Digital Laser Sensor Amplifier-separated
LS-500 SERIES

Related Information
- General terms and conditions F-7
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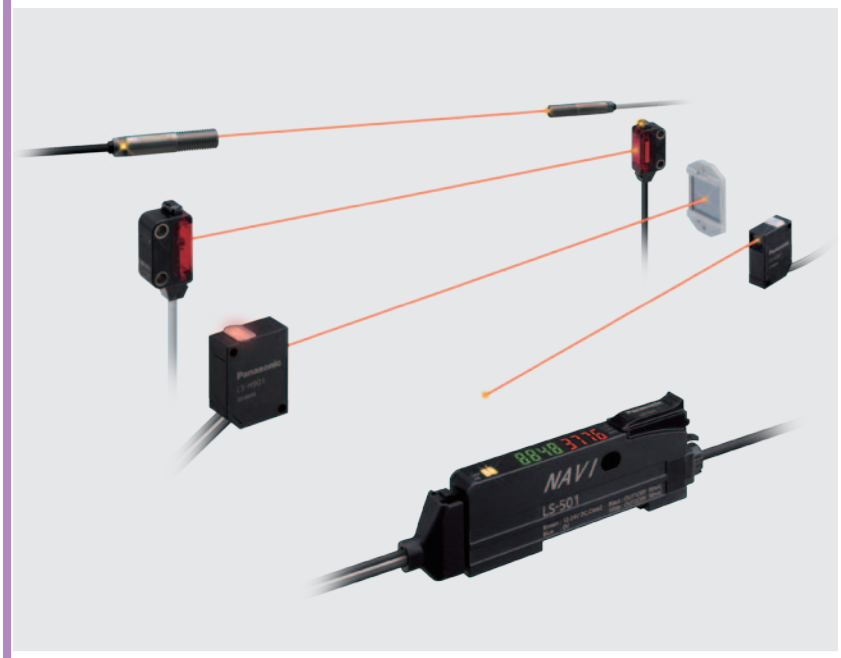
- About laser beam ..... P.1499~
- Sensor selection guide ..... P.211~
- Glossary of terms / General precautions ..... P.1455~ / P.1458~



CE Conforming to EMC Directive

FDA Conforming to FDA regulations

This product is classified as a Class 1 Laser Product in IEC / JIS standards and in FDA* regulations. Do not look at the laser beam through optical system such as a lens.

*This product complies with 21 CFR 1040.10 and 1040.11 Laser Notice No. 50, dated June 24, 2007, issued by CDRH (Center for Devices and Radiological Health) under the FDA (Food and Drug Administration).

Self-diagnosis | Test input | PNP output type available | Timer | Light intensity monitor | Interference prevention | Automatic sensitivity setting

Industry's smallest*

*Smallest amplifier-separated type laser sensor head as of September 2013 based on research conducted by our company

Industry's smallest* + Stainless steel (SUS) enclosure

*Smallest amplifier-separated type laser sensor head as of September 2013 based on research conducted by our company

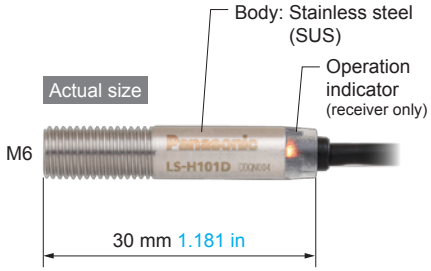
LS-H101

Stainless steel (SUS) body

Featuring stainless steel (SUS) enclosure that won't break when bumped during installation or maintenance.

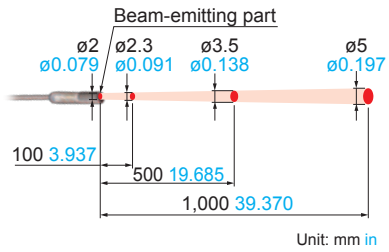
One-point M6 installation

The **LS-H101** features an easy-to-install design.



1 m 3.281 ft sensing range

(In STD amplifier response time mode)



Unit: mm in

Industry's smallest* + IP67

*Smallest amplifier-separated type laser sensor head as of September 2013 based on research conducted by our company

LS-H102

Waterproof IP67

Featuring waterproof IP67 to allow use in the presence of large amounts of water or dust.

Simple positioning

Check the optimal receiving location at a glance while watching the red spot on the beam axis adjustment screen.

1 m 3.281 ft sensing range (In STD amplifier response time mode)

The **LS-H102** delivers sufficient sensing range for use with 450 mm 17.717 in wafers.

Two-point installation

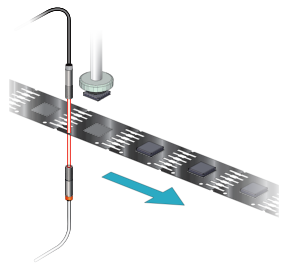
The thru-beam type **LS-H102** features the same form factor as the **EX-L200** series ultra-compact laser sensor with built-in amplifier, and it can be used as an **EX-L200** series with a digital indicator. It also delivers the same bend quality as the **EX-L200** series.

LS-H102

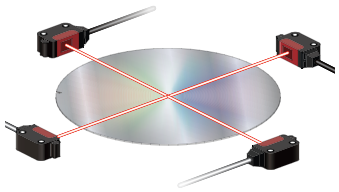
EX-L211 / EX-L212
Same installation pitch as the **EX-L200** series

APPLICATIONS

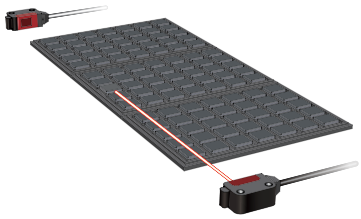
Lead frame position detection



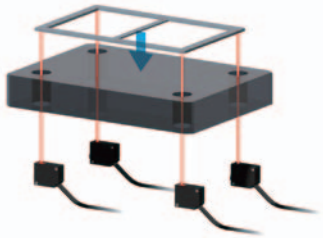
Wafer inclination detection



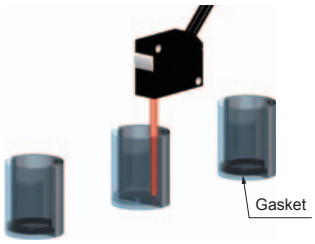
IC float detection



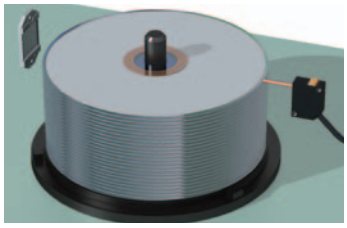
Detection of workpieces through a workbench



Detection of gaskets in caps



Detection of the top of DVDs, substrate, etc.

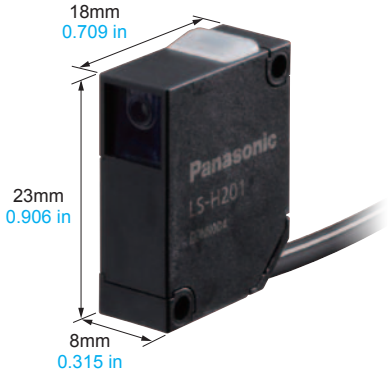


Industry's smallest* + Thinnest profile

*Smallest amplifier-separated type laser sensor head as of September 2013 based on research conducted by our company

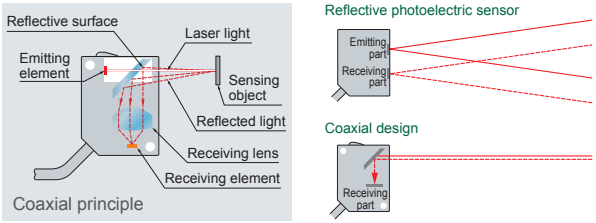
LS-H201

Featuring a 60% smaller design (by volume) than previous coaxial reflective models, our smallest unit is smaller in every dimension at just W8 × H23 × D18 mm W0.315 × H0.906 × D0.709 in (excluding indicators).



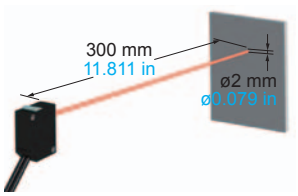
Coaxial design

By using a laser with high linearity in a coaxial design, the **LS-H201** is able to deliver stable sensing in confined spaces as well as simple installation.



Small, long-range spot

The **LS-H201** produces a spot with a diameter of 2 mm 0.079 in at a sensing range of up to 300 mm 11.811 in (in STD amplifier response time mode).



Easy-to-see operation indicator

The **LS-H201**'s operation indicator is visible from all directions.

Industry's smallest* + Horizontal symmetry

*Smallest amplifier-separated type laser sensor head as of September 2013 based on research conducted by our company **LS-H901**

Horizontal symmetry

Featuring a simple system design process thanks to a light source that is placed in the center of the sensor head and a coaxial design.

Industry's smallest* and thinnest design

The **LS-H901** is even thinner than previous models, measuring just W8 × H23 (excluding indicators) × D18 mm W0.315 × H0.906 × D0.709 in.

*Smallest amplifier-separated type laser sensor head as of September 2013 based on research conducted by our company

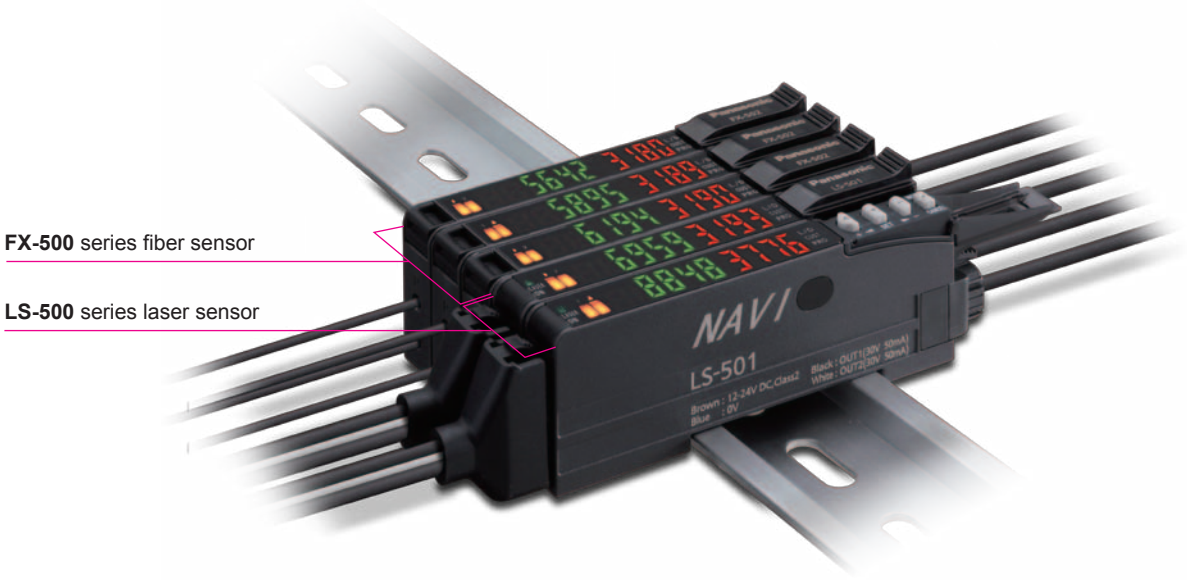
Sensing range of 10 mm to 1 m

0.394 in to 3.281 ft
(In STD amplifier response time mode)
The **LS-H901** supports close-range sensing

Among industry's fastest response times* 60 µs

*Amplifier-separated type laser sensor amplifiers as of September 2013 based on research conducted by our company **LS-501□**

Engineered for maximum compatibility with fiber sensors in every aspect of its design, from form factor to operability, the **LS-500** series delivers an environment that makes it easy to choose a laser sensor.



Maximum compatibility with fiber sensors

The **LS-500** series features the same operation, menu displays, and form factor as the **FX-500** series for increased compatibility with fiber sensors.

Stable sensing over the long term

The **LS-500**'s threshold-tracking function helps maintain stable sensing over the long term and reduce maintenance man-hours. The incident light intensity can be checked and the threshold automatically reset at a user-selected interval to track changes in light intensity due to environmental changes (such as dust, etc.) over extended periods of time.

Detection of beam axis misalignment

Dual outputs (self-diagnosis output)

The **LS-500** series can detect any reduction in incident light intensity, for example due to the accumulation of dirt such as dust, and issue an alarm. Sensing output 2 can be set as self-diagnosis output. When you teach the threshold for sensing output 1, sensing output 2 is set accordingly, allowing you to shift the threshold by a previously set margin.

Logic operations

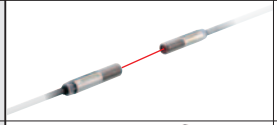
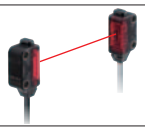
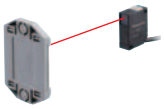
The **LS-500**'s ability to perform three logic operations (AND, OR, and XOR) on a standalone basis eliminates the need for a dedicated controller, cuts down on wiring, and lowers costs. This functionality can also be combined with the **FX-500** series.

Data bank

Eight sets of amplifier settings can be stored in the unit's built-in memory. The ability to save and load settings reduces workload when changing the setup in a multi-model production environment.

ORDER GUIDE

Sensor heads

Type		Appearance	Model No.	Sensing range ■: HYPR ■: U-LG ■: LONG ■: STD ■: FAST ■: H-SP
Thru-beam type	Cylindrical		**LS-H101**	1 m 3.281 ft 1 m 3.281 ft 1 m 3.281 ft 1 m 3.281 ft 1 m 3.281 ft 1 m 3.281 ft
	Square		**LS-H102**	1 m 3.281 ft 1 m 3.281 ft 1 m 3.281 ft 1 m 3.281 ft 1 m 3.281 ft 1 m 3.281 ft
Coaxial reflective type			**LS-H201**	750 mm 29.528 in 600 mm 23.622 in 450 mm 17.717 in 300 mm 11.811 in 200 mm 7.874 in 150 mm 5.906 in
Coaxial retroreflective type			**LS-H901**	0.01 to 2.5 m 0.033 to 8.202 ft 0.01 to 2 m 0.033 to 6.562 ft 0.01 to 1.5m 0.033 to 4.921 ft 0.01 to 1m 0.033 to 3.281 ft 0.01 to 1m 0.033 to 3.281 ft 0.01 to 1m 0.033 to 3.281 ft

5 m 16.404 ft cable length type

5 m 16.404 ft cable length types (Standard: 2 m 6.562 ft) are available. When ordering this type, add "**-C5**" at the end of the model number.

LS-H101-C5 **LS-H102-C5** **LS-H201-C5** **LS-H901-C5**

Package without reflector

The **LS-H901** is also available without a reflector (**RF-330**).
When ordering this type, add "**-Y**" at the end of the model number.

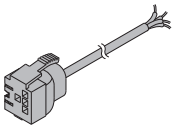
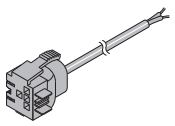
LS-H901-Y

Amplifiers

Type	Appearance	Model No.	Output	Connection method
Connector type		**LS-501**	NPN open-collector transistor two outputs	Use quick-connection cable (4-core) (optional)
		LS-501P	PNP open-collector transistor two outputs	
Cable type (With external input)		**LS-501-C2**	NPN open-collector transistor two outputs	2 m 6.562 ft cabtyre cable (6-core) included Cable outer diameter: ø4 mm ø0.157 in
		LS-501P-C2	PNP open-collector transistor two outputs	

Quick-connection cables

Quick-connection cable is not supplied with the connector type amplifier. Please order it separately.

Type	Appearance	Model No.	Description	
Main cable (4-core)		**CN-74-C1**	Length: 1 m 3.281 ft	0.2 mm² 4-core cabtyre cable, with connector on one end Cable outer diameter: ø3.3 mm ø0.130 in
		CN-74-C2	Length: 2 m 6.562 ft	
		CN-74-C5	Length: 5 m 16.404 ft	
Sub cable (2-core)		**CN-72-C1**	Length: 1 m 3.281 ft	0.2 mm² 2-core cabtyre cable, with connector on one end Cable outer diameter: ø3.3 mm ø0.130 in Up to 15 sub cables can be connected to 1 main cable.
		CN-72-C2	Length: 2 m 6.562 ft	
		CN-72-C5	Length: 5 m 16.404 ft	

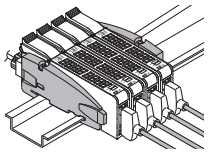
Connector

Type	Appearance	Model No.	Description
Connector for amplifier		**CN-EP4**	Connector included with sensor head Use for maintenance, for example when another connector is damaged. Five pcs. per set

ORDER GUIDE

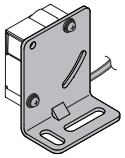
End plates

End plates are not supplied with the amplifier. Please order them separately when the amplifiers are mounted in cascade.

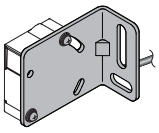
Appearance	Model No.	Description
	**MS-DIN-E**	When cascading multiple amplifiers, or when it moves depending on the way it is installed on a DIN rail, these end plates clamp amplifiers into place on both sides. Make sure to use end plates when cascading multiple amplifiers together. Two pcs. per set

Accessories

MS-LS-1 (Sensor head mounting bracket)
For **LS-H201**□ / **LS-H901**□



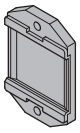
Foot angled mounting



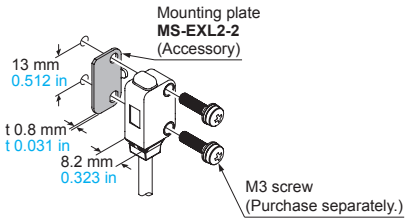
Back angled mounting

Material: Stainless steel (SUS304)
Two M2 (length 12 mm 0.472 in) screws with washers [stainless steel (SUS)] are attached.

RF-330 (Reflector)



MS-EXL2-2 (Mounting plate for thru-beam type)



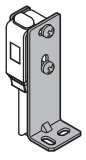
Material: Stainless steel (SUS)

OPTIONS

Designation	Model No.	Description	
Sensor head mounting bracket	**MS-EXL2-1**	For **LS-H102**□ (square side sensing type) Foot angled mounting bracket	
	MS-EXL2-4	For **LS-H102**□ (square side sensing type) Universal sensor mounting bracket	
	MS-EXL2-5	For **LS-H102**□ (square side sensing type) Back angled mounting bracket	
Amplifier mounting bracket	**MS-DIN-2**	Mounting bracket for amplifier	
Amplifier protective seal	**FX-MB1**	10 sets of 2 communication window seals and 1 connector seal Communication window seal: It prevents malfunction due to transmission signal from another amplifier, as well as, prevents effect on another amplifier. Connector seal: It prevents contact of any metal, etc., with the pins of the quick-connection cable.	
Reflector	**RF-310**	For coaxial retroreflective type Compact reflector	Sensing range: 0.01 to 1 m 0.033 to 3.281 ft
Reflective tape	**RF-31**	For coaxial retroreflective type Size: 9.2 × 9.2 × t 0.4 mm 0.362 × 0.362 × t 0.016 in	
	RF-33	For coaxial retroreflective type Size: 25.2 × 27.8 × t 0.4 mm 0.992 × 1.094 × t 0.016 in	Sensing range: Same as the **RF-330**.

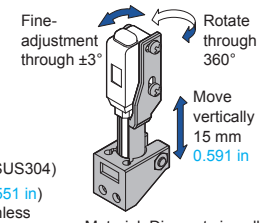
Sensor head mounting bracket

• **MS-EXL2-1**



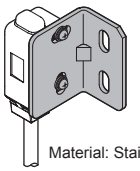
Material: Stainless steel (SUS304)
Two M3 (length 14 mm 0.551 in) screws with washers [stainless steel (SUS304)] are attached.

• **MS-EXL2-4**



Material: Die-cast zinc alloy
Two M3 (length 14 mm 0.551 in) screws with washers [stainless steel (SUS)], one M3 (length 10 mm 0.394 in) hexagon-socket-head bolt [stainless steel (SUS)], and one M3 hexagon nut [stainless steel (SUS)] are attached.

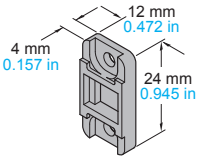
• **MS-EXL2-5**



Material: Stainless steel (SUS)
Two M3 (length 14 mm 0.551 in) screws with washers [stainless steel (SUS)] are attached.

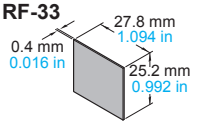
Reflector

• **RF-310**

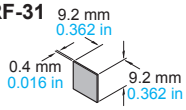


Reflective tape

• **RF-33**

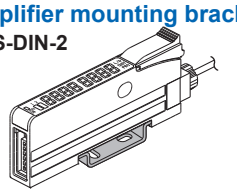


• **RF-31**



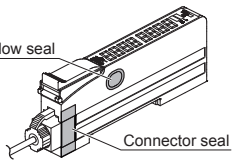
Amplifier mounting bracket

• **MS-DIN-2**



Amplifier protective seal

• **FX-MB1**



SPECIFICATIONS

Sensor heads

Item \ Type		Thru-beam type		Coaxial reflective type	Coaxial retroreflective type
		Cylindrical	Square		
Model No.		**LS-H101**	**LS-H102**	**LS-H201**	**LS-H901**
Applicable amplifiers		**LS-501(P)**, **LS-501(P)-C2** (Note 2)			
Sensing range (Note 3,4)	H-SP	1 m 3.281 ft	1 m 3.281 ft	150 mm 5.906 in	0.01 to 1 m 0.033 to 3.281 ft
	FAST	1 m 3.281 ft	1 m 3.281 ft	200 mm 7.874 in	0.01 to 1 m 0.033 to 3.281 ft
	STD	1 m 3.281 ft	1 m 3.281 ft	300 mm 11.811 in	0.01 to 1 m 0.033 to 3.281 ft
	LONG	1 m 3.281 ft	1 m 3.281 ft	450 mm 17.717 in	0.01 to 1.5 m 0.033 to 4.921 ft
	U-LG	1 m 3.281 ft	1 m 3.281 ft	600 mm 23.622 in	0.01 to 2 m 0.033 to 6.562 ft
	HYPR	1 m 3.281 ft	1 m 3.281 ft	750 mm 29.528 in	0.01 to 2.5 m 0.033 to 8.202 ft
Spot size		ø5 mm ø0.197 in approx. or less (at a distance from the emitter of 1 m 3.281 ft)	ø5 mm ø0.197 in approx. or less (at a distance from the emitter of 1 m 3.281 ft)	ø2 mm ø0.079 in approx. or less (at a distance from the sensor head of 300 mm 11.811 in)	ø6 mm ø0.236 in approx. or less (at a distance from the sensor head of 1 m 3.281 ft)
Sensing object		Opaque, translucent, or transparent object (Note 5)			
Operation indicator		Orange LED (lights up when the amplifier output is ON)			
Environmental resistance	Protection	IP40 (IEC)	IP67 (IEC)	IP40 (IEC)	IP40 (IEC)
	Ambient temperature	–10 to +55 °C +14 to +131 °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			
	Ambient illuminance	Incandescent light: 3,000 ℓx at the light-receiving face			
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure			
	Insulation resistance	20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure			
	Vibration resistance	10 to 500 Hz frequency, 1.5 mm 0.059 in amplitude in X, Y and Z directions for two hours each			
	Shock resistance	100 m/s² acceleration (10 G approx.) in X, Y and Z directions for three times each			
Emitting element	Type	Red semiconductor laser diode			
	Peak emission wavelength	660 nm 0.026 mil			
	Laser class	Class 1 (IEC / FDA / JIS) (Note 6)			
	Max. output	2 mW	2 mW	2 mW	1 mW
Material		Enclosure: Stainless steel (SUS303) Cover: Polycarbonate	Enclosure: PBT Cover: Acrylic	Enclosure: PBT, Indicator cover: Polycarbonate Beam-emitting / receiving surfaces: Glass	
Cable		0.09 mm² 2-core shielded cable, 2 m 6.562 ft long (Note 7)		0.15 mm², 2-core two parallel shielded cables, 2 m 6.562 ft long (Note 7)	
Weight		Net weight: 50 g approx. Gross weight: 75 g approx.	Net weight: 50 g approx. Gross weight: 70 g approx.	Net weight: 50 g approx. Gross weight: 80 g approx.	Net weight: 50 g approx. Gross weight: 85 g approx.
Accessories		M6 screw: 4 pcs. Toothed lock washer: 2 pcs.	**MS-EXL2-2** (Mounting plate): 2 pcs.	**MS-LS-1** (Mounting bracket): 1pc.	**MS-LS-1** (Mounting bracket): 1pc. **RF-330** (Reflector): 1pc.

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
2) When using the thru-beam type **LS-H101**□ or **LS-H102**□, do not set the receiving light sensitivity (gctL) of the applicable **LS-500** series amplifier to level 2 or less. This is because there is a possibility of sensing becoming unstable.
3) The sensing range of the coaxial reflective type sensor is specified for white non-glossy paper (100 × 100 mm 3.937 × 3.937 in) as the object.
4) The sensing ranges for coaxial retroreflective type sensors are values for the **RF-330** reflector. In addition, the sensing range is the possible setting range for the reflector. The sensor can detect an object less than 0.01 m 0.033 ft away. Note that if there are white papers or specular objects near the sensor head, reflected light from these objects may be received. In such cases, use the amplifier unit's receiving sensitivity function to lower the sensitivity, change the response time, or move the sensor head away from the target object. The incident light intensity may vary with the condition of the reflector surface. When using one of the applicable **LS-500** series amplifiers, leave an adequate safety margin when setting the threshold.
5) Make sure to confirm detection with an actual sensor before use.
6) This product complies with 21 CFR 1040.10 and 1040.11 Laser Notice No. 50, dated June 24, 2007, issued by CDRH (Center for Devices and Radiological Health) under the FDA (Food and Drug Administration). For details, refer to the Laser Notice No. 50.
7) Cable cannot be extended.

SPECIFICATIONS

Amplifiers

Item		Type / Model No.	Connector type	Cable type
		NPN output	LS-501	LS-501-C2
		PNP output	LS-501P	LS-501P-C2
Supply voltage			12 to 24 V DC $^{+10}_{-15}$ % Ripple P-P 10 % or less	
Power consumption			Normal operation: 1,200 mW or less (Current consumption 50 mA or less at 24 V supply voltage,Cable type: excluding monitor current output) ECO mode: 980 mW or less (Current consumption 40 mA or less at 24 V supply voltage,Cable type: excluding monitor current output)	
Sensing outputs (Sensing output 1, 2) (Note 4)			<NPN output type> NPN open-collector transistor • Maximum sink current: 50 mA (Note 2) • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 2 V or less (at max. sink current)	<PNP output type> PNP open-collector transistor • Maximum source current: 50 mA (Note 2) • Applied voltage: 30 V DC or less (between output and +V) • Residual voltage: 2 V or less (at max. source current)
	Output operation		Selectable either Light-ON or Dark-ON	
	Short-circuit protection		Incorporated	
Sensing output setting	Sensing output 1		Normal mode, differential mode, hysteresis mode, window comparator mode, selectable	
	Sensing output 2 (Note 4)		Normal mode, differential mode, hysteresis mode, self-diagnostic output mode, selectable	Normal mode, differential mode, hysteresis mode, self-diagnostic output mode, answer-back output mode, selectable
Response time			H-SP: 60 µs or less, FAST: 150 µs or less, STD: 250 µs or less, LONG: 500 µs or less, U-LG: 5 ms or less, HYPR: 24 ms or less , selectable	
Monitor current output			———	Output current: Approx. 4 to 20 mA (H-SP, FAST, STD: at 0 to 4,000 indication) Response time: 2 ms or less Zero point: 4 mA ± 1 % F.S. Span: 16 mA ± 5 % F.S. Linearity: ± 3 % F.S. Load resistance: 0 to 250 Ω
External input (Note 4)			<NPN output type> NPN non-contact input • Signal condition High: +8 V to +V DC or open, Low: 0 to +2 V DC (source current 0.5 mA or less) • Input impedance: 10 kΩ approx.	<PNP output type> PNP non-contact input • Signal condition High: +4 V to +V DC (sink current 3.0 mA or less), Low: 0 to +0.6 V DC or open • Input impedance: 10 kΩ approx.
External input function			Laser emission halt / teaching (full-auto teaching, limit teaching, 2 point teaching) / logic operation setting / copy lock / display adjustment / data bank load / data bank save, selectable	
Sensing output operation indicator			Orange LED (lights up when sensing output 1 or sensing output 2 is ON)	
Laser emission indicator			Green LED (lights up during laser emission)	
Output select indicator			Yellow LED (lights up when output is selected)	
Digital display			8-digit 7-segment digital display (4-digit green LED + 4-digit red LED), MODE indicator (Yellow LED): L/D, CUST, PRO	
Incident light indication range			H-SP / FAST / STD: 0 to 4,000, LONG / U-LG / HYPR: 0 to 9,999	
Sensitivity setting			2-level teaching / limit teaching / full auto teaching / manual adjustment	
Logical operation			Between sensing output 1 and calculation target: Disabled / AND / OR / XOR, selectable Calculation target: Sensing output 2 / adjacent upstream amplifier (sensing output 1) / external input, selectable	
Timer functions			<Sensing output 1> OFF-delay timer, ON-delay timer, ONE-SHOT timer, ON / OFF-delay timer, ON-delay / ONE-SHOT timer, switchable either effective of ineffective, with variable timer period	
			<Sensing output 2> OFF-delay timer, ON-delay timer, ONE-SHOT timer, switchable either effective of ineffective, with variable timer period	
	Timer period		Timer range “ms”: 0.5 ms approx., 1 to 9,999 ms approx., in approx. 1 ms intervals Timer range “sec”: 0.5 sec. approx., 1 to 32 sec. approx., in approx. 1 sec. intervals Timer range “1/10 ms”: 0.05 ms approx., 0.1 to 999.9 ms approx., in approx. 0.1 ms intervals, Set separately for each output.	
Interference prevention function			Incorporated (Note 3)	
Environmental resistance	Ambient temperature		– 10 to +55°C +14 to +131 °F (If 4 to 7 units are mounted close together, – 10 to +50°C +14 to +122 °F; if 8 to 16 units (cable type: 8 to 12 units) are mounted close together, – 10 to +45 °C +14 to +113°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	
	Voltage withstandability		1,000 V AC for one min. between all supply terminals connected together and enclosure	
	Insulation resistance		20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure	
	Vibration resistance		10 to 150 Hz frequency, 0.75 mm 0.030 in (max. 10 G) amplitude in X, Y and Z directions for two hours each	
	Shock resistance		98 m/s² acceleration (10 G approx.) in X, Y and Z directions for five times each	
Material			Enclosure: Polycarbonate, Cover: Polycarbonate, Switch: Polyacetal	
Protection			IP40 (IEC)	
Cable			———	0.2 mm² 6-core cabtyre cable, 2 m 6.562 ft long
Cable extension			Extension up to total 100 m 328.084 ft is possible with 0.3 mm², or more, cable.	
Weight			Net weight: 15 g approx., Gross weight: 55 g approx.	Net weight: 75 g approx., Gross weight: 110 g approx.
Accessory			**FX-MB1** (Amplifier protective seal): 1 set	

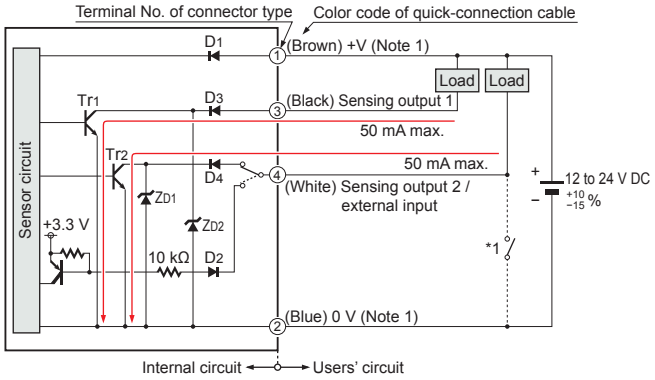
Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.
2) 25 mA if 5 or more amplifier are connected in cascade (excluding cable extension).
3) Number of units that can be mounted close together: 0 for H-SP; 2 for FAST; 4 for STD, LONG, U-LG, or HYPR
4) Select either sensing output 2 or external input as the connector type.

I/O CIRCUIT AND WIRING DIAGRAMS

I/O circuit diagrams

NPN output type

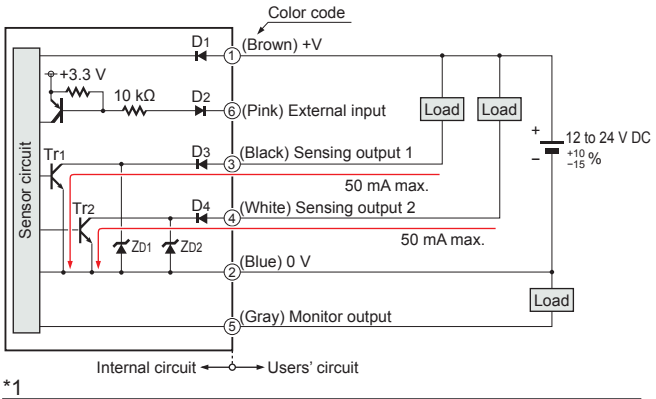
Connector type



Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.
2) Wiring when sensing output 2 is selected is shown with solid lines. Wiring when external input is selected is shown with broken lines.

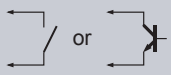
Symbols ... D_1, D_2, D_3, D_4: Reverse supply polarity protection diode
Z_{D1}, Z_{D2}: Surge absorption zener diode
Tr_1, Tr_2 : NPN output transistor

Cable type



*1

Non-voltage contact or NPN open-collector transistor

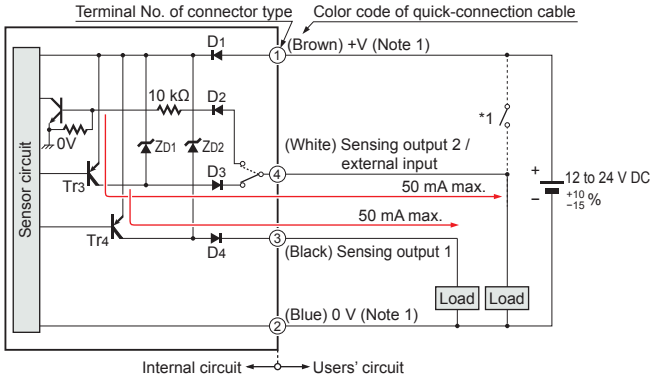


or

- External input
  High: +8 V to +V, or open
  Low: 0 to +2 V (source current: 0.5 mA or less)
- Light emission halts and teaching occurs when at Low.

PNP output type

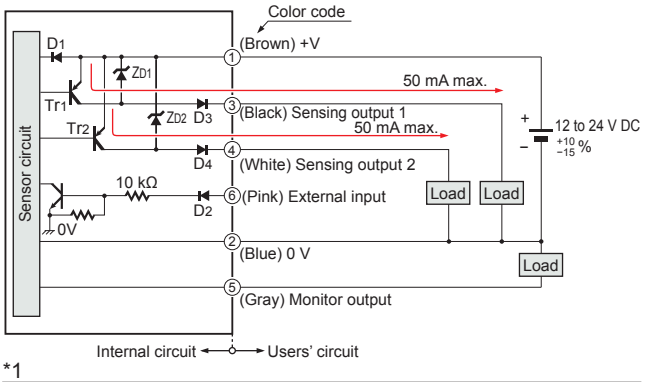
Connector type



Notes: 1) The quick-connection sub cable does not have +V (brown) and 0 V (blue). The power is supplied from the connector of the main cable.
2) Wiring when sensing output 2 is selected is shown with solid lines. Wiring when external input is selected is shown with broken lines.

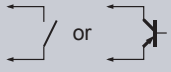
Symbols ... D_1, D_2, D_3, D_4: Reverse supply polarity protection diode
Z_{D1}, Z_{D2}: Surge absorption zener diode
Tr_1, Tr_2 : PNP output transistor

Cable type



*1

Non-voltage contact or PNP open-collector transistor

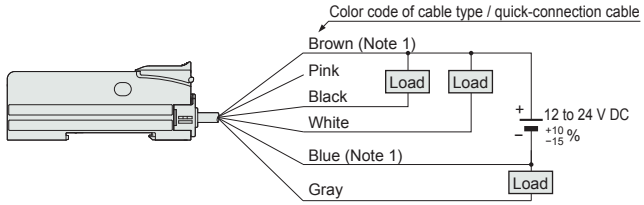


or

- External input
  High: +4 V to +V (sink current: 3 mA or less)
  Low : 0 to +0.6 V, or open
- Light emission halts and teaching occurs when at High.

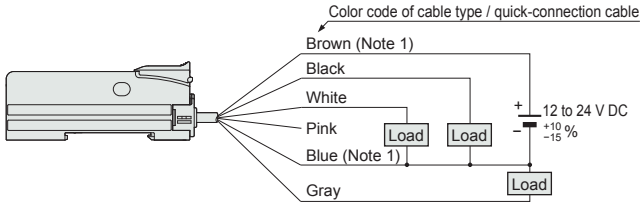
Wiring diagrams

NPN output type



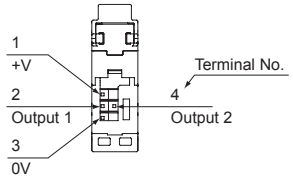
Notes: 1) The quick-connection sub cable does not have brown lead wire and blue lead wire. The power is supplied from the connector of the main cable.
2) The quick-connection cable does not have gray or pink lead wires.

PNP output type

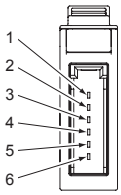


Notes: 1) The quick-connection sub cable does not have brown lead wire and blue lead wire. The power is supplied from the connector of the main cable.
2) The quick-connection cable does not have gray or pink lead wires.

Terminal layout of connector type



* Connector for amplifier (CN-EP4) pin position



Terminal No.	Connection cable
①	Purple
②	White
③	Shield
④	Shield
⑤	Black
⑥	Pink

PRECAUTIONS FOR PROPER USE

Refer to p.1458~ for general precautions and p.1499~ for information about laser beam.

- This catalog is a guide to select a suitable product. Be sure to read the instruction manual attached to the product prior to its use.

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

Cautions for laser beams

- These products are Class 1 laser in compliance with IEC, JIS and FDA* regulations. To reduce the risk of danger, do not look directly at the laser beam or view it through an optical system.
- A label with instructions as found at the below is affixed to the product. Handle this sensor as per the instruction on the labels.

*This product complies with 21 CFR 1040.10 and 1040.11 Laser Notice No. 50, dated June 24, 2007, issued by CDRH (Center for Devices and Radiological Health) under the FDA (Food and Drug Administration).

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. **LS-H□** is classified as Class 1 laser.

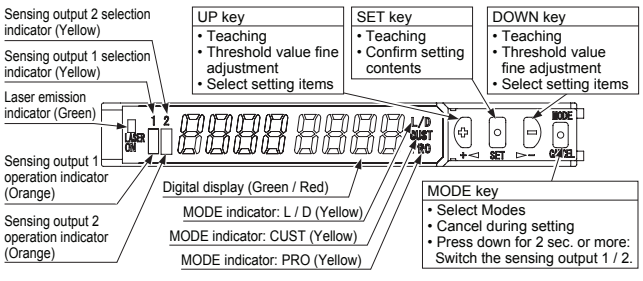
Classification by IEC 60825-1

Classification	Description
Class 1	Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.

Safe use of laser products

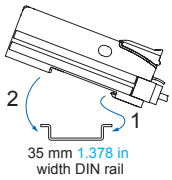
- For the purpose of preventing users from suffering injuries by laser products, IEC 60825-1 (Safety of laser products). Kindly check the standards before use. (Refer to About laser beam.)

Part description (Amplifier)



Mounting

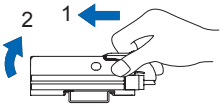
Amplifier



<How to mount the amplifier>

(1) Fit the rear part of the mounting section of the amplifier on a 35 mm 1.378 in width DIN rail.
(2) Press down the rear part of the mounting section of the unit on the 35 mm 1.378 in width DIN rail and fit the front part of the mounting section to the DIN rail.

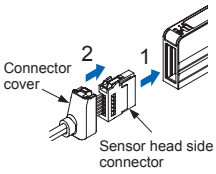
<How to remove the amplifier>



(1) Push the amplifier forward.
(2) Lift up the front part of the amplifier to remove it.

Note: Be careful. If the front part is lifted without pushing the amplifier forward, the hook on the rear portion of the mounting section is likely to break.

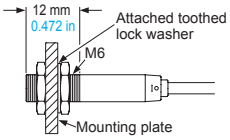
<How to mount the sensor head>



(1) Insert the sensor head connector into the inlet until it clicks.
(2) Fit the cover to the connector.

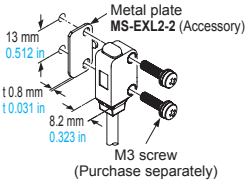
Sensor head

LS-H101□



- The tightening torque should be 0.98 N·m or less.

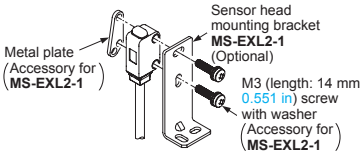
LS-H102□



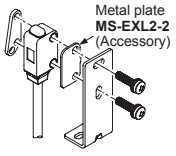
- In case mounting this product, use a metal plate **MS-EXL2-2** (accessory).
- The tightening torque should be 0.5 N·m or less with M3 screws.

- In case using the dedicated sensor head mounting bracket **MS-EXL2-1** (optional) when mounting this product, the metal plate **MS-EXL2-2** (accessory) is required depending on the mounting direction. Mount as the diagram below indicates.

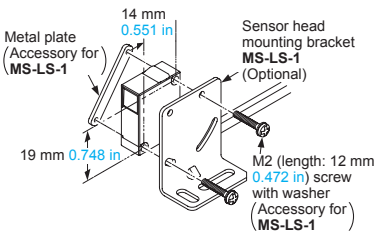
<Not requiring the metal plate>



<Requiring the metal plate>



LS-H201□, LS-H901□



- The tightening torque should be 0.5 N·m or less.
- When placing the sensor head horizontally or vertically, the reflector must also be positioned horizontally or vertically as shown in Fig. 1 below.If the sensor head is placed horizontally or vertically but the reflector is tilted as shown in Fig. 2 below, the reflection amount will decrease, which may cause unstable detection.

PRECAUTIONS FOR PROPER USE

Refer to p.1458~ for general precautions and p.1499~ for information about laser beam.

Fig. 1 Proper positioning

When placing the sensor head horizontally or vertically, the reflector shall also be positioned horizontally or vertically.

<Correct>

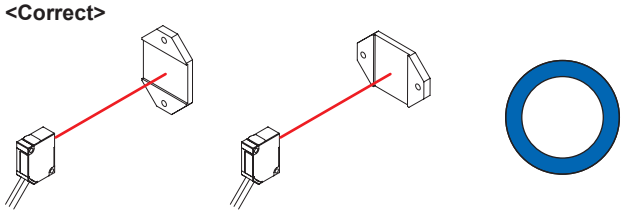
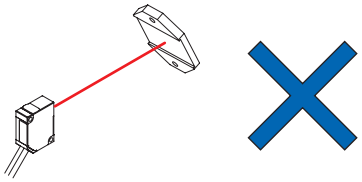


Fig. 2 Improper positioning

When placing the reflector tilted even when the sensor head is positioned horizontally or vertically.

<Incorrect>



Wiring

- Make sure that the power supply is off while wiring.
- Verify that the supply voltage variation is within the rating.
- Take care that if a voltage exceeding the rated range is applied, or if an AC power supply is directly connected, the sensor may get burnt or damaged.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- Make sure to use the optional quick-connection cable for the connection of the amplifier [connector type **LS-501(P)**]. Extension up to total 100 m 328.084 ft is possible with 0.3 mm², or more, cable. However, in order to reduce noise, make the wiring as short as possible. Set the supply voltage after considering the voltage drop caused by the cable's resistance.
  When adding units, wiring length must not exceed 50 m 164.042 ft (for 5 to 8 amplifiers) or 20 m 65.617 ft (for 9 to 16 amplifiers).

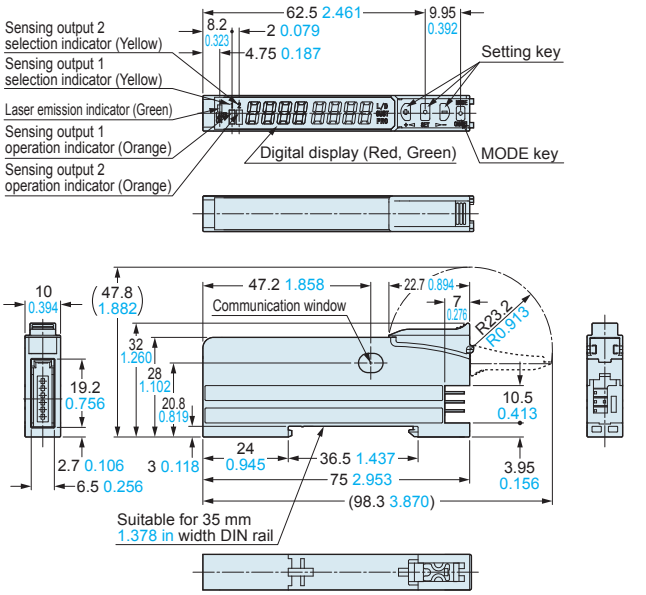
Others

- Do not use during the initial transient time (0.5 sec. approx.) after the power supply is switched on.
- Because the sensitivity is higher in U-LG and HYPER modes than in other modes, it can be more easily affected by extraneous noise. Check the operating environment before use.

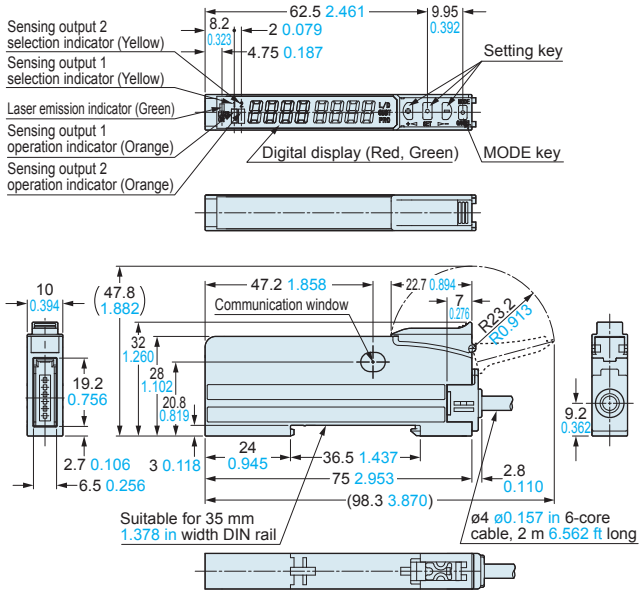
DIMENSIONS (Unit mm in)

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

LS-501 LS-501P — Amplifier



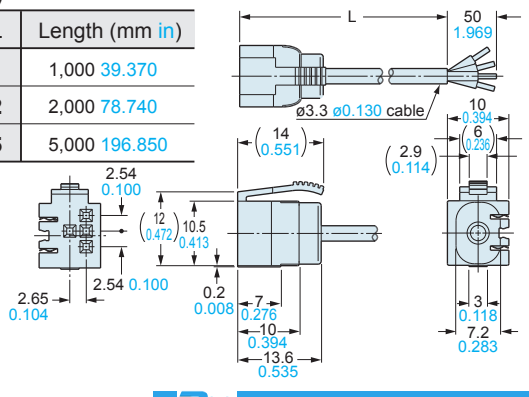
LS-501-C LS-501P-C — Amplifier



CN-74-C1 CN-74-C2 CN-74-C5 — Main cable (Optional)

• Length (L)

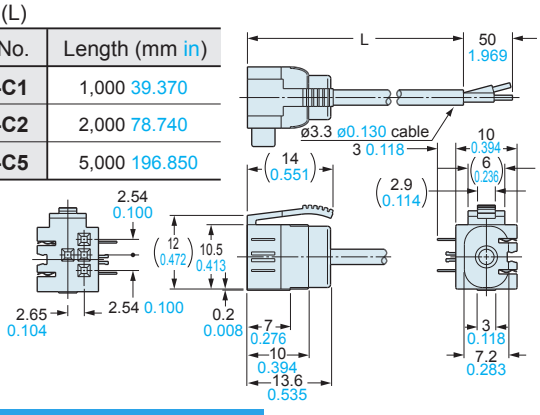
Model No.	Length (mm in)
CN-74-C1	1,000 39.370
CN-74-C2	2,000 78.740
CN-74-C5	5,000 196.850



CN-72-C1 CN-72-C2 CN-72-C5 — Sub cable (Optional)

• Length (L)

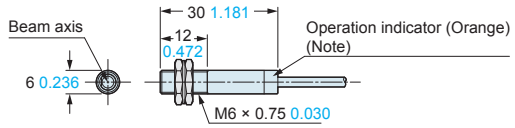
Model No.	Length (mm in)
CN-72-C1	1,000 39.370
CN-72-C2	2,000 78.740
CN-72-C5	5,000 196.850



DIMENSIONS (Unit mm in)

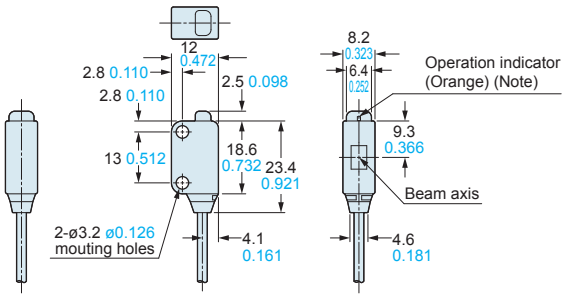
The CAD data in the dimensions can be downloaded from our website.

LS-H101□ Sensor head



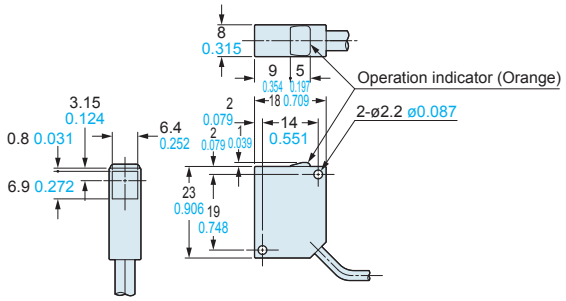
Note: Not incorporated on the emitter.

LS-H102□ Sensor head

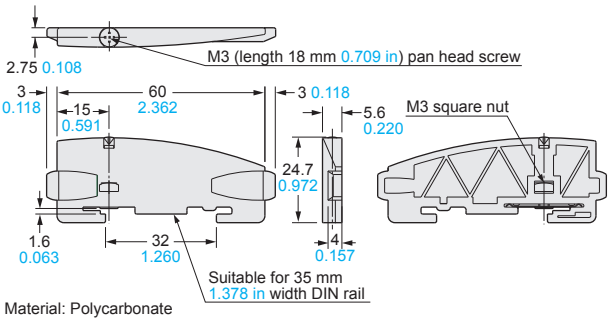


Note: Not incorporated on the emitter.

LS-H201□ LS-H901□ Sensor head

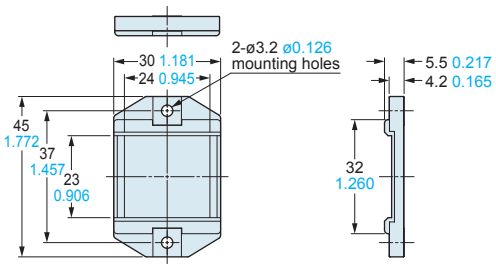


MS-DIN-E End plate (Optional)



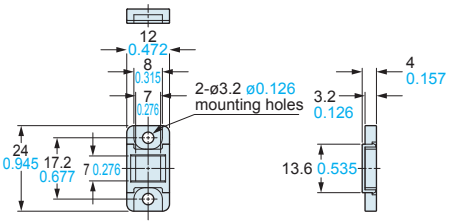
Material: Polycarbonate

RF-330 Reflector (Accessory for LS-H901□)



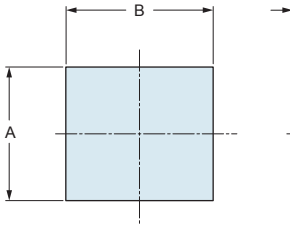
Material: Acrylic (Reflector)
ABS (Base)

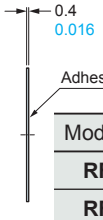
RF-310 Reflector (Optional)



Material: Acrylic (Reflector)
ABS (Base)

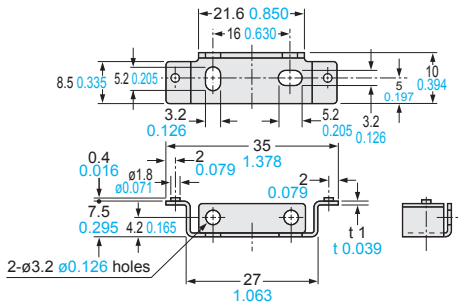
RF-33 RF-31 Reflective tape (Optional)





Model No.	A	B
RF-33	25.2 0.992	27.8 1.094
RF-31	9.2 0.362	9.2 0.362

MS-DIN-2 Amplifier mounting bracket (Optional)

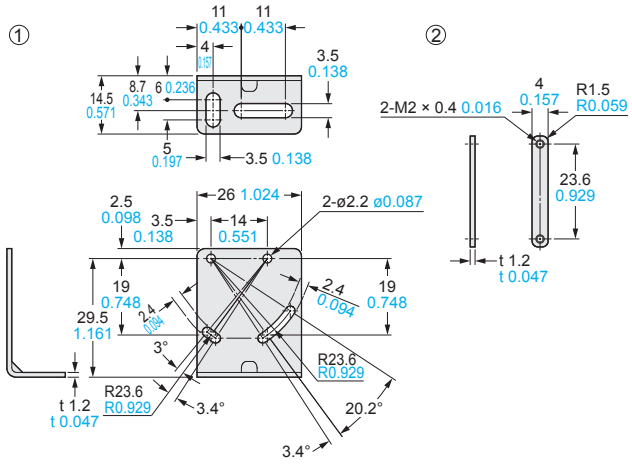


Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)

DIMENSIONS (Unit mm in)

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

MS-LS-1 Sensor head mounting bracket (Accessory for LS-H201□, LS-H901□)

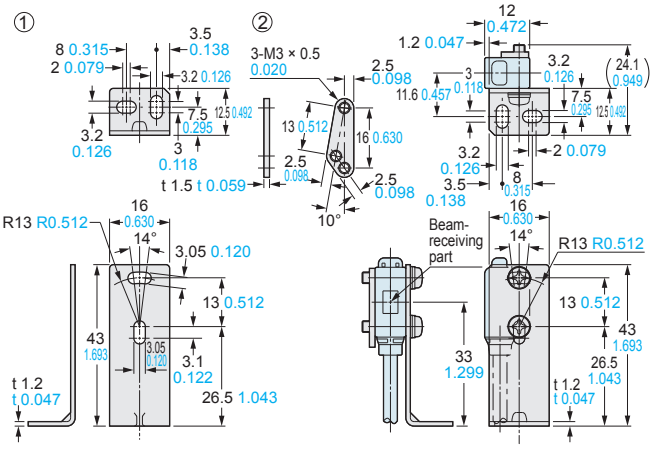


MS-EXL2-1 Sensor head mounting bracket for LS-H102□ (Optional)

Foot angled mounting bracket

Assembly dimensions

Mounting drawing with the receiver of **LS-H102□**

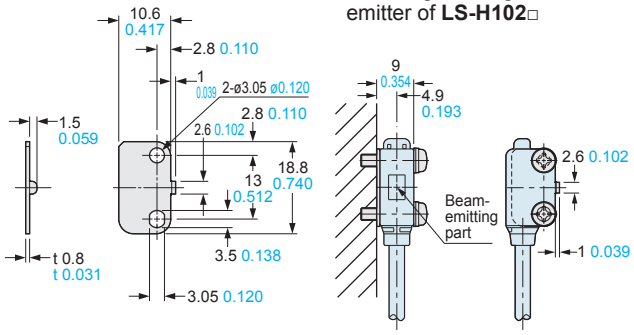


Material: Stainless steel (SUS304)
Two M3 (length 14 mm 0.551 in) screws with washers [stainless steel (SUS304)] are attached.

MS-EXL2-2 Mounting plate (Accessory for LS-H102□)

Assembly dimensions

Mounting drawing with the emitter of **LS-H102□**

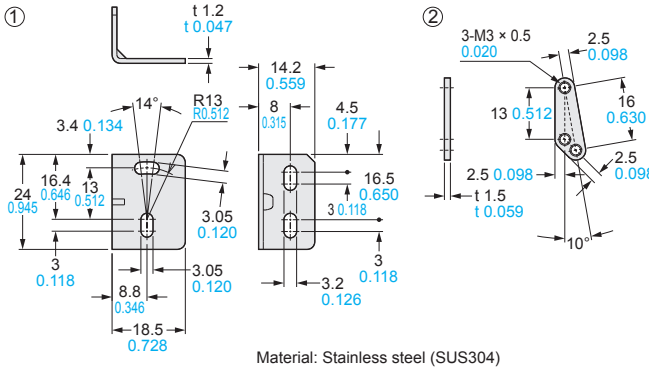


Material: Stainless steel (SUS304)
Note: Screws are not attached. Purchase separately.

Note: Without using the mounting plate, beam misalignment may occur.

MS-EXL2-5 Sensor head mounting bracket for LS-H102□ (Optional)

Rear mounting bracket



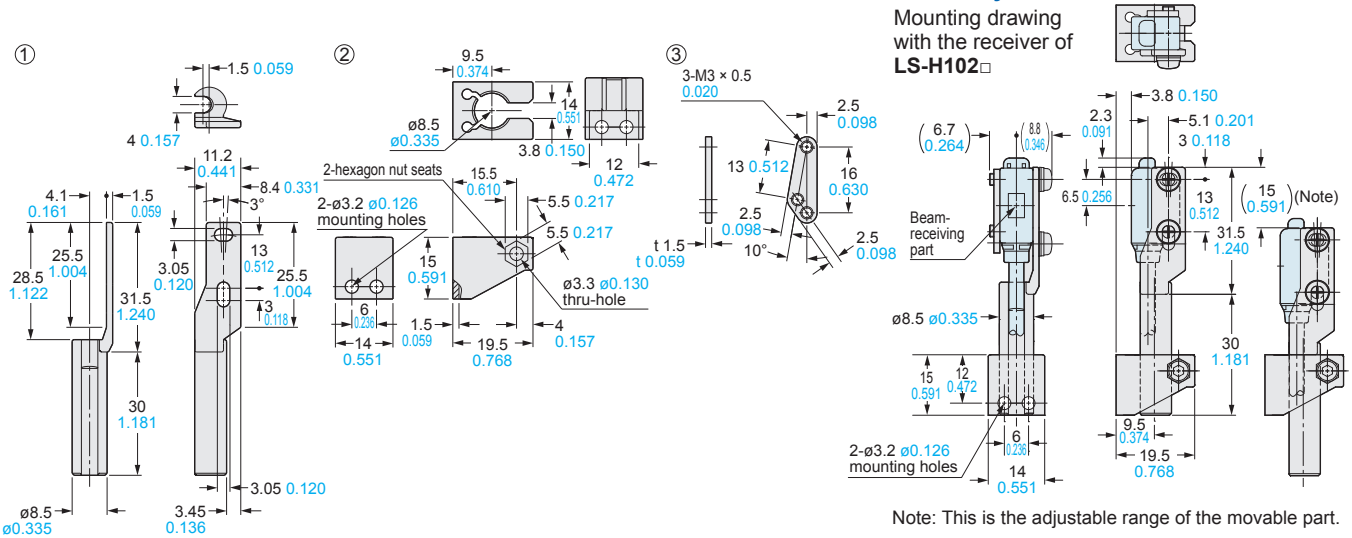
Material: Stainless steel (SUS304)
Two M3 (length 14 mm 0.551 in) screws with washers [stainless steel (SUS304)] are attached.

MS-EXL2-4 Sensor head mounting bracket for LS-H102□ (Optional)

Universal sensor mounting bracket

Assembly dimensions

Mounting drawing with the receiver of **LS-H102□**



Material: Die-cast zinc alloy

Two M3 (length 14 mm 0.551 in) screws with washers, one M3 (length 10 mm 0.394 in) hexagon socket-head bolt [stainless steel (SUS)], and one M3 hexagon nut [stainless steel (SUS)] are attached.

Note: This is the adjustable range of the movable part.