

# Panasonic

Amplifier Built-in  
Compact Photoelectric Sensor

CX-400 SERIES Ver.2



## Global Standard



### Upgraded to Increase Usability

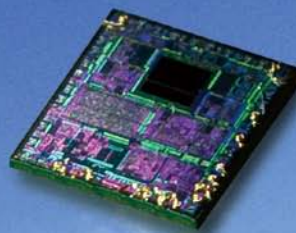
Achieving low power consumption and high noise-resistance  
The basic types are added in lineup

# The global standard CX-400 series Sensors that are environmentally and user friendly.

The various lineup covers through the inclusion of a newly developed custom integrated circuit. The **CX-400** series achieves a significantly higher reliability in the same package than previous models.



Providing stable detection with low power consumption  
Includes an analog CMOS  
processor ASIC



## Strong

Demonstrating stable detection,  
even in harsh environments



The **CX-400** series incorporates an acrylic that strongly resists oils and coolant fluids, and a polycarbonate indicator cover that strongly resists ethanol. The **CX-400** series is also characterized by strong resistance to noise, reciprocal interference and cold environments.

### Resistant to oil and coolant liquids CX-41□/42□/49□

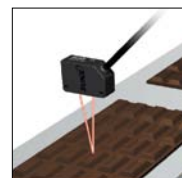
The lens material is made of a strong acrylic that resists the harmful effects of coolants. These sensors can be used with confidence even around metal processing machine that disperse oil mists. The protection mechanism also conforms to IP67 (IEC).

Test Oil	JIS Standard	Product Name
Lubricant	-	Velocity Oil No. 3
Water-insoluble cutting oil	2-5	Daphnecut AS-30D
	2-11	Yushiron Oil No.2ac (Note)
Water-soluble cutting oil	W1-1	Yushiron Lubic HWC68 (Note)
	W2-1	Yushiroken S50N (Note)

1,000 hours; Immersion (depth 0 m); Insulation resistance 20 MΩ/250 V  
Note: Yushiron and Yushiroken are registered trademarks of Yushiro Chemical Industry Co., Ltd.

### Strongly ethanol resistant CX-44□/48□

A strong, ethanol resistant polycarbonate was used for the front and display covers. Safe even for installing near food processing machinery that disperses ethanol based detergents. The protection mechanism also conforms to IP67 (IEC).



Caution: Set the **CX-48□** so that cleaning liquid will not get on to the attached reflector.

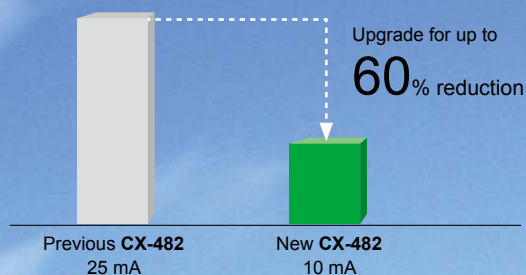


## Upgrade 1

Reducing environmental burdens further

### Up to 60% less power consumption

The **CX-400** series achieves reductions in power consumption of up to 60%, averaging 44% reduction when upgrading due to its unique design. These sensors reduce carbon emissions and contribute to environmental friendliness.



### Contributing to reduced carbon dioxide emissions

Electricity consumed by the **CX-400** series has been reduced on average 10.5 mA. Calculating 8 hours/day, 260 days (operating 5 days/week) for a total of 2,080 hours/year leads to:

The **CX-400** contributes

**Approx. 84.6 t** annually in carbon dioxide reductions to the world

## Upgrade 2

Stronger noise resistance

### Stronger inverter countermeasures

The **CX-400** has a high noise resistance then its previous model. By incorporating an inverter countermeasure circuit that appropriately shifts with peak wavelength, the sensor now resists high-frequency noise from high-voltage inverter motors and inverter lights more effectively.

## Upgrade 3

Stronger output short-circuit resistance

### Stronger inverse wiring connection protection

Strengthening the output circuit inverse polarity protection prevents sensor damage caused by mistaken output or power supply wiring.

## High Performance

High performance for many applications



The **CX-400** series is capable of stably detecting a minute difference of 0.4 mm **0.016 in** (the thickness of a business card) or 10 μm **0.394 mil** ultra-thin film, thanks to its unique optics and specialized design of electronic circuits. Bright red beam spot is useful when confirming a detection position.

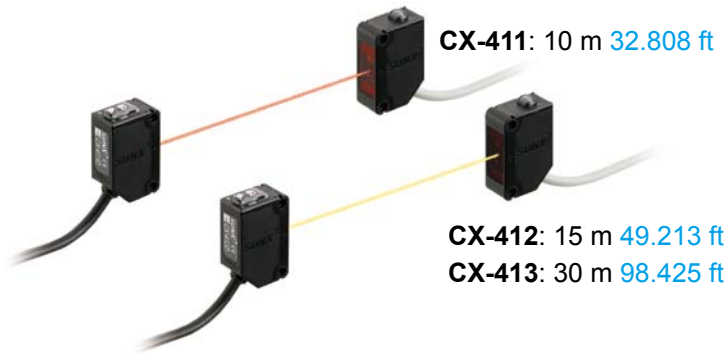
## Save

Thoroughly eliminating unnecessary waste, reducing many environmental burdens



The **CX-400** series has three different cable length types and uses very simple packaging to reduce waste. The bag is made of polyethylene and does not emit toxic gasses.

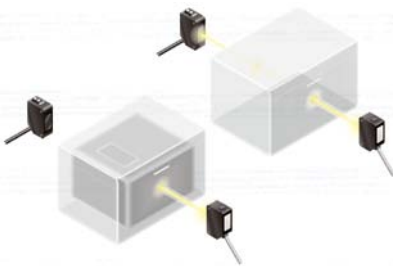
## Thru-beam type



### Strong infrared beam

CX-412/413

Remarkable penetrating ability enables applications such as package content detection come into practice. (Note)



Note: When utilizing penetrating power in detection, make sure to verify using the actual sensor.

### Strong in dust and dirt

CX-412/413

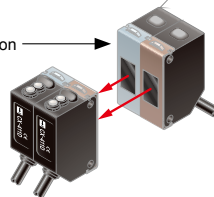
The infrared light source is strong in dust and dirt compared to the red beam type.

### Even the thru-beam type is strong at mutual interference

CX-411

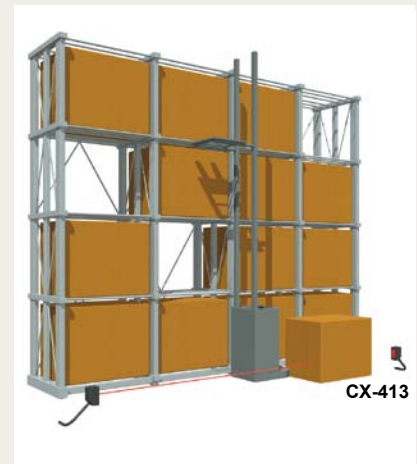
Two CX-411 sensors, with their red beam light source, can be installed close together by inserting an interference prevention filter.

Interference prevention filter (Optional)

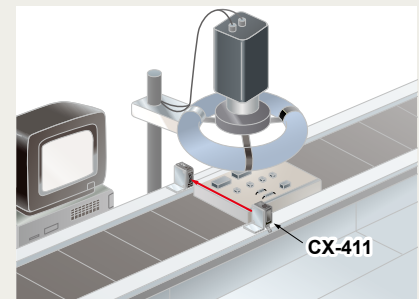


## Applications

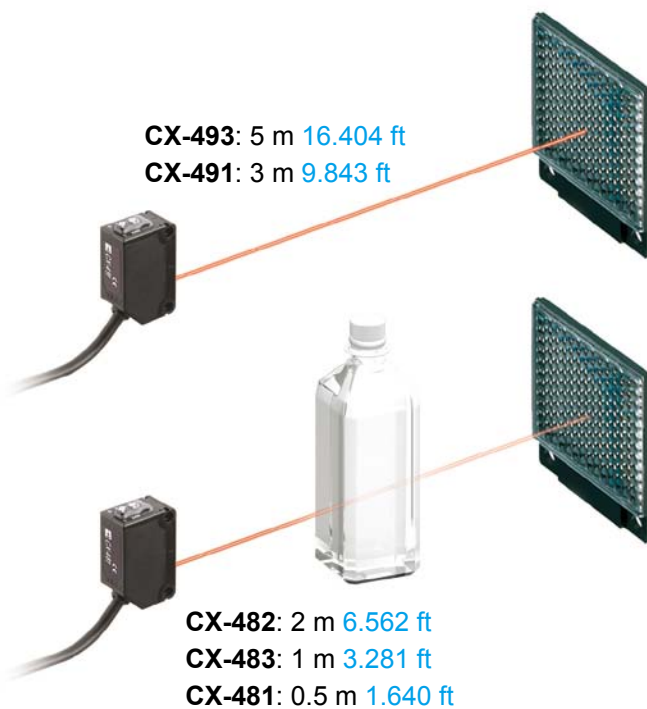
- Detecting box collapsing within the rail of stacker crane



- Synchronizing sensor for image processing systems



## Retroreflective type

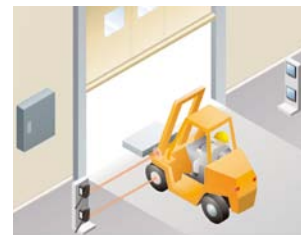


For transparent object sensing

### Long sensing range of 5 m 16.404 ft

CX-493

A long 5 m 16.404 ft sensing range is possible with the red LED type that is easy to align with the beam axis. The sensors can be used for wide automatic door shutters.



### Retroreflective type with polarizing filters

CX-491

Built-in polarizing filters ensure stable sensing even on a mirror surface object.

### Strong against extraneous light and noise

CX-491

Hardly affected by extraneous lights or noises, these sensors provide stable sensing.

### Two sensors can be mounted close together

All models

The interference prevention function lets two sensors of any type to be mounted close together precisely.

## Diffuse reflective type

**CX-422:** 800 mm **31.496 in**

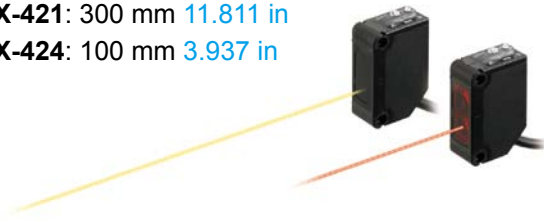
**CX-421:** 300 mm **11.811 in**

**CX-424:** 100 mm **3.937 in**

**CX-423:** 70 to 300 mm

**2.756 to 11.811 in**

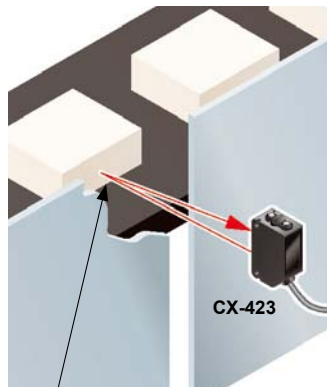
**Narrow-view type**



### Beam axis alignment made easy with a high luminance spot beam CX-423

These sensors have a high luminance red LED spot beam which provides bright visibility enabling the sensing position to be checked at a glance.

Because it achieved small beam spot approx.  $\varnothing 2$  mm  $\varnothing 0.079$  in at setting distance 100 mm **3.937 in**, approx.  $\varnothing 5$  mm  $\varnothing 0.197$  in at setting distance 200 mm **7.874 in**, even the minutest object can be accurately detected.



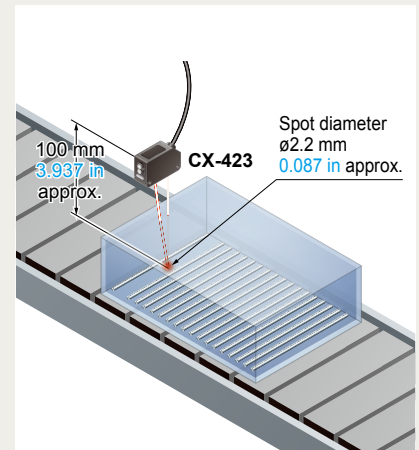
Great visibility approx.  $\varnothing 2$  mm  $\varnothing 0.079$  in high luminance spot beam (at setting distance 100 mm **3.937 in**)

### Reduction of volume adjustment labor All models

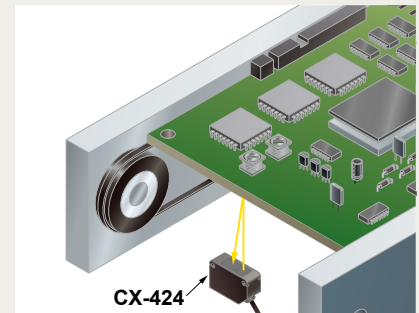
Because these sensors possess many variations depending on the sensing range, they enable you to make optimal volume adjustment easily.

## Applications

### ■ Detecting pins in the case

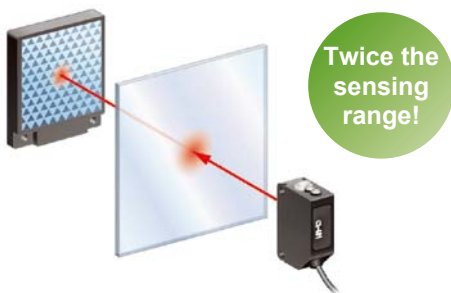


### ■ Passage confirmation on substrate conveyor equipment



## Transparent object sensing type sensor CX-48□

Our unique optical system and transparent object sensing circuit provide stable sensing of thinner transparent objects than the conventional models.



Twice the sensing range!

### Transparent objects detectable with CX-48□ (Typical examples)

Sensing object	Sensing object size (mm in)	
Glass sheet	$\varnothing 50$ $\varnothing 1.969$	$t=0.7$ $t=0.028$
Cylindrical glass	$\varnothing 50$ $\varnothing 1.969$ $l=50$ $l=1.969$	$t=1.3$ $t=0.051$
Acrylic board	$\varnothing 50$ $\varnothing 1.969$	$t=1.0$ $t=0.039$
Styrol (Floppy case)	$\varnothing 50$ $\varnothing 1.969$	$t=0.9$ $t=0.035$
Food wrapping film	$\varnothing 50$ $\varnothing 1.969$	$t=10 \mu\text{m}$ $t=0.394 \text{ mil}$
Cigarette case film	$\varnothing 50$ $\varnothing 1.969$	$t=20 \mu\text{m}$ $t=0.787 \text{ mil}$
Vinyl bag	$\varnothing 50$ $\varnothing 1.969$	$t=30 \mu\text{m}$ $t=1.181 \text{ mil}$
Pet bottle (500ml)	$\varnothing 66$ $\varnothing 2.598$	

Reflector setting range **CX-481:** 300 to 500 mm **11.811 to 19.685 in**

**CX-482:** 1 to 2 m **3.281 to 6.562 ft**

**CX-483:** 500 to 1,000 mm **19.685 to 39.370 in**

[with the **RF-230** reflector at the optimum condition (Note)]

Each object should pass across the beam at the center between the sensor and the reflector.

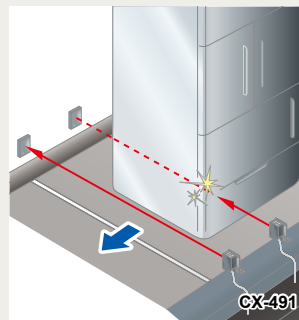
$l$  : Length of cylindrical glasses

$t$  : Thickness of sensing object

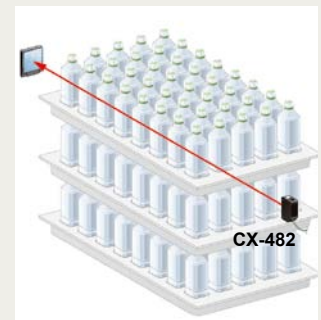
Note: The optimum condition is defined as the condition in which the sensitivity level is set such that the stability indicator just lights up when the object is absent.

## Applications

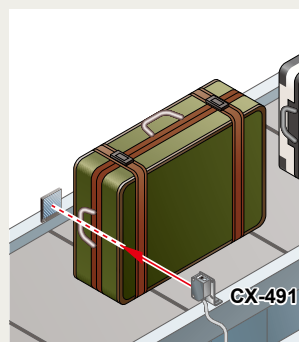
### ■ Detecting glossy electric appliances



### ■ Detecting plastic bottles stacked on pallets



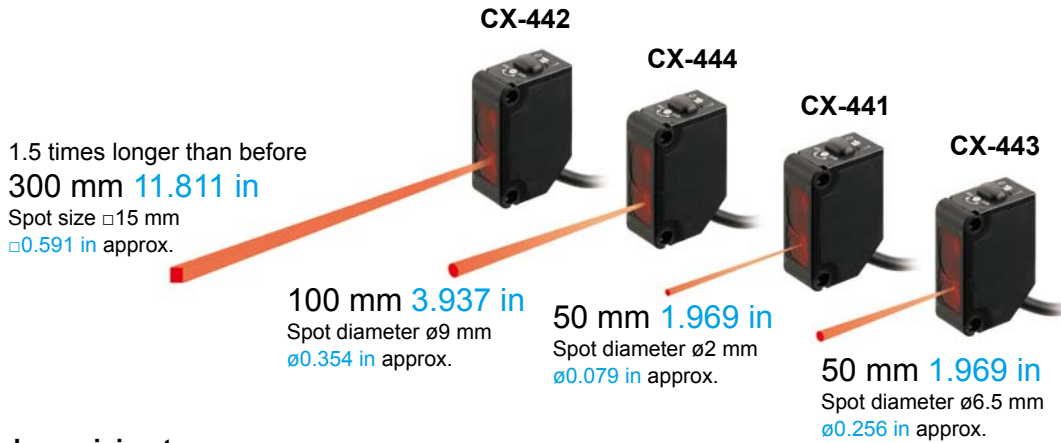
### ■ Passage confirmation of object on a conveyor belt



### ■ Detecting transparent film



## Adjustable range reflective type

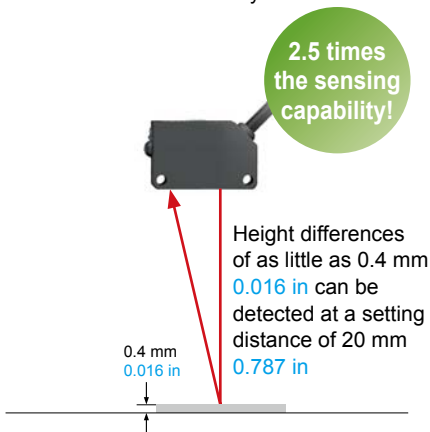


### High precision type

CX-441/443

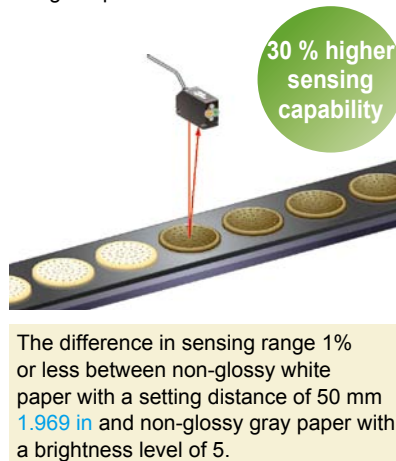
#### Can sense height differences as small as 0.4 mm 0.016 in, with hysteresis of 2 % or less

An advanced optical system provides sensing performance that is approx. 2.5 times than conventional models. Even ultra-small differences of 0.4 mm **0.016 in** can be detected accurately.



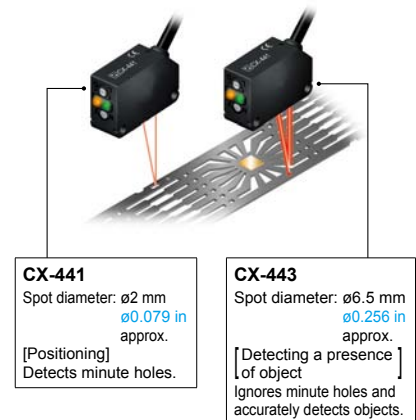
#### Hardly affected by colors

Both black and white objects can be sensed at the same distances. No adjuster control is needed, even when products of different colors are moving along the production line.



#### Select from 2 spot diameters as per application

Within the choice of 50 mm **1.969 in** sensing range sensors, we offer small spot type of approx.  $\varnothing$ 2 mm **0.079 in** optimal for detecting minute objects and large spot type of approx.  $\varnothing$ 6.5 mm **0.256 in** capable of sensing objects covered with holes and grooves.



### The bright spot makes beam axis alignment easy

All models

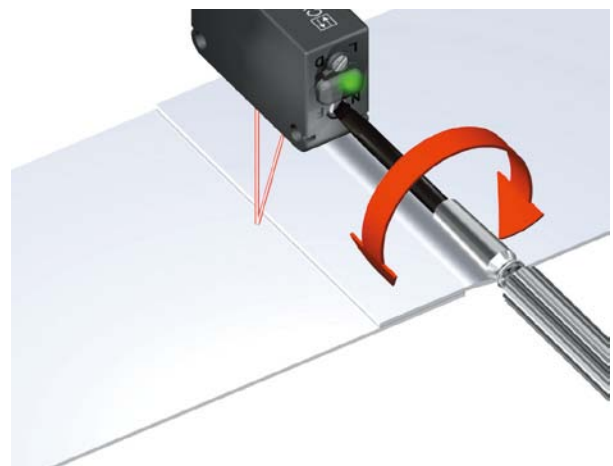
These sensors have a high luminance red spot that provides bright visibility. The sensing position can be checked at a glance. Because the **CX-441** sensor has a small spot beam, at approx.  $\varnothing$ 2 mm **0.079 in**, even the minutest object can be accurately detected.



### Can be used for sensing minute differences

All models

Equipped with a 5-turn adjuster so that even challenging range settings can be handled with ease.



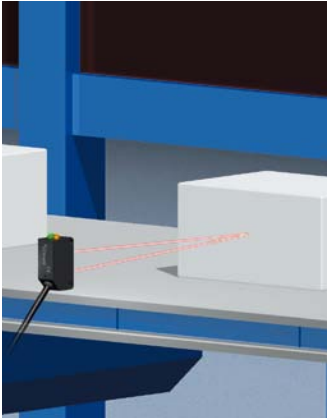
# BGS / FGS functions make even the most challenging settings possible!

The BGS function is best suited for the following case

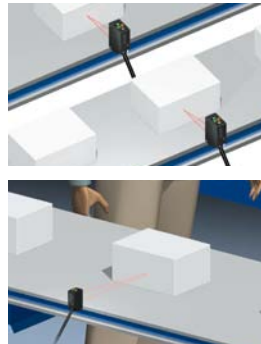
## BGS

### Background not present

When object and background are separated



Not affected if the background color changes or someone passes behind the conveyor.

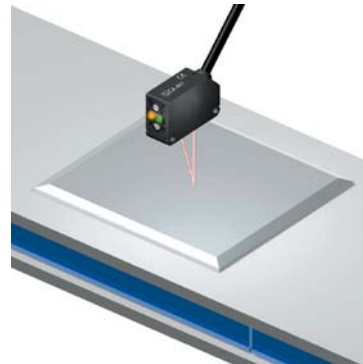


The FGS function is best suited for the following case

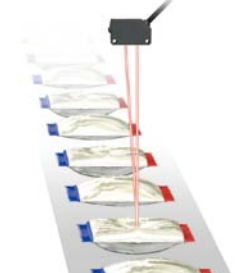
## FGS

### Background present

When object and background are close together  
When the object is glossy or uneven



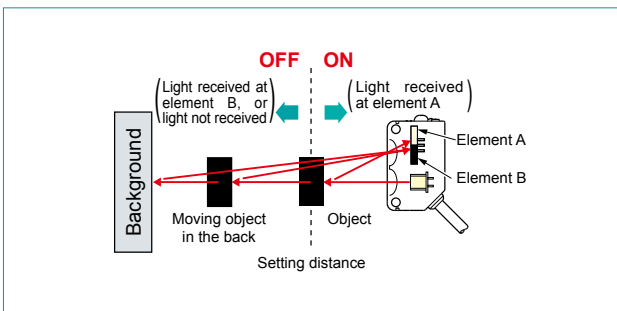
Unaffected by gloss, color or uneven surfaces when sensing objects present on a conveyor belt.



Caution: Please use the FGS function together with a conveyor or other background unit.

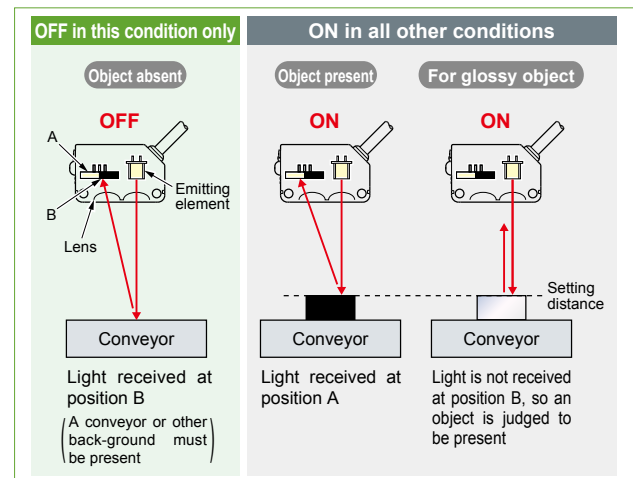
## BGS (Background suppression) function

The sensor judges that an object is present when light is received at position A of the light-receiving element (2-segment element). This is useful if the object and background are far apart. The distance adjustment method is the same as the conventional adjustment method for adjustable range reflective type sensors.



## FGS (Foreground suppression) function

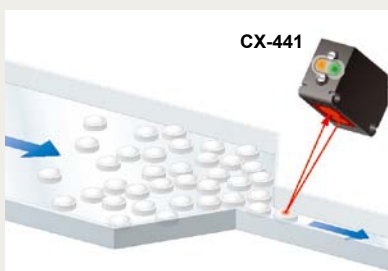
The sensor judges that an object is present when no light is received at position B of the light-receiving element (2-segment element). Accordingly, even objects that are glossy can be sensed. This is useful if the object and background are close together, or if the object being sensed is glossy.



## Applications

### ■ Small tablet detection

Detects minute objects unaffected by glossy background objects. Uses FGS function.



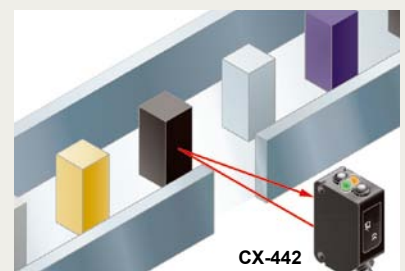
### ■ Thin biscuit detection

Stable sensing even for thin objects. Uses FGS function.



### ■ Passage confirmation

Not affected by color variations in objects and background objects. Uses BGS function.



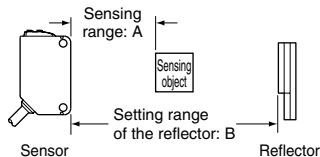
# ORDER GUIDE

## Standard type

Type	Appearance	Sensing range	Model No. (Note 1)		Output operation	Emitting element	
			NPN output	PNP output			
Thru-beam		10 m <b>32.808 ft</b>	<b>CX-411</b>	<b>CX-411-P</b>	Switchable either Light-ON or Dark-ON	Red LED	
		15 m <b>49.213 ft</b>	<b>CX-412</b>	<b>CX-412-P</b>		Infrared LED	
		30 m <b>98.425 ft</b>	<b>CX-413</b>	<b>CX-413-P</b>		Infrared LED	
Retroreflective		With polarizing filters	3 m <b>9.843 ft</b> (Note 2)	<b>CX-491</b>		<b>CX-491-P</b>	Red LED
		Long sensing range	5 m <b>16.404 ft</b> (Note 2)	<b>CX-493</b>		<b>CX-493-P</b>	Red LED
		For transparent object sensing	50 to 500 mm <b>1.969 to 19.685 in</b> (Note 2)	<b>CX-481</b>		<b>CX-481-P</b>	Infrared LED
			50 to 1,000 mm <b>1.969 to 39.37 in</b> (Note 2)	<b>CX-483</b>	<b>CX-483-P</b>		
			0.1 to 2 m <b>0.328 to 6.562 ft</b> (Note 2)	<b>CX-482</b>	<b>CX-482-P</b>		
Diffuse reflective		100 mm <b>3.937 in</b>	<b>CX-424</b>	<b>CX-424-P</b>	Infrared LED		
		300 mm <b>11.811 in</b>	<b>CX-421</b>	<b>CX-421-P</b>			
		800 mm <b>31.496 in</b>	<b>CX-422</b>	<b>CX-422-P</b>			
	Narrow-view	70 to 300 mm <b>2.756 to 11.811 in</b>	<b>CX-423</b>	<b>CX-423-P</b>	Red LED		
Adjustable range reflective			<b>CX-441</b>	<b>CX-441-P</b>	Switchable either Detection-ON or Detection-OFF	Red LED	
			<b>CX-443</b>	<b>CX-443-P</b>			
			<b>CX-444</b>	<b>CX-444-P</b>			
			<b>CX-442</b>	<b>CX-442-P</b>			

**NOTE:** Mounting bracket is not supplied with the sensor. Please select from the range of optional sensor mounting brackets.

- Notes: 1) The model No. with "E" shown on the label affixed to the thru-beam type sensor is the emitter, "D" shown on the label is the receiver.  
 2) The sensing range 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 on the shape of sensing object. Be sure to check the operation with the actual sensing object.



	<b>CX-491</b> □	<b>CX-493</b> □	<b>CX-481</b> □	<b>CX-483</b> □	<b>CX-482</b> □
A	0 to 3 m <b>0 to 9.843 ft</b>	0 to 5 m <b>0 to 16.404 ft</b>	50 to 500 mm <b>1.969 to 19.685 in</b>	50 to 1,000 mm <b>1.969 to 39.37 in</b>	0.1 to 2 m <b>0.328 to 6.562 ft</b>
B	0.1 to 3 m <b>0.328 to 9.843 ft</b>	0.1 to 5 m <b>0.328 to 16.404 ft</b>	100 to 500 mm <b>3.937 to 19.685 in</b>	100 to 1,000 mm <b>3.937 to 39.37 in</b>	0.8 to 2 m <b>2.625 to 6.562 ft</b>



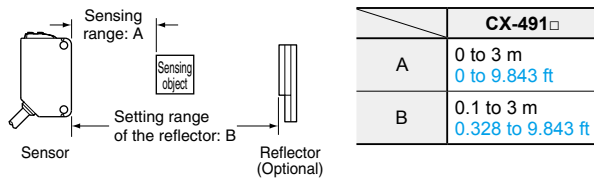
## ORDER GUIDE

**Basic type** (Without operation mode switch and sensitivity adjuster. Cable is 0.5 m 0.02 in long.)

Type	Appearance	Sensing range	Model No.(Note 1)		Output operation	Emitting element
			NPN output	PNP output		
Thru-beam Long sensing range		10 m 32.808 ft	<b>CX-411A-C05</b>	<b>CX-411A-P-C05</b>	Light-ON	Red LED
			<b>CX-411B-C05</b>	<b>CX-411B-P-C05</b>	Dark-ON	
		15 m 49.213 ft	<b>CX-412A-C05</b>	<b>CX-412A-P-C05</b>	Light-ON	Infrared LED
			<b>CX-412B-C05</b>	<b>CX-412B-P-C05</b>	Dark-ON	
Retroreflective With polarizing filters	 Optional (Note 2)	3 m 9.843 ft (Note 3)	<b>CX-491A-C05-Y</b>	<b>CX-491A-P-C05-Y</b>	Light-ON	Red LED
		<b>CX-491B-C05-Y</b>	<b>CX-491B-P-C05-Y</b>	Dark-ON		

**NOTE:** Mounting bracket is not supplied with the sensor. Please select from the range of optional sensor mounting brackets.

- Notes: 1) The model No. with "E" shown on the label affixed to the thru-beam type sensor is the emitter, "D" shown on the label is the receiver.  
 2) The reflector is sold separately.  
 3) The sensing range of the retroreflective type sensor is specified for the **RF-230** (optional) reflector. The sensing range represents the actual sensing range of the sensor. The sensing range: A of the table below may vary depending on the shape of sensing object. Be sure to check the operation with the actual sensing object.



## ORDER GUIDE

### 0.5 m 1.640 ft / 5 m 16.4 ft cable length types

0.5 m 1.640 ft / 5 m 16.404 ft cable length types (standard: 2 m 6.562 ft, basic: 0.5 m 1.640 in) are also available.

When ordering this type, suffix “-C05” for the 0.5 m 1.640 ft cable length type, “-C5” for the 5 m 16.404 ft cable length type to the model No. (Excluding CX-44□ and basic type.)

(e.g.) 0.5 m 1.640 ft cable length type of CX-411-P is “CX-411-P-C05”  
5 m 16.404 ft cable length type of CX-411-P is “CX-411-P-C5”

### M8 plug-in connector type, M12 pigtailed type

M8 plug-in connector type and M12 pigtailed type are also available.

When ordering this type, suffix “-Z” for the M8 connector type, “-J” for the M12 pigtailed type to the model No.

(Please note that M12 pigtailed type is not available for CX-44□. Excluding basic type.)

(e.g.) M8 connector type of CX-411-P is “CX-411-P-Z”  
M12 pigtailed type of CX-411-P is “CX-411-P-J”

### • Mating cables (2 cables are required for the thru-beam type)

Type		Model No.	Cable length	Description
For M8 plug-in connector type	Straight	CN-24A-C2	2 m 6.562 ft	Can be used with all models
		CN-24A-C5	5 m 16.404 ft	
	Elbow	CN-24AL-C2	2 m 6.562 ft	
		CN-24AL-C5	5 m 16.404 ft	
For M12 pigtailed type	2-core	CN-22-C2	2 m 6.562 ft	For thru-beam type emitter (2-core)
		CN-22-C5	5 m 16.404 ft	
	4-core	CN-24-C2	2 m 6.562 ft	Can be used with all models
		CN-24-C5	5 m 16.404 ft	

### Package without reflector

NPN output type: CX-491-Y

PNP output type: CX-491-P-Y

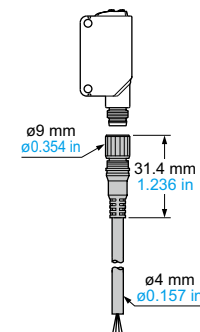
### Accessory

- RF-230 (Reflector)

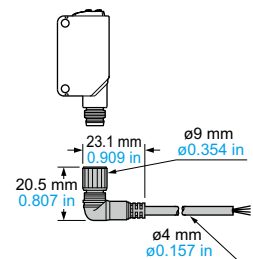


### Mating cables

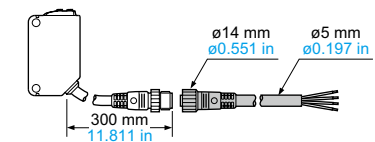
- CN-24A-C2  
CN-24A-C5



- CN-24AL-C2  
CN-24AL-C5



- CN-22-C2, CN-22-C5  
CN-24-C2, CN-24-C5



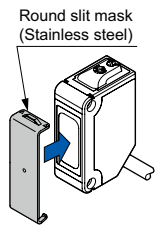
# OPTIONS

Designation	Model No.		Slit size	Sensing range		Min. sensing object	
	Slit mask	Sensor		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-CX-05	CX-411□	ø0.5 mm ø0.020 in	400 mm 15.748 in	20 mm 0.787 in	ø12 mm ø0.472 in	ø0.5 mm ø0.020 in
		CX-412□		600 mm 23.622 in	30 mm 1.181 in		
		CX-413□		1,200 mm 47.242 in	60 mm 2.362 in		
	OS-CX-1	CX-411□	ø1 mm ø0.039 in	900 mm 35.433 in	100 mm 3.937 in	ø12 mm ø0.472 in	ø1 mm ø0.039 in
		CX-412□		1.35 m 4.429 ft	150 mm 5.906 in		
		CX-413□		2.7 m 8.857 ft	300 mm 11.811 in		ø1.5 mm ø0.059 in
	OS-CX-2	CX-411□	ø2 mm ø0.079 in	2 m 6.562 ft	400 mm 15.748 in	ø12 mm ø0.472 in	ø2 mm ø0.079 in
		CX-412□		3 m 9.843 ft	600 mm 23.622 in		
		CX-413□		6 m 19.685 ft	1,200 mm 47.242 in		ø3 mm ø0.118 in
Rectangular slit mask (For thru-beam type sensor only)	OS-CX-05×6	CX-411□	0.5×6 mm 0.020×0.236 in	2 m 6.562 ft	400 mm 15.748 in	ø12 mm ø0.472 in	0.5×6 mm 0.020×0.236 in
		CX-412□		3 m 9.843 ft	600 mm 23.622 in		
		CX-413□		6 m 19.685 ft	1,200 mm 47.242 in		
	OS-CX-1×6	CX-411□	1×6 mm 0.039×0.236 in	3 m 9.843 ft	1 m 3.281 ft	ø12 mm ø0.472 in	1×6 mm 0.039×0.236 in
		CX-412□		4.5 m 14.764 ft	1.5 m 4.921 ft		
		CX-413□		9 m 29.528 ft	3 m 9.843 ft		
	OS-CX-2×6	CX-411□	2×6 mm 0.079×0.236 in	5 m 16.404 ft	2 m 6.562 ft	ø12 mm ø0.472 in	2×6 mm 0.079×0.236 in
		CX-412□		7.5 m 24.606 ft	3 m 9.843 ft		
		CX-413□		15 m 49.213 ft	6 m 19.685 ft		

Designation	Model No.	Sensing range	Min. sensing object	
Interference prevention filter (For CX-411□ only)	PF-CX4-V (Vertical, Silver) 2 pcs. per set	5 m 16.404 ft (Note 1)	ø12 mm ø0.472 in (Note 1)	
	PF-CX4-H (Horizontal, Light brown) 2 pcs. per set			
Reflector (For retro-reflective type sensor only)	RF-210	CX-491□	1 m 3.281 ft (Note 2)	ø30 mm ø1.181 in
		CX-493□	1.5 m 4.921 ft (Note 2)	
		CX-481□	—	
		CX-483□	0.1 to 0.3 m 0.328 to 0.984 ft (Note 2)	
	RF-220	CX-482□	0.1 to 0.6 m 0.328 to 1.969 ft (Note 2)	ø35 mm ø1.378 in
		CX-491□	1.5 m 4.921 ft (Note 2)	
		CX-493□	3 m 9.843 ft (Note 2)	
		CX-481□	50 to 300 mm 1.969 to 11.811 in (Note 2)	
	RF-230 (Note 3)	CX-483□	0.1 to 0.7 m 0.328 to 2.297 ft (Note 2)	ø50 mm ø1.969 in
		CX-482□	0.1 to 1.3 m 0.328 to 4.265 ft (Note 2)	
RF-230 (Note 3)	CX-491-Y	3 m 9.843 ft (Note 2)	ø50 mm ø1.969 in	

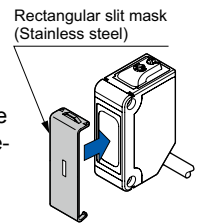
## Round slit mask

- OS-CX-□  
Fitted on the front face of the sensor with one-touch.



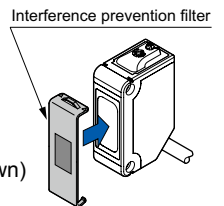
## Rectangular slit mask

- OS-CX-□×6  
Fitted on the front face of the sensor with one-touch.

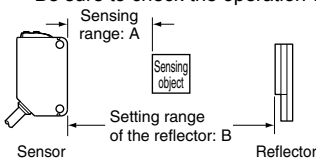


## Interference prevention filter

- PF-CX4-V  
(Vertical, Silver)
- PF-CX4-H  
(Horizontal, Light brown)  
Two sets of CX-411□ can be mounted close together.



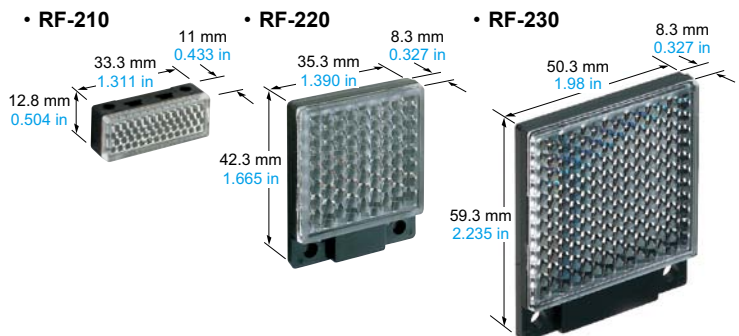
Notes: 1) Value when attached on both sides.  
2) Set the distance between the CX-491□/493□ and the reflector to 0.1 m 0.328 ft or more. However, see the table below for CX-48□.  
The sensing range: A of the table below may vary depending on the shape of sensing object. Be sure to check the operation with the actual sensing object.



Model No.		A	B
Sensor	Reflector		
CX-481□	RF-220	50 to 300 mm 1.969 to 11.811 in	100 to 300 mm 3.937 to 11.811 in
CX-483□	RF-220	0.1 to 0.7 m 0.328 to 2.297 ft	0.2 to 0.7 m 0.656 to 2.297 ft
	RF-210	0.1 to 0.3 m 0.328 to 0.984 ft	0.1 to 0.3 m 0.328 to 0.984 ft
CX-482□	RF-220	0.1 to 1.3 m 0.328 to 4.265 ft	0.5 to 1.3 m 1.640 to 4.265 ft
	RF-210	0.1 to 0.6 m 0.328 to 1.969 ft	0.3 to 0.6 m 0.984 to 1.969 ft

## Reflector

- RF-210



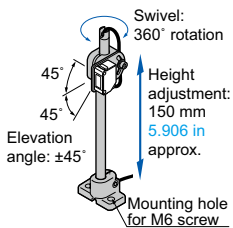
3) RF-230 is attached to the retroreflective type sensor other than the basic type.

Designation	Model No.	Description
Reflector mounting bracket	<b>MS-RF21-1</b>	Protective mounting bracket for <b>RF-210</b> It protects the reflector from damage and maintains alignment.
	<b>MS-RF22</b>	For <b>RF-220</b>
	<b>MS-RF23</b>	For <b>RF-230</b>
Reflective tape	<b>RF-11</b>	<ul style="list-style-type: none"> <li>Sensing range (Note 4): 0.5 m <b>1.640 ft [CX-491□]</b> 0.8 m <b>2.625 ft [CX-493□]</b></li> <li>Ambient temperature: -25 to +50 °C -13 to +122 °F</li> <li>Ambient humidity: 35 to 85 % RH</li> </ul> Notes: 1) Keep the tape free from stress. If it is pressed too much, its capability may deteriorate. 2) Do not cut the tape. It will deteriorate the sensing performance.
	<b>RF-12</b>	<ul style="list-style-type: none"> <li>Sensing range (Note 4): 0.7 m <b>2.297 ft [CX-491□]</b> 1.2 m <b>3.937 ft [CX-493□]</b> 0.1 to 0.6 m <b>0.328 to 1.969 ft [CX-482□]</b></li> </ul>
	<b>RF-13</b>	<ul style="list-style-type: none"> <li>Sensing range (Note 5): 0.5 m <b>1.640 ft [CX-491□]</b></li> <li>Ambient temperature: -25 to +55 °C -13 to +131 °F</li> <li>Ambient humidity: 35 to 85 % RH</li> </ul>
Sensor mounting bracket (Note 1)	<b>MS-CX2-1</b>	Foot angled mounting bracket It can also be used for mounting <b>RF-210</b> .
	<b>MS-CX2-2</b>	Foot biangled mounting bracket It can also be used for mounting <b>RF-210</b> .
	<b>MS-CX2-4</b>	Protective mounting bracket
	<b>MS-CX2-5</b>	Back biangled mounting bracket
	<b>MS-CX-3</b>	Back angled mounting bracket
Universal sensor mounting stand (Note 2)	<b>MS-AJ1</b>	Horizontal mounting type
	<b>MS-AJ2</b>	Vertical mounting type
	<b>MS-AJ1-A</b>	Horizontal mounting type
	<b>MS-AJ2-A</b>	Vertical mounting type
	<b>MS-AJ1-M</b>	Horizontal mounting type
	<b>MS-AJ2-M</b>	Vertical mounting type
Sensor checker (Note 3)	<b>CHX-SC2</b>	It is useful for beam alignment of thru-beam type sensors. The optimum receiver position is given by indicators, as well as an audio signal.

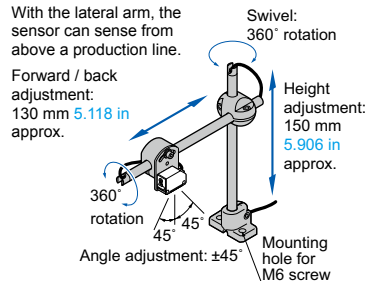
- Notes: 1) The plug-in connector type sensor does not allow use of some sensor mounting brackets because of the protrusion of the connector.  
 2) Refer to the general catalog for details of the universal sensor mounting stand.  
 3) Refer to the general catalog for details of the sensor checker **CHX-SC2**.  
 4) Set the distance between the sensor and the reflective tape to 0.1 m **0.328 ft [CX-482□]**, 0.4 m **1.312 ft** or more.  
 5) Set the distance between the sensor and the reflective tape to 0.2 m **0.656 ft** or more.

**Universal sensor mounting stand**

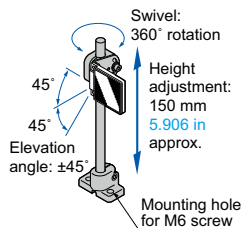
• **MS-AJ1**



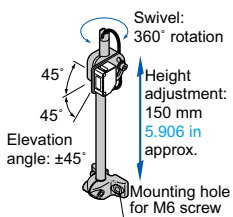
• **MS-AJ1-A**



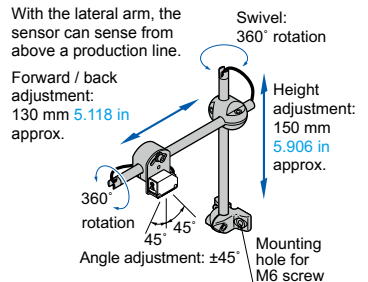
• **MS-AJ1-M**



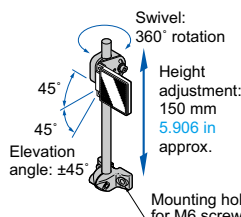
• **MS-AJ2**



• **MS-AJ2-A**

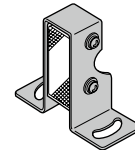


• **MS-AJ2-M**



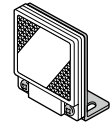
**Reflector mounting bracket**

• **MS-RF21-1**



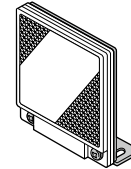
Two M3 (length 12 mm **0.472 in**) screws with washers are attached.

• **MS-RF22**



Two M3 (length 8 mm **0.315 in**) screws with washers are attached.

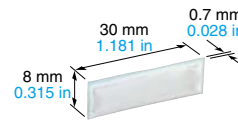
• **MS-RF23**



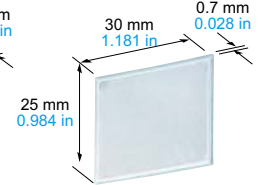
Two M4 (length 10 mm **0.394 in**) screws with washers are attached.

**Reflective tape**

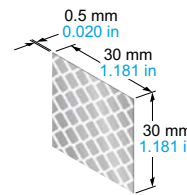
• **RF-11**



• **RF-12**

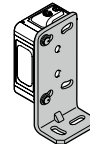


• **RF-13**



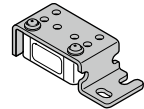
**Sensor mounting bracket**

• **MS-CX2-1**



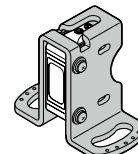
Two M3 (length 12 mm **0.472 in**) screws with washers are attached.

• **MS-CX2-2**



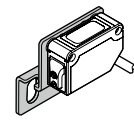
Two M3 (length 12 mm **0.472 in**) screws with washers are attached.

• **MS-CX2-4**



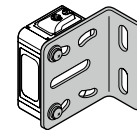
Two M3 (length 14 mm **0.551 in**) screws with washers are attached.

• **MS-CX2-5**



Two M3 (length 12 mm **0.472 in**) screws with washers are attached.

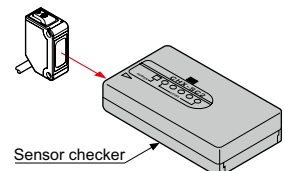
• **MS-CX-3**



Two M3 (length 12 mm **0.472 in**) screws with washers are attached.

**Sensor checker**

• **CHX-SC2**

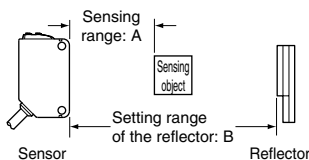


# SPECIFICATIONS

## Standard type

Item	Model No.	Type	Thru-beam			Retroreflective					Diffuse reflective			Narrow-view
			Long sensing range	With polarizing filters	Long sensing range	For transparent object sensing								
		NPN output	<b>CX-411</b>	<b>CX-412</b>	<b>CX-413</b>	<b>CX-491</b>	<b>CX-493</b>	<b>CX-481</b>	<b>CX-483</b>	<b>CX-482</b>	<b>CX-424</b>	<b>CX-421</b>	<b>CX-422</b>	<b>CX-423</b>
		PNP output	<b>CX-411-P</b>	<b>CX-412-P</b>	<b>CX-413-P</b>	<b>CX-491-P</b>	<b>CX-493-P</b>	<b>CX-481-P</b>	<b>CX-483-P</b>	<b>CX-482-P</b>	<b>CX-424-P</b>	<b>CX-421-P</b>	<b>CX-422-P</b>	<b>CX-423-P</b>
Applicable CE marking directive														
EMC Directive, RoHS Directive														
Sensing range			10 m 32.808 ft	15 m 49.213 ft	30m 98.425 ft	3 m 9.843 ft (Note 2)	5 m 16.404 ft (Note 2)	50 to 500 mm 1.969 to 19.685 in (Note 2)	50 to 1,000mm 1.969 to 39.37 in (Note 2)	0.1 to 2 m 0.328 to 6.562 ft (Note 2)	100 mm 3.937 in (Note 3)	300 mm 11.811 in (Note 3)	800 mm 31.496 in (Note 3)	70 to 300 mm 2.756 to 11.811 in (Note 3)
Sensing object			ø12 mm ø0.472 in or more opaque object (Note 4)			ø50 mm ø1.969 in or more opaque, translucent or specular object (Note 2, 5)	ø50 mm ø1.969 in or more opaque or translucent object (Note 2, 5)	ø50 mm ø1.969 in or more transparent, translucent or opaque object (Note 2, 5)			Opaque, translucent or transparent object (Note 5)			Opaque, translucent or transparent object (Note 5) (Min. sensing object: ø1.5 mm / ø0.059 in copper wire)
Hysteresis			15 % or less of operation distance (Note 3)											
Repeatability (perpendicular to sensing axis)			0.5 mm 0.020 in or less								1 mm 0.039 in or less		0.5 mm 0.020 in or less	
Supply voltage			12 to 24 V DC ±10 % Ripple P-P 10 % or less											
Current consumption			Emitter: 15 mA or less Receiver: 10 mA or less	Emitter: 20 mA or less Receiver: 10 mA or less	Emitter: 25 mA or less Receiver: 10 mA or less	13 mA or less	10 mA or less			13 mA or less			15 mA or less	
Output			<b>&lt;NPN output type&gt;</b> NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 2 V or less (at 100 mA sink current) 1 V or less (at 16 mA sink current)						<b>&lt;PNP output type&gt;</b> PNP open-collector transistor • Maximum source current: 100 mA • Applied voltage: 30 V DC or less (between output and +V) • Residual voltage: 2 V or less (at 100 mA source current) 1 V or less (at 16 mA source current)					
Output operation			Switchable either Light-ON or Dark-ON											
Short-circuit protection			Incorporated											
Response time			1 ms or less		2 ms or less		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 (lights up when the power is ON) (incorporated on the emitter)			—————								
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 with interference prevention filters. (Sensing range: 5 m 16.404 ft)			Incorporated (Two units of sensors can be mounted close together.)								
Protection			IP67 (IEC)											
Ambient temperature			-25 to +55 °C -13 to +131 °F (No dew condensation or icing allowed), Storage: -30 to +70 °C -22 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 double amplitude (10 G max.) in X, Y and Z directions for two hours each											
Shock resistance			500 m/s <sup>2</sup> acceleration (50 G approx.) in X, Y and Z directions three times each											
Emitting element (modulated)			Red LED	Infrared LED		Red LED	Infrared LED		Infrared LED			Red LED		
Peak emission wavelength			680 nm 0.027 mil	870 nm 0.034 mil	850 nm 0.033 mil	680 nm 0.027 mil	650 nm 0.026 mil	870 nm 0.034 mil			860 nm 0.033 mil		645 nm 0.025 mil	
Material			Enclosure: PBT (Polybutylene terephthalate), Lens: Acrylic (CX-48□: Polycarbonate), Indicator cover: Acrylic (CX-48□: Polycarbonate)											
Cable			0.2 mm <sup>2</sup> 3-core (thru-beam type emitter: 2-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 mm <sup>2</sup> , or more, cable (thru-beam type: both emitter and receiver)											
Weight			Net			Emitter: 45 g approx., Receiver: 50 g approx.			50 g approx.					
			Gross			100 g approx.			80 g approx.			60 g approx.		
Accessories			RF-230 (Reflector): 1 pc.											

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.  
 2) The sensing range and the sensing object of the retroreflective type sensor are specified for the RF-230 reflector. The sensing range represents the actual sensing range of the sensor. The sensing range: A of the table below may vary depending on the shape of sensing object. Be sure to check the operation with the actual sensing object.



	CX-491□	CX-493□	CX-481□	CX-483□	CX-482□
A	0 to 3 m 0 to 9.843 ft	0 to 5 m 0 to 16.404 ft	50 to 500 mm 1.969 to 19.685 in	50 to 1,000 mm 1.969 to 39.37 in	0.1 to 2 m 0.328 to 6.562 ft
B	0.1 to 3 m 0.328 to 9.843 ft	0.1 to 5 m 0.328 to 16.404 ft	100 to 500 mm 3.937 to 19.685 in	100 to 1,000 mm 3.937 to 39.37 in	0.8 to 2 m 2.625 to 6.562 ft

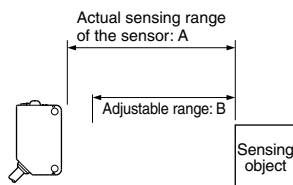
- 3) The sensing range and hysteresis of the diffuse reflective type sensor are specified for white non-glossy paper (200 × 200 mm 7.874 × 7.874 in) as the object.  
 4) If slit masks (optional) are fitted, an object of ø0.5 mm ø0.020 in (using round slit mask) can be detected.  
 5) Make sure to confirm detection with an actual sensor before use.

# SPECIFICATIONS

## Standard type

Item	Model No.	Type	Adjustable range reflective				
			Small spot				
		NPN output	<b>CX-441</b>	<b>CX-443</b>	<b>CX-444</b>	<b>CX-442</b>	
		PNP output	<b>CX-441-P</b>	<b>CX-443-P</b>	<b>CX-444-P</b>	<b>CX-442-P</b>	
Applicable CE marking directive		EMC Directive, RoHS Directive					
Adjustable range (Note 2)		20 to 50 mm <b>0.787 to 1.969 in</b>		20 to 100 mm <b>0.787 to 3.937 in</b>	40 to 300 mm <b>1.575 to 11.811 in</b>		
Sensing range (with white non-glossy paper)		2 to 50 mm <b>0.079 to 1.969 in</b>		15 to 100 mm <b>0.591 to 3.937 in</b>	20 to 300 mm <b>0.787 to 11.811 in</b>		
Hysteresis (with white non-glossy paper)		2 % or less of operation distance			5 % or less of operation distance		
Repeatability		Along sensing axis: 1 mm <b>0.039 in</b> or less, Perpendicular to sensing axis: 0.2 mm <b>0.008 in</b> or less (with white non-glossy paper)					
Supply voltage		12 to 24 V DC $\pm 10\%$ Ripple P-P 10 % or less					
Current consumption		20 mA or less					
Output		<NPN output type> NPN open-collector transistor			<PNP output type> PNP open-collector transistor		
		<ul style="list-style-type: none"> <li>Maximum sink current: 100 mA</li> <li>Applied voltage: 30 V DC or less (between output and 0 V)</li> <li>Residual voltage: 2 V or less (at 100 mA sink current) 1 V or less (at 16 mA sink current)</li> </ul>			<ul style="list-style-type: none"> <li>Maximum source current: 100 mA</li> <li>Applied voltage: 30 V DC or less (between output and +V)</li> <li>Residual voltage: 2 V or less (at 100 mA source current) 1 V or less (at 16 mA source current)</li> </ul>		
		Output operation		Switchable either Detection-ON or Detection-OFF			
		Short-circuit protection		Incorporated			
Response time		1 ms or less					
Operation indicator		Orange LED (lights up when the output is ON)					
Stability indicator		Green LED (lights up under stable operating condition) (Note 3)					
Distance adjuster		5-turn mechanical adjuster					
Sensing mode		BGS / FGS functions: Switchable with wiring of sensing mode selection input					
Automatic interference prevention function (Note 4)		Incorporated					
Environmental resistance	Protection		IP67 (IEC)				
	Ambient temperature		-25 to +55 °C <b>-13 to +131 °F</b> (No dew condensation or icing allowed), Storage: -30 to +70 °C <b>-22 to +158 °F</b>				
	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 M $\Omega$ , or more, with 250 V DC megger between all supply terminals connected together and enclosure				
	Vibration resistance		10 to 500 Hz frequency, 3 mm <b>0.118 in</b> double amplitude (20 G max.) in X, Y and Z directions for two hours each				
	Shock resistance		500 m/s <sup>2</sup> acceleration (50 G approx.) in X, Y and Z directions three times each				
Emitting element		Red LED (Peak emission wavelength: 650 nm <b>0.026 mil</b> , modulated)					
Spot diameter		$\phi 2$ mm <b><math>\phi 0.079</math> in</b> approx. (at 50 mm <b>1.969 in</b> distance)	$\phi 6.5$ mm <b><math>\phi 0.256</math> in</b> approx. (at 50 mm <b>1.969 in</b> distance)	$\phi 9$ mm <b><math>\phi 0.354</math> in</b> approx. (at 100 mm <b>3.937 in</b> distance)	$\square 15$ mm <b><math>\square 0.591</math> in</b> approx. (at 300 mm <b>11.811 in</b> distance)		
Material		Enclosure: PBT (Polybutylene terephthalate), Lens: Polycarbonate, Indicator cover: Polycarbonate					
Cable		0.2 mm <sup>2</sup> 4-core cabtyre cable, 2 m <b>6.562 ft</b> long					
Cable extension		Extension up to total 100 m <b>328.084 ft</b> is possible with 0.3 mm <sup>2</sup> , or more, cable.					
Weight		Net weight: 55 g approx., Gross weight: 65 g approx.					

- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C **+73.4 °F**.  
 2) The adjustable range stands for the maximum sensing range which can be set with the distance adjuster. The sensor can detect an object 2 mm **0.079 in** [CX-444(-P): 15 mm **0.591 in**, CX-442(-P): 20 mm **0.787 in**], or more, away.



	CX-441□/443□	CX-444□	CX-442□
A	2 to 50 mm <b>0.079 to 1.969 in</b>	15 to 100 mm <b>0.591 to 3.937 in</b>	20 to 300 mm <b>0.787 to 11.811 in</b>
B	20 to 50 mm <b>0.787 to 1.969 in</b>	20 to 100 mm <b>0.787 to 3.937 in</b>	40 to 300 mm <b>1.575 to 11.811 in</b>

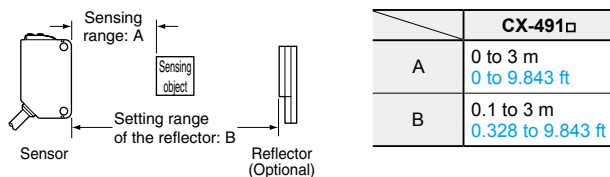
- 3) Refer to the manual or the general catalog for operation of the stability indicator.  
 4) Note that detection may be unstable depending on the mounting conditions or the sensing object. In the state that this product is mounted, be sure to check the operation with the actual sensing object.

# SPECIFICATIONS

## Basic type

Item	Model No.	Type	Thru-beam				Retroreflective			
			Light-ON	Dark-ON	Long sensing range		With polarizing filters			
					Light-ON	Dark-ON	Light-ON	Dark-ON		
		NPN output	<b>CX-411A-C05</b>	<b>CX-411B-C05</b>	<b>CX-412A-C05</b>	<b>CX-412B-C05</b>	<b>CX-491A-C05-Y</b>	<b>CX-491B-C05-Y</b>		
		PNP output	<b>CX-411A-P-C05</b>	<b>CX-411B-P-C05</b>	<b>CX-412A-P-C05</b>	<b>CX-412B-P-C05</b>	<b>CX-491A-P-C05-Y</b>	<b>CX-491B-P-C05-Y</b>		
Applicable CE marking directive			EMC Directive, RoHS Directive							
Sensing range			10 m <b>32.808 ft</b>		15 m <b>49.213 ft</b>		3 m <b>9.843 ft</b> (Note 2)			
Sensing object			ø12 mm <b>ø0.472 in</b> or more opaque object (Note 3)				ø50 mm <b>ø1.969 in</b> or more transparent, translucent or opaque object (Note 2, 4)			
Hysteresis			—							
Repeatability (perpendicular to sensing axis)			0.5 mm <b>0.020 in</b> or less							
Supply voltage			12 to 24 V DC ±10 % Ripple P-P 10 % or less							
Current consumption			Emitter: 15 mA or less Receiver: 10 mA or less		Emitter: 20 mA or less Receiver: 10 mA or less		13 mA or less			
Output			<NPN output type> NPN open-collector transistor <ul style="list-style-type: none"> <li>• Maximum sink current: 100 mA</li> <li>• Applied voltage: 30 V DC or less (between output and 0 V)</li> <li>• Residual voltage: 2 V or less (at 100 mA sink current) 1 V or less (at 16 mA sink current)</li> </ul>				<PNP output type> PNP open-collector transistor <ul style="list-style-type: none"> <li>• Maximum source current: 100 mA</li> <li>• Applied voltage: 30 V DC or less (between output and +V)</li> <li>• Residual voltage: 2 V or less (at 100 mA source current) 1 V or less (at 16 mA source current)</li> </ul>			
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 (lights up when the power is ON) (incorporated on the emitter)			—				
Sensitivity adjuster			—							
Automatic interference prevention function			[ Two units of sensors can be mounted close together with interference prevention filters. (Sensing range: 5 m <b>16.404 ft</b> ) ]			—			Incorporated (Two units of sensors can be mounted close together.)	
Protection			IP67 (IEC)							
Ambient temperature			-25 to +55 °C <b>-13 to +131 °F</b> (No dew condensation or icing allowed), Storage: -30 to +70 °C <b>-22 to +158 °F</b>							
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 <b>0.059 in</b> double amplitude (10 G max.) in X, Y and Z directions for two hours each							
Shock resistance			500 m/s <sup>2</sup> acceleration (50 G approx.) in X, Y and Z directions three times each							
Emitting element (modulated)			Red LED		Infrared LED		Red LED			
Peak emission wavelength			680 nm <b>0.027 mil</b>		870 nm <b>0.034 mil</b>		680 nm <b>0.027 mil</b>			
Material			Enclosure: PBT (Polybutylene terephthalate), Lens: Acrylic, Indicator cover: Acrylic							
Cable			0.2 mm <sup>2</sup> 3-core (thru-beam type emitter: 2-core) cabtyre cable, 0.5 m <b>1.640 ft</b> long							
Cable extension			Extension up to total 100 m <b>328.084 ft</b> is possible with 0.3 mm <sup>2</sup> , or more, cable (thru-beam type: both emitter and receiver)							
Weight		Net	Emitter: 20 g approx., Receiver: 20 g approx.				20 g approx.			
		Gross	50 g approx.				30 g approx.			

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C **+73.4 °F**.  
 2) The sensing range and the sensing object of the retroreflective type sensor are specified for the **RF-230** reflector (optional). The sensing range represents the actual sensing range of the sensor. The sensing range: A of the table below may vary depending on the shape of sensing object. Be sure to check the operation with the actual sensing object.

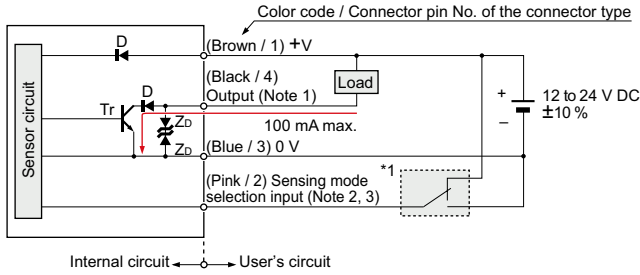


3) If slit masks (optional) are fitted, an object of ø0.5 mm **ø0.020 in** (using round slit mask) can be detected.  
 4) Make sure to confirm detection with an actual sensor before use.

# I/O CIRCUIT AND WIRING DIAGRAMS

## NPN output type

### I/O circuit diagram



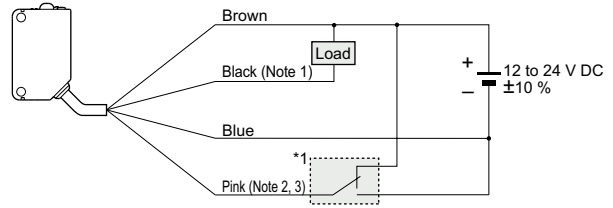
- Notes: 1) The emitter of the thru-beam type sensor does not incorporate the output.  
 2) Sensing mode selection input is incorporated only for the CX-44 adjustable range reflective type. When using the CX-44, be sure to wire the sensing mode selection input (pink / 2) as mentioned \*1. Unstable operation may occur.  
 3) When the mating cable is connected to the plug-in connector type of CX-44, its color is white.

\*1

- Sensing mode selection input  
 BGS function: Connect to 0 V  
 FGS function: Connect to +V

Symbols ... D : Reverse supply polarity protection diode  
 Z<sub>D</sub> : Surge absorption zener diode  
 Tr : NPN output transistor

### Wiring diagram



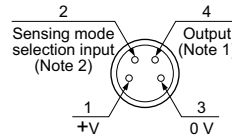
- Notes: 1) The emitter of the thru-beam type sensor does not incorporate the black wire.  
 2) The pink wire is incorporated only for the CX-44 adjustable range reflective type. When using the CX-44, be sure to wire the pink wire as mentioned \*1. Unstable operation may occur.  
 3) When the mating cable is connected to the plug-in connector type of CX-44, its color is white.

\*1

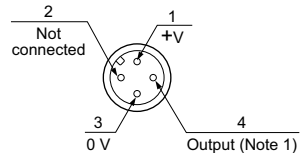
- Sensing mode selection input  
 BGS function: Connect to 0 V  
 FGS function: Connect to +V

### Connector pin position

#### M8 plug-in connector type



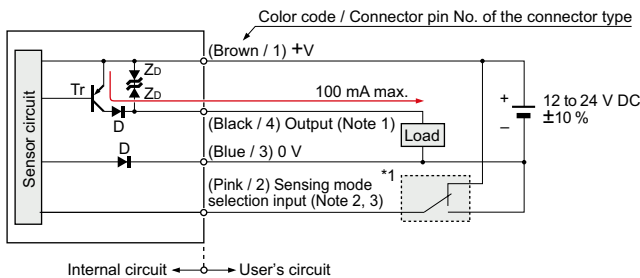
#### M12 pigtailed type



- Notes: 1) The emitter of the thru-beam type sensor does not incorporate the output.  
 2) Sensing mode selection input is incorporated only for the CX-44 adjustable range reflective type. When using the CX-44, be sure to wire the sensing mode selection input (pink / 2). Unstable operation may occur.

## PNP output type

### I/O circuit diagram



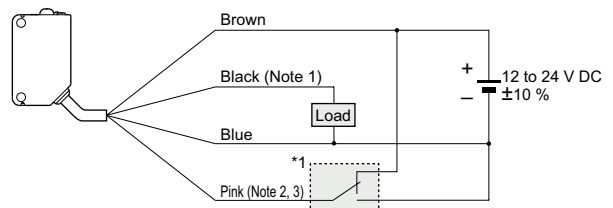
- Notes: 1) The emitter of the thru-beam type sensor does not incorporate the output.  
 2) Sensing mode selection input is incorporated only for the CX-44-P adjustable range reflective type. When using the CX-44-P, be sure to wire the sensing mode selection input (pink / 2) as mentioned \*1. Unstable operation may occur.  
 3) When the mating cable is connected to the plug-in connector type of CX-44-P, its color is white.

\*1

- Sensing mode selection input  
 BGS function: Connect to 0 V  
 FGS function: Connect to +V

Symbols ... D : Reverse supply polarity protection diode  
 Z<sub>D</sub> : Surge absorption zener diode  
 Tr : PNP output transistor

### Wiring diagram



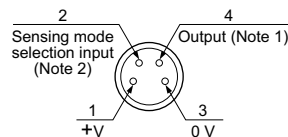
- Notes: 1) The emitter of the thru-beam type sensor does not incorporate the black wire.  
 2) The pink wire is incorporated only for the CX-44-P adjustable range reflective type. When using the CX-44-P, be sure to wire the pink wire as mentioned \*1. Unstable operation may occur.  
 3) When the mating cable is connected to the plug-in connector type of CX-44-P, its color is white.

\*1

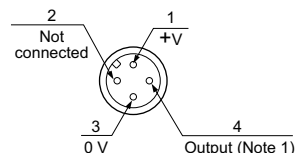
- Sensing mode selection input  
 BGS function: Connect to 0 V  
 FGS function: Connect to +V

### Connector pin position

#### M8 plug-in connector type



#### M12 pigtailed type



- Notes: 1) The emitter of the thru-beam type sensor does not incorporate the output.  
 2) Sensing mode selection input is incorporated only for the CX-44-P adjustable range reflective type. When using the CX-44-P, be sure to wire the sensing mode selection input (pink / 2). Unstable operation may occur.



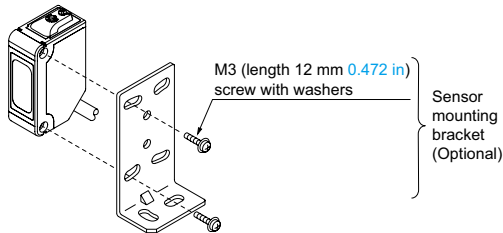
## PRECAUTIONS FOR PROPER USE



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

### Mounting

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



### Wiring

- Make sure that the power supply is off while wiring.
- 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 100 m **328.084 ft** (thru-beam type: both emitter and receiver) is possible with 0.3 mm<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.

### Others

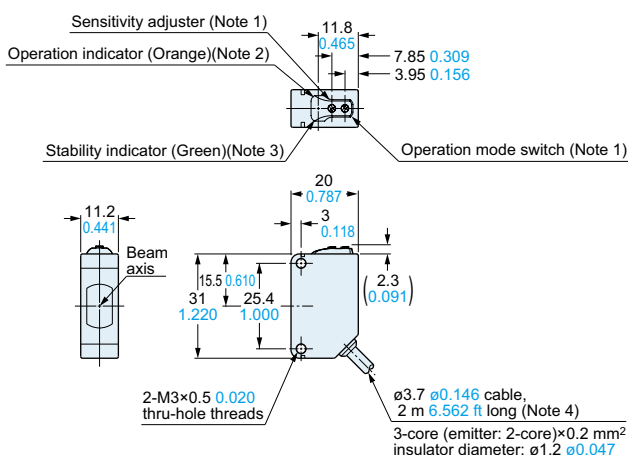
- This product has been developed / produced for industrial use only.
- Do not use during the initial transient time (50 ms) after the power supply is switched on.
- Take care that the sensor is not directly exposed to fluorescent light from a rapid-starter lamp or a high frequency lighting device, as it may affect the sensing performance.
- 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.
- This sensor cannot be used in an environment containing inflammable or explosive gases.
- Never disassemble or modify the sensor.

## DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from the website.

### CX-41□

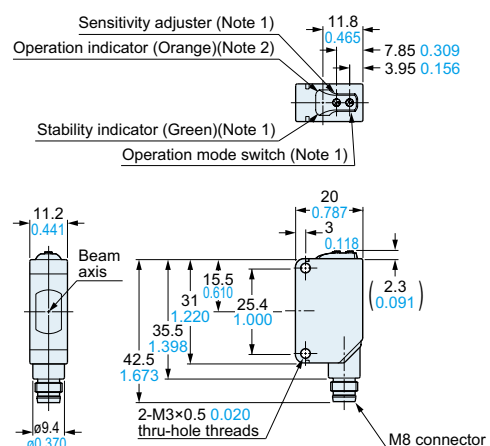
Sensor



- Notes: 1) Not incorporated on the emitter and the basic type sensor.  
 2) It is the power indicator (green) on the emitter.  
 3) Not incorporated on the emitter.  
 4) Basic type: 0.5 m **1.640 ft** long

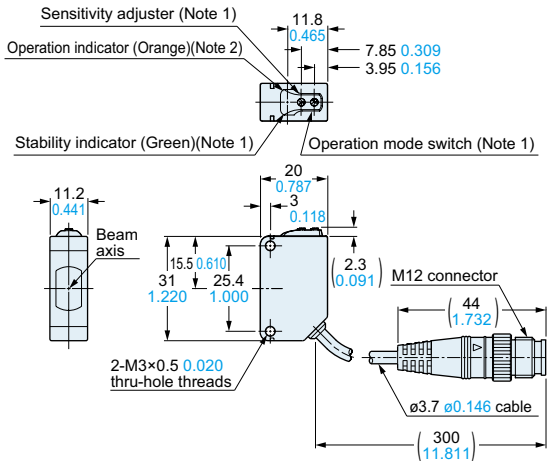
### CX-41□-Z

Sensor



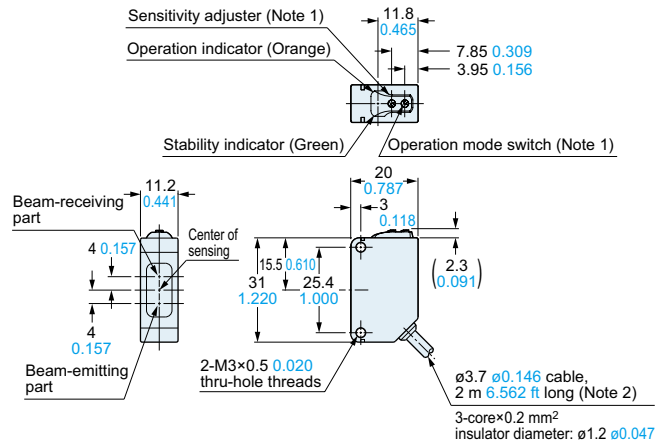
- Notes: 1) Not incorporated on the emitter.  
 2) It is the power indicator (green) on the emitter.

**CX-41□-J** Sensor



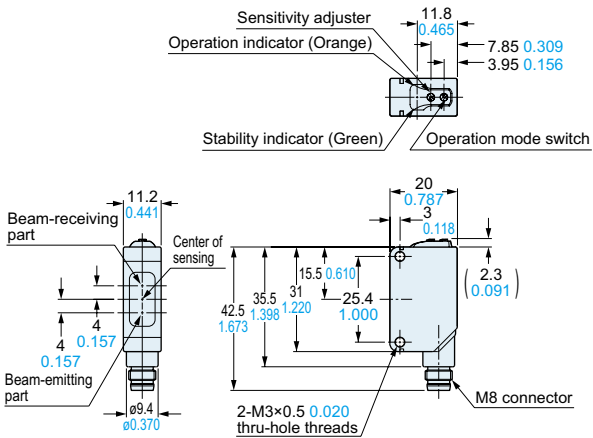
Notes: 1) Not incorporated on the emitter.  
2) It is the power indicator (green) on the emitter.

**CX-49□ CX-48□ CX-42□** Sensor

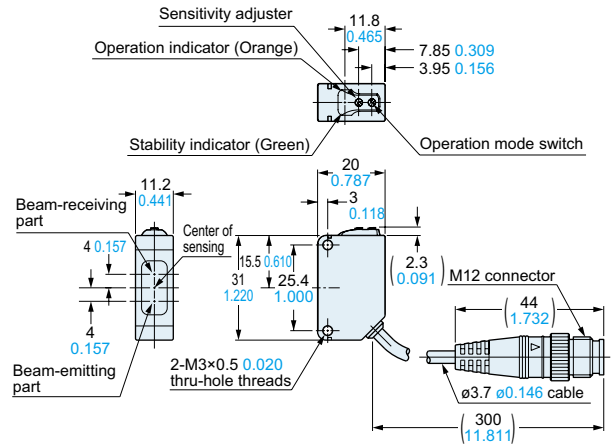


Notes: 1) Not incorporated on the Basic type sensors.  
2) Basic type: 0.5 m 1.640 ft long

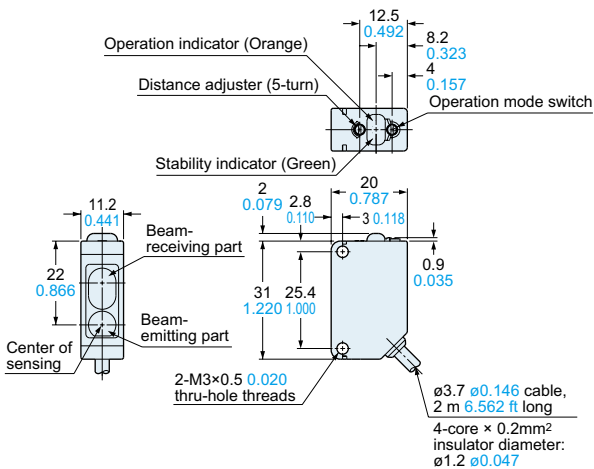
**CX-49□-Z CX-48□-Z CX-42□-Z** Sensor



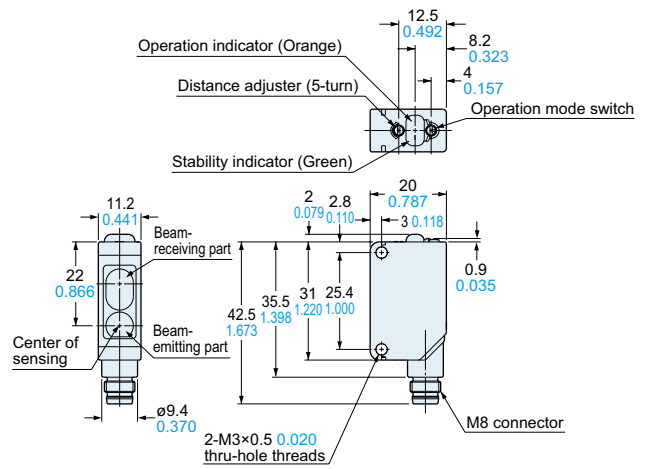
**CX-49□-J CX-48□-J CX-42□-J** Sensor



**CX-44□** Sensor



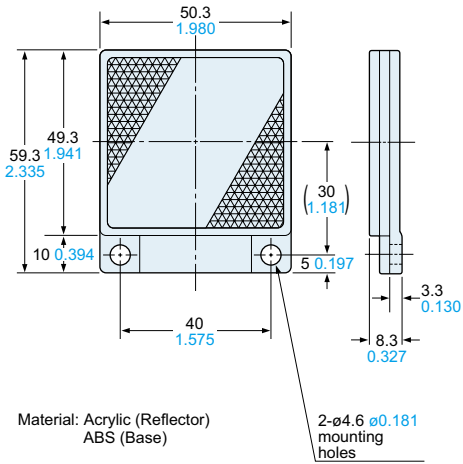
**CX-44□-Z** Sensor



# DIMENSIONS (Unit: mm in)

The CAD data can be downloaded from the website.

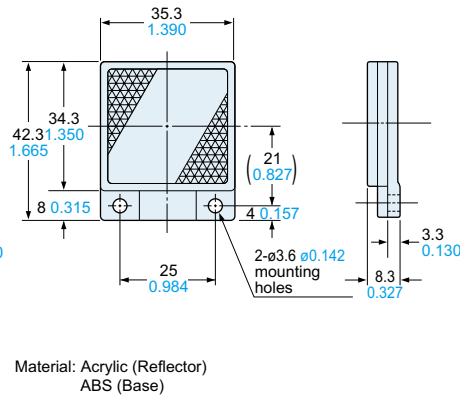
## RF-230 Reflector (Accessory for the retroreflective type sensor)



Material: Acrylic (Reflector)  
ABS (Base)

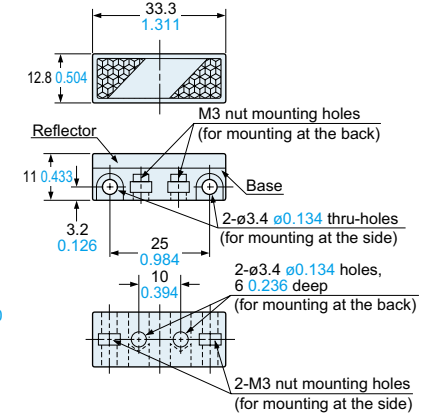
2- $\phi 4.6$   $\phi 0.181$  mounting holes

## RF-220 Reflector (Optional)



Material: Acrylic (Reflector)  
ABS (Base)

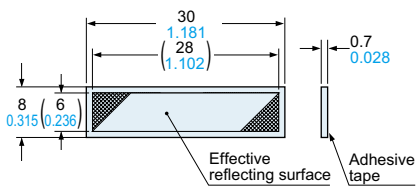
## RF-210 Reflector (Optional)



Material: Acrylic (Reflector)  
ABS (Base)

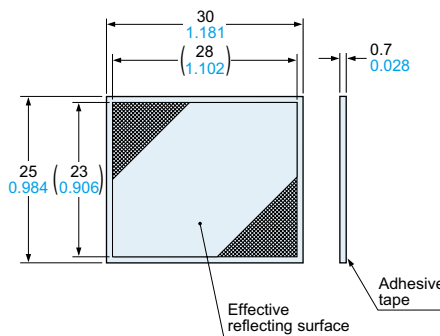
Two M3 (length 8 mm 0.315 in) screws with washers and two nuts are attached.

## RF-11 Reflective tape (Optional)



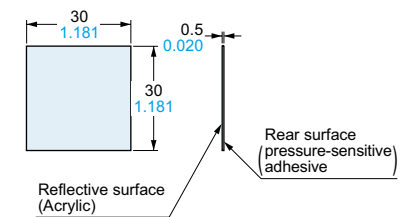
Material: Acrylic

## RF-12 Reflective tape (Optional)



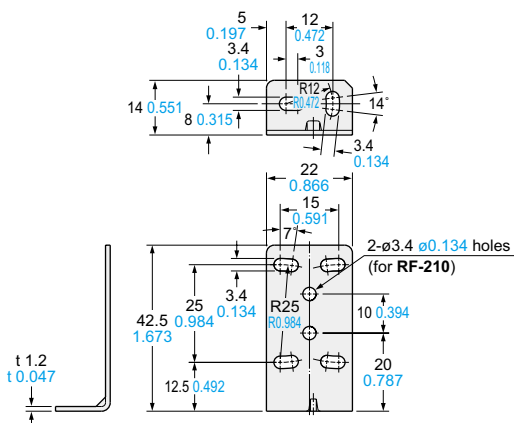
Material: Flexible polyvinyl chloride

## RF-13 Reflective tape (Optional)



## MS-CX2-1

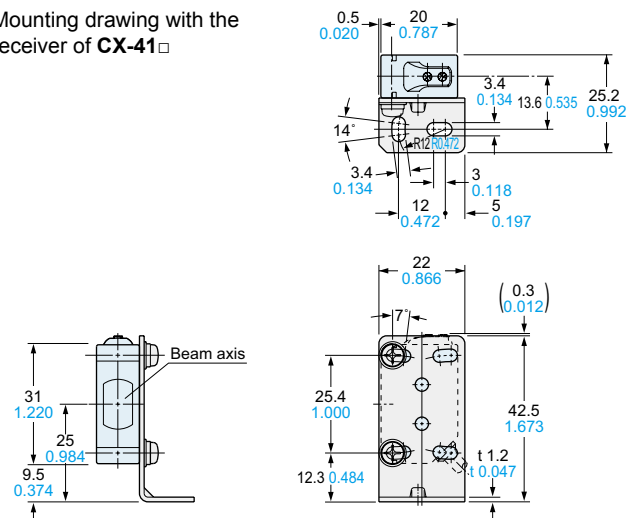
## Sensor mounting bracket (Optional)



Material: Stainless steel (SUS304)  
Two M3 (length 12 mm 0.472 in) screws with washers are attached.

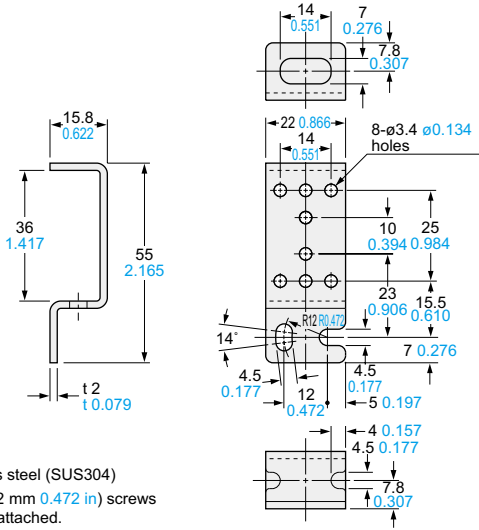
## Assembly dimensions

Mounting drawing with the receiver of CX-41



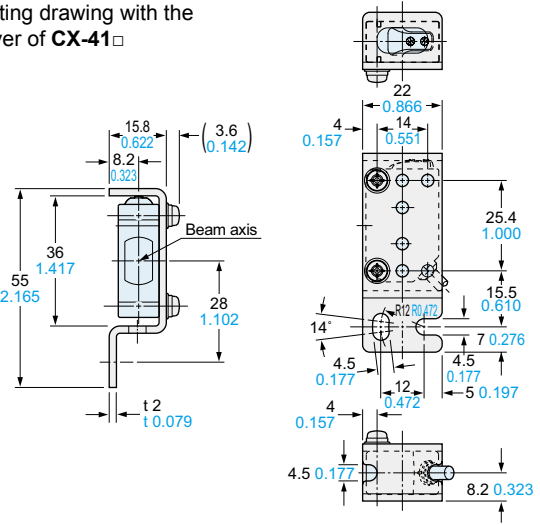
**MS-CX2-2**

**Sensor mounting bracket (Optional)**



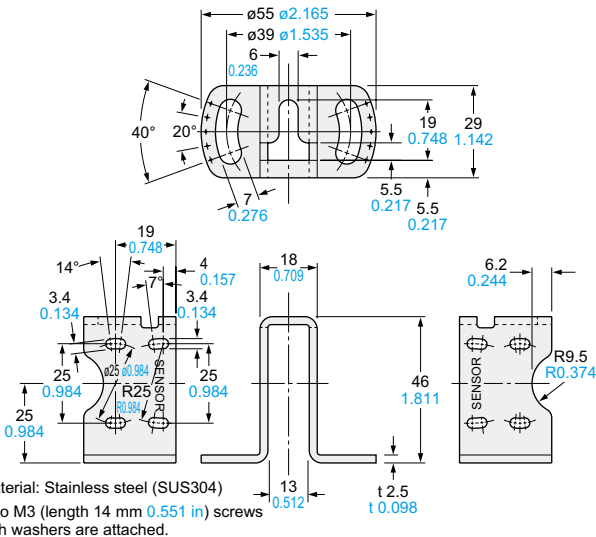
**Assembly dimensions**

Mounting drawing with the receiver of CX-41□



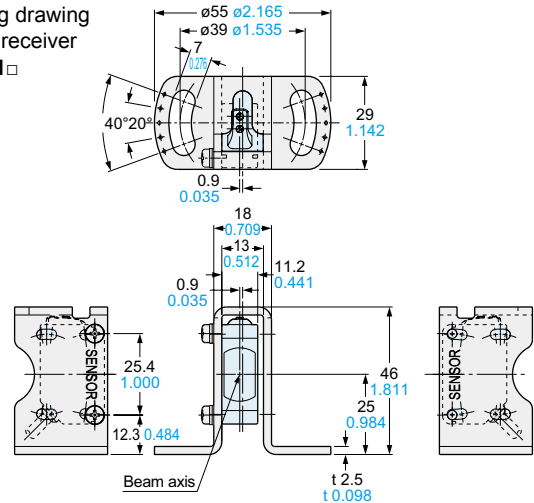
**MS-CX2-4**

**Sensor mounting bracket (Optional)**



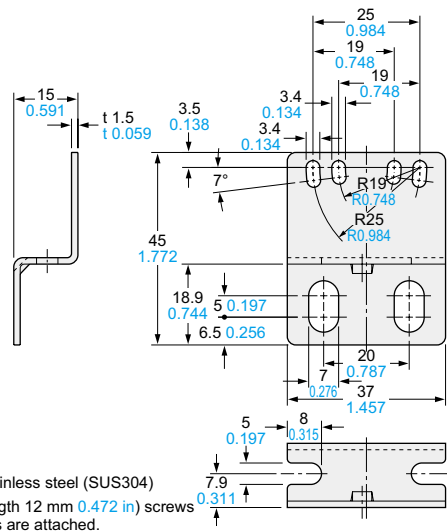
**Assembly dimensions**

Mounting drawing with the receiver of CX-41□



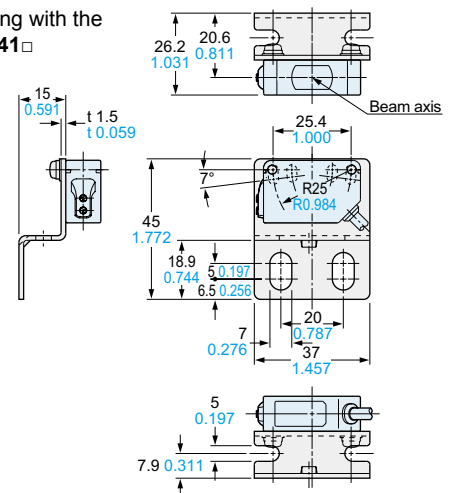
**MS-CX2-5**

**Sensor mounting bracket (Optional)**



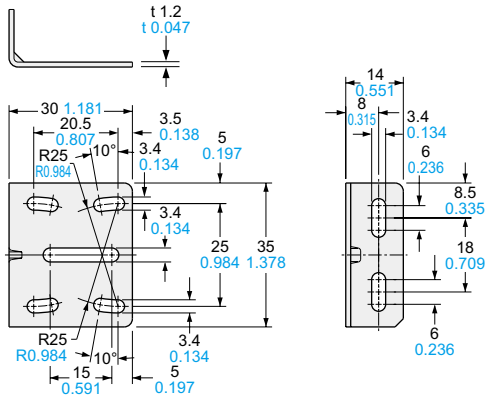
**Assembly dimensions**

Mounting drawing with the receiver of CX-41□



**MS-CX-3**

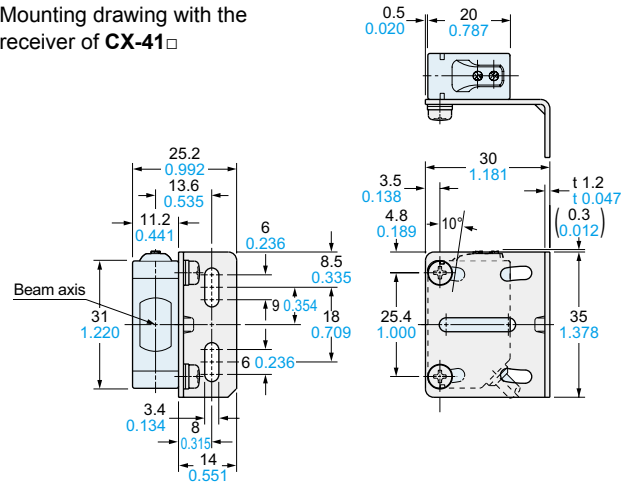
**Sensor mounting bracket (Optional)**



Material: Stainless steel (SUS304)  
Two M3 (length 12 mm 0.472 in) screws with washers are attached.

**Assembly dimensions**

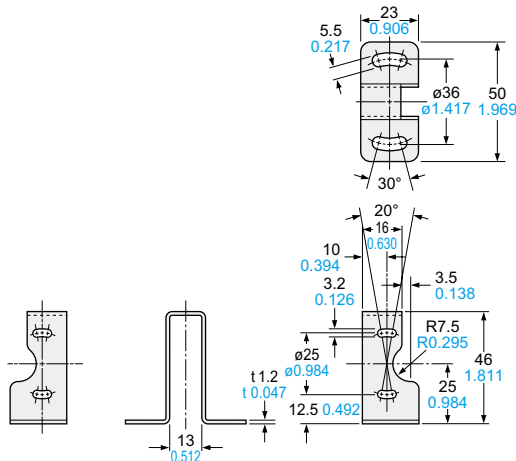
Mounting drawing with the receiver of CX-41□



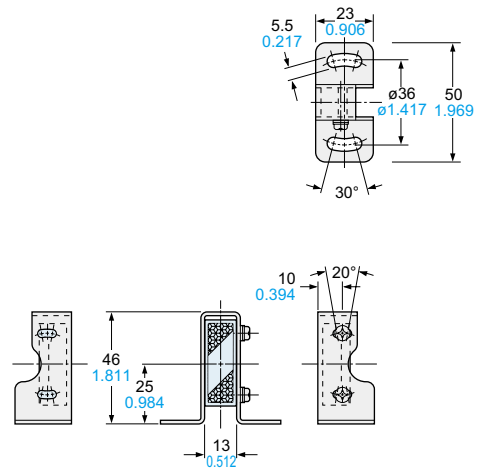
**MS-RF21-1**

**Reflector mounting bracket for RF-210 (Optional)**

**Assembly dimensions**



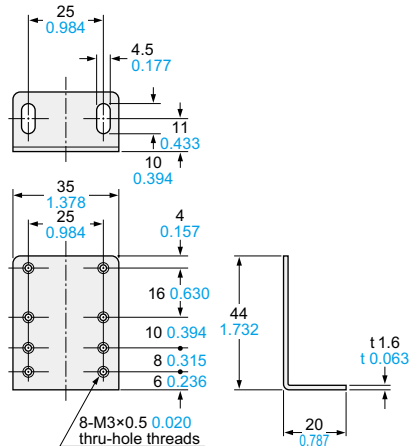
Material: Stainless steel (SUS304)  
Two M3 (length 12 mm 0.472 in) screws with washers are attached.



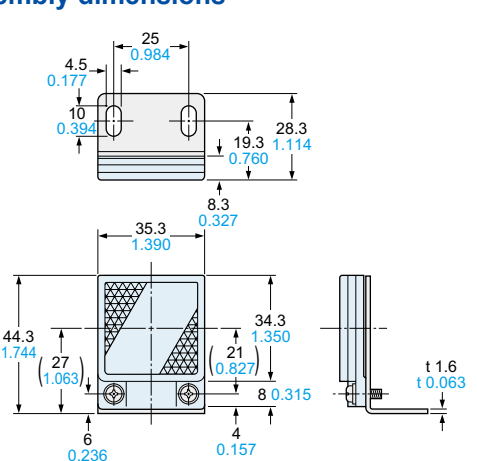
**MS-RF22**

**Reflector mounting bracket for RF-220 (Optional)**

**Assembly dimensions**



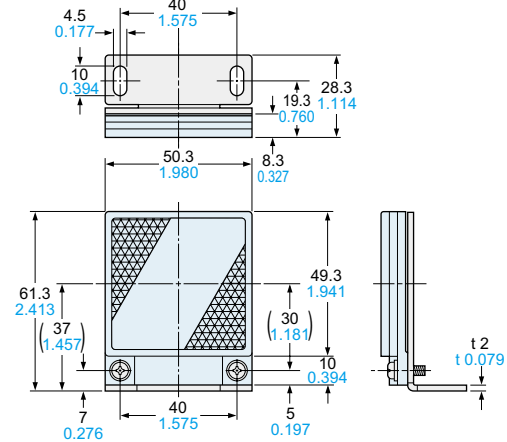
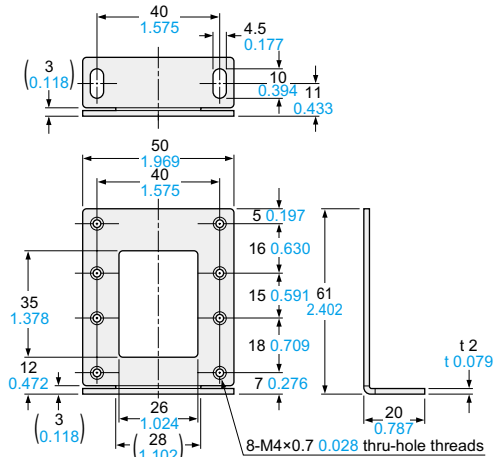
Material: Cold rolled carbon steel (SPCC) (Uni-chrome plated)  
Two M3 (length 8 mm 0.315 in) screws with washers are attached.



**MS-RF23**

**Reflector mounting bracket for RF-230 (Optional)**

**Assembly dimensions**



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

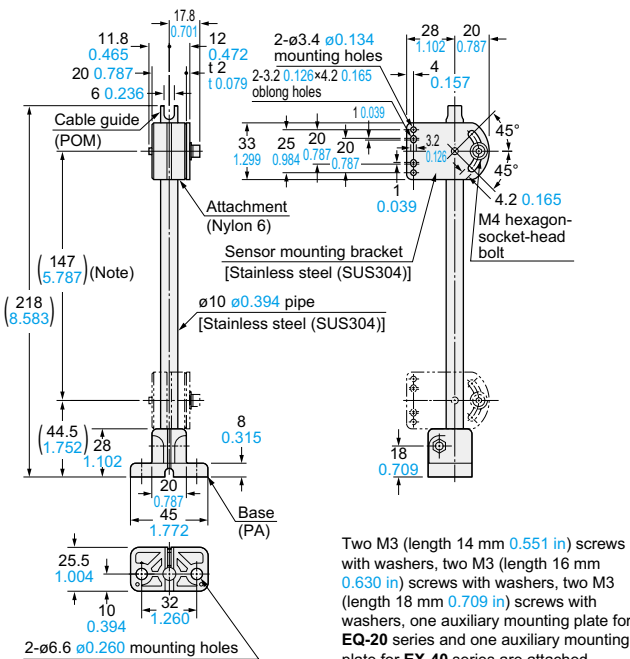
Two M4 (length 10 mm 0.394 in) screws with washers are attached.

**MS-AJ1**

**Universal sensor mounting stand (Optional)**

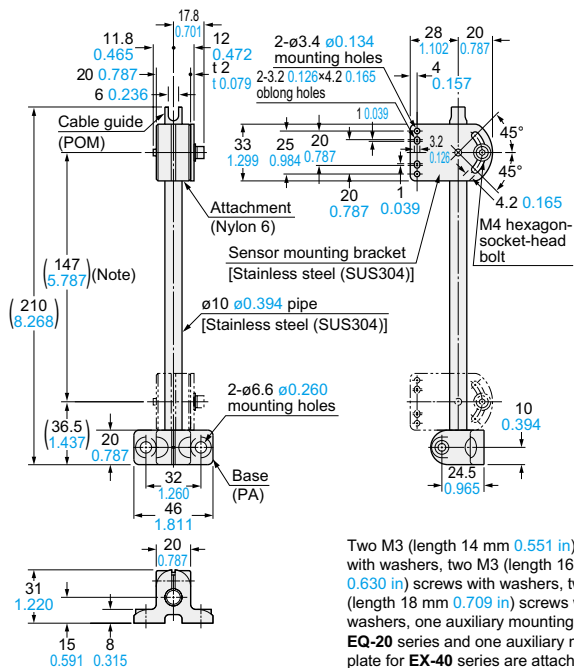
**MS-AJ2**

**Universal sensor mounting stand (Optional)**



Two M3 (length 14 mm 0.551 in) screws with washers, two M3 (length 16 mm 0.630 in) screws with washers, two M3 (length 18 mm 0.709 in) screws with washers, one auxiliary mounting plate for EQ-20 series and one auxiliary mounting plate for EX-40 series are attached.

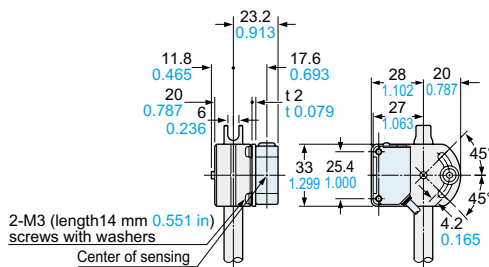
Note: The dimensions in the brackets indicate the adjustable range of the movable part.



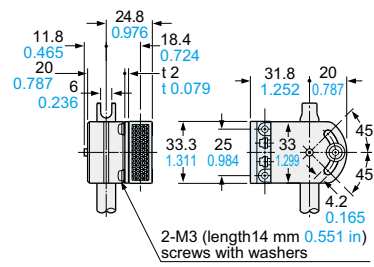
Two M3 (length 14 mm 0.551 in) screws with washers, two M3 (length 16 mm 0.630 in) screws with washers, two M3 (length 18 mm 0.709 in) screws with washers, one auxiliary mounting plate for EQ-20 series and one auxiliary mounting plate for EX-40 series are attached.

Note: The dimensions in the brackets indicate the adjustable range of the movable part.

**Assembly dimensions with CX-400 series (Mounting part only)**



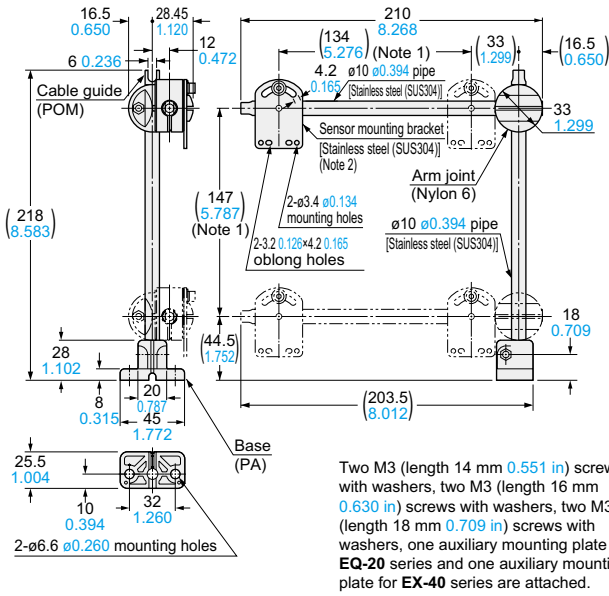
**Assembly dimensions with RF-210 (Reflector) (Mounting part only)**



# DIMENSIONS (Unit: mm in)

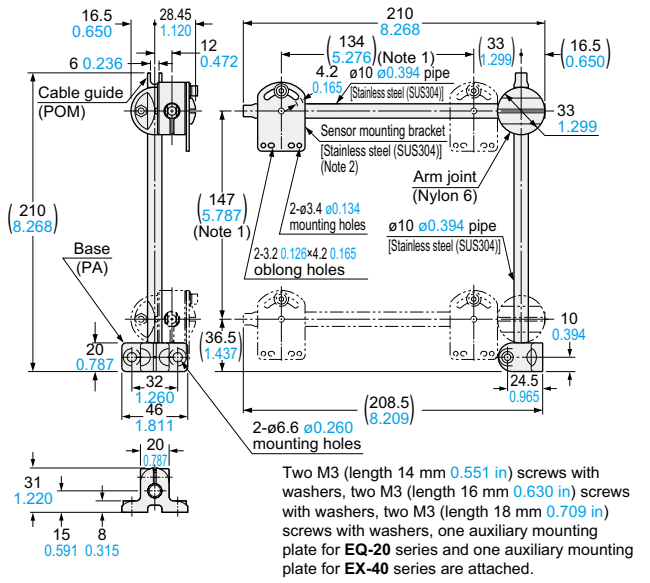
The CAD data can be downloaded from the website.

## MS-AJ1-A Universal sensor mounting stand (Optional)



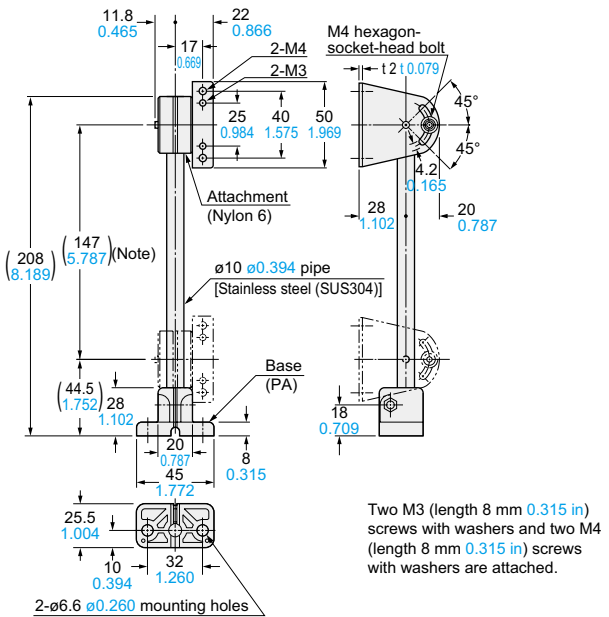
- Notes: 1) The dimensions in the brackets indicate the adjustable range of the movable part.  
 2) Refer to MS-AJ1 / MS-AJ2 for the assembly dimensions with the sensor mounting bracket, sensor or reflector.

## MS-AJ2-A Universal sensor mounting stand (Optional)



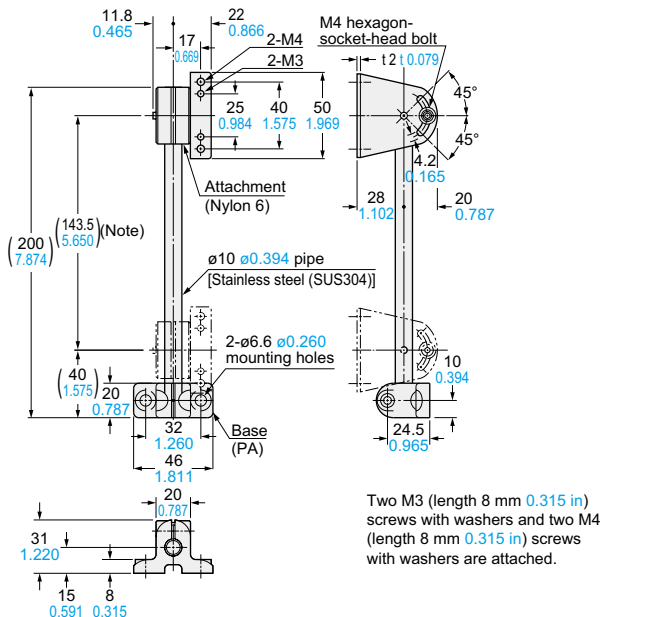
- Notes: 1) The dimensions in the brackets indicate the adjustable range of the movable part.  
 2) Refer to MS-AJ1 / MS-AJ2 for the assembly dimensions with the sensor mounting bracket, sensor or reflector.

## MS-AJ1-M Universal sensor mounting stand (Optional)



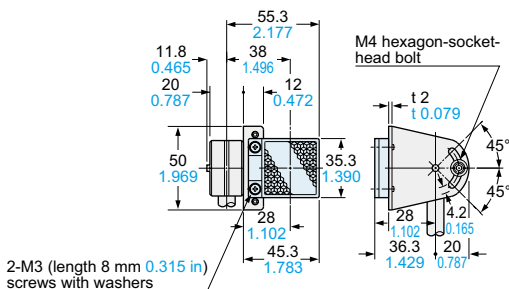
Note: The dimensions in the brackets indicate the adjustable range of the movable part.

## MS-AJ2-M Universal sensor mounting stand (Optional)

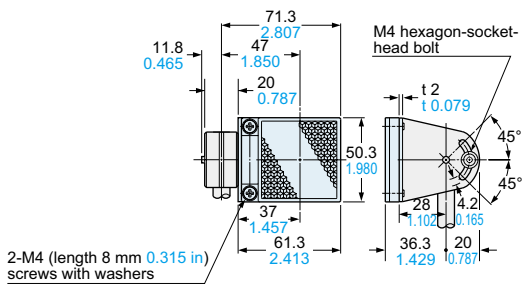


Note: The dimensions in the brackets indicate the adjustable range of the movable part.

## Assembly dimensions with RF-220 (Reflector) (Mounting part only)



## Assembly dimensions with RF-230 (Reflector) (Mounting part only)



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Please contact :

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