

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.



- 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

Type	Thru-beam		Retroreflective		Diffuse reflective				
	Long sensing range	Long sensing range	With polarizing filters (Note 2)	Long sensing range				Narrow-view	
Model No. (Note 1)	CX-411	CX-412	CX-491	CX-493	CX-424	CX-421	CX-422	CX-423	
Item	NPN output PNP output	CX-411-P	CX-412-P	CX-491-P	CX-493-P	CX-424-P	CX-421-P	CX-422-P	CX-423-P
Sensing range	10m	15m	3m (Note 3)	5m (Note 3)	100mm (Note 4)	300mm (Note 4)	800mm (Note 4)	70 to 200mm (Note 4)	
Sensing object	φ 12mm or more opaque object	φ 50mm or more opaque, translucent or specular object (Note 3)	φ 50mm or more opaque or translucent object (Note 3)	φ 50mm or more opaque or translucent object (Note 3)	Opaque, translucent or transparent object			Opaque, translucent or transparent object (Note 5)	
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 (CX-412 □: 25mA 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 6)	—	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)	Infrared 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) cabtyre cable, 2m long								
Weight	Emitter: 45g approx., Receiver: 50g approx.		50g approx.			—			
Accessory	—		RF-230 (Reflector): 1 pc.			—			

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	CN-22-C2	2m
	CN-22-C5	5m
4-core type	CN-24-C2	2m
	CN-24-C5	5m

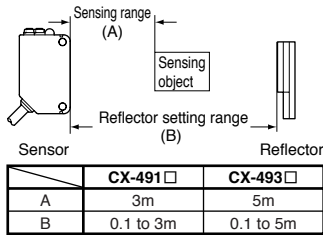
### <Connection cable for the M8 connector type>

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

The model No. with suffix 'E' shown on the label affixed to the thru-beam type sensor is the emitter, 'D' shown on the label is the receiver.  
Thru-beam type sensor emitter: CX-411-E, Thru-beam type sensor receiver: CX-411-D

The model No. of retroreflective type sensor with the suffix '-Y' is the sensor without the RF-230 reflector.  
(e.g.) CX-491-Y

- 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 '8 RETROREFLECTIVE TYPE SENSOR WITH POLARIZING FILTERS'.
- The sensing range and the sensing object of the retroreflective type sensor is specified for the RF-230 reflector. The sensing range represents the actual sensing range of the sensor. The sensing ranges itemized in 'A' of the table below may vary depending of the shape of sensing object. Be sure to check the operation with the actual sensing object.
- The sensing range of the diffuse reflective type sensor is specified for white non-glossy paper (200 × 200mm) as the object.
- The minimum sensing object of the diffuse reflective · narrow-view type sensor is φ 0.5mm copper wire.
- By mounting interference prevention filters (PF-CX4-□), two sets of the sensor can be mounted close together. For details, refer to '10 INTERFERENCE PREVENTION FILTER (OPTIONAL)'.



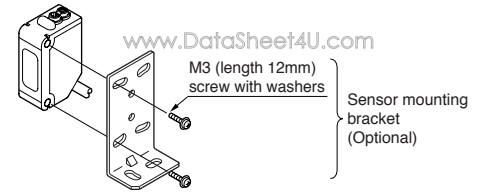
## 2 CAUTIONS

- 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 in the same raceway. This can cause malfunction due to induction.

- Take care that the sensor is not directly exposed to fluorescent lamp from a rapid-starter lamp or a high frequency lighting device, as it may affect the sensing performance.
- Do not use during the initial transient time (50ms) after the power supply is switched on.
- 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.
- This sensor is suitable for indoor use only.
- 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.
- When connecting the mating cable to the connector type sensor, the tightening torque should be 0.4N·m or less.

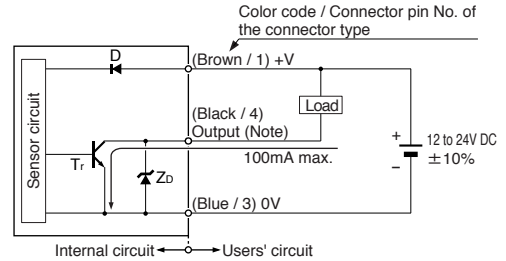
## 3 MOUNTING

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



## 4 I/O CIRCUIT DIAGRAMS

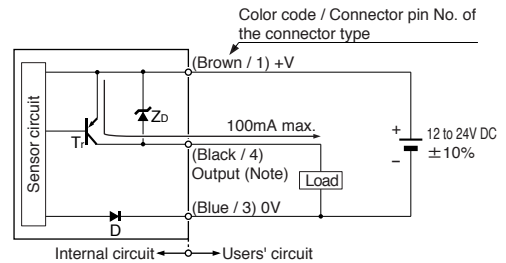
- NPN output type



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

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

- PNP output type

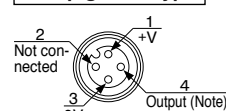


Note: The thru-beam type sensor emitter does not incorporate the output.

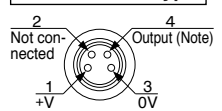
Symbols... D : Reverse supply polarity protection diode  
Zd : Surge absorption zener diode  
Tr : PNP output transistor

- Connector pin position of the connector type

### M12 pigtailed type



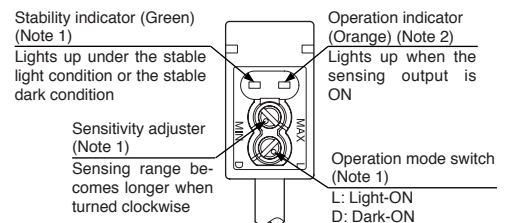
### M8 connector type



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

## 5 ADJUSTMENTS

- Part description



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

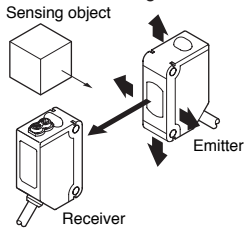
- Operation mode switch

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

● **Beam alignment**

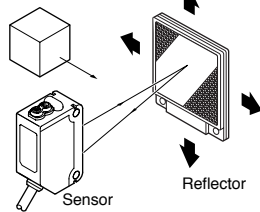
**Thru-beam type sensor**

- 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 counter-clockwise 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. If the sensor does not enter the 'Light' state operation even when the sensitivity adjuster is turned fully clockwise, the position is point (C).
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.

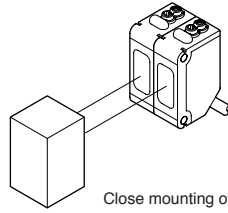
	Light received condition	Dark condition
Thru-beam		
Retroreflective		
Diffuse reflective		

**Relation between output and indicators** ☼: Lights up, ●: Turns off

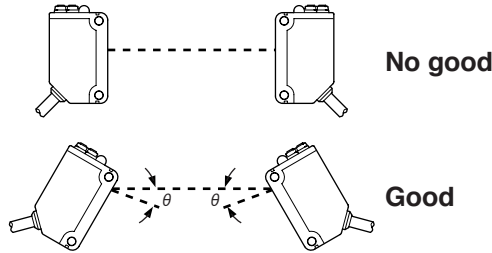
In case of Light-ON				In case of Dark-ON			
Stability indicator	Operation indicator	Output	Sensing condition	Output	Operation indicator	Stability indicator	Sensing condition
☼	☼	ON	Stable light receiving	OFF	●	☼	Stable dark receiving
●	●	OFF	Unstable light receiving	ON	☼	●	Unstable dark receiving

**6 AUTOMATIC INTERFERENCE PREVENTION FUNCTION (Excluding thru-beam type sensor)**

- Retroreflective type sensor and diffuse 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.)

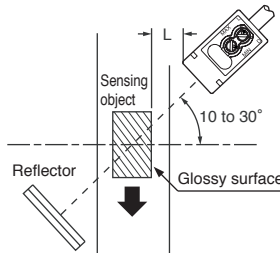


Note: If two diffuse reflective type sensor are mounted facing each other, they should be angled so as not to receive the beam from the opposing sensor or to detect its front face.



**7 LONG SENSING RANGE RETROREFLECTIVE TYPE SENSOR (CX-493□)**

- Please take care of the following points when detecting materials having a gloss.
  - Make 'L', shown in the diagram, sufficiently long.
  - Install at an angle of 10 to 30 degrees to the sensing object.



\* CX-491□ do not need the above adjustment.

**8 RETROREFLECTIVE TYPE SENSOR WITH POLARIZING FILTERS (CX-491□)**

- 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 measures.

**<Example of sensing objects>**

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

**<Measures>**

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

**9 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.

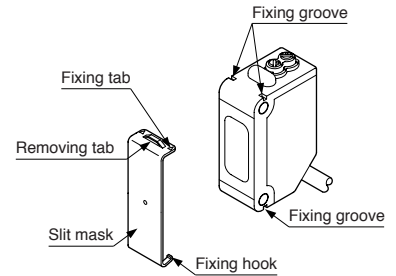
Type	Model No.	Slit size
Round slit mask	OS-CX-05	φ 0.5mm
	OS-CX-1	φ 1mm
	OS-CX-2	φ 2mm
Rectangular slit mask	OS-CX-05×6	0.5×6mm
	OS-CX-1×6	1×6mm
	OS-CX-2×6	2×6mm

**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.

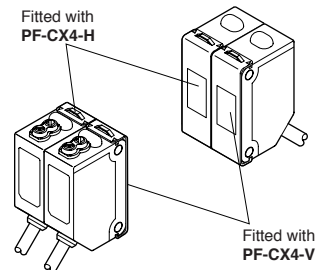
**How to remove**

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



**10 INTERFERENCE PREVENTION FILTER (OPTIONAL) (Exclusively for CX-411□)**

- By mounting the interference prevention filters (PF-CX4-□), two sets of the 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.
- Since there are two types of the interference prevention filter, the two sets of sensors should be fitted with different types of interference prevention filters, as shown in the figure below. 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 sets of the sensor.



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