source current)	Three outputs (HI, GO, LO) NPN open-collector transistor • Maximum sink current: 50mA • Applied voltage: 30V DC or less (between comparative output and 0V) • Residual voltage: 1.5V or less (at 50mA sink current) 0.4V or less (at 16mA sink current)		Three outputs (HI, GO, LO) PNP open-collector transistor • Maximum source current: 50mA • Applied voltage: 30V DC or less (between comparative output and + V) • Residual voltage: 1.5V or less (at 50mA source current) 0.4V or less (at 16mA source current)	
Output operation	ON or OFF when threshold level is reached (selectable)		ON when threshold level is reached			
Short-circuit protection	Incorporated					
Alarm output	Incorporated					
Strobe output	———		Incorporated			
Ambient temperature	0 to + 50°C (No dew condensation), Storage: − 20 to + 60°C					
Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH					
EMC	Emission: EN50081-2, Immunity: EN50082-2					
Accessory	**MS-DIN-3** (Controller mounting bracket): 1 No.		ATA4811 (Controller mounting frame): 1 set			

Notes: 1) Conditions which have not been specified are to be taken as: 24V DC supply voltage, + 20°C ambient temperature, SELECT gain setting, 300ms response time setting, center measuring distance, interference prevention function not used and white ceramic board object.
2) Including the sensor head.
3) The linearity of the sensor head and the controller has been adjusted at the time of shipment. Carry out the shift adjustment and the span adjustment to suit the operating conditions.

Guide to Users Manual and Technical Reference Manual

The separate 'Users Manual' contains details on the functions, applications, operating procedures and notes on use for the various controllers.
In addition, a 'Technical Reference Manual' which contains technical data which can be used as reference for actual use is also available.
Please ask your nearest SUNX product distributor for details.