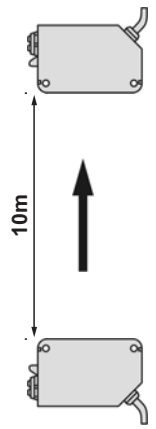
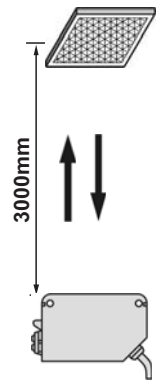
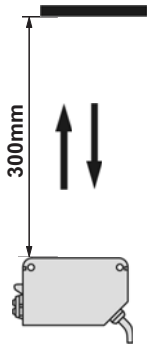
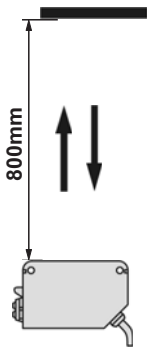
Thru-beam Mode / Retroreflective Mode with Polarizing Filter

Sensing Mode	Connection	Supply Voltage	Output Mode	Part Number
 **Thru-beam Mode** Sensing Distance 10m Red LED	**2m Cable** 	10-30V DC	Emitter	~~CP31-T010MD-EY6C3L2~~
			NPN	~~CP31-T010MN-CY6C3U2~~
			PNP	~~CP31-T010MP-CY6C3U2~~
	Quick Disconnect (Pico-Style) 	10-30V DC	Emitter	~~CP31-T010MD-EY6Q4LP~~
			NPN	~~CP31-T010MN-CY6Q4UP~~
			PNP	~~CP31-T010MP-CY6Q4UP~~
	6" Pigtail (Pico-Style) 	10-30V DC	Emitter	~~CP31-T010MD-EY6P4LP~~
			NPN	~~CP31-T010MN-CY6P4UP~~
			PNP	~~CP31-T010MP-CY6P4UP~~
	6" Pigtail (Euro-Style) 	10-30V DC	Emitter	~~CP31-T010MD-EY6P4LE~~
			NPN	~~CP31-T010MN-CY6P4UE~~
			PNP	~~CP31-T010MP-CY6P4UE~~
 **Retroreflective Mode** (with polarizing filter) Sensing Distance 3000mm (Note) Red LED	**2m Cable** 	10-30V DC	NPN	~~CP31-L3000N-CY6C3U2-PF~~
			PNP	~~CP31-L3000P-CY6C3U2-PF~~
			———	———
	Quick Disconnect (Pico-Style) 	10-30V DC	NPN	~~CP31-L3000N-CY6Q4UP-PF~~
			PNP	~~CP31-L3000P-CY6Q4UP-PF~~
			———	———
	6" Pigtail (Pico-Style) 	10-30V DC	NPN	~~CP31-L3000N-CY6P4UP-PF~~
			PNP	~~CP31-L3000P-CY6P4UP-PF~~
			———	———
	6" Pigtail (Euro-Style) 	10-30V DC	NPN	~~CP31-L3000N-CY6P4UE-PF~~
			PNP	~~CP31-L3000P-CY6P4UE-PF~~
			———	———

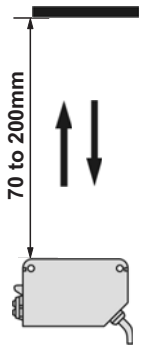
Note: Used with **RE-6152** (supplied with sensor) reflector.
Coming Soon : Part numbers with underline
In Preparation: Part numbers with a line through the middle

Standard Diffuse Mode / Long Range Diffuse Mode

Sensing Mode	Connection	Supply Voltage	Output Mode	Part Number
 **Diffuse Mode** **Sensing distance 300mm** **Infrared LED**	**2m Cable** 	**10-30V DC**	**NPN**	~~CP31-D0300N-CY9C3U2~~
			PNP	CP31-D0300P-CY9C3U2
			———	———
	Quick Disconnect (Pico-Style) 	**10-30V DC**	**NPN**	~~CP31-D0300N-CY9Q4UP~~
			PNP	~~CP31-D0300P-CY9Q4UP~~
			———	———
	6" Pigtail (Pico-Style) 	**10-30V DC**	**NPN**	~~CP31-D0300N-CY9P4UP~~
			PNP	CP31-D0300P-CY9P4UP
			———	———
	6" Pigtail (Euro-Style) 	**10-30V DC**	**NPN**	~~CP31-D0300N-CY9P4UE~~
			PNP	CP31-D0300P-CY9P4UE
			———	———
 **Diffuse Mode** **Long sensing range 800mm** **Infrared LED**	**2m Cable** 	**10-30V DC**	**NPN**	~~CP31-D0800N-CY9C3U2~~
			PNP	~~CP31-D0800P-CY9C3U2~~
			———	———
	Quick Disconnect (Pico-Style) 	**10-30V DC**	**NPN**	~~CP31-D0800N-CY9Q4UP~~
			PNP	~~CP31-D0800P-CY9Q4UP~~
			———	———
	6" Pigtail (Pico-Style) 	**10-30V DC**	**NPN**	~~CP31-D0800N-CY9P4UP~~
			PNP	~~CP31-D0800P-CY9P4UP~~
			———	———
	6" Pigtail (Euro-Style) 	**10-30V DC**	**NPN**	~~CP31-D0800N-CY9P4UE~~
			PNP	CP31-D0800P-CY9P4UE
			———	———

Note:
Coming Soon : Part numbers with underline
In Preparation: Part numbers with a line through the middle

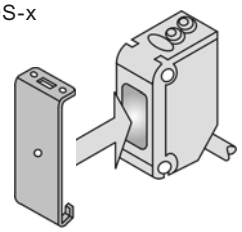
Narrow-view Diffuse Mode / Options

Sensing Mode	Connection	Supply Voltage	Output Mode	Part Number
 **Diffuse Mode** (Narrow-view) **Sensing Distance 70 to 200mm** **Red LED**	**2m Cable** 	**10-30V DC**	**NPN**	~~CP31-D0200N-CY6C3U2-N~~
			PNP	~~CP31-D0200P-CY6C3U2-N~~
			———	———
	Quick Disconnect (Pico-Style) 	**10-30V DC**	**NPN**	~~CP31-D0200N-CY6Q4UP-N~~
			PNP	~~CP31-D0200P-CY6Q4UP-N~~
			———	———
	6" Pigtail (Pico-Style) 	**10-30V DC**	**NPN**	~~CP31-D0200N-CY6P4UP-N~~
			PNP	~~CP31-D0200P-CY6P4UP-N~~
			———	———
	6" Pigtail (Euro-Style) 	**10-30V DC**	**NPN**	~~CP31-D0200N-CY6P4UE-N~~
			PNP	~~CP31-D0200P-CY6P4UE-N~~
			———	———

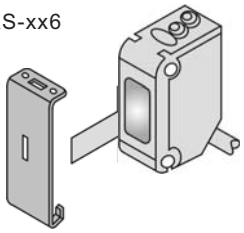
Options

Designation	Model No.	Slit size	Sensing range		Min.sensing object	
			Slit on one side	Slit on both sides	Slit on one side	Slit on both sides
Round slit mask (For thru-beam type sensor only)	OS-0.5	ϕ0.5mm	400 mm	20 mm	ϕ12mm	ϕ0.5mm
	OS-1	ϕ1mm	900 mm	100 mm	ϕ12mm	ϕ1mm
	OS-2	ϕ2mm	2 m	400 mm	ϕ12mm	ϕ2mm
Rectangular slit mask (For thru-beam type sensor only)	RS-0.5x6	0.5x6mm	2 m	400 mm	ϕ12mm	0.5x6mm
	RS-1x6	1x6mm	3 m	1 m	ϕ12mm	1x6mm
	RS-2x6	2x6mm	5 m	2 m	ϕ12mm	2x6mm

Round slit mask
Fitted on the front face of the sensor with one-touch
- OS-x



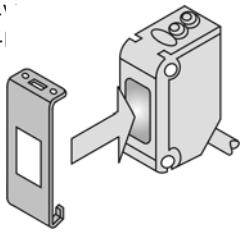
Rectangular slit mask
Fitted on the front face of the sensor with one-touch
- RS-xx6



Designation	Model No.	Sensing Range	Min. sensing object
Interference prevention filter (for thru-beam type sensor only)	PF-V (Vertical)	5m (Note 1)	ϕ12mm (Note 1)
	PF-H (Horizonal)	5m (Note 1)	ϕ12mm (Note 1)

Notes: 1) Value when attached to both sides.

Interference prevention filter
Two sets of thru-beam type sensors can be mounted close together.
- PF-V
- PF-H



Note:
Coming Soon : Part numbers with underline
In Preparation: Part numbers with a line through the middle

Specifications

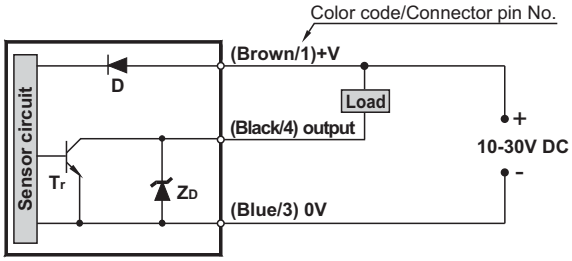
Item	Type	Thru-beam	Retroreflective (with polarizing filters)	Diffuse reflective		
				Standard	Long sensing range	Narrow-view reflective
Model No.	NPN output type	CP31-T010MN-xY6xxUx	CP31-L3000N-xY6xxUx-PF	CP31-D0300N-xY9xxUx	CP31-D0800N-xY9xxUx	CP31-D0200N-xY6xxUx-N
Model No.	PNP output type	CP31-T010MP-xY6xxUx	CP31-L3000P-xY6xxUx-PF	CP31-D0300P-xY9xxUx	CP31-D0800P-xY9xxUx	CP31-D0200P-xY6xxUx-N
Sensing range		**10m**	**3m** (Note1)	**300mm**(Note 2)	**800mm**(Note 2)	**70 to 200mm**(Note 2)
Sensing object		ϕ12mm or more opaque object (Note 3)	ϕ50mm or more opaque, translucent or specular object	Opaque, translucent or transparent object		Opaque, translucent or transparent object (Min. Sensing object ϕ0.5mm copper wire)
Hysteresis		———		15% or less of operation distance		
Repeatability(Perpend-icular to sensing axis)		0.5mm or less		1mm or less		0.5mm or less
Supply voltage		10 to 30V DC 10% Ripple P-P 10% or less				
Current consumption		Emitter: 20mA or less Receiver:20mA or less	20mA or less	25mA or less		20mA or less
Sensing output		<NPN output type> NPN open-collector transistor ● Maximum sink current: 100mA ● Applied voltage: 30V DC or less(between output and 0V) ● Residual voltage: 1V or less (at 100mA sink current) 0.4V or less(at 16mA sink current)		<PNP output type> PNP open-collector transistor ● Maximum sink current: 100mA ● Applied voltage: 30V DC or less(between output and +V) ● Residual voltage: 1V or less (at 100mA source current) 0.4V or less(at 16mA source current)		
Utilization category		DC-12 or DC-13				
Output operation		Switchable either Light-ON or Dark-ON				
Short-circuit protection		Incorporated				
Response time		1 ms or less				
Operation indicator		Orange LED (lights up when the output is ON) (incorporated on the receiver for thru-beam type)				
Stability indicator		Green LED(lights up under stable light received condition or stable dark condition) (incorporated on the receiver for thru-beam type)				
Power indicator		Green LED	———			
Sensitivity adjuster		Continuously variable adjuster (incorporated on the receiver for thru-beam type)				
Automatic interference prevention function		Two units of sensors can be mounted close together interference prevention filters. (sensing range: 5m)	Incorporated (Two units of sensors can be mounted close together.)			
Environmental resistance	Pollution degree	3 (Industrial environment)				
Environmental resistance	Protection	IP 67 (IEC)				
Environmental resistance	Ambient temperature	-25 to +55℃ (No dew condensation or icing allowed), storage: -30 to +70℃				
Environmental resistance	Ambient humidity	35 to 85 % RH, storage:35 to 85% RH				
Environmental resistance	Ambient illuminance	Sunlight: 10000 ℓ x at the light receiving face, Incandescent light: 3000 ℓ x at the light-receiving face.				
Environmental resistance	EMC	IEC 60947-5-2, Parts 7.2.6.1.2.3 or RFI>3V/m(in 30-1000MHZ), EFT>1KV, ESD>4KV(contact)				
Environmental resistance	Voltage withstandability	1000 V AC for one min. Between all supply terminals connected together and enclosure.				
Environmental resistance	Insulation resistance	20MΩ ,or more, with 250V DC megger between all supply terminals connected together and enclosure				
Environmental resistance	Vibration resistance	IEC 60947-5-2, Part 7.4.2 or 10-55HZ, 1.0mm amplitude In X, Y and Z directions for 30 min				
Environmental resistance	Shock resistance	IEC 60947-5-2, Part 7.4.1 or 30g,11ms in X,Y and Z directions for six times each				
Emitting element		Red LED (modulated)		Infrared LED (modulated)		Red LED (modulated)
Material		Enclosure: PBT (polybutylene terephthalate), lens: acrylic, front cover: acrylic				
Cable		0.2mm² 3-core (thru-beam type emitter: 2-core) cabtyre cable, 2m long				
Cable extension		Extension up to total 100m is possible with 0.3mm², or more, cable (thru-beam type: both emitter and receiver)				
Pigtail type		See **Pigtail Series** or our **Cables & Connectors** catalogue.				
Connector type		Pico style (M8) 4pin; Euro style(M12) 4pin.				
Weight		50g approx. (Emitter or thru-beam type: 45g approx.)				
Accessories		———	RE-6152(Reflector):1 pc.	———		

Notes: 1) The sensing range and the sensing object of the retroreflective type sensor are specified for the **RE-6152** (supplied with sensor) reflector. In addition, set the distance between the sensor and the reflector to 0.1m or more.
2)The sensing range of the diffuse reflective type sensor and narrow-view reflective type sensor are specified for white non-glossy paper(200x200 mm) as the object.
3)If slit masks (optional) are fitted, an fitted, an object of ϕ0.5mm (using round slit mask) can be detected.

Connection Diagrams

NPN output type

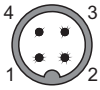
I/O circuit diagram



Symbols...D :Reverse supply polarity protection diode
Z_D: Surge absorption zener diode
Tr: NPN output transistor.

Connector pin position

Euro-style



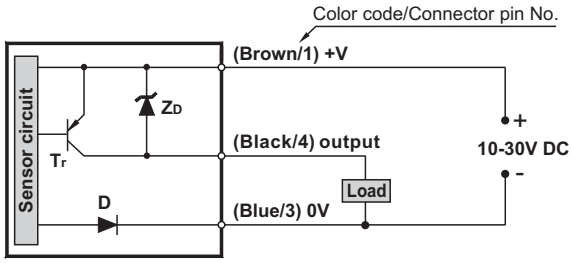
1.Brown (+)
2.Not used
3.Blue (-)
4.Black (Output)

Pico-Style

1.Brown (+)
2.Not used
3.Blue (-)
4.Black (Output)

PNP output type

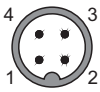
I/O circuit diagram



Symbols...D :Reverse supply polarity protection diode
Z_D: Surge absorption zener diode
Tr: PNP output transistor.

Connector pin position

Euro-style



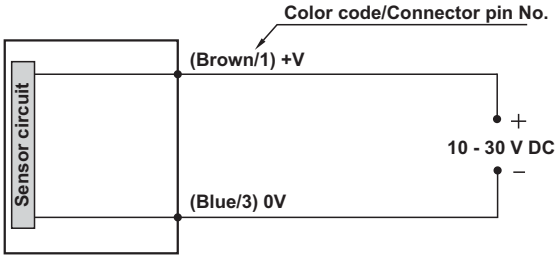
1.Brown (+)
2.Not used
3.Blue (-)
4.Black (Output)

Pico-Style

1.Brown (+)
2.Not used
3.Blue (-)
4.Black (Output)

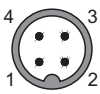
Emitter of Thru-beam Mode

I/O circuit diagram



Connector pin position

Euro-style



1.Brown (+)
3.Blue (-)
2.Not used
4.Not used

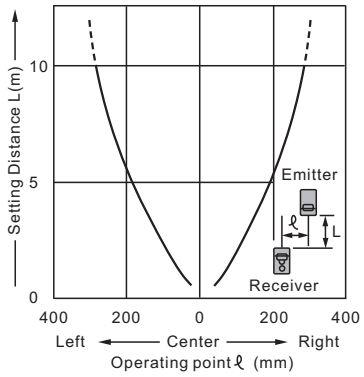
Pico-Style

1.Brown (+)
3.Blue (-)
2.Not used
4.Not used

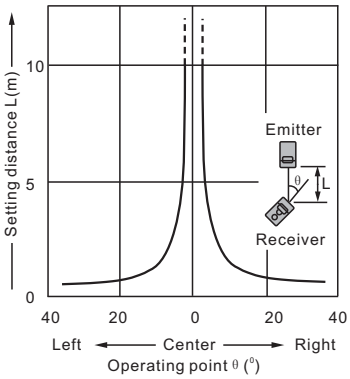
Sensing Characteristics (Typical)

Thru-beam Mode (Sn=10m)

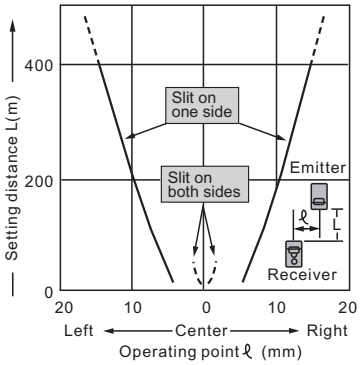
Parallel deviation



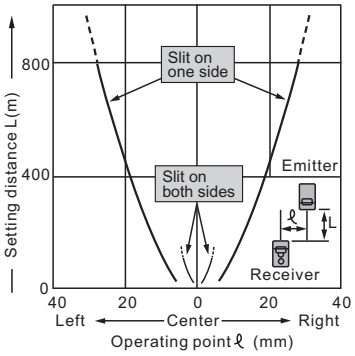
Angular deviation



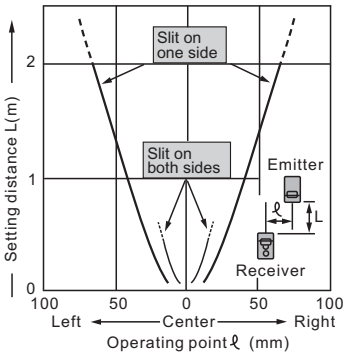
Parallel deviation with round slit masks (ϕ 0.5mm)



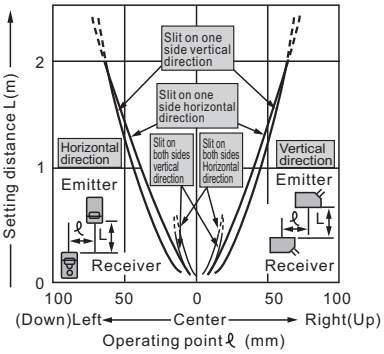
Parallel deviation with round slit masks (ϕ 1mm)



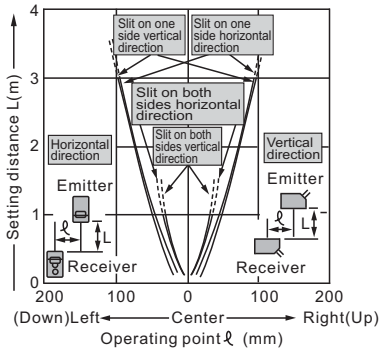
Parallel deviation with round slit masks (ϕ 2mm)



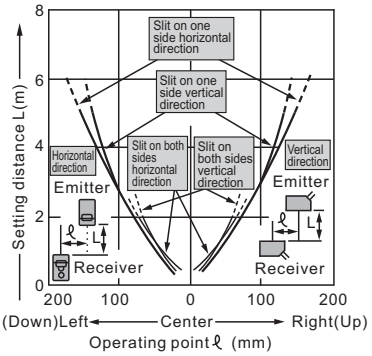
Parallel deviation with rectangular slit masks (0.5x6 mm)



Parallel deviation with rectangular slit masks (1x6 mm)

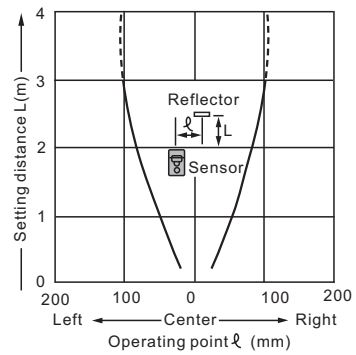


Parallel deviation with rectangular slit masks (2x6 mm)

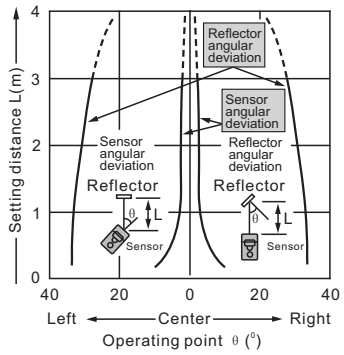


Retroreflective Mode (Sn=3m, performance on **RE-6152** reflector)

Parallel deviation



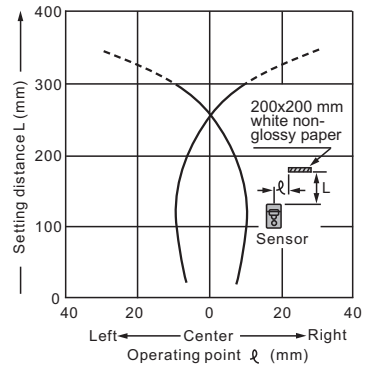
Angular deviation



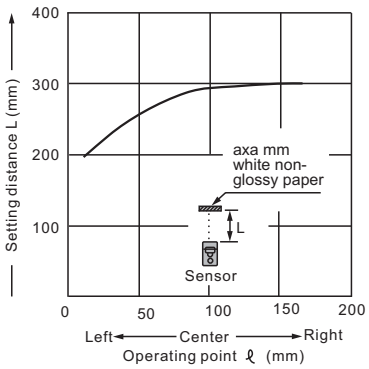
Sensing Characteristics (Typical)

Standard Diffuse Mode (Sn=300mm)

Sensing field



Correlation between sensing object size and sensing range

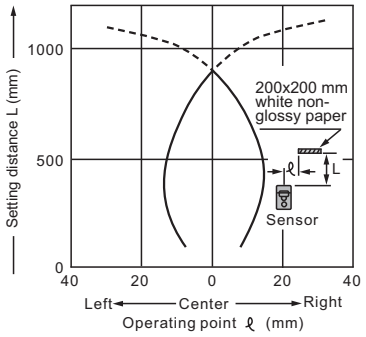


As the sensing object size becomes smaller than the standard size (white non-glossy paper 200x200 mm), the sensing range shortens, as shown in the left graph.

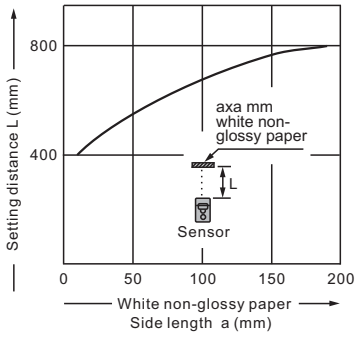
For plotting the left graph, the sensitivity has been set such that a 200x200 mm white non-glossy paper is just detectable at a distance of 300 mm.

Long Range Diffuse Mode (Sn=800mm)

Sensing field



Correlation between sensing object size and sensing range

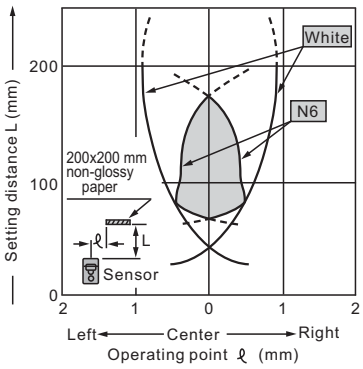


As the sensing object size becomes smaller than the standard size (white non-glossy paper 200x200 mm), the sensing range shortens, as shown in the left graph.

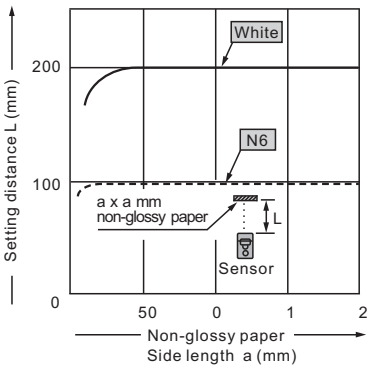
For plotting the left graph, the sensitivity has been set such that a 200x200 mm white non-glossy paper is just detectable at a distance of 800mm.

Narrow-view Diffuse Mode (Sn=200mm)

Sensing field



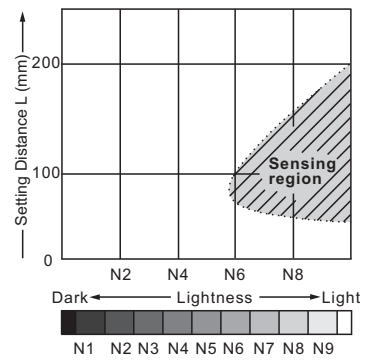
Correlation between sensing object size and sensing range



As the sensing object size becomes smaller than the standard size (white non-glossy paper 200x200 mm), the sensing range shortens, as shown in the left graph.

For plotting the left graph, the sensitivity has been set such that a 200x200 mm white non-glossy paper is just detectable at a distance of 200mm.

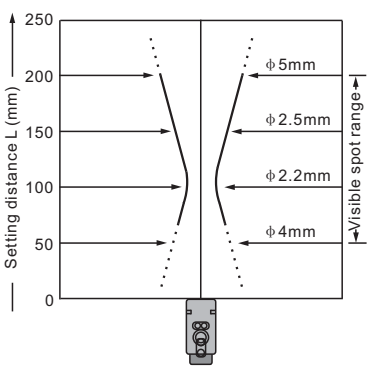
Correlation between sensing object size and sensing range



The sensing region is represented by oblique lines in the left figure. However, the sensitivity should be set with an enough margin because of slight variation in products.

Lightness shown on the lift may differ slightly from the actual object condition.

Emitted beam

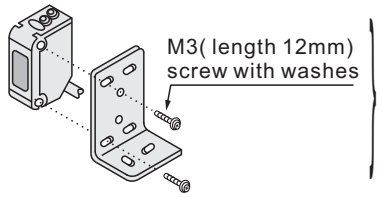


Precautions For Proper Use

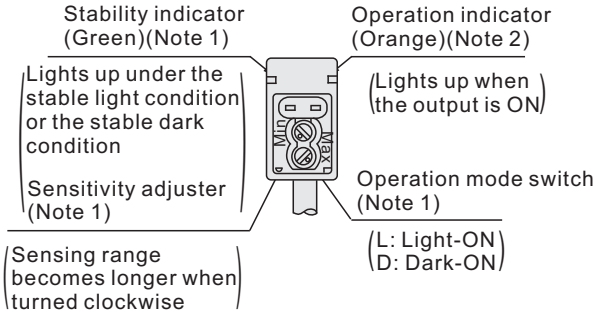
This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

Mounting

● The tightening torque should be 0.5N•m or less.



Functional description



Notes: 1) Not incorporated on the thru-beam type sensor emitter.
2) It is the power indicator (Green LED)(lights up when the power is ON) for the thru-beam type sensor emitter.

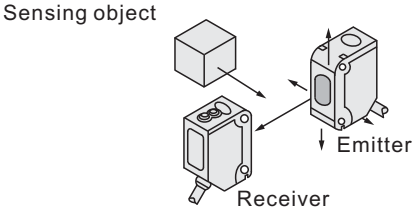
Operation mode switch

Operation mode switch	Description
	Light-ON mode is obtained when the operation mode switch(located on the receiver for the thru-beam type) is turned fully clockwise(L side)
	Dark-ON mode is obtained when the operation mode switch (located on the receiver for the thru-beam type) is turned fully counterclockwise (D side).

Beam alignment

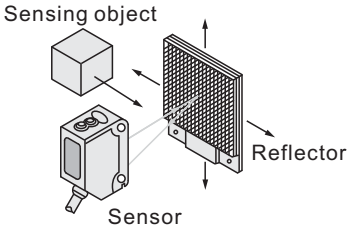
●Thru-beam type sensor

①Set the operation mode switch to the Light-ON mode position (L side).
②Placing the emitter and the receiver face to face along a straight line, move the emitter in the up, down, left and right directions, in order to determine the range of the light received condition with the help of the operation indicator (orange). Then, set the emitter at the center of this range.
③Similarly, adjust for up, down, left and right angular movement of the emitter.
④Further, perform the angular adjustment for the receiver also.
⑤Check that the stability indicator (green) lights up.
⑥Choose the operation mode, Light-ON or Dark-ON, as per your requirement, with the operation mode switch.

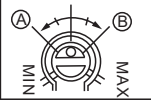


● Retroreflective type sensor

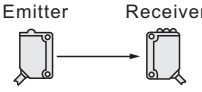
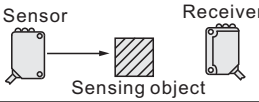
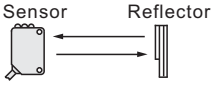
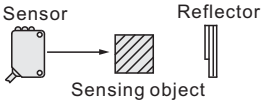
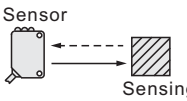
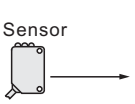
① Set the operation mode switch to the Light-ON mode position(L side).
② Placing the sensor and the reflector face to face along a straight line, move the reflector in the up, down, left and right directions, in order to determine the range of the light received condition with the help of the operation indicator (orange). Then, set the reflector at the center of this range.
③ Similarly, adjust for up, down, left and right angular movement of the reflector.
④ Further, perform the angular adjustment for the sensor also
⑤ Check that the stability indicator(green) lights up.
⑥ Choose the operation mode, Light-ON or Dark-ON, as per your requirement, with the operation mode switch.



Sensitivity adjustment

Step	Sensitivity adjuster	Description
①		Turn the sensitivity adjuster fully counter-clockwise to the minimum sensitivity position, MIN.
②		In the light received condition, turn the sensitivity adjuster slowly clockwise and confirm the point Ⓐ where the sensor enters the 'Light' state operation.
③		In the dark condition, turn the sensitivity adjuster further clockwise until the sensor enters the 'Light' state operation and then bring it back to confirm point Ⓑ where the sensor just returns to the 'Dark' state operation. If the sensor does not enter the 'Light' state operation even when the sensitivity adjuster is turned fully clockwise, the position is point Ⓑ
④		The position at the middle of point Ⓐ and Ⓑ is the optimum sensing position.

Note: Use the 'minus' adjusting screwdriver(please arrange separately) to turn the adjuster slowly. Turning with excessive strength will cause damage to the adjuster.

	Light received condition	Dark condition
Thru-beam type		
Retroreflective type		
Diffuse reflective type and Narrow-view reflective type		

Precautions For Proper Use

Relation between output and indicators

In case of Light-ON			Sensing condition	In case of Dark-ON		
Stability indicator	Operation indicator	Output		Stability indicator	Operation indicator	Output
○	○	ON	Stable light receiving	OFF	●	○
●			Unstable light receiving			●
	●	OFF	Unstable dark receiving	ON	○	
○			Stable dark receiving			○

○ :Lights up ● :Lights off

Retroreflective type sensor with polarizing filters

- If a shiny object is covered or wrapped with a transparent film, such as those described below, the retroreflective type sensor with polarizing filters may not be able to detect it. In that case, follow the steps given below.

Example of sensing objects

- Can wrapped by clear film
- Aluminum sheet covered by plastic film
- Gold or silver color (specular) label or wrapping paper

Steps

- Tilt the sensor with respect to the sensing object while fitting.
- Reduce the sensitivity.
- Increase the distance between the sensor and the sensing object.

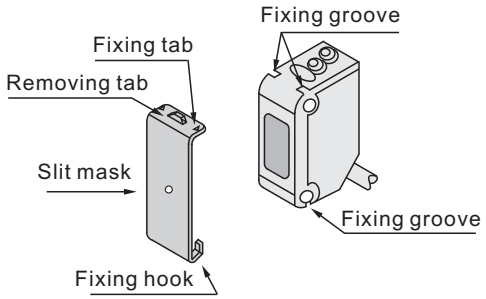
Slit mask (optional) (Exclusively for thru-beam type sensor)

- With the slit mask (OS-x), the sensor can detect a small object. However, the sensing range is reduced when the slit mask is mounted.

How to mount

Insert the fixing hook into the fixing groove.

Then, pressing the slit mask against the main unit, insert the fixing tab into the fixing groove.



How to remove

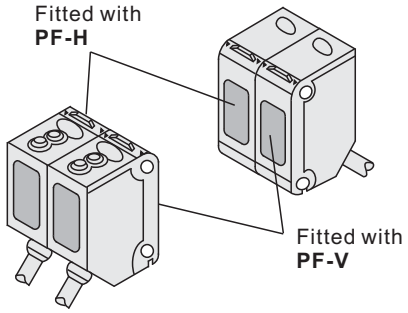
Insert a screwdriver into the removing tab

Pull forward while lifting the remove tab

Interference prevention filter(Optional) (Exclusively for thru-beam type sensor)

- By mounting interference prevention filters(PF-x), two sets of CP31-T10000x-xX6xxUx can be mounted close together. However, the sensing range is reduced when the interference prevention filter is mounted.
- The filters can be mounted by the same method as for the slit masks.
- The two sets of sensors should be fitted with different types of interference prevention filters.

  The interference prevention does not work even if the filters are mounted for emitters only, receivers only or the same model No. Of the interference prevention filters are mounted on both the set of the sensor.



Wiring

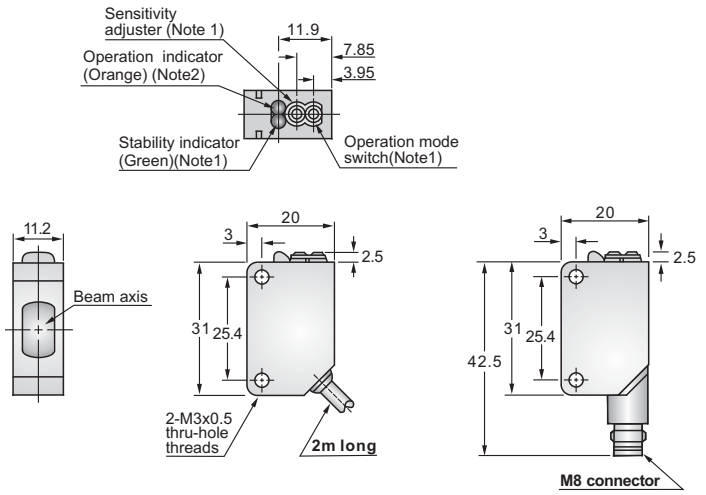
- Make sure to carry out the wiring in the power supply off condition.
- Take care that wrong wiring will damage the sensor.
- Verify that the supply voltage variation is within the rating.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) Terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) Is used in the vicinity of this product, connect the frame ground(F.G) terminal of the equipment to an actual ground.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- Extension up to total 100m (thru-beam type: both emitter and receiver) is possible with 0.3mm^2, or more, calbe. However, in order to reduce noise, make the wiring as short as possible.
- Make sure that stress by forcible bend or pulling is not applied directly to the sensor cable joint.

Others

- Do not use during the initial transient time (50 ms) after the power supply is switched on.
- This sensor is suitable for indoor use only.
- Avoid dust, dirt, and steam.
- Take care that the sensor does not come in direct contact with water, oil, grease, or organic solvents, such as, thinner, etc.

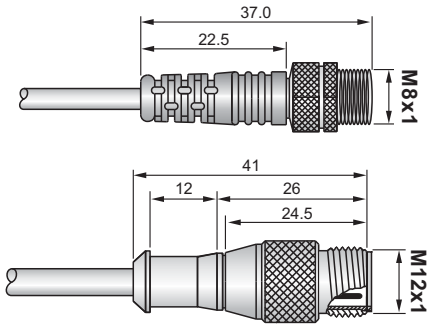
Dimensions (Unit: mm)

Sensor Type



Cable Type **Connector Type**

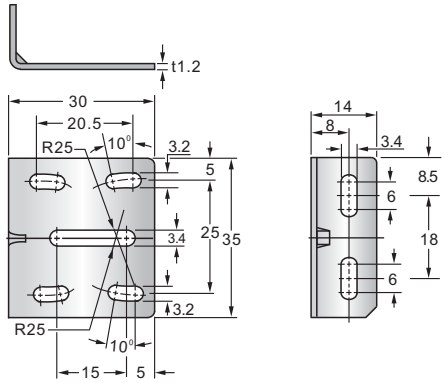
Pigtail* Type



Notes: 1)Not incorporated on the emitter of thru-beam mode.
2) It is the power indicator (green) on the emitter of thru-beam mode.

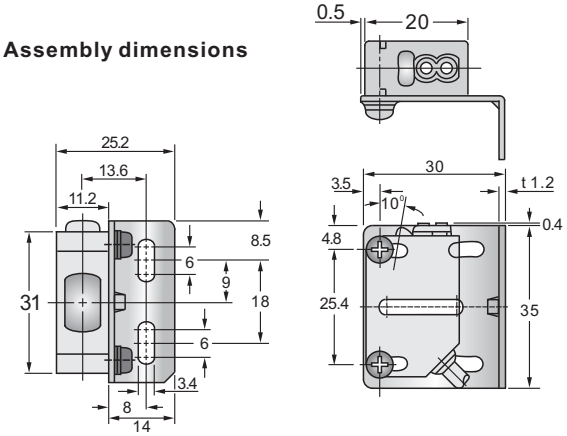
***:** Please see **Pigtail Series** or our **Cables & Connectors** catalogue for more information.

MB-3530 (Sensor mounting bracket-optional)

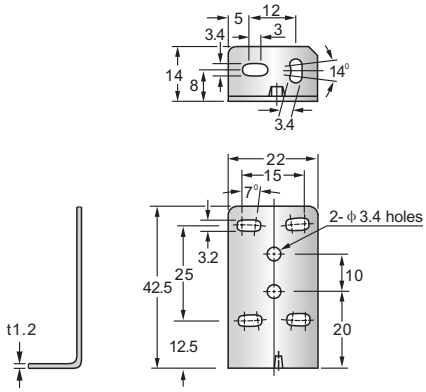


Material: Stainless steel (SUS 304)
Two M3(length 12mm) screws with washers are attached

Assembly dimensions

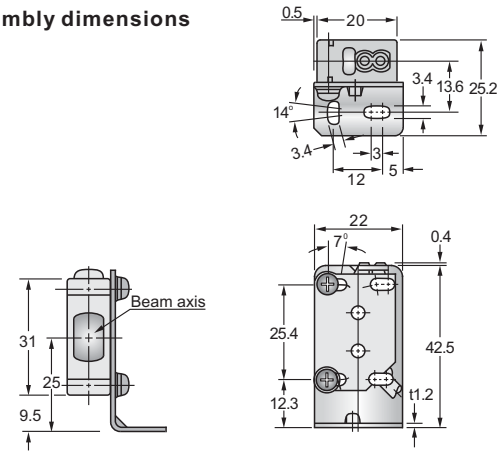


MB-4322 (Sensor mounting bracket-optional)



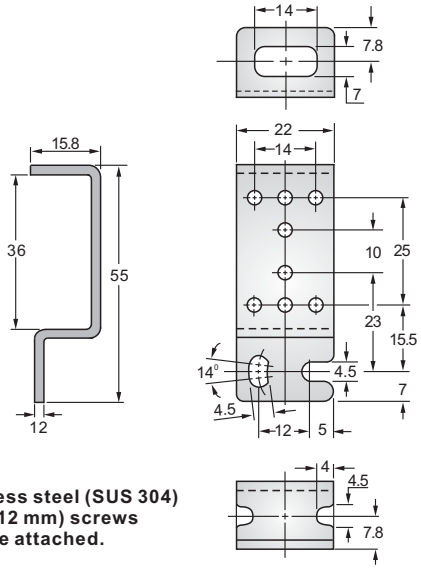
Material: Stainless steel (SUS 304)
Two M3 (length 12mm) screws with washers are attached.

Assembly dimensions

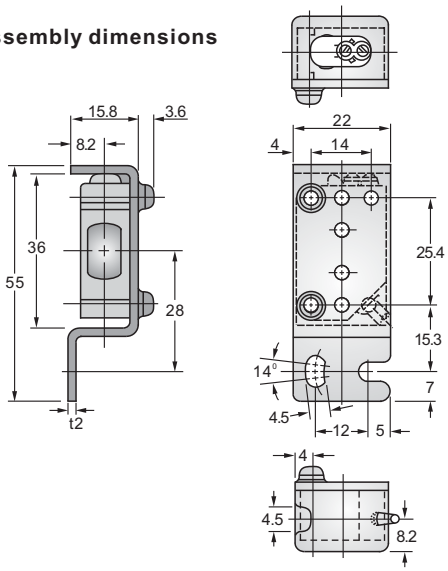


Dimensions (Unit: mm)

MB-5522 (Sensor mounting bracket-optional)

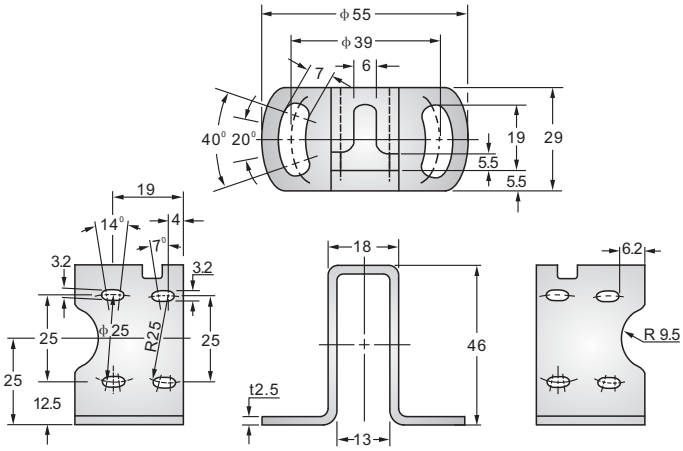


Assembly dimensions

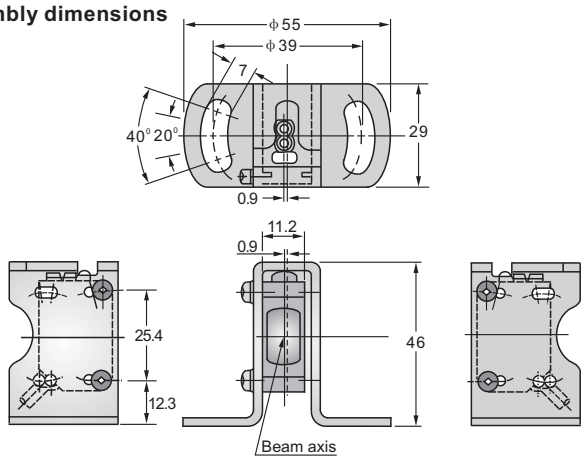


Material: Stainless steel (SUS 304)
Two M3(length 12 mm) screws
with washers are attached.

MB-4629 (Sensor mounting bracket-optional)

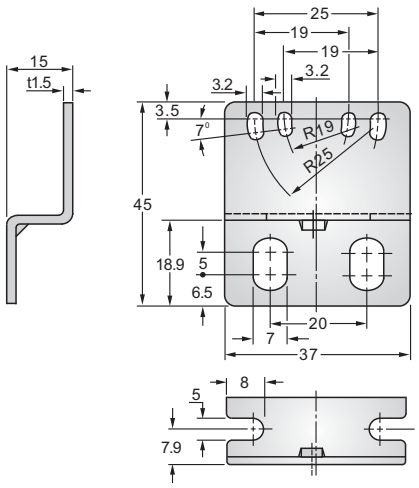


Assembly dimensions

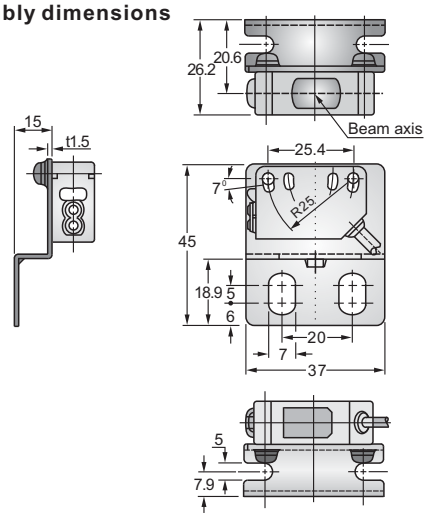


Material: Stainless steel (SUS 304). Two M3(length 12 mm) screws with washers are attached.

MB-4537 (Sensor mounting bracket-optional)



Assembly dimensions



Material: Stainless steel (SUS 304)
Two M3(length 12 mm) screws with washers are attached.