

# INSTRUCTION MANUAL

Compact Size Photoelectric Sensor

Amplifier Built-in

## CX-400 Series

Thank you very much for using SUNX products. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference.



**WARNING**

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

### 1 SPECIFICATIONS

Item	Type	Thru-beam	Retroreflective type sensor with polarizing filters (Note 2)		Diffuse reflective		Narrow-view reflective
			Model No.	NPN output	Short sensing range	Long sensing range	
			<b>CX-411</b>	<b>CX-491</b>	<b>CX-421</b>	<b>CX-422</b>	<b>CX-423</b>
			<b>CX-411-P</b>	<b>CX-491-P</b>	<b>CX-421-P</b>	<b>CX-422-P</b>	<b>CX-423-P</b>
Sensing range		10m	3m (Note 3)	300mm (Note 4)	800mm (Note 4)	70 to 200mm (Note 4)	
Sensing object		φ12mm or more opaque object	φ50mm or more opaque, translucent or specular object (Note 3)	Opaque, translucent or transparent object		Opaque, translucent or transparent object (Min. sensing object φ0.5mm copper wire)	
Repeatability (perpendicular to sensing axis)		0.5mm or less		1mm or less		0.5mm or less	
Supply voltage		12 to 24V 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	
Output		<b>&lt;NPN output type&gt;</b> 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)		<b>&lt;PNP output type&gt;</b> PNP open-collector transistor · Maximum source 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)			
	Output operation	Switchable either Light-ON or Dark-ON					
Short-circuit protection		Incorporated					
Response time		1ms or less					
Operation indicator		Orange LED (lights up when the output is ON), thru-beam type sensor: located on the receiver					
Stability indicator		Green LED (lights up under stable light received condition or stable dark condition) thru-beam type sensor: located on the receiver					
Power indicator		Green LED (lights up when the power is ON) located on the emitter	—				
Sensitivity adjuster		Continuously variable adjuster					
Automatic interference prevention function		— (Note 5)	Incorporated (Two units of sensors can be mounted closely.)				
Protection		IP67 (IEC)					
Ambient temperature		-25 to +55°C (No dew condensation or icing allowed), Storage: -30 to +70°C					
Ambient humidity		35 to 85% RH, Storage: 35 to 85% RH					
Emitting element		Red LED (modulated)	Infrared LED (modulated)	Red LED (modulated)			
Material		Enclosure: PBT, Lens: Acrylic, Indicator cover: Acrylic					
Cable		0.2mm <sup>2</sup> 3-core (thru-beam type sensor emitter: 2-core) cabtype cable, 2m long					
Weight		Emitter: 45g approx. Receiver: 50g approx.	50g approx.				
Accessory		RF-230 (Reflector): 1 No.					

Notes: 1) The model No. with suffix '-J' is the M12 pigtailed type, '-Z' is the M8 connector type.

(e.g.) M12 pigtailed type: **CX-411-J**, M8 connector type: **CX-411-Z**

Use the connection cables as shown below. (Two sets are required for the thru-beam type sensor.)

#### <Connection cable for the M12 pigtailed type>

Type	Model No.	Cable length
2-core type	<b>CN-22-C2</b>	2m
	<b>CN-22-C5</b>	5m
4-core type	<b>CN-24-C2</b>	2m
	<b>CN-24-C5</b>	5m

#### <Connection cable for the M8 connector type>

Type	Model No.	Cable length
Straight type	<b>CN-24A-C2</b>	2m
	<b>CN-24A-C5</b>	5m
Elbow type	<b>CN-24AL-C2</b>	2m
	<b>CN-24AL-C5</b>	5m

The model No. of retroreflective type sensor with the suffix '-Y' is the sensor without the RF-230 reflector.

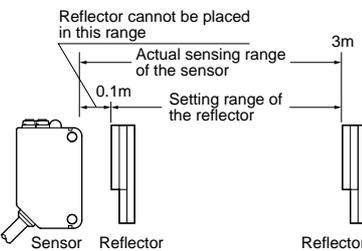
(e.g.) **CX-491-Y**

- 2) The retroreflective type sensor with polarizing filters may not stably detect specular or glossy objects through transparent film since light is polarized by the transparent film.

For details, refer to **RETROREFLECTIVE TYPE SENSOR WITH POLARIZING FILTERS**.

- 3) The sensing range and the sensing object for the retroreflective type sensor is specified for the RF-230 reflector. Further, make sure to mount the sensor and the reflector 0.1m, or more, away from each other.
- 4) The sensing range of the diffuse reflective type sensor and the narrow-view reflective type sensor is specified for white non-glossy paper (200×200mm) as the object.
- 5) By mounting interference prevention filters (PF-CX4-□), two sets of the sensor can be mounted close together.

For details, refer to **INTERFERENCE PREVENTION FILTER (OPTIONAL)**.

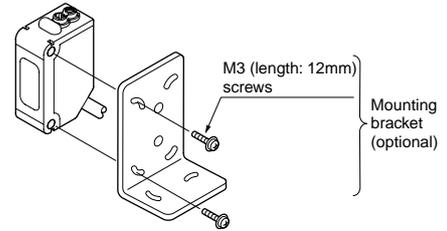


### 2 CAUTIONS

- Make sure to carry out 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 race-way. This can cause malfunction due to induction.
- Do not use cable during the initial transient time (50ms) after the power supply is switched on.
- This sensor is suitable for indoor use only.
- Extension up to total 100m, or less, is possible with 0.3mm<sup>2</sup>, or more, cable. 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.
- Do not use this sensor in places having excessive vapor, dust, etc., or where it may come in direct contact with water, or corrosive gas.
- Take care that the sensor does not come in direct contact with water, oil, grease, or organic solvents, such as, thinner, etc.

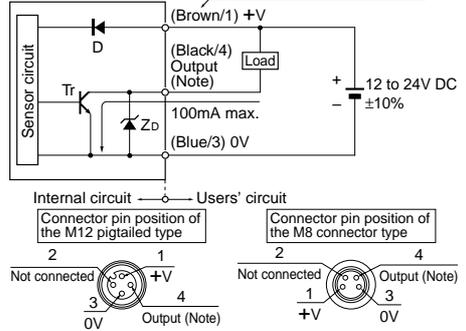
### 3 MOUNTING

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



### 4 I/O CIRCUIT DIAGRAMS

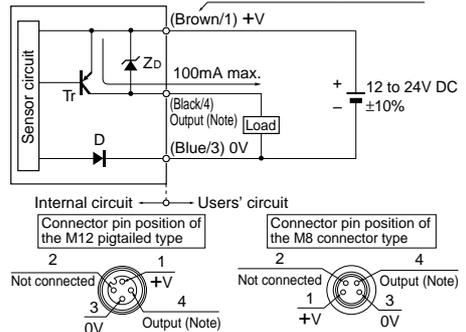
- **NPN output type** Color code / Connector pin No. of the connector type



Note: The emitter of thru-beam type sensor does not incorporate the output.

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

- **PNP output type** Color code / Connector pin No. of the connector type

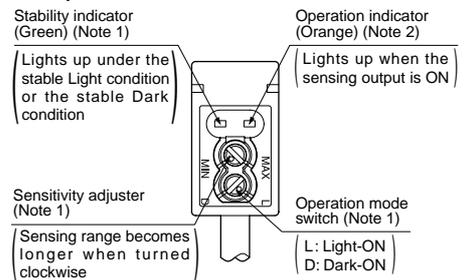


Note: The emitter of thru-beam type sensor does not incorporate the output.

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

### 5 ADJUSTMENTS

- **Top face**



- Notes: 1) Not incorporated on the thru-beam type sensor emitter.  
2) It is the power indicator for the thru-beam type sensor emitter.

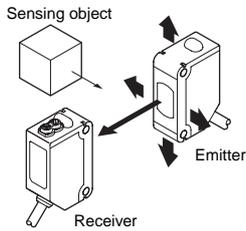
- **Operation mode switch**

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

## ● Beam alignment

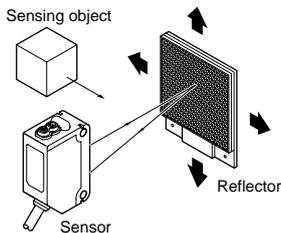
### Thru-beam type sensor

- Set the operation mode switch to the Light-ON mode position (L side).
- Placing 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.
- Similarly, adjust for up, down, left and right angular movement of the emitter.
- Further, perform the angular adjustment for the receiver also.
- Check that the stability indicator (green) lights up.
- Choose the operation mode, Light-ON or Dark-ON, as per your requirement, with the operation mode switch.



### Retroreflective type sensor

- Set the operation mode switch to the Light-ON mode position (L side).
- 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.
- Similarly, adjust for up, down, left and right angular movement of the reflector.
- Further, perform the angular adjustment for the sensor also.
- Check that the stability indicator (green) lights up.
- 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 counterclockwise to the minimum sensitivity position, MIN.
②		In the light received condition, turn the sensitivity adjuster slowly clockwise and confirm the point (A) 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 (B) where the sensor just returns to the 'Dark' state operation. <i>If the sensor does not enter the 'Light' state operation even when the sensitivity adjuster is turned fully clockwise, the position is point (B).</i>
④		The position at the middle of points (A) and (B) 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				
Retroreflective				
Diffuse reflective Narrow-view reflective				

## Relation between output and indicators

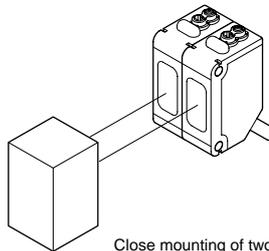
In case of Light-ON			In case of Dark-ON			
Stability indicator	Operation indicator	Output	Sensing condition	Output	Operation indicator	Stability indicator
		ON	Stable light receiving	OFF		
		OFF	Unstable light receiving	ON		
		ON	Unstable dark condition	OFF		
		OFF	Stable dark condition	ON		

: lights up    : lights off

## 6 AUTOMATIC INTERFERENCE PREVENTION FUNCTION

### (Excluding thru-beam type sensor)

- Retroreflective type sensor, diffuse reflective type sensor and narrow-view reflective type sensor incorporate this function. Up to two sets of sensor can be mounted closely.  
(Thru-beam type sensor does not have this function.)



## 7 RETROREFLECTIVE TYPE SENSOR WITH POLARIZING FILTERS

- As light is polarized by a transparent film or membrane, CX-491 may not detect an object covered or wrapped by transparent film. In that case, take the following steps.

(Example of sensing objects)

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

(Steps)

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

## 8 SLIT MASK (OPTIONAL)

### (Exclusively for thru-beam type sensor)

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

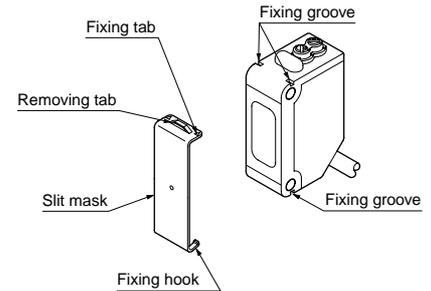
Type	Model No.	Slit size
Round slit mask	OS-CX-05	φ0.5mm
	OS-CX-1	φ1mm
	OS-CX-2	φ2mm
Rectangular slit mask	OS-CX-05 x 6	0.5 x 6mm
	OS-CX-1 x 6	1 x 6mm
	OS-CX-2 x 6	2 x 6mm

### 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

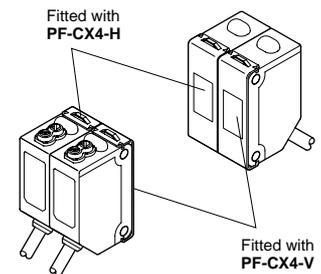
- Insert a screwdriver into the removing tab.
- Pull forward while lifting the removing tab.



## 9 INTERFERENCE PREVENTION FILTER (OPTIONAL)

### (Exclusively for thru-beam type sensor)

- By mounting interference prevention filters (PF-CX4-□), two sets of CX-411 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.



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