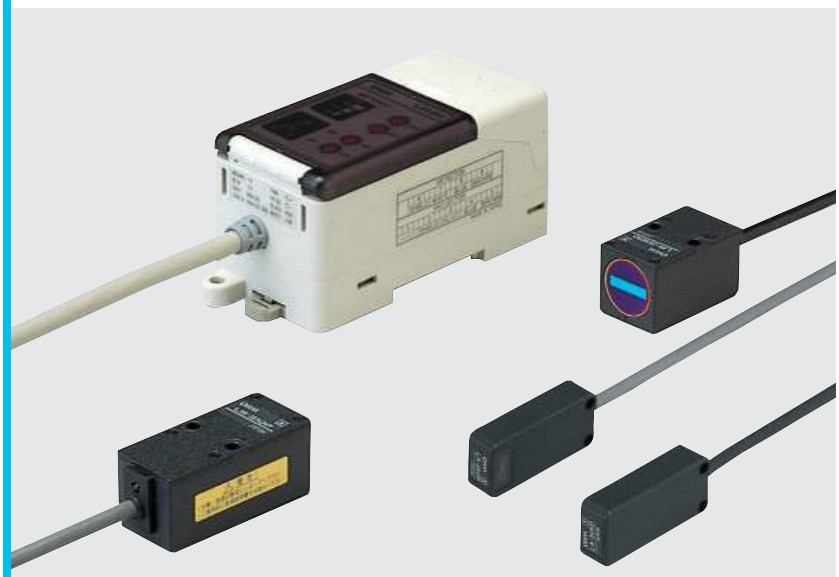
LED Collimated Beam Sensor

LA-300 SERIES

Related Information
■ General terms and conditions..... P.1
■ Sensor selection guide .....P.11~ / P.833~
■ CA2.....P.793~
■ General precautions..... P.1027

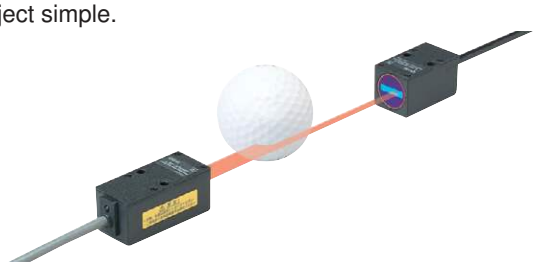


CE Conforming to EMC Directive

LED collimated beam type which is as accurate as a laser sensor, but much safer

Safe red LED beam

Since a red LED, harmless to your eyes, has been incorporated as the beam source, you are free from strict laser safety regulations.
Moreover, due to the red LED beam source, the measuring spot is visible, which makes positioning of the object simple.



Compact size

Its emitter and receiver are much smaller compared to those of the amplifier built-in type (**LA-510**). Hence, they can be installed even in a narrow space inside an automatic assembly machine, etc.

Long sensing range type / LA-310

■ Emitter:
W20 × H20 × D45 mm
W0.787 × H0.787 × D1.772 in
■ Receiver:
W20 × H20 × D35 mm
W0.787 × H0.787 × D1.378 in

Slim type / LA-305

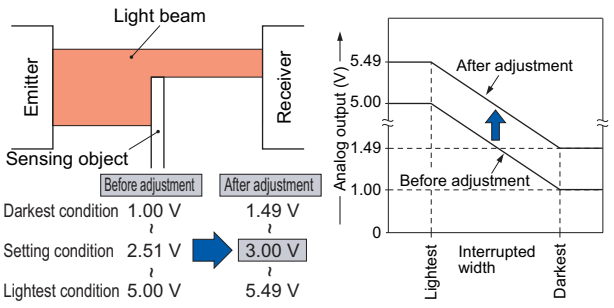
■ Emitter:
W18 × H40 × D10 mm
W0.709 × H1.575 × D0.394 in
■ Receiver:
W18 × H40 × D10 mm
W0.709 × H1.575 × D0.394 in

FUNCTIONS

Span & shift adjustment

For the analog output, in addition to the span adjustment function, a convenient shift function which enables the analog voltage to be shifted by ±0.5 V has been incorporated.

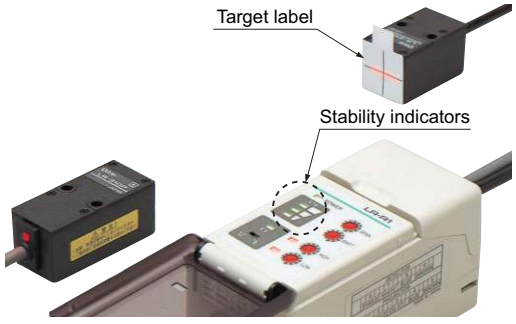
Example: To shift the analog voltage from 2.51 V to 3.00 V with a certain amount of beam interruption



MOUNTING

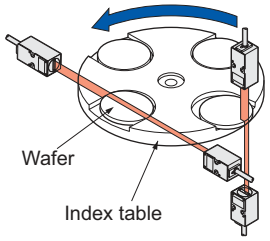
Simple beam alignment

Beam alignment is easy by using the target label (accessory). Further, the 3-stage stability indicators on the amplifier indicate the incident beam level at a glance.

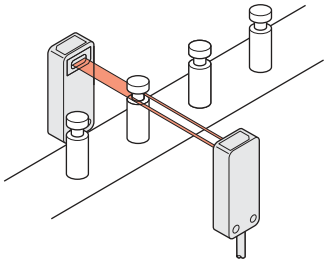


APPLICATIONS

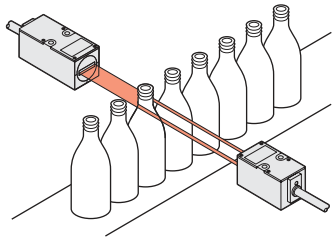
Detecting unseated wafers
Two sensors inspect vertical and lateral displacement of wafers.



Inspecting burrs on workpieces
If burrs are present, they increase the width of beam interruption.

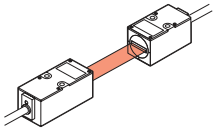
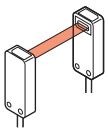


Detecting glass bottles
Even clear glass bottles are reliably detected.



ORDER GUIDE

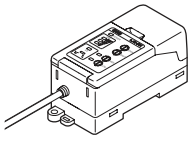
Sensor heads

Type	Appearance	Sensing range	Sensing width	Minimum sensing object	Model No. (Note)
Long sensing range		500 mm 19.685 in	10 mm 0.394 in	ø0.1 mm ø0.004 in opaque object	**LA-310**
Slim		300 mm 11.811 in	5 mm 0.197 in	ø0.05 mm ø0.002 in opaque object	**LA-305**

Order for the long sensing range type **LA-310** will be stopped by December, 2007.

Note: The model No. with suffix "**P**" shown on the label affixed to the product is the emitter, "**D**" shown on the label is the receiver.
(e.g.) Emitter of **LA-305**: **LA-305P**, Receiver of **LA-305**: **LA-305D**

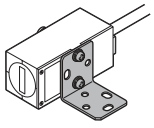
Amplifiers

Type	Appearance	Model No.	Output
NPN output		**LA-A1**	NPN open-collector transistor (Comparative outputs) Analog voltage • Output voltage: 1 to 5 V
PNP output		**LA-A1P**	PNP open-collector transistor (Comparative outputs) Analog voltage • Output voltage: 1 to 5 V

Always use the sensor head and the amplifer together as a set.

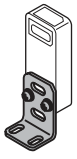
Accessories

• **MS-LA3-1**
(Sensor head mounting bracket for **LA-310**)
(Note)



Two M3 (length 25 mm 0.984 in) screws with washers are attached.

• **MS-LA3-2**
(Sensor head mounting bracket for **LA-305**)
(Note)



Two M3 (length 15 mm 0.591 in) screws with washers are attached.

Note: 2 sets are required to mount the emitter / receiver.

OPTIONS

Designation	Model No.	Description
Digital panel controller (Note)	**CA2-T2**	This is a very small controller which allows two independent threshold level settings. • Supply voltage: 24 V DC ± 10 % • Output: NPN open-collector transistor • No. of inputs: 1 No. (sensor input) • Input range: 1 to 5 V DC • Main functions: Threshold value setting function, zero-adjust function, scale setting function, hysteresis setting function, start / hold function, auto-reference function, power supply ON-delay function, etc.

Note: If analog voltage output of **LA-A1** or **LA-A1P** is shifted, the input range may be exceeded. In that case, use **CA2-T5** (input range –10 to +10 V). For further details, refer to p.793~ for the ultra-compact digital panel controller **CA2** series.

Digital panel controller

• **CA2-T2**

SPECIFICATIONS

Sensor heads

Item \ Type	Model No.	Long sensing range **LA-310**	Slim **LA-305**
Applicable amplifiers		**LA-A1**, **LA-A1P**	
Beam width		10 mm 0.394 in	5 mm 0.197 in
Sensing range		500 mm 19.685 in	300 mm 11.811 in
Min. sensing object		ø0.1 mm ø0.004 in opaque object	ø0.05 mm ø0.002 in opaque object
Repeatability		Perpendicular to sensing axis: 0.01 mm 0.0004 in or less	
Temperature characteristics		0.1 % F.S./°C or less	0.2 % F.S./°C or less
Emission indicator		Red LED (lights up when emitting)	———
Environmental resistance	Pollution degree	3 (Industrial environment)	
	Ambient temperature	0 to +40 °C +32 to +104 °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: 10,000 ℓx at the light-receiving face	
	EMC	EN 61000-6-2, EN 61000-6-4	
	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 amplitude in X, Y and Z directions for two hours each	
	Shock resistance	500 m/s² acceleration (50 G approx.) in X, Y and Z directions for three times each	
Emitting element		Red LED (Peak emission wavelength 670 nm 0.026 mil, modulated)	Red LED (Peak emission wavelength 650 nm 0.026 mil, modulated)
Material		Enclosure: Die-cast zinc alloy Top face: Aluminum	Enclosure: Heat-resistant ABS Cover: Heat-resistant ABS, Front cover: Glass
Cable		0.22 mm² 3-core composite cabtyre cable, 2 m 6.562 ft long	0.18 mm² 3-core composite cabtyre cable, 2 m 6.562 ft long
Cable extension		Extension up to total 10 m 32.808 ft is possible, for both emitter and receiver, with 0.22 mm², or more, cable. (Shield wire must be extended with shield wire.)	Extension up to total 10 m 32.808 ft is possible, for both emitter and receiver, with 0.18 mm², or more, cable. (Shield wire must be extended with shield wire.)
Net weight		Emitter: 110 g approx., Receiver: 100 g approx.	Emitter: 70 g approx., Receiver: 70 g approx.
Accessories		**MS-LA3-1** (Sensor head mounting bracket): 1 set for emitter and receiver, Target label: 2 pcs.	**MS-LA3-2** (Sensor head mounting bracket): 1 set for emitter and receiver, Target label: 2 pcs.

Order for the long sensing range type **LA-310** will be stopped by December, 2007.

Note: Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C +68 °F.

SPECIFICATIONS

Amplifiers

Item \ Type		NPN output type	PNP output type
Model No.		**LA-A1**	**LA-A1P**
Applicable sensor heads		**LA-310, LA-305**	
Supply voltage		12 to 24 V DC ± 10 % Ripple P-P 10 % or less	
Current consumption		120 mA or less (including sensor heads)	
Comparative outputs (HIGH, LOW)		NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less (between comparative output and 0 V) • Residual voltage: 1.5 V or less (at 100 mA sink current) 0.5 V or less (at 16 mA sink current)	PNP open-collector transistor • Maximum source current: 100 mA • Applied voltage: 30 V DC or less (between comparative output and +V) • Residual voltage: 1.5 V or less (at 100 mA source current) 0.5 V or less (at 16 mA source current)
	Utilization category	DC-12 or DC-13	
	Response time	0.5 ms or less	
	Output operation	HIGH output: ON when the received beam level is equal to or lower than HIGH (Over-dark) level LOW output: ON when the received beam level is equal to or higher than LOW (Under-dark) level	
	Short-circuit protection	Incorporated	
Analog output		Analog voltage • Output voltage: 1 V (Darkest) to 5 V (Lightest) • Output impedance: 75 Ω	
	Slew rate	8 V/ms or more	
	Temperature characteristics	0.05 % F.S./°C or less	
External synchronization		Incorporated (Either gate trigger or edge trigger is selectable)	
Indicators	Power	Green LED (lights up when the power is ON)	
	Stable incident beam	Three green LEDs (light up in three stages in proportion to the amount of beam received)	
	Operation	Two orange LEDs (light up when High and Low comparative outputs are ON, respectively)	
	External synchronization	Green LED (lights up when the comparative outputs are effective)	
Adjusters	Span	15-turn adjuster sets the span for the analog output voltage	
	Shift	15-turn adjuster sets the offset for the analog output voltage	
	HIGH (Over-dark) level	15-turn adjuster sets the HIGH output threshold level (Over-dark level)	
	LOW (Under-dark) level	15-turn adjuster sets the LOW output threshold level (Under-dark level)	
Environmental resistance	Pollution degree	3 (Industrial environment)	
	Ambient temperature	0 to +50 °C +32 to +122 °F (No dew condensation), Storage: –20 to +70°C –4 to +158 °F	
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH	
	EMC	EN 61000-6-2, EN 61000-6-4	
	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 amplitude in X, Y and Z directions for two hours each	
	Shock resistance	500 m/s² acceleration (50 G approx.) in X, Y and Z directions for three times each	
Material		Enclosure: Heat-resistant ABS, Terminal cover: Heat-resistant ABS, Front cover: Polycarbonate	
Cable		0.22 mm² (shield wire: 0.15 mm²) 7-core composite cabtyre cable, 2 m 6.562 ft long	
Cable extension (Note 2)		Extension up to total 50 m 164.042 ft is possible with 0.22 mm², or more, cable. (Shield wire must be extended with 0.15 mm², or more, shield wire.)	
Weight		Net weight: 200 g approx.	
Accessory		Adjusting screwdriver: 1 pc.	

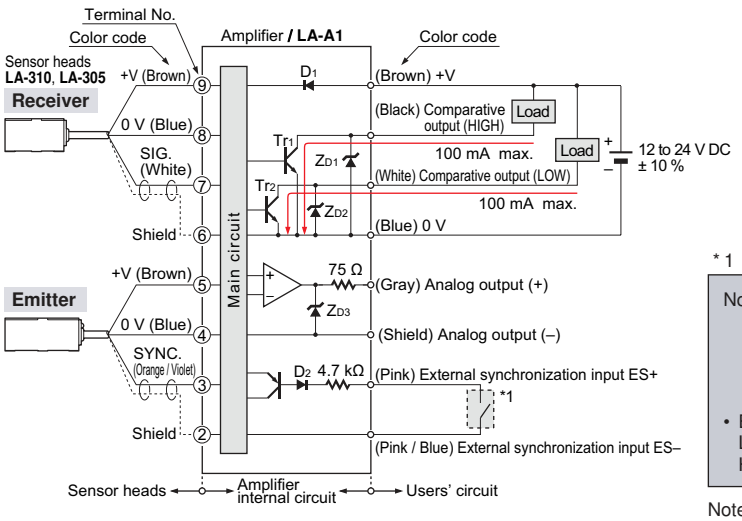
Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C +68 °F.
2) This product is CE compliant and complies with EMC directives. EN 61000-6-2 is the applicable standard that covers immunities relating to use of this product, but in order to comply with this standard, the following conditions must be satisfied.

Conditions
- The amplifier should be connected less than 10 m 32.808 ft from the power supply.
- The signal line to connect with the amplifier should be less than 30 m 98.425 ft.

I/O CIRCUIT DIAGRAMS

LA-A1

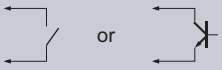
NPN output type



Symbols ... D_1: Reverse supply polarity protection diode
D_2: Input protection diode
Z_{D1}, Z_{D2}, Z_{D3}: Surge absorption zener diode
Tr_1, Tr_2: NPN output transistor

* 1

Non-voltage contact or NPN open-collector transistor

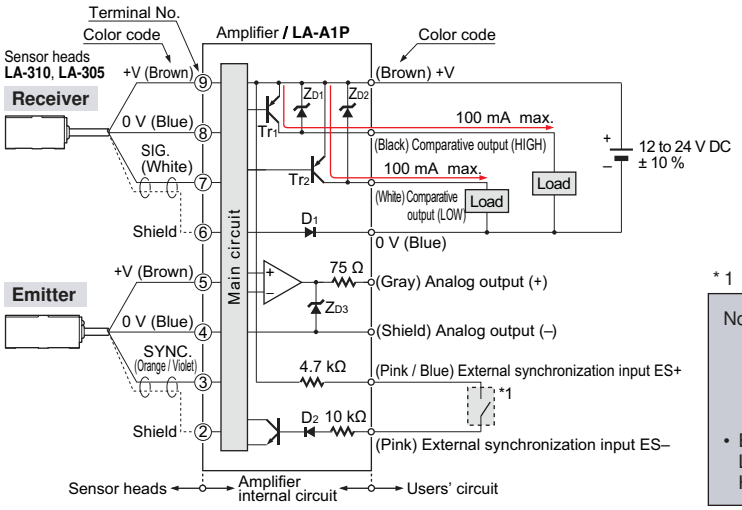


- External synchronization input (Voltage between ES+ and ES–)
  Low: 0 to 1 V
  High: +V or open

Notes: 1) When ES+ (pink) and ES– (pink / blue) of external synchronization input are connected, both HIGH and LOW comparative outputs are triggered in the mode selected by the external synchronization selection switch.
If the external synchronization function is not used, always short-circuit ES+ and ES– and set the external synchronization selection switch to gate trigger.
2) To use the analog output (gray), choose a device with an input impedance of 1 MΩ, or more, and connect the shield wire of the analog output to 0 V (common input) of the device.
3) Insulate all unused wires individually to avoid miscontact.

LA-A1P

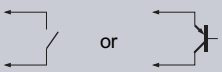
PNP output type



Symbols ... D_1: Reverse supply polarity protection diode
D_2: Input protection diode
Z_{D1}, Z_{D2}, Z_{D3}: Surge absorption zener diode
Tr_1, Tr_2: PNP output transistor

* 1

Non-voltage contact or PNP open-collector transistor



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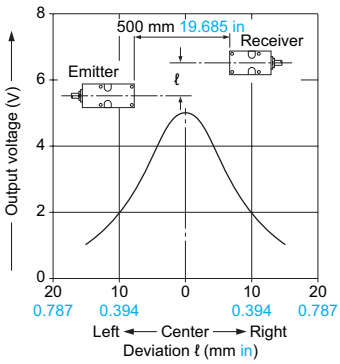
Notes: 1) When ES+ (pink / blue) and ES– (pink) of external synchronization input are connected, both HIGH and LOW comparative outputs are triggered in the mode selected by the external synchronization selection switch.
If the external synchronization function is not used, always short-circuit ES+ and ES– and set the external synchronization selection switch to gate trigger.
2) To use the analog output (gray), choose a device with an input impedance of 1 MΩ, or more, and connect the shield wire of the analog output to 0 V (common input) of the device.
3) Insulate all unused wires individually to avoid miscontact.

SENSING CHARACTERISTICS (TYPICAL)

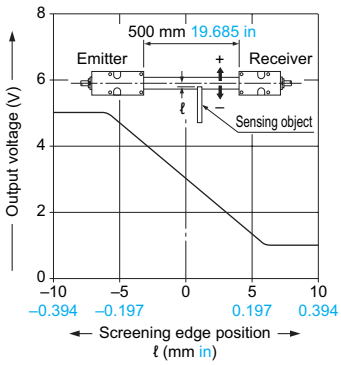
LA-310

Long sensing range type

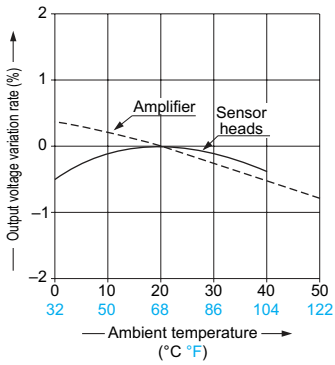
Correlation between transverse deviation and output voltage



Correlation between interrupted beam width and output voltage



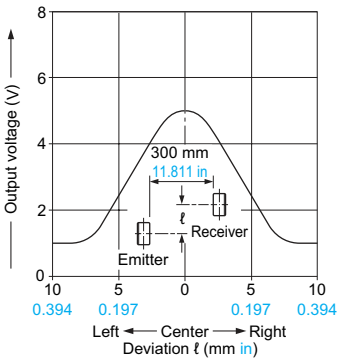
Correlation between ambient temperature and output voltage variation rate



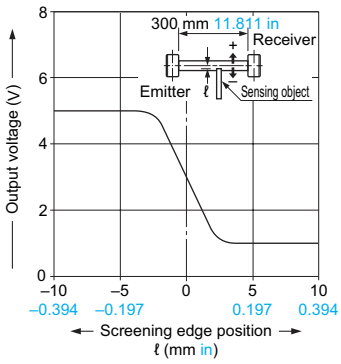
LA-305

Slim type

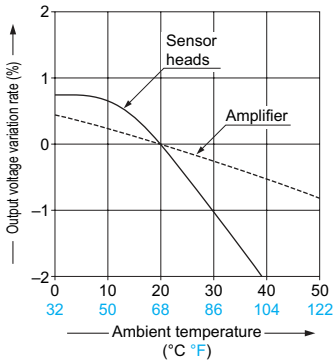
Correlation between transverse deviation and output voltage



Correlation between interrupted beam width and output voltage



Correlation between ambient temperature and output voltage variation rate



PRECAUTIONS FOR PROPER USE

Refer to p.1027 for general precautions.

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

Mounting

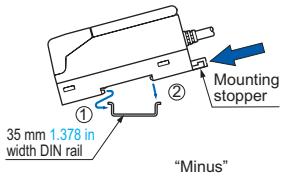
Amplifier

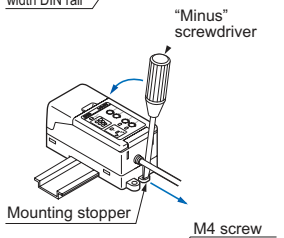
<Mounting on DIN rail>

① Make sure that the mounting stopper is latched inside. Hook the front side of the controller mounting section on the 35 mm 1.378 in width DIN rail.

② Snap the controller down on the 35 mm 1.378 in width DIN rail.

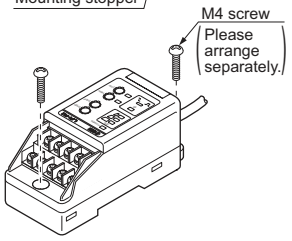
*To remove, insert a "minus" screwdriver into the mounting stopper and pull out.





<Mounting with screws>

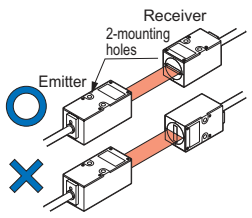
- Use two commercially available M4 screws. The tightening torque should be 1.2 N·m or less.



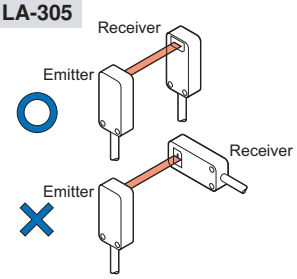
Sensor heads

- The projected LED beam has a directionality. Hence, take care of emitter and receiver mounting direction.

LA-310

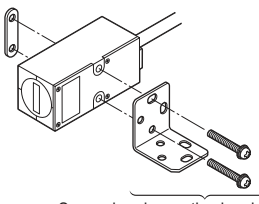


LA-305



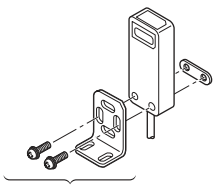
- The tightening torque should be 0.5 N·m or less.

LA-310



Sensor head mounting bracket for **LA-310**
MS-LA3-1 (Accessory)

LA-305



Sensor head mounting bracket for **LA-305**
MS-LA3-2 (Accessory) (Note)

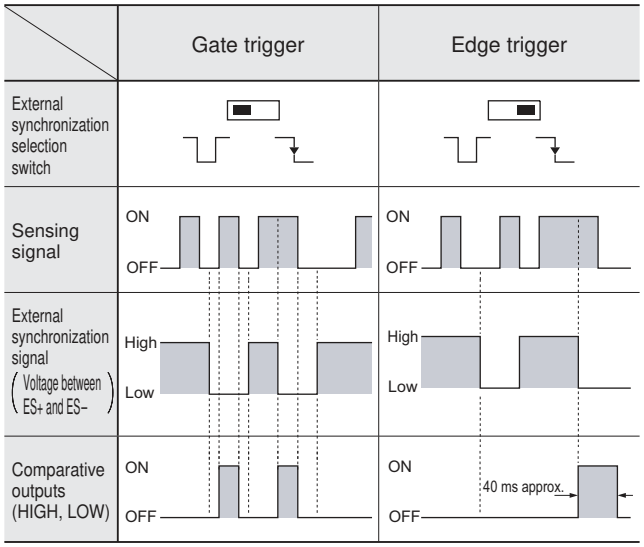
Note: When carrying out high accuracy sensing with **LA-305**, install the mounting bracket on the front face as shown in the above figure.

PRECAUTIONS FOR PROPER USE

Refer to p.1027 for general precautions.

External synchronization

- The external synchronization input controls the timing or the effective duration of the two comparative outputs. Either edge or gate trigger is selectable.



External synchronization input signal: Low ... 0 to 1 V, High ... +V or open

Note: If external synchronization is not used, set the external synchronization selection switch on “Gate trigger” and short-circuit the external synchronization inputs (ES+ and ES–).

Others

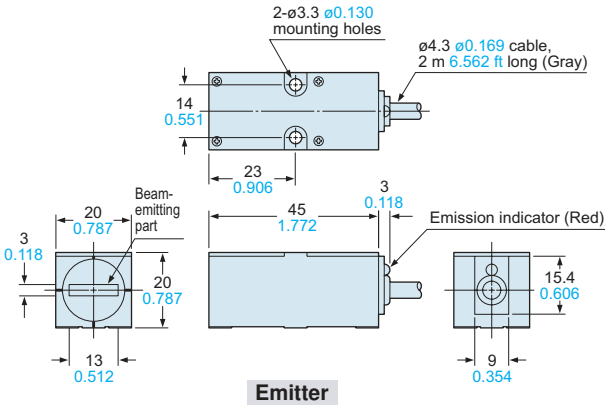
- The sensor’s output is proportional to the amount of the LED light received. Since there is some variation in the light intensity at the center and the periphery of the sensing area, take care that “output = dimension” may not hold.
- For stable operation, use the sensor 10 min., or more, after switching on the power supply.
- Keep the front faces of the sensor heads free of dust, dirt, metal powder, etc. Should the faces be covered with it, deteriorating its performance, wipe them clean with a soft cloth or blown air.

DIMENSIONS (Unit: mm in)

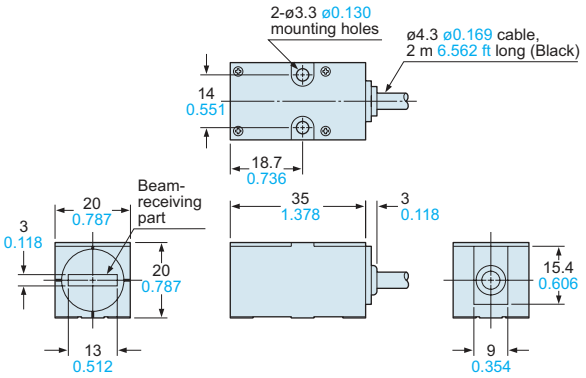
The CAD data in the dimensions can be downloaded from the SUNX website.

LA-310

Sensor head



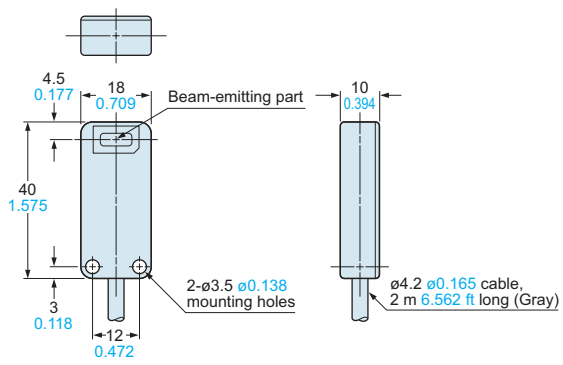
Emitter



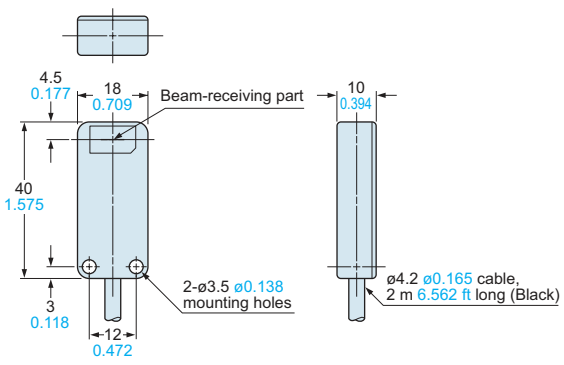
Receiver

LA-305

Sensor head



Emitter



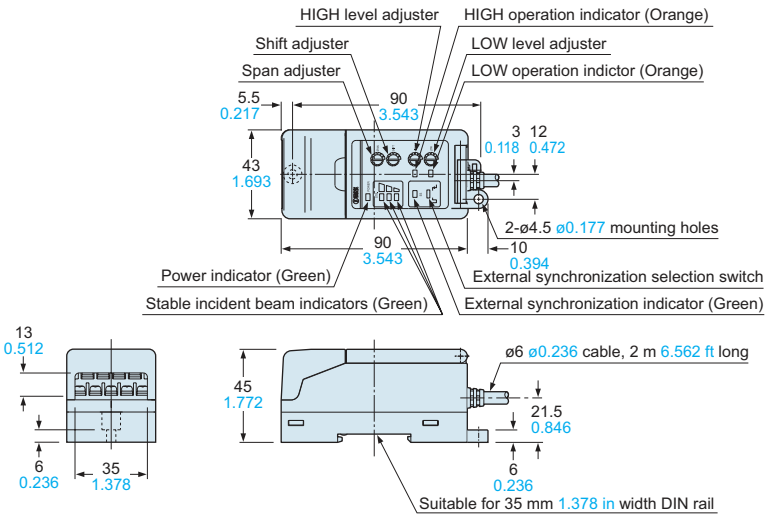
Receiver

DIMENSIONS (Unit: mm in)

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

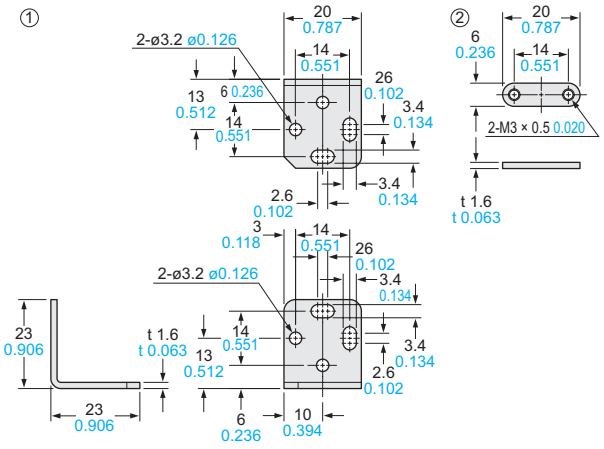
LA-A1 LA-A1P

Amplifier



MS-LA3-1

Sensor head mounting bracket for **LA-310** (Accessory for **LA-310**)

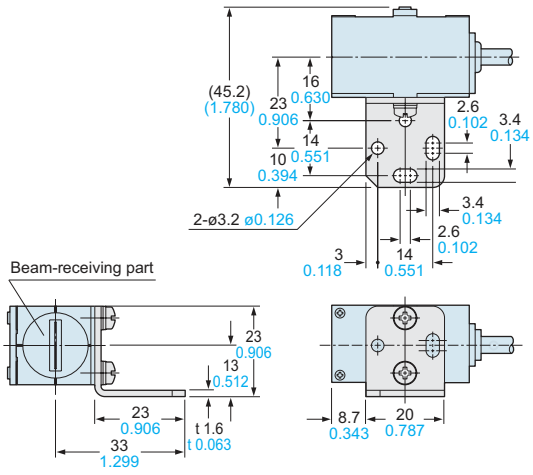


Material: Cold rolled carbon steel (SPCC)
(Uni-chrome plated)

Two M3 (length 25 mm 0.984 in) pan head screws are attached.

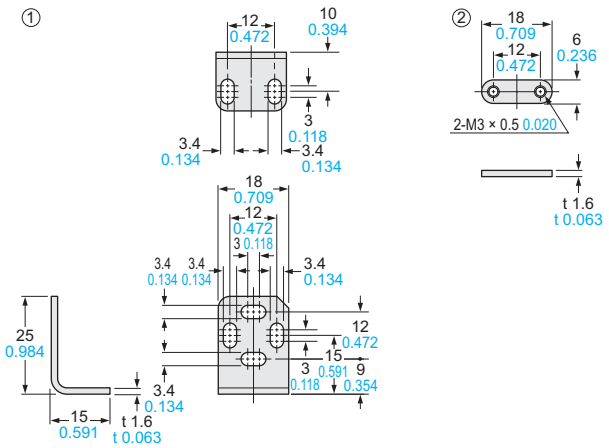
Assembly dimensions

Mounting drawing with the receiver



MS-LA3-2

Sensor head mounting bracket for **LA-305** (Accessory for **LA-305**)



Material: Cold rolled carbon steel (SPCC-P3)
(Uni-chrome plated)

Two M3 (length 15 mm 0.591 in) screws with washers are attached.

Assembly dimensions